Scripts and icons for the Italian (RFI) signals – version 5.1 of 21/01/2021

This zip file contains all the icons and scripts needed to simulate the Italian (RFI – *Rete Ferroviaria Italiana*) signals in Traindir 3[1]; they work only since version 3.9.2 (new versioning after the letters) of the program.

This version restores backward compatibility with the last version 4 of the package, so it fully replaces version 5.0, which is deemed obsolete and abandoned.

Please read carefully the 'Important Notes' that come after the new features list.

New features in this version

- The indicator to control the orientation and occupancy of a block section protected by permissive signals has been simplified: giving up the occupancy status it just show if in its direction the signals are lit or not, but there is no need to copy and adapt the script to each block: just assign the specific script to an icon and link it to the first permissive signal of the section. The complex controls with full occupancy indication are still available, for those who prefer them despite the greater effort needed to use them.
- Permissive signals propagate the swicth on / off action to the next signal of the same type, unless it's the last permissive before a non permissive one; that last permissive will be always lit (normally at red). These signals can be set automatic, like any other, to propagate also the clear / unclear action.
- At the beginning of the simulation the permissive signals for the right track are not automatic, so they'll never clear when the "Set signal to green" command is issued, and are unlit only if the controls to switch them on again are present: no more backword compatibility issues with older layouts.
- New "solution 2" – now for all cases – for signals shared by more tracks; no need to customize any script.
- The shunting dwarves used as departure dwarfs when followed by a shared signal ("solution 1"), now automatically clear and unclear also the shared signal.
- The direction indicator now looks for the fake stations also after a distant, so it can "see" beyond a real station that would hide them; added a new special distant to be used when the layout doesn't feature one.
- The transition form normal to ETCS L2 signals and viceversa can now occur almost everywhere (diverging routes protected by ETCS L2 signals will not be "seen" by the preceding normal signals, which will clear at yellow), so the latter can start replacing the former like in the real world[2].
- No stop routes through triangle departure signals are not allowed by the rules, and now the signals are compliant: if the previous signal is clear, the departure signal that follows will be clearable only when the train has passed the previous signal, and the latter won't clear if the departure signal is already clear. Any automatic mechanism that violates this rule will not work, and the player will have to clear the signals manually according to the rules.
- New distant (a sign) for the home signal (another sign) that protects LC without barriers.
- New icon to implement the "button" to swicth off any signal, to be used with the specific scripts.
- The hidden signal named 'UPDATE' is not needed anymore to update all the other signals.

Features kept and improved from version 5.0

- The demonstration layouts (see the list later on) are now contained in a separate `Demo_segnali_rfi_5.1.zip` archive, published in the layout page of the site (https://www.backerstreet.com/traindir/trackse.htm).
- New 'disabled', 'off' and 'fault' aspects for almost all signals, so they can be switched off depending on the block direction or to simulate faults. Only a specific script can set these aspects, but now it's easy to assign the script to an icon and link it to the signal to "damage", obtaining a "button" to do so.
- All the signals can be cleared only for shunting when unlit or followed by an unlit signal, and cannot be cleared at all if a signal at 'fault' follows (i.e. unlit but forced clear with ctrl-click). Only permissive signals can be cleared and passed normally even when unlit.
- 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 trains clear on both sides and on all the tracks of the LC, and faults can be simulated: to the barriers, the signals or the lights seen by the cars.

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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 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] Unfortunately they're not as much interesting to watch in a simulation…

- 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 scripts for the departure dwarfs, identical to shunting dwarfs except for the flashing clear aspect, used in solution 1 for a simpler simulation of departure signals that are shared between more tracks: no need to use hidden signals anymore.
- 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 `rfi_avv_dev.tds` distant or for a fake 'K' station (the latter can now be used also with the normal series).
- New scripts indicating just the direction af 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 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 'I' indication when the signal clears towards an occupied track (for example for a join).
- New shunting bumper that forces shunting aspects in the previous signals.
- 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.
- New scripts to simulate temporary speed reductions along the line (three signs marking the announcement, the start, and the end of the speed reduction). The author must still set the wanted limits in the track.
- New departure repeater signals, with one head and a triangle below; can be cleared even before a clear departure signal.
- When a triangle departure signal is clear, previous signals cannot be cleared towards it, and by setting its 'Blocked by' property the opposite is obtained: the triangle departure signal cannot be cleared when the previous signals are cleared towards it (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.
- 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.
- A train won't move from a station at the departure time if the departure signal is marked as such in its properties and is unclear.
- 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 shunting limit and the beginning of plain line signs now force shunting aspects in previous signals when "Unclear".

Important Notes

This package is more compliant to the rules than the previous ones, and doesn't allow many actions that were allowed in the past, even if not allowed by the rules. This can have an impact on previous layouts:

- Triangle departure signals have the 'Departure' property set by default: the trains will not move at the departure time if the signal is not clear yet. If a pedal or a script is placed after the stopping point, waiting for the moving train to open its signal, this will not happen: the player will have to clear the signal manually.
- When triangle departure signals are clear they prevent previous signals to clear towards them, and vice-versa. It's not possible to clear both of them at the same time, so any mechanism or itinerary trying to do so will not work.

All the mechanisms designed to clear a departure signal automatically will have to detect the train passage after it has passed the previous signal, and before it stops at the station.

The authors of already existing layouts could not know of these new enforcements, and may have used some of the now prevented actions to automate their simulations in the way they wanted. Now these layouts may not work as desired, so **it is highly recommended to install the new package in a dedicated folder, and to keep the previous version 4 of the package**, so any layout that should become problematic would still be playable with the package for which it was designed.

The new package is infact fully compatible only with the built in features of the program, but there's no way to take into account all the mechanisms created by the authors to automate their simulations in the way they

want. All those simulations can still be played if the player manually clears the signals following the new rules, but the automations may not work anymore.

If the aspect of a signal or icon depends on the aspect of other signals (as with all pure distants, or the controls of a series of permissive signals) the latter must be defined and stable before the former can be calculated. The order in which signals are updated is the one they have inside the .trk file, which is the reverse of the order of placement in the layout: the last placed signal goes in the first line of the .trk file. As the aspect dependency chain goes backwards, **the fundamental rule is that control icons must be placed in the layout before the signals, and the latter must be placed in the order the trains will encounter them.**

The update order is also the order in which the "Set sig. to green" command will clear the automatic signals at the beginning of the simulation. This order is important **when the signals are automatic in both directions** on the same track: the last placed ones will be activated first, so **the signals for the "correct" direction must be placed last** (permissive signals will automatically comply with this rule).

It's therefore advisable to draw the tracks, then place icons and signals following the above rules and finally save the layout. Afterwards the author will proceed to link them, assign the scripts and even to move them, if corrections to the layout are needed, as it's the order of the first placement that counts. As a last resort, the .trk file can be edited (when the program is closed) to move forward / backward the objects that must be updated after / before others. Signals and icons are the lines beginning with a '2' or a '5' respectively.

The signals that need to be automatic to work will be set so by their scripts, so don't use the two head tool of the editor to place them. Other signals can still be made automatic using the two head tool 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.

The automation can be temporarily disabled by right-clicking an automatic signal when it's clear (so it will remain uncleared 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 signal[3]. 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 itself.

Many new scripts determine the aspect of a signal by comparing its direction with the one in which their linked 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 signals should be assigned only to horizontal or vertical track elements,** otherwise their working is not guaranteed[4].

Summary of the available signals

- Pure distant signals (see the glossary), with round heads, square heads or square heads with an arrow above[5].
- Home signals with round heads, square heads or square heads with an arrow above[5] and a rappel (speed indication, see the glossary) below. These signals are also used as departure signals for station tracks where a no stop route is allowed or the exit route is straight (see the glossary).
- Triangle departure signals and repeaters with round heads, square heads or square heads with an arrow above[5] 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 above[5] 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 to simulate block reversal operations.
- Home and block signals for radio block lines (ETCS L2); block signals are permissive and switchable.
- Shunting signals: dwarf or high, shunting limits and bumper.
- Auxiliary indicators: train announcement, block busy indicator, block status and control, simple direction indicator, direction and occupancy indicator and control, shunting limits, bumpers, direction indicators, facing point lock status, temporary speed reductions, move in and move on indicators.

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[3] The script itself will enable the automation again for the signals that need to be automatic to work.

[4] Signals linked to curved or diagonal elements usually work, but each case should be checked, as it's not guaranteed.

[5] 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.

- Signals for level crossings with or without barriers, simulating the specific home and distant signals, and the position / status of the barriers / lights for the cars.
- 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, in most cases these signals 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 any signal is cleared with Ctrl-click (white track), or if a speed limit lower than 30 km/h is detected before the next signal, or if an unlit signal follows, the cleared signal remains red, but the track turns white or green (respectively) and shunting trains can pass it; shunting signals, move in, move on and route continuation indicators will show the correct aspect accordingly. Three headed signals show the correct RYY aspect ("proceed by sight, as the track is occupied before the next signal") with the 'I' indicator to allow joining.

Main signals can now have the 'off' aspect, meaning they're out of service, and pure distants will go 'off' 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 unclear and stay so. On the other hand permissive signals can be cleared and passed even when unlit (they go 'disabled', and their pure distants too), as this only means that the block is oriented in the other direction. They show 'fault' only if cleared with ctrl-click when at 'off'.

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.

Obsolete scripts

The following scripts are obsolete, as stated in their comments, and shouldn't be used anymore. The macros supporting the obsolete scripts are not included in the package anymore, but scripts and icons are still in the package, so the layouts created with a previous version of it will continue to work.

rfi_AT_a.tds	Train Announcement, automatic version; use the other version (rfi_AT_i.tds)
rfi_AT_small_a.tds	As above, smaller version; use rfi_AT_small_i.tds.
tln_DB_s.tds	Direction indicators for a block section; use the new ones (3 possible types).
rfi_DB_avv.tds	Direction indicators for a block section; use the new ones (3 possible types).
rfi_DB_bi.tds	Direction indicators for a block section; use the new ones (3 possible types).
rfi_DB_s.tds	Simple direction indicators for a block section; use rfi_DB.tds.
rfi_OB_auto.tds	Busy Block Indicator, automatic version; use rfi_OB_new.tds
rfi_OB_a_small.tds	As above, smaller version; use rfi_OB_small.tds
rfi_OB_bi.tds	Busy Block Indicator, bidirectional version; use rfi_OB_new.tds
rfi_OB_b_small.tds	As above, smaller version; use rfi_OB_small.tds
rfi_PL_a.tds	Old repeaters of the barriers status in a LC; use rfi_PL_cb.tds
rfi_PL_i.tds	Old repeaters of the barriers status in a LC; use rfi_PL_cb.tds
rfi_prot_PL_b.tds	Old repeaters of the lights status in a LC; use rfi_PL_sb.tds
rfi_prot_PL_a.tds	Old home signal for a LC with barriers; use rfi_prot_PL_i.tds
rfi_prot_PL_big_a.tds	As above, bigger version; use rfi_prot_PL_big_i.tds
rfi_TD.tds	Old Facing Point Lock status indicator; use rfi_TD_new.tds

Installation

Create a folder for the new package (typically `C:\Program Files\Traindir3\Signals_RFI_5.1`) and set the chosen folder in the "Path to signal scripts" property of the "Environment" tab under the Edit | Preferences command of the program. Then open the .zip file, select all the files and extract them in that folder.

As more and more packages will hopefully be available in the future, this mechanism enables you to use any available package, by just modifying the property whenever the signalling system changes. This is most useful should an existing layout have problems with the new package: it can be still played as before just pointing to the older package for which it was designed.

Once the program knows where to look for the signals' scripts and icons, there's no need to include all of 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, undescore, 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; a set of demonstration layouts, is now published on the site in a separate archive.

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

`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) and go off together with it; should another distant follow, it will be 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 departure 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 departure signal or by a signal at 'fault'. When these signals are used as departure signals, set their 'Departure' property, so the trains will not move at the departure time if they're still unclear.
`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 can be cleared and passed even when unlit (they go 'disabled', ans so do the pure distants preceding them), as this only means that the block is oriented in the other direction, but will not clear when followed by a clear triangle departure signal or by a signal at 'fault'. Permissive signals propagate the swicth on / off action to the next signal of the same type, unless it's the last permissive before a non permissive one; that last permissive will be always lit (normally at red). These signals can again be set automatic, like any other, to propagate also the clear / unclear action. At the beginning of the simulation the permissive signals for the right track are not automatic, so they'll never clear when the "Set signal to green" command is issued, and are unlit only if the controls to switch them on again are present.
`rfi_part_**.tds`	Triangle departure signals, used when no stop routes are not allowed and every exit route has at least one diverging switch (see the glossary); they can have 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'. A signal of this kind and the one before cannot be clear together at the same time: if one is already clear, the other won't clear, as no stop routes are not allowed with these signals[6]. Trains will not move at the departure time if they're still unclear.
`rfi_part_R*.tds`	Departure repeater signals with a triangle under the head, which can be round (N), square (Q) or square with an arrow above (F); its G, Yx or Y aspect just tells if the departure signal that follows is clear with no limitations or not, but it doesn't act as a distant of the latter. They can stop trains and will not clear when followed by a signal at 'fault'. A signal of this kind and the one before cannot be clear together at the same time: if one is already clear, the other won't clear, as no stop routes are not allowed with these signals[6]. Trains will not move at the departure time if they're still unclear. These are the only signals that can be cleared when followed by a clear triangle departure signal (in the real world they would be forced to clear together).

[6] Technically a triangle departure signal can be cleared only if a train is occupying the track circuit before it. This enforces the fact that departure and home signals cannot be clear at the same time (as no stop routes are not allowed through these signals).

rfi_imp_b.tds rfi_imp_bf.tds	Main signal with 1 square head (and an arrow above in the 'f' version) protecting the illegal track (see glossary) of a not fully reversible line. It's involved in block reversal operations (see later) and when lit it works like a home signal with just one head and two aspects only: red and green.

Normal signals, 'nd' series

rfi_avv_**_nd.tds rfi_prot_**_nd.tds rfi_prot_*R*_nd.tds rfi_part_**_nd.tds rfi_perm_**_nd.tds	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 rfi_avv_dev.tds distant or of a fake 'K' station. If that letter is in use and these signals need the direction indicator, use the one that looks two signals ahead (rfi_ind_dir_2.tds).

Signals for ETCS L2 lines

rfi_prot_AV*.tds rfi_prot_Av*n.tds	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.
rfi_perm_AV*.tds rfi_perm_Av*n.tds	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.

The transition form normal signals to these ones and viceversa can now occur almost everywhere (diverging routes protected by ETCS L2 signals will not be "seen" by the preceding normal signals, which will clear at yellow).

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. There's no way to simulate this behaviour.

Train announcement (a train will soon appear in the visible part of an entry point)

rfi_AT_i.tds	Special main signal to be placed at a visible entry point and to be "cleared" by a trigger placed at the beginning of an auxiliay hidden track section that precedes the 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 rings the "leopolder" bell (see later) and goes off when the train passes it it's compatible with the Block Busy indicator. The sound file Leopolder.wav must be distributed with every layout that uses it.
rfi_AT_small_i.tds	Small version of the previous indicators.

The other scripts related to the Train Announcement indication (rfi_AT_a.tds, rfi_AT_small_a.tds) are outdated, as stated in their comments. They're still included in the package, so the layouts made with previous versions of it will still work, but they shouldn't be used anymore.

Block busy (a train just left the visible part of an entry point: no trains can enter from there yet)

rfi_OB_new.tds	Special signal to be placed as 'Intermediate' at the end of an auxiliary hidden track section that follows a visible exit point; if the signals before it are concatenated, place also a hidden 'Intermediate' signal (without a script) at the beginning of the hidden section, so the signal before it will show 'Warning' when a train is in that section. The indicator is lit when the signal before is clear towards it, so the indicator is compatible both with the Train Announcement indicator and with block reversal operations on the section that precedes it. When the indicator is lit no train can enter the layout from its track.
rfi_OB_small.tds	Small version of the previous indicator.

The other scripts related to the Block Busy indication are outdated (rfi_OB_auto.tds, rfi_OB_bi.tds, rfi_OB_b_small.tds, rfi_OB_a_small.tds), as stated in their comments. They're still included in the package, so the layouts made with previous versions of it will still work, but they shouldn't be used anymore.

Special signals to be used as hidden distants

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

`rfi_avv_dev.tds`	Force diverging aspects: hide 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 tipically 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.
`rfi_avv_part.tds`	Block no stop routes: hide this signal before a main signal to prevent previous signals from clearing when that main is clear, and viceversa. It's used when the departure signal is normal (triangle departure signals already behave in this way) but no stop routes aren't allowed, even if the route is straight. No normal distants can precede or follow this signal.
`rfi_avv_tronc.tds`	Very short block: hide this distant after a main signal to force it at YY or RYY when it would show Y ("Prepare to stop at next signal"), even if the distance to the next unclear signal (or bumper) is more than 600 m. Other aspects will not be changed, and the actual distance will be considered, as usual. It's tipically used in head stations, to indicate that the train will be received in the shortest tracks, even if they are actually longer than 600 m. Normal distants can ve placed only before this signal.

Ringbell

`rfi_leopolder.tds`	This is a distant to be hidden before a home signal, to play a sound whenever that signal is cleared. 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: 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: 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. The played sound can be customized: make a copy of the script in the layout folder and modify the line 'do play Leopolder' (the file name is written without the .wav extension). The original sound file `Leopolder.wav` or the customized script and sound must be distributed with every layout that uses it.

Controls to just switch on and off the signals of a block

`rfi_blocco.tds`	This script must be assigned to an icon (no need to select an image, as the script will set the correct one), which will be linked to the main block signal or to the first permissive signal of the section to control. The indicator just tells if the linked signal is on (white arrow) or off (black arrow)[7]. It's up to the player to switch the signal on and off – by clicking on the indicator – only when no train is in the section an no signal is clear towards it. In the real world any of these situation would preclude the operation, but only the complete and complex indicators described in the next paragraph do that check before allowing the operation. Controls are separate for the two directions of the controlled section, so to reverse the block the player has to first switch off the signals in the current direction an then switch on the signals for the opposite one. All the permissive signals should be set as "Intermediate", so also the clearing/unclearing action will propagate. Only the first one can be left as is, if it should clear again after each train passage (typically on the left track of the line). IMPORTANT: each indicator must be placed in the layout before the signals it controls, as it should be updated after them (see the Important Notes at the beginning).

[7] If other permissive signals follow the first, they will switch on and off with it, so the indication is for all of them.

Block direction and occupancy indicator

`rfi_ind_blocco.tds`	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 the main block protection signal[8]), 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 controlled signals. Controls are separate for the two directions of the controlled section, so to reverse the block the player has to first switch off the signals in the current direction an then switch on the signals for the opposite one. All the permissive signals should be set as "Intermediate", so also the clearing/unclearing action will propagate. Only the first one can be left as is, if it should clear again after each train passage (typically on the left track of the line). IMPORTANT: each indicator must be placed in the layout before the signals it controls, as it should be updated after them (see the Important Notes at the beginning). **Aspects**: *disabled* (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 in the opposite direction, they will also clear themselves); *free* (grey arrow): all the controlled signals are lit and red; the indicator can be clicked to switch them off; *oriented* (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; *locked* (white arrow): a signal before the block is clear towards it, so the block cannot be reversed; the controlled signals can be on or off. *busy* (orange arrow): at least one train is in the section in the direction of the indicator, so the block cannot be reversed; the controlled signals can be on off. **How it works**: 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 two important track elements: IN: the first track element of the section; when its'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: `rfi_sig_up_on_enter.tds`. IB: the track element before the first permissive signal of the section in the direction of the indicator (if no such signals are present, it's ignored. The script `rfi_sig_up_on_enter.tds` must be assigned to the track element before the first main signal after the block (usually a home signal), so the block can be freed and reversed again after the last passing train leaves the section from this element. 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 player can manually unclear all the signals of a direction, and the indicator will detect and show the result of this action. If the player suspends the automation of the controlled signals while they are cleared, the indicator will not detect the 'busy' state. 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.

The other scripts related to the block direction and occupancy indicators are outdated (`rfi_DB_avv.tds, rfi_DB_ bi.tds)`, as stated in their comments. They're still included in the package, so the layouts made with previous versions of it will still work, but they shouldn't be used anymore.

[8] All cases, including ERTMS signals, are illustrated in the demonstration `Demo_blocco.trk` layout.

Simple block direction indicator for a section with no signals

rfi_DB.tds	Direction indicator for a section with no intemediate signals, not showing its occupancy status; 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: rfi_sig_up_on_exit.tds.

The other scripts related to the simple block direction indication are outdated (rfi_DB_s.tds, tln_DB_s.tds), as stated in their comments. They're still included in the package, so the layouts made with previous versions of it will still work, but they shouldn't be used anymore.

Special signals to be placed before and adjacent to a main signal.

rfi_avanz.tds rfi_avvio.tds	"Move in" and "Move on" indicators, mounted respectively under the heads of a home or departure signal (normal or shared) 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 unlit. If the main signal features also the direction indicator (see below), the latter should be placed between this indicator and the main signal itself.
rfi_ind_dir.tds	Special pure distant implementing the direction indicator (numbers 0-9) and the letters A, D, P (unmanned stations), ^ (route continuation), I (track is occupied); see the glossary for the details. It should be placed adjoined to the next signal (normal or shared) and linked just before it. Put a fake station in each branch after the main signal, named after the number (in letters) or letter (uppercase) you want to appear (except 'I', which is automatic). The letters A, D, P are always lit, while the other indications are lit only when their signal is clear (even at shunt); the ^ letter requires the letter V and its signal showing 'shunt'. The indicator automatically shows an 'I' when its signal is clear towards an occupied track. In the real world this new use is still experimental. It supports the presence of the hidden rfi_avv_ind_dir.tds distant (see below) after its signal, in case the fake stations for the directions (placed after the hidden distant) wuold be hidden by a real station placed before.
rfi_ind_dir_2.tds	This version of the direction indicator (see above) 'looks' two signals ahead instead of one, for the cases when after the first signal there is already a another station for other purposes (real or fake – typically when the 'nd' signal series is used). This version doesn't support the hidden distant that follows.
rfi_avv_ind_dir.tds	Special pure distant allowing the direction indicator rfi_ind_dir.tds (see above) to "see" the fake stations for the directions, which are places as usual after the junction, even when a real station placed before the junction would hide them. This distant is not to be placed near a signal, but must be hidden and linked after the real station mentioned above, before the usual fake stations that follow the junction.

Shunting signals (dwarfs or high)

rfi_marm_i.tds	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, to simulate the departure dwarf when the departure signal is shared by more tracks (see the specific chapter, solution 1).
rfi_marm_a.tds	Irrelevant repeater dwarf, a pure 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") and flashes if the latter is followed by an unlit signal.
rfi_marm_m.tds	Irrelevant shunting dwarf, a pure distant that clears only when the main signal that follows shows "Shunt", and flashes if the latter is followed by an unlit signal.
rfi_marm_*d.tds	Same as above, but to be placed to the right of the track they command.
rfi_sam_*.tds	High shunting signal: it works like the corresponding i, a, m version of the above dwarfs, but doesn't feature the flashing aspect. Versions a and m can be used also with shared signals.

Shunting limits

rfi_LM.tds rfi_LM_s.tds rfi_LM_d.tds	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" (without changing their aspect) for normal trains to pass them. For this reason it's advisable to set them as "Intermediate". When they're "unclear" they force shunting aspects in the previous signals.

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 the road. If in any of such directions the 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.

fi_avv_PL cb.tds rfi_avv_PL sb.tds	First signal of the sequence (the only one if the LC is protected by normal signals): 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 sig_up_on_ exit.tds must be assigned to these elements, which must be of length 1. Use one of these signals for each track direction. If the LC has more then 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 need to know the coordinates of the control elements on the other tracks, elements 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 elments is coloured, and unclear all together when the last train leaves the LC, as it happens in the real world. Specific scripts (see later) can be used 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.
rfi_prot_PL_i.tds rfi_prot_PL_s.tds	Second segnal of the sequence (use the 'i' or 's' type if the first signal is of type 'cb' or 'sb' respectively): it's the signal that actually protects the LC, 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 barries or switch on the lights for the cars, allowing the signal to show the "Clear" aspect. If this or the first signal are faulty (this can be done using specific scripts for each direction independently – see the Demo_PL_1_bin_AT_OB.trk demonstration 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 has passed the LC can accelerate again. In case of more than one track each coming train has to "clear" its own signal in any case, as like in the real world all the signals will show "Clear" since the the first coming train "closes" the LC and until the last passing train "frees" the road.
rfi_avv_PL.tds rfi_avv_PL_i.tds rfi_avv_PL_s.tds	Third and last signal of the sequence (use the 's' type for LC's without barriers, the others for LCs with): it's the distant to be placed before the second signal, and determines the aspect of the normal signals precedeing 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. The rfi_avv_PL_s.tds script can be hidden before any other signal to mask it, so the previous signals will "see" a clear line and show 'green' when clear.
rfi_avv_PL_big.tds rfi_avv_PL_big_i.tds rfi_prot_PL_big_i.tds	Bigger version of the signals described above, only for LCs with barriers.

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, and shouldn't be used anymore. The macros supporting those scripts are not included in the package anymore, but scripts and icons are still in the package, so the layouts created with a previous version of it will continue to work.

High departure indicator

rfi_ind_part.tds	Departure indicator to be used as a distant of the departure signal when the latter is not visible from the point of the platform where the trains stop (warning: there cannot be any switch between this signal and the departure signal it repeats). The indicator is lit when the next signal is lit and clear, and flashes when its signal is followed by an off or faulty one.

Signs for temporary speed reductions

rfi_rall_a.tds rfi_rall_i.tds rfi_rall_f.tds	These scripts represents the signs that respectively announce, enforce and mark the end of a temporary speed reduction along the line. They are fake distants that do nothing per se, as it'up to the author of the layout to set and restore the actual speed limits in the tracks near the signs. Leave these signs ***unlinked*** from the tracks when another distant follows, as they would mask it to the preceding signals.

Facing point lock status indicator

rfi_TD_new.tds	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 swithches 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 trail-able by design, but some may be locked when requested – this indicator is for them. The script should be assigned to the track element adiacent to the points of the switch, and must be adapted by inserting the coordinates of the TD_off_X.xpm 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 = N.

The older rfi_TD.tds script is outdated, as stated in its comments; it shouldn't be used anymore, but it's still included in the package, so the layouts made with previous versions of it will still work.

Bumper

rfi_tronc.tds rfi_LM_tronc.tds	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. For the previous signals the first is a "red", while the second (shunting bumper) will force the shunting aspects, like the first – or any other signal – when preceded by a speed limit lower than 30 km/h.

"Buttons" to be clicked to "damage" and "repair" a segnal

These scripts must be assigned to an icon (no need to select an image, as each script will set the correct one), which will be linked to the signal to "damage" A click on the icon will switch off or on the linked signal, and other signals will change their aspect accordingly.

rfi_spegni_sbarre.tds	Script to simulate a fault in the barriers or the lights of a level crossing.
rfi_spegni_seg_pl.tds	Script to simulate a fault in the signals that protect a level crossing.
rfi_spegni_nperm.tds	Script to simulate a fault in a non permissive signal: if clear, it will also unclear, but when "repaired" it won't clear again.
rfi_spegni_perm.tds	Script to switch off and on a permissive signal: if clear, it will also unclear, and when switched on again it will also clear, if possible.

Signals shared between more tracks[9]

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 works only in one case – the most common, but not the only one – while the second solution now works in all cases, so it's the recommended one.

Solution 1: standard signals

This solution is shown in the right part of the `Demo_com_RIP.trk` demonstration layout; 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 latter will be the same triangle departure signal that would be used for each track. On each track the dedicated departure signal will be just a shunting dwarf (`rfi_marm_i.tds`), followed by an 'X' fake station, so the shared signal will clear and unclear automatically together with them. The departure dwarfs should be preceded by the hidden `rfi_avv_part.tds` distant, so they won't clear together with the previouos signals, as if they were triangle departure signals.

Solution 2: specific signals

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

In the previous versions of the package this solution required an adaptation of the scripts, so it will still work, but this is the one to use from now on.

`rfi_prot_com_**.tds` `rfi_part_com_**.tds`	Departure dwarfs to be used – one for each track – before 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 ot 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 the dwarf leading to it shows 'off' or 'fault'.
`rfi_com_**.tds`	Signals shared between more tracks, with 1, 2 or 3 round heads (N), eventually with a triangle (T) or a rappel (RN), to be used only after the departure dwarfs above. If a distant follows, the shared signal must be "told" so by placing a fake 'G' station after it, and the fake stations for the eventual direction indicator must be placed after that distant.

These are the possible combinations:

Shared signal		Dwarf (*rfi_prot_com_[1|2|3]*.tds* or *rfi_part_com_[1|2]*.tds*)
rfi_com_3(R)N.tds	(3 heads, no triangle)	any
rfi_com_2T.tds	(2 heads with triangle)	any except rfi*_prot_com_3*.tds*
rfi_com_2(R)N.tds	(2 heads, no triangle)	*rfi_prot_com_2*.tds, rfi_prot_com_1*.tds* or *rfi_part_com_1*.tds*
rfi_com_1T.tds	(1 head with triangle)	only *rfi_part_com_1*.tds*
rfi_com_1N.tds	(1 head, no triangle)	*rfi_prot_com_1*.tds* or *rfi_part_com_1*.tds* (exception)

[9] In the real world they 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.

Track scripts

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

`rfi_TD_new.tds`	See the paragraph "Facing point lock status indicator" above.
`rfi_sig_up_on_busy.tds`	Script used to update the aspects of the signals when the track element to which the script is assigned is reserved (coloured) for a train to pass.
`rfi_sig_up_on_free.tds`	Script used to update the aspects of the signals when the track element to which the script is assigned is freed (its colour goes back to black).
`rfi_sig_up_on_enter.tds`	Script 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`	Script used to update the aspects of the signals when a train leaves the track element to which the script is assigned.

The older `rfi_sig_up_ib.tds` script is outdated and is not included in the package anymore. Use `rfi_sig_up_on_exit.tds` instead.

Summary of the demo layouts

They're contained in the `Demo_segnali_rfi_5.1.zip` archive, which is published separately on the site.

`Demo_PL_1_bin_AT_OB.zip`	Level crossings with or without barriers on a single track line (faults included), train announcement with ringbell, block busy indication.
`Demo_rall_2pl.zip`	Level crossing on a two track line (faults included), signs for temporary speed reductions, simple block direction indicator.
`Demo_com_RIP.zip`	Signals shared between more tracks (solutions 1 and 2) with direction indicator, departure repeater, route continuation indicator; faults included.
`Demo_staz_man_int.zip`	Station example with normal and shunting signals, bumpers, shunting limits, departure indicator, diection indicator, face point lock status indicator.
`Demo_serie_nd.zip`	Example of a junction that features the 'nd' series signals, because not all branches are divergent for the signals; hidden distants to force diverging aspects or short track aspects.
`Demo_guasti_aux.zip`	How to simulate faults in the signals, and what is their effect on the other ones (normal and auxiliary).
`Demo_blocco.zip`	Permissive signals and block reversal, using both the simple and the complete controls, with every possible signal combination.

The package includes also a technical `Demo.trk` layout to test all the signals' combinations.

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.), undescore, one uppercase letter indicating the direction, `.xpm` extension.

Types

AT:	Train Announcement
OB:	Block Occupancy
BL, DB:	Block Direction (simple, with basic control o full control with occupancy status)
ID:	Direction Indicator (from 0 to 9) or the letters P, A, D, ^ for unmanned stations
TD:	Facing Point Lock Status indicator, Controls to switch off single signals
PL:	Level Crossing barriers position, signs or lights for LCs without barriers
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
RL:	Signs for temporary speed reductions along the line
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 departure signals with round heads, square heads or square heads with an arrow above
AV	"Move in" or "Move on" indicator (see glossary) or signals for ETCS L2 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.
|, –, _, !, =:	Barriers 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,I, off, 0,1,...,9:	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*

Trivialized line (*linea banalizzata*)

In a given direction, a line where all the tracks can be used interchangeably in that direction, with no impact on the traffic speed or capacity, as all of them feature all the necessary block signals[10]. On these lines the CTC can send trains on any track indifferently, by just "orienting" the desired track and setting the route, with the driver that will just follow the signals and the switches. If a line is trivialized, it's usually so in both directions (fully reversible line).

Legal track (*binario legale*)

In a given direction, the left track of a line that is not trivialized in that direction. On these lines intermediate block signals are installed usually only along this track, which is the normal one in Italy.

Left track (*binario di sinistra*)

In a given direction, the left track of a line that is trivialized in that direction. This is the normal one in Italy.

Illegal track (*binario legale*)

In a given direction, the right track of a line that is not trivialized in that direction. This track is used only when there are problems along the other one, as a specific authorization form must be given to the driver before he can travel on this track. Usually just one main block signal (see later) protects the whole track section in this direction, and it's normally off. Sometimes no signals are present on this track in this direction, at all.

Right track (*binario di destra*)

In a given direction, the right track of a line that is trivialized in that direction.

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

In Italy each light of a signal has its own head, which is black with a white border; the heads have a round or square shape depending on whether the signal is placed to the left or to the right of the protected track. When two signals commanding two tracks are placed together between them, the square headed signal features a white diagonal arrow ↙ in a black panel 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 the "Stop" aspect (in Italy a single red light in the topmost head) and stop trains; most of the signals are of this type.

Distant signal (*segnale di avviso*)

A signal that can tell something about the aspect of the next signal. All main signals can show restrictive aspects (requiring a stop or a speed reduction), so they must be preceded by a distant warning about those aspects in advance. Nowadays most of the distants are combined with the preceding main signal (see also Pure / Combined main signal), but pure distants (see below) still exist, usually on single track lines or when block sections are very long, so the intermediate block signals are not concatenated.

Pure distant (*segnale di avviso puro*)

This signal can only tell something about the aspect of the next signal; it cannot show aspects requiring a stop or a speed reduction, i.e. aspects with a red on the upper head (see later). 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 mast 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: they can just be passed expecting a "Stop" at the next signal.

[10] The signals are lit only for the current direction of use of each track, i.e usually lit on the left one and off on the right one.

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

Pure main signals don't tell anything about the aspect of the next signal: 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 departure 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 unlit or at "Stop" (usually after stopping and waiting for some time, but without being told to proceed 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 tipical example of this kind of signals.

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, and so on, that in the real world are combined with the heads of 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).

Departure 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). In smaller or low traffic stations a single departure signal can be shared between more tracks; the departure dwarf (see later) will flash on the track to which a clear aspect of such a signal refers.

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

When a departure 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 the triangle is empty, 60 km/h if "60" is written in it). When these signals are clear the topmost head of these signals would always be red, so it's replaced by the triangle and must be just imagined by the driver, thus saving the installation of a 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 there.

Departure Repeater (*ripetitore di partenza*)

This signal looks exactly like a triangle departure signal with one head, so a sign with a 'RIP.' inscription is mounted under the triangle to distinguish it. This signal is used on side tracks that merge in another track far from the departure signal of the merged track, so the signal of the "main" track must be "repeated" on the side track. The repeater can be cleared only when the next signal is clear, but it's not a distant of that signal: the repeater just tells if the next signal is clear with or without restrictions: if the next signal shows G or RG the repeater shows G, otherwise it shows Y. The repeater can feature the "Route continuation" indicator, as in bigger stations with multiple departure signals.

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 unlit[11]. A block reversal operation (see later) is needed to change the direction along which the signals are 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. It can show only two aspects (R and G) and being a special block signal (see above) it's unlit when not in use. The normal departure signals will not clear towards this signal, as a special form must be given to the driver to tell him he will travel along the illegal track, and the form also allows him to pass the departure signal at red. The green on the main block signal will then tell him that the line is free and everything is OK until the home signal of the next station.

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 opposite[12], 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[13].

High departure indicator (*indicatore alto di partenza*)

This signal consists in a matt white vertical rectangular screen with two vertical lights behind it. The indicator is lit when the departure 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 departure signal is unlit.

"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 a departure 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 route[14]. 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.

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. This indicator is used when it's very likely that the distant cannot indicate any speed to the train, because the signal with the rappel is not clear yet; without the rappel the implied requested speed at that signal would always be 30 km/h.

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[11] 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 distants must also be lit.

[12] In Traindir the two switch operations require two separate clicks on the simple or complete controls.

[13] If not, the signals in the current direction remain lit.

[14] 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 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).

Direction indicators (*indicatori di direzione*)

These indicators consist of a set of white light dots mounted on a black rectanguar 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 in one or more black panels with white light dots, mounted together with the signal heads; from top to botton a signal can infact have: an arrow, at least one head, the triangle, the rappel, the move in and/or the move on indicator, a letter, a digit.

0-9 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.

↙ An arrow to distinguish the signal commanding to the left from the one commanding to the right, when both are mounted on the same mast.

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 departure 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 redundant[15]. 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 redundant[15]. 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 departure 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 departure 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 departure signal and stop the train in front of the next.
In Traindir this indicator lights up when the first departure signal shows "Shunt" and a fake 'V' station is present along the route to the next signal.

I "Obstruction" (*Ingombro* in italian). 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.

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 sumulated). 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.

[15] "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.

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 departure 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 geometry[16]) and specific signal aspects (see later) if line speed is higher then the requested speed.

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 lower than line speed; which speed is told by the triangle, by the rappel (if present, see later) or by the distant. If no triangle or 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 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 which route he'll travel.

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 driver[17]), as the train will follow the straight route (see above).

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

Normal	Diverging[18]	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[19]	RYY	"Prepare to stop by sight". The line is not clear, as the route goes towards a very short or already occupied track (this aspect is used to join trains or to occupy the same station track with two short trains).
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.

[16] 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.

[17] In Traindir 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.

[18] See the previous page for further details.

[19] 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.

Normal	Diverging[18]	Meaning
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_xG_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.
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.

Departure dwarf (*segnale basso di partenza*)

This signal is like a shunting dwarf (see later) featuring only the two vertical white lights. They flash when the departure signal that follows is shared beween more tracks and is now clear for this track.

Shunting Dwarf / Signal (*segnale basso di manovra[20] / 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 one or two vertical lines 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 departure one), 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 when they act as departure dwarfs[21]: this aspect is used to indicate the track to which a clear departure signal is commanding when the latter signal is shared by more than one track.

Shunting aspects (*aspetti dei segnali di manovra*)

Aspect	Meaning
–	"Stop" (two horizontal lights or one 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"[22].
|	"Shunting clear" (two vertical lights or one 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[21]. 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 (*limite delle manovre*)

Shunting movements in stations should always be protected by the home signals, so shunting trains moving towards the line should never get nearer than a braking distance to the home signal protecting the station. This point is usually marked by a concrete post coloured with white and black horizontal stripes, which is simulated also in Traindir.

[20] In the jargon: *marmotta*

[21] In Traindir this aspect is used also by shunting dwarfs when the next signal is unlit.

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

Beginning of the plain line (*inizio della piena linea*)

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: a white square with a magenta triangle pointing sideways towards the track. This sign is 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 barriers aren't closed, and the request to clear the signal triggers the barriers 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 barriers can be pushed to obtain this, in case a car is stuck on the tracks when the barriers 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 barriers position, and specific signals will be installed to protect the LC: 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 signal protecting a level crossing with no barriers is just a squared black and yellow chequered sign with a yellow light in the middle. The light flashes when the red lights for the cars are lit and is off otherwise.
The "distant" of this signal is a simple yellow triangular sign pointing up, with a black border and 'PL' written in black in the triangle.
When the driver sees a level crossing distant at "Warning" he/she must prepare to stop by the home signal (if still unclear). Afterwards he/she can proceed by sight at max 30 km/h, ready to stop the train by sight immediately before each road (their number is on a sign on the signal mast). He/she can so be seen and heard by the cars (using the horn is mandatory) and only then the train can cross the road at human speed (4 km/h); when the loco is beyond the road, the driver can accelerate again.

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

...	"Caution": the gate closure has not been detected. Stop the train, then proceed by sight at 30 km/h maximum, to be ready to stop again before any 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 barriers 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 "Caution" (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). The 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, as with "Caution" (see above).

Temporary speed reductions (*rallentamenti temporanei*)

Maintenance works along the line may request that passing trains slow down for safety reasons. These temporary speed reductions are not enforced by modifying the aspects of the signals, but by placing 3 specific

signs before, near and at the end of the section where the slow down is needed. This is the order in which a train will see them: the “prepare to slow” sign, placed 1200 m before the start of the reduced speed section, the “start of speed restriction” sign where that section starts, the “end of speed restriction” where that section ends. The first is a yellow hexagonal sign with a black border and a yellow light in both the top left and the bottom right corner; the requested speed is printed twice in black: to the right of the top light and to the left of the bottom one. The second is a yellow rectangular sign with a black border and two yellow lights placed horizontally across it; the driver must remember the requested speed and travel at it before passing this signal. The third is a green rectangular sign with a white border and a single green light in its center. The driver will always receive a form telling him/her where the restricted speed section is and which is the requested speed, so he/she can pay more attention to see and obey the signs. Only the form will tell the driver if he/she can accelerate again when just the loco has passed the end sign or when all the train has passed the end sign.

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

Signal	Type	Aspects	Rules for preceding normal signals
rfi_avanz	*distant*	*off, on, flashing*	*To be ignored: consider the next one*
rfi_avvio	*distant*	*off, on, flashing*	*To be ignored: consider the next one*
rfi_ind_part	*distant*	*off, on, flashing*	*To be ignored: consider the next one*
rfi_avv_ind_dir	*distant*	*nothing*	*To be ignored: consider the next one*
rfi_ind_dir	*distant*	*off, nothing, a, d, p, v, zero…nine*	*To be ignored: consider the next one*
rfi_ind_dir_2	*distant*	*off, nothing, a, d, p, v, zero…nine*	*To be ignored: consider the next one*
rfi_LM	main	off, green	To be intercepted as a special case
rfi_LM_s	main	off, green	To be intercepted as a special case
rfi_LM_d	main	off, green	To be intercepted as a special case
rfi_marm_a	*distant*	*red, shunt, flashing, off*	*To be ignored: consider the next one*
rfi_marm_m	*distant*	*red, shunt, flashing, off*	*To be ignored: consider the next one*
rfi_marm_i	main	red, shunt, flashing, off, fault	Already considered (same aspects as a main signal)
rfi_sam_a	*distant*	*red, shunt, off*	*To be ignored: consider the next one*
rfi_sam_m	*distant*	*red, shunt, off*	*To be ignored: consider the next one*
rfi_sam_i	main	red, shunt, off, fault	Already considered (same aspects as a main signal)
rfi_AT_i	main	red, on	Irrelevant, as it's always the first signal
rfi_AT_a	automatic	red, off	Irrelevant, as it's always the first signal
rfi_OB_new	intermediate	red, green	Already considered (same aspects as a main signal)
rfi_DB	*distant*	*black, white*	*Irrelevant, as it's linked to an isolated track*
rfi_ind_blocco	main	disabled, oriented, free, locked, busy	Irrelevant, as it's linked to an isolated track
rfi_prot_PL_i	main	red, shunt, green, closed, off, fault	To be preceded and intercepted by `rfi_avv_PL` or `rfi_avv_PL_i`
rfi_prot_PL_s	main	red, shunt, green, closed, off, fault	To be preceded and intercepted by `rfi_avv_PL` or `rfi_avv_PL_i`
rfi_avv_PL	*distant*	*yellow_flashing, green, open*	*To be intercepted as a normal distant*
rfi_avv_PL_s	*distant*	*yellow_flashing, green, open*	*To be intercepted as a normal distant*
rfi_avv_PL_i	*distant*	*yellow_yellow, yellow, green, open*	*To be intercepted as a normal distant*
rfi_avv_PL_cb	*distant*	*open, fault, closed*	*To be preceded and intercepted by `rfi_prot_PL_*`*
rfi_avv_PL_sb	*distant*	*open, fault, closed*	*To be preceded and intercepted by `rfi_prot_PL_*`*
rfi_tronc	main	red	Already considered (same aspect as a main signal)
rfi_leopolder	*distant*	*red, sound*	*To be ignored: consider the next one*
rfi_avv_part	*distant*	*block, red, red_short*	*To be intercepted as a special case*
rfi_avv_tronc	*distant*	*short*	*To be intercepted as a special case*
rfi_avv_dev	*distant*	*block, thrown, yellow_thrown, flashing_thrown, green_thrown, short_thrown*	*To be intercepted as a special case*

* Distant signals are in colour, smaller or bigger versions are not listed, as they behave in the same way.