

Scripts and icons for the Italian (RFI) signals – version 4.7 of 01/04/2020

This zip file contains all the icons and scripts needed to simulate Italian (RFI – *Rete Ferroviaria Italiana*) signals in Traindir 3¹; they work only since version 3.9w of the program.

New features in this version

- New ‘disabled’, ‘off’ and ‘fault’ aspects for many signals, so they can be switched off depending on the block direction or to simulate faults. Only another script can set these aspects, not the player.
- All the signals can be cleared only for shunting when an ‘off’ signal follows, and cannot be cleared at all if a signal at ‘fault’ follows (i.e. off but forced clear with ctrl-click²). Only permissive signals can now be passed when off.
- New scripts to control the orientation and the occupancy of an automatic block section protected by permissive signals (concatenated or not) or by an imperative block signal: now the signals can be switched on and off depending on the direction of the block section. Controls are separate for the two possible direction of every track section.
- New scripts indicating just the direction of a block section featuring no intermediate signals: the indicator goes on when the track is locked in its direction and goes off when the train leaves the section.
- New scripts for a simple yet realistic simulation of a level crossing (LC), with or without barriers: no more need of extra hidden tracks or customized scripts, unless the LC has more than one track. The specific signals for the train clears on both sides and for all the tracks of the LC, and faults can be simulated, to the barriers, the signals or the lights seen by the cars.
- New scripts for departure dwarfs, identical to shunting dwarfs except for the flashing clear aspect, for a simpler simulation of signals that are shared between more tracks: no more need of hidden signals.
- New script for the simulation of the facing point lock status indicator: now it’s as simple as placing the off icon in the layout and assigning the script to the track element before the points.
- New ‘nd’ (not diverging) series of scripts, to simulate signals that don’t consider the switches position to show diverging aspects, but look ahead for the special `rfl_avv_dev.tds` distant or for a fake ‘K’ station.
- New direction indicator that looks two signals ahead instead of just one, to be used with the ‘nd’ series signals or whenever after the first signal other fake stations are already present for other purposes.
- New scripts for high speed lines with radio block system (ETCS level 2) with the new design (yellow arrow on a blue background or black arrow on a white background); following Paolo Gronchi’s suggestions I added the mast on one side of the signs, both to the old and to the new series.
- When departure signals with a triangle are clear, the previous signals cannot be cleared, and by setting their ‘Blocked by’ property the opposite is obtained: they cannot be cleared when the previous signals are cleared towards them (completely realistic simulation).
- All the restrictive aspects now force a speed limit: 50 for YY, 110 for Y, YG, YxGx, 150 for Yx/Gx, Yx.
- “Unclear” shunting limit and beginning of plain line signs now force shunting aspects in previous signals.
- All the signals that need to be automatic to operate correctly – for example the permissive ones – are now set so by the scripts, so there’s no more need to use the two head icon of the editor to place them in the layout. Only for the other signals the author can still choose which icon to use.
- The P under the permissive signals is now black on a white background, as it should be, to fully distinguish the signals that are always permissive (the P is a sign) from the ones that are so only at times (the P is a light pattern on a black background). The latter case now requires the use of the direction indicator just before a normal signal, which should be followed by a fake ‘P’ station.
- The behaviour of the permissive signals is now oriented to the simulation of the reversal of the direction of the block, where signals light up for the desired direction and go off for the other. That’s why the signals for the right track (the “illegal” one in Italy) are now off at the beginning of the simulation, with the exception of the two-headed ones: they remain lit so they can turn on the other ones in the layouts created with previous versions of the signal package, when the controls to switch the block direction were not available.
- The “demo” layouts are now all in a specific “Demo” folder, to be moved under the tree where the layouts are kept, for easier access.

¹ A software by Giampiero Caprino, who designed an excellent and very versatile simulator. I must thank him for all the improvements that allowed the implementation of this package, and particularly for track scripts and the new signal properties that check the direction of the track to which a signal is linked.

² At the moment the program doesn’t permit to completely prevent a signal from clearing: ctrl-click cannot be cancelled.

Obsolete scripts

The scripts implementing the previous way to simulate level crossings and to show the direction and occupancy of a block are obsolete, as stated in the comments of those scripts. They're still in the package so the layouts created with previous versions of the package will continue to work, but they shouldn't be used anymore. Macros supporting the obsolete scripts are not included in the package anymore.

Summary of the available signals

- Pure distant signals (see the glossary), with round heads, square heads or square heads with an arrow above³.
- Home signals with round heads, square heads or square heads with an arrow above³ and a rappel (speed indication, see the glossary) below. These signals are also used as exit signals for station tracks where a no stop route is allowed or the exit route is straight (see the glossary).
- Triangle exit signals with round heads, square heads or square heads with an arrow above³ and a triangle below. This means that any exit route from their station track has at least one diverging switch, so when the signal is not at red the driver must read the aspect as if another head was present on top, showing red. These signals cannot be used if a no stop route is allowed on the track they command.
- Permissive block signals with round heads, square heads or square heads with an arrow above³ and a black P below. These are automatic signals that try to clear themselves as soon as possible. They can be switched on and off depending on the direction of the block (see the direction and occupancy indicator).
- Home and block signals for radio block lines (ERTMS); block signals are permissive and switchable.
- Other signals: shunting and departure dwarfs, high shunting signals, level crossing signals, train announcement, block direction and occupancy⁴, shunting limit, bumper, direction indicator, facing point lock status.
- Templates for signals shared between more tracks, with round heads and eventually the triangle or the rappel (speed indicator): unlike the other scripts of the package, these must be adapted to the layout and distributed with it, so please read the specific chapter to learn how to use them.

All main signals (i.e. all that can stop trains) support the “Shunt” aspect for shunting: if the signal is cleared with Ctrl-click (white track), or if a speed limit lower than 30 km/h is detected before the next signal, the signal remains red, but the track turns white or green (respectively) and shunting trains can pass the signal, with shunting signals, move in, move on, route continuation indicators showing the correct aspect accordingly. Three head signals show the correct RYY aspect (“proceed by sight, as another train is on your track before the next signal”) to allow joining.

Main signals can now have the ‘off’ aspect, meaning they’re out of service, and pure distant signals will go ‘off’ or ‘disabled’ together with the signal that follows. This aspect stops trains like ‘red’, and previous signals will show “Shunt” towards it. Signals at ‘off’ can be cleared with ctrl-click to show ‘fault’: they still look off, but trains can pass them in shunting, and previous signals will go ‘red’ and stay so. On the other hand permissive signals can be passed even when disabled (they become pure distant signals), as this only means that the block is oriented in the other direction: if the line is clear the main signal before the permissive ones will clear normally even when they’re off, unless the next main signal (after the permissive ones) shows ‘off’ or ‘fault’.

To fully understand these instructions, please read the detailed description and glossary later on, as I’m not sure about the terms used in other administrations, and some features of the Italian signals could be quite unique, thus needing specific explanations for foreign players and layout designers.

Installation

Before installing the package for the first time, choose a folder for it (typically C:\Program Files\Traindir3\Signals) and set the chosen folder in the “Path to signal scripts” property of the “Environment” tab under the Edit | Preferences command of the program. If a previous version of the package is already installed, look at that property to note the current signals’ folder.

³ As square heads command to the left and round heads command to the right, the arrow (which is lit only when the signal is clear) helps distinguish which signal is the left one when two signals are placed on the same mast between two tracks, one commanding to the left and one commanding to the right.

⁴ These indicators now act also as controls to reverse the direction of the block, switching on and off the permissive signals accordingly.

Open the .zip file, select all the files and extract them in that folder; the package is compatible with the other packages of mine, so the same folder can be used for all of them and mixed layouts can be designed.

However, more and more packages will hopefully be available in the future, so it could be a good option to use a separate folder for each package (for example C:\Program Files\Traindir3\Signals_RFI for this one) and modify the property whenever the signalling system changes. Now the program knows where to look for the signals' scripts and icons, so there's no need to include them in every layout you create.

Description of the scripts

The script name for normal signals follows this scheme: "rfi" (the network manager company), underscore, signal type, underscore, number of heads, head shape, .tds extension. The script names for special signals follow their own scheme (see the following table). All the scripts have comments explaining how they work and how to use them; the package includes a Demo.trk layout showing most cases.

All the signals should be placed in the layout using the single head icon of the editor, as those that need to be automatic to work will be set so by the scripts themselves. The author can still use the two head icon for signals that are usually not automatic, if he needs them to be automatic in a particular case of his layout.

Normal signals

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| rfi_avv_**.tds | Pure distant signals (see the glossary) with 1 or 2 heads: round (N), square (Q) or square with an arrow above (F). They cannot stop trains and thus cannot show the "Stop" (red) aspect (all the aspects have 'none' as action). They must be followed by a main signal (normal or special); following distants are ignored, as according to the Italian rules only one pure distant can exist between two main signals. |
| rfi_prot_**.tds rfi_prot_*R*.tds | Home signal – or exit signal when a no stop route is allowed or at least one exit route is straight (see the glossary) – with 1, 2 or 3 heads: round (N), square (Q) or square with an arrow above (F), eventually with a rappel (R between the number and the shape of the heads – see the glossary). They can stop trains, can be followed by whatever signal (normal or special) and will not clear when followed by a clear triangle exit signal or by a signal at 'fault'. |
| rfi_part_**.tds | Triangle exit signals, used when a no stop routes are not allowed and every exit route has at least one diverging switch (see the glossary), with 1 or 2 heads: round (N), square (Q) or square with an arrow above (F) and a triangle below. They can stop trains, can be followed by whatever signal (normal or special) and will not clear when followed by a signal at 'fault'. Previous signals will not clear when these are clear and their 'Blocked by' property should be set to the first track elements leading to them, so they also will not clear when the previous signal is clear, as a no stop routes are not allowed with these signals ⁵ . |
| rfi_perm_**.tds | Permissive signals (black P under the heads), with 1 or 2 heads: round (N), square (Q) or square with an arrow on top (F); they can stop trains and can be followed by whatever signal (normal or special). They have been redesigned to be switched on and off by the block direction and occupancy indicator (see the specific paragraph), so they can be passed even when at off. When followed by another permissive, they switch on and off with it, and the signals for the right track (the 'illegal' one in Italy) are already 'disabled' at the beginning of the simulation. The two headed ones are an exception, so they can be cleared to switch on the preceding permissives in a layout made with previous versions of this package, where the controls were not available. New layouts can use the new scripts with the 'y' or the 'r' after the head type, as these signals don't really switch off, even when they are disabled: they stay at yellow ('y', old rules) or go red ('r', new rules) ⁶ . |

⁵ In Italy a triangle exit signal can be cleared only if a train is occupying the track circuit before it. This enforces the fact that exit and home signals cannot be cleared simultaneously (as no stop routes are not allowed by these signals).

⁶ Thanks to Luca Mazzucco and Francesco di Nubila for informing me about this change in the rules.

Normal signals, 'nd' series

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| <code>rfi_avv_**_nd.tds</code> <code>rfi_prot_**_nd.tds</code> <code>rfi_prot_*R*_nd.tds</code> <code>rfi_part_**_nd.tds</code> <code>rfi_perm_**_nd.tds</code> | The signals of this series work like those without '_nd' in the filename, except they don't consider the switches position to show the diverging aspects (see the glossary). They instead look for the presence of the special <code>rfi_avv_dev.tds</code> distant or of a fake 'K' station. When these signals need the direction indicator, the one that looks two signals ahead must be used (<code>rfi_ind_dir_2.tds</code>). |
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Signals for high speed lines

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| <code>rfi_prot_AV*.tds</code> <code>rfi_prot_Av*n.tds</code> | Main signals for lines equipped with radio block system (ETCS level 2), placed to the left ('s') or to the right ('d') of the track they command. They are actually signs ('n' means with the new drawing), so they don't change aspect, but they work like normal main signals, including the 'off' and 'fault' aspects. |
| <code>Rfi_perm_AV*.tds</code> <code>rfi_perm_Av*n.tds</code> | Block signals for lines equipped with radio block system (ETCS level 2), placed to the left ('s') or to the right ('d') of the track they command. They are actually signs ('n' means with the new drawing), so they don't change aspect, but they work like normal permissive signals, including the ability to be switched on and off depending on the block direction (script 'r'), using the block direction and occupancy indicator. |

Normally these signs are to be ignored by the drivers. Only in case of problems to the radio block system (lack of the proceed permission) they become meaningful, and trains cannot pass them without specific permission.

Shunting signals (dwarfs or high)

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| <code>rfi_marm_i.tds</code> | Main shunting dwarf: it's actually a main signal, as it stops trains when off or not clear, and doesn't clear if a signal at 'fault' follows; it's normally used in yards to control shunting movements. The flashing aspect is obtained by putting a fake 'X' station after it, usually to simulate the departure dwarf when the exit signal is shared between more tracks (see the specific chapter, solution 1). |
| <code>Rfi_marm_a.tds</code> | Irrelevant repeater dwarf, a distant that's just a repeater of the main signal that follows. The dwarf is clear whenever the main signal is clear (so also when it shows "Shunt"). The flashing aspect is obtained by putting a fake 'X' station after it. |
| <code>Rfi_marm_m.tds</code> | Irrelevant shunting dwarf, a distant that clears only when the main signal that follows shows "Shunt". The flashing aspect is obtained by putting a fake 'X' station after it. |
| <code>Rfi_marm_*d.tds</code> | Same as above, but to be placed to the right of the track they command. |
| <code>Rfi_sam_*.tds</code> | High shunting signal, working like the corresponding I, a, m version of the above dwarfs, but never featuring the flashing aspect. |

Shunting limit

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| <code>rfi_LM.tds</code> <code>rfi_LM_s.tds</code> <code>rfi_LM_d.tds</code> | This signal looks like and simulate the post or the sign (to the left or to the right of the track) that shunting trains cannot pass when moving towards the plain line. The post is used inside the home signals and the signs outside. They are actually main signals that stop trains, and as they cannot be limited to shunting trains, they can be cleared as any other signal (without changing their aspect), so normal trains can pass them. When they're 'unclear' previous signals show 'Shunt'. |
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Ringbell

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| <code>rfi_leopolder.tds</code> | This is a distant to be hidden before a home signal or before the train announcement <code>rfi_AT_i.tds</code> . When the signal that follows is cleared, a sound is played. The sound file (<code>leopolder.wav</code>) must be distributed with every layout that uses this script. In the real world this characteristic bell rings as long as the home signal is clear, warning all the people in the station that the home signal is clear for a train to arrive, so no shunting can occur and no manual switches can be thrown. When the ring stops the train has passed the home signal, so it's very near: all people are warned to stop crossing any track until the train has stopped or passed by. Nowadays this bell is obsolete and is being dismissed, as most switches are remotely operated and voice announcements keep warning everyone that crossing a track is always prohibited. |
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Facing point lock status

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| <code>rfi_TD_new.tds</code> | Track script to manage the icons that show the facing point lock (FPL) status of a switch. When FPL is active, the points are locked in such a strong way that a trailing point movement would force the train to derail (otherwise it would just break the switch mechanism and throw the points in the needed position). FPL is required active for every facing point movement, except when the now rare elastic switches are used. In these switches simple springs keep the points in the straight position (the only one allowing facing point movement, at very low speed) but allow trailing point movements also from the diverging track. Most of the switches are never trailable by design, but some may be locked when requested – this indicator is for them. The script should be assigned to the track element adjacent to the points of the switch, and must be adapted by inserting the coordinates of the <code>TD_off_X.xpm</code> icon, which has been directly placed in the layout near the switch, and the direction leading to the switch itself: 0 = W, 1 = E, 16 = S, 17 = |
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Train announcement (indicating that a train will soon appear in the visible part of the layout)

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| <code>rfi_AT_i.tds</code> | Special main signal to be placed immediately after a visible entry point and to be “cleared” by a trigger placed at the beginning of an auxiliary hidden track that precedes the visible entry point. The indicator goes off when the train passes it. The length of the hidden track determines how long the player will see the indicator lit before the train becomes visible. This signal is compatible with the block busy indicator for bidirectional tracks (<code>rfi_OB_bi.tds</code>), so it’s the only one suitable for single track lines, where trains enter and exit the layout from the same point, and should be the preferred one in all cases. |
| <code>rfi_AT_a.tds</code> | Special automatic signal to be linked at the beginning of an auxiliary hidden track that precedes a visible entry point. The length of the hidden track determines how long the player will see the indicator lit before the train becomes visible. The indicator lights up as soon as the train passes the signal and remains lit until the train passes the first signal after the visible entry point. If the first signal is very far from the entry point, consider placing a hidden automatic signal just after the visible entry point, to turn off the announcement as soon as the train becomes visible. This indicator works only for unidirectional tracks where trains enter the layout, so it’s suitable only for two track lines, where all trains enter from one track and exit from the other. That’s why the other indicator should always be preferred. |
| <code>rfi_AT_small_i.tds</code> <code>rfi_AT_small_a.tds</code> | Small version of the previous indicators. |

Block busy indicator (indicates that a train is still occupying the block just after a visible exit point)

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| <code>rfi_OB_bi.tds</code> | Special distant to be placed before an auxiliary hidden signal, the latter being at the end of an auxiliary hidden track that follows a visible exit point. The indicator lights up when the auxiliary signal is cleared by a trigger placed just before the visible exit point, and goes off when the train passes the auxiliary signal. This signal is compatible with the Train Announcement indicator for bidirectional tracks (<code>rfi_AT_i.tds</code>), so it’s the only one suitable for single track lines, where trains enter and exit the layout from the same track. |
| <code>rfi_OB_auto.tds</code> | Special automatic signal to be linked at the beginning of an auxiliary hidden track that follows a visible exit point. The indicator lights up when the train passes the signal, and goes off when the train actually leaves the layout from the hidden track. When the indicator is lit the previous signal will show “Prepare to stop”, otherwise it will show “Clear”. This indicator works only for unidirectional tracks where trains leave the layout, so it’s suitable only for two track lines, where all trains enter from one track and exit from the other. |
| <code>rfi_OB_a_small.tds</code> <code>rfi_OB_b_small.tds</code> | Small version of the previous indicators. |

Block direction and occupancy indicator

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| rfi_ind_blocco.tds | <p>This indicator refers to one direction of a bidirectional track, and must be assigned to a signal linked to a hidden track in the desired direction. As it works together with the signals protecting the block in the indicator's direction (one or more permissive signals, or just main block protection signal⁷), a copy of this script must be adapted and distributed with the layout. When possible, the player can click on the indicator to switch off or on the signals that protect the block section in the direction of the indicator. Controls are separate for the two directions of the controlled section, so the player will first switch off the signals in the current direction and then switch on the signals for the opposite one. The player can manually unclear all the signals of a direction, and the indicator will detect and show the result of this action. If a train reverses its movement while in the section, these indicators will show the correct aspect only after that train passes a signal in the new direction.</p> <p>Aspects:</p> <p><i>disabled</i> (black arrow): all the controlled signals are off, and the indicator can be clicked to switch them on (if no trains are in the section, they will also clear themselves);</p> <p><i>free</i> (grey arrow): all the controlled signals are lit and red; the indicator can be clicked to switch them off;</p> <p><i>oriented</i> (white arrow): all the controlled signals are lit and at least one is clear (the direction is locked, but no train is arriving); the indicator can still be clicked to switch them off;</p> <p><i>locked</i> (white arrow): a signal before the block is clear towards it, so the block cannot be reversed, but the controlled signals could already be off.</p> <p><i>busy</i> (orange arrow): at least one train is in the section, so the block cannot be reversed, but the controlled signals could already be off.</p> <p>How it works:</p> <p>Each copy of the script (one for each direction to control) must be adapted by inserting the names or coordinates of the controlled signals and of three important track elements:</p> <p>IN: the first track element of the section; when it's reserved (coloured) in the direction of the indicator the latter shows 'locked' and when a train passes it to enter the section the indicator shows 'busy'. To obtain this a script must also be assigned to this element: <code>rfi_sig_up_on_enter.tds</code>.</p> <p>IB: the track element before the first controlled permissive signal of the section in the direction of the indicator (if no such signals are present, it's ignored); it acts like FB (see below) when the controlled signals are off and doesn't require any script.</p> <p>FB: the track element before the first main signal after the block (usually a home signal); the block can be reversed again only after the last train leaves the section from this element. To obtain this a script must also be assigned to this element: <code>rfi_sig_up_on_enter.tds</code> if the controlled signals are permissive, or <code>rfi_sig_up_ib.tds</code> if the controlled signal is just the main block protection one.</p> <p>The presence of a train beyond a signal is detected by the signal being red with the automation enabled, as the automation is disabled when the player unclears the signal and the script reenables it whenever the signal is cleared. The script assigned to FB disables the automation of the main block protection signal, which should not be permissive, just before it would clear again by itself.</p> |
| rfi_DB.tds | <p>Direction indicator for a section with no intermediate signals, not showing its occupancy; it's a distant to be linked to the last track element of the section. It lights up when that element is reserved in the direction of the indicator and goes off when the train leaves the section through that element. To obtain this a script must also be assigned to that element: <code>rfi_sig_up_on_exit.tds</code>.</p> |

⁷ All cases, including ERTMS signals, are illustrated in the demonstration `Demo.trk` layout.

All the ‘update’ scripts quoted in the above table need a signal named ‘UPDATE’ to be hidden somewhere in the layout, otherwise they won’t work.

The other scripts related to the block direction and occupancy indicator (`rfi_DB_avv.tds`, `rfi_DB_bi.tds`, `rfi_DB_s.tds`, `tl_n_DB_s.tds`) are outdated, as stated in their comments. They’re still included in the package, so the layouts made with previous versions of the package will continue to work, but they should not be used anymore. Macros supporting these obsolete scripts are not included in the package anymore.

Level crossing signals

The now fully realistic simulation of a level crossing (LC) requires at least the first signal of the sequence, for each direction of each track that is crossed by a road. If in any direction normal signals are near enough to the LC, the other signals of the sequence are not required, as the normal signals will themselves protect the PL and trigger its closure.

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| <code>fi_avv_PL_cb.tds</code> <code>rfi_avv_PL_sb.tds</code> | First signal of the sequence (eventually hidden): it shows the barriers (cb) or the lights for the cars (sb) and sets the level crossing status (open or closed) for the other signals, by looking at the colour of the track elements near the road (typically a platform element); the script <code>sig_up_on_exit.tds</code> must be assigned to these elements, which must be of length 1. Use one of these signals for each track direction that features the other signals of the sequence. If the LC has more than one track, a signal is needed for each direction of each track, and all of them will be an adapted copy of the script to be distributed with the layout, because each script needs to know the coordinates of the control elements of the other tracks to which the adapted scripts themselves are assigned. This way the other signals of the sequence will clear all together when one of the control elements is coloured, and unclear all together when the last train leaves the LC, as it happens in the real world. Other scripts can force the ‘fault’ aspect in these signals, to simulate a fault to the barriers or to the lights for the cars, and the aspect of the other signals will take this into account. |
| <code>rfi_prot_PL_i.tds</code> <code>rfi_prot_PL_s.tds</code> | Second signal of the sequence (use the ‘i’ or ‘s’ type if the first signal is of type ‘cb’ or ‘sb’ respectively): it’s the signal dedicated to protecting LCs, where the train should stop if the barriers are still open or the lights for the cars are still off. A trigger should clear this signal in advance, so it will colour the track elements near the road and “close” the barriers or switch on the lights for the cars, allowing the signal to show the “Clear” aspect. If this or the first signal are forced to ‘fault’ (this can be done by another script for each direction independently – see the demonstration <code>Demo.trk</code> layout), this signal will show “Unclear”, but the train will pass it at 10 km/h, to simulate the “proceed at man’s speed while crossing the road” that this aspect means. The line speed limits must be set again before this signal, so the trains that have passed the LC can accelerate again. |
| <code>rfi_avv_PL.tds</code> <code>rfi_avv_PL_i.tds</code> | Third and last signal of the sequence (to be hidden if the second signal is of type ‘s’): it’s the distant to be placed before the second signal, and determines the aspect of the normal signals preceding it. Usually they will ‘see’ a clear line even when the LC protection signal is unclear, but using the type ‘i’ script they will instead ‘see’ the “Unclear” aspect of the LC protection signal and show “Prepare to stop” accordingly. |
| <code>rfi*_PL_big*.tds</code> | Bigger version of the signals described above. |

The other scripts related to level crossings (`rfi_prot_PL_b.tds`, `rfi_prot_PL_a.tds`, `rfi_PL_i.tds`, `rfi_PL_a.tds`) are outdated, as stated in their comments. They’re still included in the package, so the layouts made with previous versions of the package will continue to work, but they should not be used anymore. Macros supporting these obsolete scripts are not included in the package anymore.

Departure repeater

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| <code>rfi_ind_part.tds</code> | Departure indicator, to be used as a distant of the exit signal when the latter is far from the platform point where the trains stop (warning: there cannot be any switch between this signal and the exit signal it repeats). The indicator is lit when the exit signal is not off and not red (i.e. neither at “Stop” nor at “Shunt”). |
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Bumper

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| <code>rfi_tronc.tds</code> | This always red signal (mark the specific option in the properties) looks like a bumper. It should be linked to the last track element of an exit point to block the trains, that would otherwise exit the layout. Previous signals will show the correct aspect (“Prepare to stop”). |
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Special signals to be placed before and adjacent to a main signal.

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|--|--|
| <code>rfi_avanz.tds</code> <code>rfi_avvio.tds</code> | “Move in” and “Move on” indicators, mounted under the heads of a home or exit signal (respectively) to indicate that the train can respectively enter or leave the station even if the signal cannot be set to a clear aspect. In Traindir they are distants, working as shunting indicators: they light up (in white and light blue respectively) when the main signal is clear for shunting (i.e. red but passable). They flash if the signal after the main one is off. If the main signal features also the direction indicator (see below), the latter should be placed between this indicator and the main signal itself. |
| <code>rfi_ind_dir.tds</code> | Direction indicator, actually a distant to be placed adjacent to a main signal. To activate the indicator, put a fake station in each branch after the main signal, named after the number you want to appear when the main signal is clear towards that branch ⁸ (‘zero’ for 0, ‘one’ for 1, and so on). If no such stations are found in the route after the main signal, the indicator will stay off. The indicator can show also the letters A, D, P, ^ (these are lit also when the signal is red) to be combined with the home and the exit signal on the straight route track of a station when the station is disabled and unmanned (insert a fake station named A, D, P, V respectively). See the glossary for details. When used with a signal that is shared between more tracks (see the specific chapter, solution 2), a copy of this script must be customized, by inserting the name or the coordinates of the shared signal, and distributed with the layout. |
| <code>rfi_ind_dir_2.tds</code> | This version of the indicator (see above) ‘looks’ two signals ahead instead of one, for the cases when there is already a fake station after the first signal, for other purposes (for example the fake ‘K’ station used with the ‘nd’ signal series). |

Special signals to be used as hidden distants

These distants can be combined, provided they encountered by trains in the order they are listed here.

| | |
|--------------------------------|---|
| <code>rfi_avv_dev.tds</code> | Force diverging aspects: hid this signal after a main signal if you want it to show diverging aspects even if all the switches along the route are straight. No switches can appear between this signal and the next, but the other special distants may follow, or just a normal one. It is typically used in bigger stations, to slow down also the straight route track without needing to slow down the line speed, or with the ‘nd’ signal series. |
| <code>rfi_avv_part.tds</code> | Block no stop routes: hid this signal before a main signal and previous signals will not clear when that main is clear. It’s used when the exit signal is normal but no stop routes aren’t allowed. Exit signals with the triangle don’t need this distant anymore. The ‘Blocked by’ property of the main signal that follows should be set to the first track elements leading to it, so it won’t clear when the previous signal is clear towards it. No normal distants can precede or follow this signal. |
| <code>rfi_avv_tronc.tds</code> | Very short block: place this distant after a main signal to force it at YY or RYY (“Prepare to stop at next signal, which is nearer than 600 m”) even when the distance to the next unclear signal (or bumper) is more than 600 m. When the next signal is clear the actual distance will be considered, as usual. It’s typically used in head stations, to indicate that the train will be received in a set of shorter tracks, even if they are actually longer than 600 m. Normal distants can appear only before this signal. |

⁸ Counting the branches from left to right; 0 is used for “dead” or special branches like yards, depots, etc.

Signals shared between more tracks

In Traindir a signal can command only one track, so the simulation of a signal commanding more tracks (being clear for only one of them at a time) requires some tricks, explained in the two solutions that follow. The first solution doesn't require to modify the scripts, but it works only in one case – the most common, but not the only one – while the second solution works in all cases, but requires to adapt the scripts to the specific layout and to distribute the adapted scripts with it.

In the real world the signals shared between more tracks have always round heads, and if a no stop route is allowed on one of the commanded tracks – typically the straight one – the signal is placed near it, as if it were dedicated to that track.

Solution 1: standard signals without modification.

This solution is shown in the right part of the demonstration layout `Demo_comune.trk` that's included in the package; it works only if all the paths from the commanded tracks have diverging switches, all at the same speed, and at least one of that switches is after the shared signal. In this case the shared signal, placed immediately after the confluence of the commanded tracks, can be the same exit signal with triangle that would be used for each track. On each track the dedicated exit signal will be just a commanding dwarf (`rfi_marm_i.tds`), followed by an 'X' fake station to activate the flashing aspect that indeed indicates the track for which the shared signal that follows is clear. As the shared signal should clear only together with one of the dwarfs, please consider the use of concatenated itineraries and/or setting the "Intermediate" property of the shared signal. The dwarfs should be blocked as the triangle exit signals and should be preceded by the hidden distant `rfi_avv_part.tds`, so previous signals won't clear when they are clear.

Solution 2: specific signals adapted to the layout

This solution is shown in the left part of the demonstration layout `Demo_comune.trk`.

| | |
|--|--|
| <code>rfi_prot_com_**.tds</code> <code>rfi_part_com_**.tds</code> | Departure dwarfs to be used – one for each track – with signals shared between more tracks (see below); these signals look like dwarfs, so the type of head is 'S' or 'D' if the signal is to the left or to the right of the commanded track, but for previous signals they simulate the aspects of the normal signal with the same name. The shared signal that follows will replicate the aspect of the signal with the flashing aspect that is clear towards it. They can be forced at 'off' or 'fault' like the signals they simulate, but the shared signal will go 'off' only when all the replicated signals show 'off' or 'fault'. |
| <code>rfi_com_**.tds</code> | Templates for signals shared between more tracks, with 1, 2 or 3 round heads (N), eventually with a triangle (T) or a rappel (R between the number and the shape of the heads – see the glossary). For each set of tracks that shares this signal, a copy of the script must be adapted to the layout and distributed with it, as in order to replicate the departure dwarf that is clear (see above), the coordinates of all of them must be inserted in the script. The adapted script must be assigned to an isolated track element, and the template to use depends on the combination of departure dwarfs that is used, as explained in the comments at the beginning of each script. These templates are designed for 4 tracks; the comment in the script explains what to do if they're less or more. |

If the shared signal features the direction indicator (`rfi_ind_dir.tds`), a copy of its script needs to be adapted and distributed with the layout. There are four points in it where you need to move # at the beginning of the next line and to replace `sc` with the coordinates of the shared signal to which the indicator is adjacent. The indicator must be linked to a track element after the confluence of the tracks that share the signal, so it can "see" all the branches it should indicate (see the example layout `Demo_comune.trk`).

Important Notes

For the signals to be correctly initialized, they must be placed in the layout in the order the train sees, and those that depend on other signals should be placed in the layout before them. It's therefore advisable to draw the tracks, then place all the signals following the above rules and finally save the layout. Afterwards the author will proceed to assign the scripts and even to move the signals, if corrections to the layout are needed, as it's the order of the first placement that counts.

If the above rules are not obeyed, the aspect of the signals at the beginning of the simulation may not be correct, until at least one signal is updated, **and the program performance will be worse**, as a bigger number of updating cycles will be needed to reach a stable combination of aspects.

The signals that need to be automatic to work will be set so by their scripts, so there's no need to use the two head icon of the editor to place them. Other signal can still be made automatic using the two head icon of the editor to place them, in case it's needed by the peculiarity of the layout. At the beginning of the simulation the "Set sig. to green" menu command activates the automation and clears all the automatic signals.

This feature can be temporarily disabled by right-clicking an automatic signal when clear (so it will remain unleared after the next train passes it), or by explicitly unclearing it. This feature can later be activated again by clearing and then right-clicking the signal⁹. Unfortunately, there is no way to know if a scripted signal is automatic and if the feature is active at the moment, as its aspects are overridden by the script.

Many new scripts determine their aspect by comparing their direction with the one in which their track element has been reserved (coloured in green or white). For historic reasons only the four "straight" directions are consistent, (0 = W, 1 = E, 16 = S, 17 = N) so **the these signals must be assigned only to horizontal or vertical track elements, and never to curved or diagonal ones.**

Track scripts

The signal package now features some scripts that are to be assigned to track elements; some are needed by some signals or indicators, but others may be just useful on their own. All are listed here for convenience¹⁰.

| | |
|-------------------------|---|
| rfi_TD_new.tds | See "Facing point lock status" above. |
| rfi_sig_up_ib.tds | This script is used to simulate the block reversal operation (see glossary) when just the main block protection signal is present for the 'illegal' direction (see glossary). It should be assigned to the last track element before the first non permissive signal, at the end of the simulated block. |
| rfi_sig_up_on_busy.tds | This script is used to update the aspects of the signals when the track element to which it's assigned is reserved (coloured) for a train to pass. |
| rfi_sig_up_on_free.tds | This script is used to update the aspects of the signals when the track element to which it's assigned is now free (black). |
| rfi_sig_up_on_enter.tds | This script is used to update the aspects of the signals when a train enters the track element to which the script is assigned. |
| rfi_sig_up_on_exit.tds | This script is used to update the aspects of the signals when a train leaves the track element to which the scripts is assigned. |
| rfi_spegni_sbarre.tds | This script is used to simulate a fault in the barriers or the lights of a level crossing, by replacing S1 with their coordinates. The script should be assigned to an icon or an isolated track element acting as a button: a click on it will "damage" the barriers or lights (forcing their aspect to 'fault') and another click will "repair" them, setting the aspect corresponding to their current status. |
| rfi_spegni_nperm.tds | This script is used to simulate a fault in a non permissive signal, by replacing S1 with its name or coordinates. The script should be assigned to an icon or an isolated track element acting as a button: a click on it will disable the signal (forcing its aspect to 'off') and another click will enable it again, setting its aspect to 'red'. |
| rfi_spegni_nperm.tds | This script is used to switch off and on a permissive signal, by replacing S1 with its name or coordinates. The script should be assigned to an icon or an isolated track element acting as a button: a click on it will switch the signal off (forcing its aspect to 'disabled') and another click will switch it on again, setting its aspect to 'red' and then trying to clear it. |

⁹ The script itself will enebale the automation again for the signals that need to be automatic to work.

¹⁰ All these scripts, except rfi_TD_new.tds, require a signal named 'UPDATE' to be hidden somewhere in the layout.

Icon naming

This is the naming convention for the icons: two uppercase letters telling the icon type, underscore, lowercase letters describing the aspect (colour sequence, position, size, etc.), underscore, one uppercase letter indicating the direction, .xpm extension.

Types

| | |
|-------------|--|
| AT: | Train Announcement |
| OB: | Block Occupancy |
| BL, DB | Block Direction (and occupancy) |
| ID: | Direction Indicator (from 0 to 9) or the letters P, A, D, ^ for unmanned stations |
| TD: | Facing Point Lock Status indicator |
| PL: | Level Crossing gates position, sign or lights for LCs without gates |
| LQ, LT: | Special signals for protecting level crossings, with square or triangular head |
| LM: | Post or sign indicating the shunting limit or the beginning of the plain line |
| MA, MF: | Shunting dwarf, commanding to the right or to the left |
| SM: | High shunting signal |
| TR: | Dead End, special fake signal to prevent trains from exiting the layout |
| PN, PQ, PF: | Permissive signals (white sign with a black P) with round heads, square heads or square heads with an arrow above |
| NN, NQ, NF: | Normal signals, with round heads, square heads or square heads with an arrow above |
| RN, RQ, RF: | Signals with a rappel (speed indication) under the heads, with round heads, square heads or square heads with an arrow above |
| TN, TQ, TF: | Triangle exit signals with round heads, square heads or square heads with an arrow above |
| AV | “Move in” or “Move on” signal (see glossary) or signals for ERTMS lines |

Aspects

| | |
|--------------------------------|---|
| b,r,y,g: | Colours: black (off), red, yellow, green – one letter per head starting from the top. |
| –, =, +: | After the colours, indicates what’s lit: the rappel (one or two lines), the arrow, or just the P. |
| on, off, b,a, r,w,c: | On, off or colours for auxiliary signals: black (off), orange, red, white, cyan. |
| , –, _, !, =: | Gates position (open, closed) or shunting signal aspects: vertical line, horizontal line, off. |
| big, sml: | Size (for level crossing, train announcement and block busy indicators). |
| P,A,D,V, off, zero ... nine | Letters, off, numbers, for the direction indicator. |

Orientation

| | |
|------------|---|
| N,S,W,E,X: | Icon is oriented for trains going up, down, to the left, to the right, or in any direction. |
|------------|---|

GLOSSARY

The Italian equivalent is in *italic*

Legal track (*binario legale*)

Looking along the line in one direction, the left track of a two track line that is not fully reversible, because it doesn't feature all the necessary signals in both directions (in Italy trains travel on the left). On these lines intermediate permissive signals are installed only along this track.

Left track (*binario di sinistra*)

Looking along the line in one direction, the left track of a two track line that is fully reversible, as it features all the signals in both directions. On these lines intermediate permissive signals are installed along both tracks¹¹, so the CTC can send trains on both tracks indifferently, reversing the block as needed, with the driver that just follows the signals and the switches.


Illegal track (*binario legale*)

Looking along the line in one direction, the right track of a two track line that is not fully reversible, because it doesn't feature all the necessary signals in both directions. Specific authorizations must be given to the driver before he can travel on this track, otherwise it's illegal to do so. Usually just one main block signal (see later) protects the whole line section in this direction, and it's normally off. Sometimes no signal is present at all.

Right track (*binario di destra*)

Looking along the line in one direction, the right track of a two track line that is fully reversible, as it features all the signals in both directions. On these lines intermediate permissive signals are installed along both tracks¹¹, so the CTC can send trains on both tracks indifferently, reversing the block as needed, with the driver that just follows the signals and the switches.

Round / square head (*vela tonda / quadra*)

In Italy each light of a signal has its own head, which is black with a white border; heads have a round or square shape depending on whether the signal is placed to the left or to the right of the track they protect. When two signals are placed together between two tracks the square headed one features a white diagonal arrow () in a black panel above mounted above the heads. The arrow is lit when the signal is clear, so the driver can better distinguish from a distance to which track the clear aspect refers.

Main signal (*segnale imperativo*)

A signal that can show aspects that stop trains, for example the 'red' ("Stop"¹²) or the new 'off' ("Unlit") one; most of the signals are of this type.

Pure / Combined main signal (*segnale imperativo puro / segnale con avviso accoppiato*)

Pure main signals don't tell anything about the next signal aspect (they can only show "Stop", "Clear" or "Diverging clear"- R, G or RG). Nowadays the main lines feature concatenated block signalling, so most of the signals are "combined", i.e. they act also as distant of the next, showing many more aspects. The only pure main signals remaining are exit signals protecting single track lines or home signals protecting single track junctions. Pure main signals must be followed by pure distants, which have a different mast colouring, so main signals are qualified as pure or combined only when necessary, otherwise they're just main signals.

Permissive signal (*segnale permissivo*)

A particular main signal that in the real world can be passed even when at "Stop" (usually after stopping and waiting for some time, but without being told by someone else). Signals that are always permissive feature a white sign with a black P on the mast, while a white P may light up under the heads of other signals when they are permissive only at times. Block signals (see later) are the typical example of this kind of signals.

¹¹ These signals are lit only for the current direction of each track, i.e. usually lit on the left one and off on the right one.

¹² Real aspects names have a capital letter, Traindir aspects names are all lowercase, both are quoted.

Distant signal (*segnale di avviso*)

A signal that can tell something about the next signal aspect. All main signals that can show restrictive aspects (requiring a stop or a speed reduction) must be preceded by a distant warning about those aspects in advance. Nowadays most of the distant signals are combined with the preceding main signal (see also Pure / Combined main signal), but pure distant signals (see below) still exist, usually on single track lines.

Pure distant (*segnale di avviso puro*)

This signal cannot stop trains, so it cannot show any “Stop” aspect, but it gives just some information about the next signal aspect. In Traindir this signal has no effect on trains and track reservation, as all of its aspects have *none* as action, so many special and “fake” signals are of this type. In the real world the most of these signals and the signs announcing them are coloured in a unique way, so the drivers know that even if unlit (faulty) these signals don’t require an emergency stop.

Normal signals (*segnali normali*)

In Traindir, signals that represent and simulate real world signals.

Special signals (*segnali speciali*)

In Traindir, signals used to simulate other objects, like level crossings, dead ends, block status, etc.

Auxiliary signals (*segnali ausiliari*)

In Traindir, signals that represent and simulate indicators, signs, etc. that in the real world are combined with the heads in a single signal, but in Traindir need a separate “signal” object.

Home signal (*segnale di protezione*)

The signal that protects a station, a junction or a level crossing. Bigger stations can have more than one such signal along the entering route (each one acting also as distant of the next).

Exit signal (*segnale di partenza*)

The signal that protects the line and allows a train to leave a station. Bigger stations can have more than one such signal along the exiting route (each one acting also as distant of the next).

Triangle exit signal (*segnale di partenza con triangolo*)

When an exit signal can show only diverging aspects (see later), all enforcing the same speed, and a no stop route is not allowed, a white triangle with a black border is mounted under the heads to tell the enforced speed (30 km/h if empty, 60 km/h if “60” is written in it), and the topmost head at red must be imagined by the driver when the signal is clear, as it will show a normal aspect, thus saving the installation of a topmost head that would always be red. The diverging speed must be kept until the last car has passed the last switch of the station, or until the next signal is reached, or until the “beginning of plain line” sign is reached, whichever occurs first. As non stop routes are not allowed by these signals, they can be cleared only when the track circuit just before them is shorted by a train, which therefore is forced to stop.

Block signal (*segnale di blocco*)

Intermediate signal that protects just a track section of the line, in one direction. It’s usually permissive (see above), completely automatic and concatenated with the next, i.e. each of these signals acts also as distant of the next. Only on high speed or low capacity lines, where block sections are longer, they are not concatenated and each one is preceded by a pure distant. These signals are lit only when their track is used in their direction, otherwise they’re unlit¹³. A block reversal operation (see later) is needed to change the direction along which the signals are lit.

¹³ The only exception is the last one along the line, which is usually the distant of the home signal of the next station. Home signals are always lit, so their distant signals must also be lit.

Main block signal (*segnale imperativo di blocco*)

Main signal that protects a section of the ‘illegal’ track (see above) of a line that is not fully reversible. As this direction is used only when a problem occurs on the ‘legal’ track (see above), no other signals are installed along the track in this direction. This signal is placed to the right of the track immediately after the last switch of the station, so it has just one square head. Being a special block signal (see above) it’s unlit when not in use.

Block reversal (*inversione del blocco*)

The operation required to change the direction in which the trains travel along a track. The operation switches the signals off in the current direction and on in the opposite¹⁴, so the whole section must be free of trains at that time. This operation is possible only if at least the main block signal is present for the new direction.

Departure indicator (*indicatore di partenza*)

This signal consists in a matt white vertical rectangular screen with two vertical lights behind it. The indicator is lit when the exit signal that follows, which is not visible from the platform point where trains stop, is clear. In Traindir a flashing aspect is also implemented, used when the signal after the exit signal is unlit.

Straight route (*corretto tracciato*)

The route in a station/junction that is usually the continuation of the plain/main line and so has no switches in the diverging position. In disabled unmanned stations (e.g. by night) this route is permanently locked in the switches, so the home and exit signals can become permissive (a P is lit under their heads) and clear themselves automatically as soon as possible. Normal signal aspects tell the driver that his train will travel along this route. Actually, any route that doesn’t require a speed lower than line speed is “straight”.

Diverging route (*tracciato deviato*)

Any route that has at least one switch in the diverging position, thus requiring a speed reduction (to 30, 60 or 100 km/h, depending on the switch geometry¹⁵) and specific signal aspects (see later) if line speed is higher than the requested speed.

Normal (signal) aspects (*aspetti normali*)

All clear aspects when the topmost head is not red and no triangle is present under the heads. No speed reduction is specifically enforced (preparing to stop or to reduce speed by the next signal is left to the driver¹⁶), as the train will follow the straight route (see above).

Diverging (signal) aspects (*aspetti in deviata*)

All clear aspects when the topmost head is red or when a triangle is present under the heads (the rest of the aspect is and means the same as a normal aspect). They indicate that the train will follow a diverging route requiring a speed reduction (to which speed is told by the distant, and eventually “reminded” by the rappel that is mounted under the heads). If no rappel is present and the distant didn’t give any speed indication – the next signal being not clear yet – a reduction to 30 km/h is implied. Actually, “diverging” means “requiring to slow down to a speed lower than line speed”: if line speed is not higher than the one required by the switch geometry for the diverging route, normal aspects are used also for that route, and only the direction indicator (see later) will tell the driver the route he’ll travel.

¹⁴ In Traindir the two switch operations require two separate clicks on the block direction and occupancy indicators.

¹⁵ In curved or Y switches, both branches can be “straight” or “diverging”, depending on the possibility to travel at line speed or not. In Traindir Y switches are “straight” on both branches.

¹⁶ In Traindir Y restrictive distant aspects now enforce a speed reduction: 50 km/h for YY, 110 km/h for Y, YG, YxGx, 150 km/h for Yx/Gx, Yx.

Signal aspects (*aspetti dei segnali*) for main and distant signals:

| Normal | Diverging ¹⁷ | Meaning |
|-------------------|-------------------------|--|
| R | R | “Stop”. Call the CTC operator to ask what to do; if it’s not possible and the signal is not permissive, just wait until the aspect changes or someone arrives to tell what to do. If permissive, wait for 3 minutes and then proceed by sight (max 30 km/h) until the next signal is seen. |
| Y | RY | “Prepare to stop”. Line is clear (at a speed depending on the braked mass, or at the diverging speed), but next signal is at “Stop” or at “Prepare to stop within short distance” or at “Prepare to stop by sight”. |
| YY | Not allowed | “Prepare to stop within short distance”. Line is clear at low speed (the previous Y or RY made the driver prepare to stop) but next signal is at “Stop” or at “Prepare to stop by sight” and is nearer than 600 m. |
| RYY ¹⁸ | RYY | “Prepare to stop by sight”. The line is not clear, as the route goes towards a short or already occupied track (this aspect is used to join trains or to occupy the same station track with two short trains). |
| YG | RYG | “Prepare to slow”. Line is clear (at a speed depending on the braked mass, or at the diverging speed), but next signal shows a diverging aspect requiring a speed reduction to: - 30 km/h if the Y and G lights are fixed (YG) - 60 km/h if the Y and G lights flash together (Y _x G _x) - 100 km/h if the Y and G lights flash alternately (Y _x /G _x) Please note that the announced speed may be higher than the one enforced by this signal (if diverging), but it’s always lower than line speed. |
| Y _x | RY _x | “Warning”. Line is clear (at a speed depending on the braked mass, or at the diverging speed), but the next signal shows “Prepare to stop” or “Prepare to slow” and it’s nearer than 1200 m (standard braking distance) to the next. |
| G | RG | “Clear”: line is clear at full or diverging speed. No info is given about the next signal aspect, as the driver can safely wait to see it before taking any action. |

R, Y, G = Red, Yellow, Green; the subscript _x means flashing.

Rappel (*rappel*)

A speed reminding indicator placed under the lower head of a main signal that can show diverging aspects, to be considered only when such an aspect is shown: two horizontal white lines mean reduction to 100 km/h, one horizontal white line means reduction to 60 km/h, unlit means reduction to 30 km/h. When no rappel is present the reduction is to 30 km/h, unless the distant indicated another speed, so this indicator is used when it’s very likely that the distant cannot indicate any speed to the train, because the following signal is not clear yet.

“Move in” / “Move on” indicators (*segnale di avanzamento / segnale di avvio*)

These indicators consists in two horizontal lights that are placed under the heads of a home signal (white lights) or an exit signal (cyan lights) respectively. The indicator is manually lit by the CTC operator when the signal cannot be cleared (for example due to a faulty switch position detector), but the operator has checked that the line is clear, so the signal can be passed at shunting speed even if unclear. If the lights flash (together), the driver must proceed very slowly, as he/she has to check the position of the switches for the expected route¹⁹. In Traindir the fixed lit aspect is used when the signal is clear only for shunting, while the flashing aspect is used when the next signal is unlit.

¹⁷ See above for further details.

¹⁸ This is the only “diverging” aspect used also on the straight route, due to a modification of the rules. In the past the YY and RYY aspects were “regular” and meant “Prepare to stop by sight” (track may end or be occupied, or the next red signal is nearer than 600 m), for the straight or the diverging route respectively, and YG preceded RYY, like any other diverging aspect. Now both YY and RYY are always preceded by a Y or RY (and RYY may be preceded by YY or RYY if it’s at less then 600 m from the previous signal, as if it were R).

¹⁹ If the CTC operator is unsure of a switch position on the panel, but he can be sure by sight that it’s correct, he will bypass the control and light up this indicator in the fixed aspect (no bypass ever allows to clear the normal signal). If he is uncertain of the position of a switch he cannot see, he can bypass the control, light up this indicator in the

Direction indicators (*indicatori di direzione*)

These indicators consist of a set of light dots mounted on a black rectangular plate under the signal heads. When lit they show a number, telling the driver which route he will travel. It's up to the driver to check that the route is correct for his train and eventually stop immediately if the route is wrong (even if the signal is clear). Possible routes are counted from left (1) to right and 0 (simulated) or numbers above 9 (not simulated) are sometimes used for special routes towards yards, depots, dead ends, etc.

Indicator aspects (*aspetti degli indicatori*)

Full list of what may appear under the signal heads, in the same way as the rappel or the direction indicators:

1-9 Number indicating the direction (see "Direction indicator" above) the train will travel.

– "Rappel" at 60 km/h (see "Rappel" above).

= "Rappel" at 100 km/h (see "Rappel" above). This speed is not allowed with the RY aspect.

P The signal is now permissive: if red, wait for 3 minutes and then proceed at shunting speed (max 30 km/h) until the next signal is seen. In Traindir the red aspect means always "Stop", so it's up to the player shunting the train and opening the signal with ctrl-click to have it passed at red.

A "Advance" (may appear under block and exit signals only): line is clear. If the signal is red a control signal is missing, preventing the signal to clear normally, but the driver can pass the signal by sight even if the signal is red. If the "A" is flashing (not simulated) the driver has to check the position of the switches and eventually stop and throw them before proceeding. When the signal is red the "A" means the same as the "Move on" indicator, otherwise it's redundant²⁰. In Traindir the red aspect means always "Stop", so it's up to the player shunting the train and opening the signal with ctrl-click to have it passed at red.

D "Disabled" (may appear under home signals only): the station is disabled, so the straight route through the station is locked in the switches, and the line is free. If the signal is red a control signal is missing, preventing the signal to clear normally, but the driver can enter the station by sight even if the signal is red. If the "D" is flashing (not simulated) the driver has to check the position of the switches and eventually stop and throw them before proceeding. When the signal is red the "D" means the same as the "Move in" indicator, otherwise it's redundant²⁰. In Traindir the red aspect means always "Stop", so it's up to the player shunting the train and opening the signal with ctrl-click to have it passed at red.

^ "Route continuation". When a station features more than one exit signal along the exit route, all of them are interlocked to clear together (all or none), but in practice it may be helpful to allow an entering or ready-to-leave train to proceed beyond the first exit signal (up to the next).

If that movement is safe, the CTC operator can manually light up this indicator, and the driver can proceed at shunting speed beyond the first exit signal and stop the train in front of the next.

In Traindir this indicator lights up when the first exit shows "Shunt" and a fake 'V' station is present along the route to the next signal.

C "Closed" (not simulated). The line or station is closed to normal traffic (which is prohibited) for maintenance, so maintenance vehicles can circulate freely (by sight) and their operators are free to throw switches as needed.

T "Telephone" (not simulated). The home signal is red because the CTC operator has something to tell the driver, so he should get down the loco and pick up the phone that is always installed near the signal. Nowadays all the drivers are given a mobile phone (restricted to the railway mobile network), so the CTC operator can almost always call them as needed in advance, without forcing them to stop at a signal. Exceptions are secondary mountain lines or long tunnels, where no field of the mobile network is present. This "old" procedure is one of the most feared by the drivers, as the almost never used telephone boxes are perfect places for bees and wasps to build their nest into.

I "Obstruction" (*Ingombro* in italian, not simulated). This indicator is being experimented with the RYY aspect when another train is occupying the track, to distinguish this from the case when the free distance is just lower than 600 m.

flashing position and have the train driver check the switch position (if wrong, the driver will stop the train and throw the switch manually before proceeding).

²⁰ "A" and "D" are automatic indicators, used to minimize human checking and intervention at night and/or in disabled and unmanned stations, so they are allowed only when the straight through route is locked in the switches; "Move in" and "Move on" indicators are manually lit by an operator, and can be used on any route.

Dwarf / Shunting signal (*marmotta* or *segnale basso di manovra* / *segnale alto di manovra*)

Dwarfs are placed at ground level, and are triangular signals featuring 3 white lights arranged in an L shape. High shunting signals consist in an hexagonal head that can show an horizontal or vertical line of white dots; it may be alone on its mast or mounted just below the lower head of a main signal. All of these signals are meaningful only for shunting trains. They usually command only short movements (over a couple of switches or so), and don't tell anything about the next signal, as the latter should be already visible. The first of them is usually mounted together with a normal signal (the home or the exit), forming a single signal that can show "Shunt" (red with dwarf or shunting head showing "Clear"). If the normal signal is clear, all shunting signals are to be ignored until the next normal signal, so they can show either "Clear" (typically in bigger stations, to help the driver "see" the route he will travel) or remain at "Stop" and just be ignored. Shunting dwarfs can show a flashing aspect that when they act as departure dwarfs: this aspect is used to indicate the track to which a clear exit signal is commanding when that exit signal is shared by more than one track.

Shunting aspects (*aspetti dei segnali di manovra*)

| Aspect | Meaning |
|--------|--|
| – | "Stop" (two horizontal lights or horizontal line of dots). Shunting trains cannot pass the signal until it changes its aspect or someone tells the driver to do so. A train is shunting if its movement was commanded by a shunting signal or by a shuntman. If the movement was commanded by a normal signal showing a clear aspect, dwarfs and shunting signals must be ignored up to the next normal signal, so they can be passed even when showing "Stop" ²¹ . |
| | "Shunting clear" (two vertical lights or vertical line of dots). Shunting trains (see the definition above) can proceed by sight at max 30 km/h up to the next unclear signal (normal or shunting); other trains may proceed obeying the clear aspect of the previous normal signal. |
| x | "Clear" (same as above, but flashing): this is not a shunting aspect, so it's shown only by departure dwarfs. It indicates that the clear normal signal that follows is shared between more tracks and is now commanding to this one. Proceed obeying the clear aspect of that signal. |

Shunting limits / Beginning of the plain line (*limite delle manovre* / *inizio della piena linea*)

Shunting movements in stations should always be protected by the home signals, so shunting trains moving towards the line should never get at less than a braking distance from the home signal. This point is usually marked by a concrete post coloured with white and black horizontal stripes.

When the line features concatenated block signalling, the last automatic signal before the home signal can detect any train that passes the latter towards the line, and protect it by turning immediately to a "Stop" aspect. So if no other trains have already passed this last signal, shunting movements can proceed towards the line until all the shunting train is just beyond the home signal (the last block signal is always further than a braking distance for an arriving train). This simplifies shunting, as the next movement, typically back towards the station, can be controlled by the home signal itself with normal aspects, so just one dwarf per track in the exit direction is the minimum installation required to control all shuntings. In this case the maximum length allowed beyond the home signal, towards the line, is marked by a special sign indicating the "beginning of the plain line" (*inizio della piena linea*): a white square with a magenta triangle pointing sideways towards the track. Both markers are simulated in Traindir.

Level crossings (*passaggi a livello*)

Level crossings are protected by normal signals when these are near enough: the interlocking just prevents the signal from clearing if the gates aren't closed, and the request to clear the signal triggers the gates closure (the signal then clears when the closed position is detected). Should the closed position detection go off, the signal would turn back to "Stop" immediately and automatically. In some larger crossings a button near the gates can be pushed to obtain this, in case a car is stuck on the tracks when the gates have closed. The above logic applies also when the level crossing features no barriers, but just the two alternatively flashing red lights for the cars: just read 'lights' instead of 'barriers' and 'lit' instead of 'closed'. If normal signals are too far, on one or both sides, they will ignore the gates position, and specific signals will be installed to protect the LC.

²¹ Nowadays normal and shunting signals are independent only in smaller and older stations, while in modern or refitted ones the shunting signals open together with the normal signals to show the driver the path that its train will follow, so they're ignored only formally.

When the driver sees a level crossing distant at “Warning” he/she must slow down enough to pass the level crossing home (if still unclear) at a speed that allows him/her to stop the train by sight immediately before each level crossing (their number is on a sign on the signal mast) protected by the signal. He can so be seen and heard (using the horn is mandatory) by the cars and only then he can cross the road at human speed (4 km/h). When the loco is beyond the road, the driver can accelerate again.

The home and distant for level crossings with barriers feature respectively a square or triangular black head with a yellow border, with five lights arranged in an upsidedown T shape. The single signal protecting a level crossing with no barriers is just a rectangular black and yellow chequered sign with a yellow light in the middle. This light flashes when the red lights for the cars are lit and is off otherwise.

Aspects of level crossing signals (*aspetti dei segnali per i passaggi a livello*)

| | |
|----------------|---|
| ... | “Caution”, as the gate closure has not been detected. The home signal may be passed at 30 km/h maximum to be ready to stop before the road and then proceed at 4 km/h until the loco has passed it. In Traindir a speed reduction to 10 km/h is enforced, from the signal to the first speed limit encountered along the track (usually placed just beyond the signal protecting the level crossing in the opposite direction). |
| ... | “Fault”: the home signal cannot detect the barrier position, or its lights are burned out. The home signal may be passed at 30 km/h maximum, to be ready to stop before the road and then proceed normally if the gates are found closed, or proceed at 4 km/h until the loco has passed the road if they’re found open. In Traindir a speed reduction to 10 km/h is enforced, as with “Caution”. |
| ... | “Warning”, the aspect shown by the distant when the home signal shows “Gates open” (if the home signal shows “Fault”, the distant also shows “Fault”). |
| : | “Clear”: proceed at line speed, as the barriers are confirmed to be closed. Shown both by the home and the distant LC signal. |
| • _x | “Clear”: proceed at line speed, as the red lights for the cars are lit; only low speed secondary lines can have level crossing with no barriers, otherwise they are required. The driver will blow the horn as necessary to be heard, and will pay close attention that no one is going to cross the track anyway. |
| • | “Unclear”: the signal cannot show “Clear”, for whatever reason (lights not lit or burned out). |

Rules for script designers to be obeyed by normal signals when placed before special signals

| Signal | Type | Aspects | Rules for preceding normal signals |
|-----------------------|----------------|--|--|
| <i>rfi_avanz</i> | <i>distant</i> | <i>off, on, flashing</i> | <i>To be ignored: consider the next one</i> |
| <i>rfi_avvio</i> | <i>distant</i> | <i>off, on, flashing</i> | <i>To be ignored: consider the next one</i> |
| <i>rfi_ind_part</i> | <i>distant</i> | <i>off, on, flashing</i> | <i>To be ignored: consider the next one</i> |
| <i>rfi_ind_dir</i> | <i>distant</i> | <i>off, none, zero...nine, a, d, p, v</i> | <i>To be ignored: consider the next one</i> |
| <i>rfi_ind_dir_2</i> | <i>distant</i> | <i>off, none, zero...nine, a, d, p, v</i> | <i>To be ignored: consider the next one</i> |
| <i>rfi_LM</i> | main | off, green | To be intercepted as a special case |
| <i>rfi_LM_s</i> | main | off, green | To be intercepted as a special case |
| <i>rfi_LM_d</i> | main | off, green | To be intercepted as a special case |
| <i>rfi_marm_a</i> | <i>distant</i> | <i>red, shunt, flashing, off</i> | <i>To be ignored: consider the next one</i> |
| <i>rfi_marm_m</i> | <i>distant</i> | <i>red, shunt, flashing, off</i> | <i>To be ignored: consider the next one</i> |
| <i>rfi_marm_i</i> | main | red, shunt, flashing, off, fault | Already considered (same aspects as a main signal) |
| <i>rfi_sam_a</i> | <i>distant</i> | <i>red, shunt, off</i> | <i>To be ignored: consider the next one</i> |
| <i>rfi_sam_m</i> | <i>distant</i> | <i>red, shunt, off</i> | <i>To be ignored: consider the next one</i> |
| <i>rfi_sam_i</i> | main | red, shunt, off, fault | Already considered (same aspects as a main signal) |
| <i>rfi_AT_i</i> | main | red, on | Irrelevant, as it's always the first signal |
| <i>rfi_AT_a</i> | automatic | red, off | Irrelevant, as it's always the first signal |
| <i>rfi_OB_auto</i> | automatic | red, green | Already considered (same aspects as a main signal) |
| <i>rfi_OB_bi</i> | <i>distant</i> | <i>yellow_flashing, green</i> | Already considered (same aspects as a distant) |
| <i>rfi_DB</i> | <i>distant</i> | <i>black, white</i> | <i>Irrelevant, as it's linked to an isolated track</i> |
| <i>rfi_ind_blocco</i> | main | disabled, oriented, free, locked, busy | Irrelevant, as it's linked to an isolated track |
| <i>rfi_prot_PL_i</i> | main | red, shunt, green, closed, off, fault | To be preceded and intercepted by <i>rfi_avv_PL</i> or <i>rfi_avv_PL_i</i> |
| <i>rfi_prot_PL_s</i> | main | red, shunt, green, closed, off, fault | To be preceded and intercepted by <i>rfi_avv_PL</i> or <i>rfi_avv_PL_i</i> |
| <i>rfi_avv_PL</i> | <i>distant</i> | <i>yellow_flashing, green, open</i> | <i>To be intercepted as a normal distant</i> |
| <i>rfi_avv_PL_i</i> | <i>distant</i> | <i>yellow_yellow, yellow, green, open</i> | <i>To be intercepted as a normal distant</i> |
| <i>rfi_avv_PL_cb</i> | <i>distant</i> | <i>open, fault, closed</i> | <i>To be preceded and intercepted by rfi_prot_PL *</i> |
| <i>rfi_avv_PL_sb</i> | <i>distant</i> | <i>open, fault, closed</i> | <i>To be preceded and intercepted by rfi_prot_PL *</i> |
| <i>rfi_tronc</i> | main | red | Already considered (same aspect as a main signal) |
| <i>rfi_leopolder</i> | <i>distant</i> | <i>red, sound</i> | <i>To be ignored: consider the next one</i> |
| <i>rfi_avv_part</i> | <i>distant</i> | <i>block, red, red_short</i> | <i>To be intercepted as a special case</i> |
| <i>rfi_avv_tronc</i> | <i>distant</i> | <i>short</i> | <i>To be intercepted as a special case</i> |
| <i>rfi_avv_dev</i> | <i>distant</i> | <i>block, thrown, yellow_thrown, flashing_thrown, green_thrown, short_thrown</i> | <i>To be intercepted as a special case</i> |

* Distant signals are in colour, smaller or bigger version are not listed, but behave in the same way.