

Scripts and icons for the Italian (RFI) signals – version 6.0 of 4/7/2025

This zip file contains all the icons and scripts needed to simulate the Italian (RFI – *Rete Ferroviaria Italiana*) signals in Traindir 3¹; they work only since version 3.9.11 (new versioning after the letters) of the program.

This version of the package implements many new features so, although the best was done to keep backward compatibility with version 5.1, it's advisable to install this package separately, to be able to switch back to version 5.1 in case of problems with scenarios designed for that version.

This will probably be the last version of the Italian signal package, as all signals should now be simulated.

The operation of a signalling system is not trivial; to fully understand how to use each feature of the packet in Traindir, please read the dedicated chapters or paragraphs, and maybe also the glossary at the end. 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.

PLEASE READ CAREFULLY THE 'IMPORTANT NOTES' THAT COME AFTER THE INDEX.

New features in this version

- Pure distant signals can now be distinguished: they have a striped base, as is their mast in the real world.
- New distant repeater signal, to be hidden before a pure distant in case it should be “seen” by previous signals when other distant are in between.
- New departure repeaters with 1 or 2 heads, for every situation (with or without triangle); they can be distinguished by the white rectangle simulating the “RIP” sign of the real world.
- New set of signals (now complete) to be shared among more tracks: home, departure or repeater signals, in every combination of heads, with or without triangle, and high shunting signals. Now a normal departure signal can follow them.
- New set of departure dwarfs to be used on each track when the main signal is shared among more tracks. Now the solution is the same in all cases, and no hidden signals or adapted scripts are required anymore.
- New set of “transparent” shunting dwarfs: when clear they concatenate and become transparent to the previous normal signal, which will “see” the aspect of the next normal signal if the path arrives to it. The old shunting signals are normal for the “transparent” ones.
- New shunting and line limits, now special cases of the above “transparent” shunting signals. The old ones continue working as before, but now shunting movements cannot pass them, as with the new ones.
- The above new signals can also be faulty, like many other signals.
- The Block Busy in the Exit Direction indicator now supports trains having a length.
- High shunting signals now work correctly (new aspects), and can be shared among more tracks.
- Main block protection signals now work correctly: previous signals clear at shunt towards them.
- Normal signals can now be cleared only with ctrl-click towards the signals of the “transparent” set, unless the latter can also be cleared up to a non transparent signal; if possible the clearing will occur automatically, activating their transparency to the other signals.
- New high departure indicator drawn on a platform element, where usually is.
- New shunting bumper with a congruent name.
- Line limits are now drawn with the mast, as the new and old signals for radio block (ETCS L2) lines.
- New special hidden distant to try and clear a signal set as ‘Departure’ just before a train stops at a station in front of it.
- New special hidden distant to allow a direction indicator located before a real station to see the fake stations indicating the directions of a junction located after that real station.
- New short_* aspects for “Prepare to stop” (Y) and “Prepare to slow” (YG, YxGx, YX/Gx) when shown at less than 1200 m from the next signal; they require “Warning” (Yx) instead of “Clear” (G) in the previous signal. The new ones should be easier to detect in the scripts.
- New flashing red aspect to indicate that the signal cannot show the requested aspect, probably because the chosen script is not the correct one.

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

Features kept and improved from version 5.1

- The indicator to control the orientation and occupancy of a block section protected by permissive signals has been simplified: leaving out the occupancy status it just shows 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 swith 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). The clear / unclear action is also propagated to the permissives that follow, up to the last permissive before a non permissive one.
- At the beginning of the simulation the permissive signals for the right track are not automatic, so they won't 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 backward compatibility issues with older layouts.
- The transition from 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 world².
- 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 automation implemented by the authors 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 swith off any signal, to be used with the specific scripts.
- The demo layouts (see the list later on) are now in a separate *Demo_segali_rfi_6.0.zip* archive that will be published later in the layout page of the site (<https://www.backerstreet.com/trainidir/trackse.htm>).
- The 'disabled', 'off' and 'fault' aspects are now implemented 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 or remove 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, to the signals or to the lights seen by the cars. Now station LCs can be simulated as well.
- 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 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 signal series for lines equipped with the 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.
- All the restrictive aspects now force a speed limit: 50 for YY, 110 for Y, YG, YxGx, 150 for Yx/Gx, Yx.
- A train stopped at a station in front of a triangle departure signal will not move at the departure time if the signal is still unclear; set the new 'Departure' attribute to obtain this in signals not featuring the triangle.
- All the signals that need to be automatic to operate correctly – for example the permissive ones – are now set so by the scripts, so there's no more need to use the two head icon of the editor to place them in the layout. Only for the other signals the author can still choose which icon to use.
- The hidden signal named 'UPDATE' is not needed anymore to update all the other signals.

² Unfortunately they're not as much interesting to watch in a simulation...

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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 in some situations, described in the following paragraphs.

The authors of already existing layouts could not know that most of the constraints set by the rules would be enforced over time, and may have exploited 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 5.1 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 in fact 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 wanted. 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.

Layout modifications

As now the signal features change whether the signal is clear or not, and some of them are saved in the layout file, after any modification it is mandatory to **save the layout only with all the signals in the unclear state**, as this is the initial condition. Running simulations can obviously be saved and reloaded in any moment.

Script assignment to the signals

The script name in the property dialog of a signal **must match the file name and capitalization**, as the *next* script function used by other signals to detect the script of the next signal is case sensitive and cannot detect capitalization variants as `rfi_prot_1n.tds` or `rfi_prot_1N.TDS`. The other signals' logic might therefore fail in detecting the variants, and could then show an incorrect aspect. The fact that Traindir loads and uses also the variants is due to Windows, as its file system is not case sensitive (Unix on the contrary would not find any variant).

Adapted or layout specific scripts

In some cases a script 'template' must be adapted to the situations in the layout (LC with more tracks, full control of a block direction, etc.), by creating a copy of it – to be distributed together with the layout – which will be assigned to the signals or icons requiring it. In order for other signals to recognize such copy, **its file name must begin with the name of the originating 'template'**, followed by a `_` and a number or an alphanumeric code to distinguish it uniquely. Ex. `rfi_avv_PL_sb_1+063.tds`.

The rule above applies also to any 'custom' script created by an author for a particular layout.

Placing order of the signals in the layout

New signals should be automatically compliant with the rules below, so following them is still advisable – for efficiency and speed – but it's not mandatory as before.

If the aspect of a signal or icon depends on the aspect of other signals (as with all pure distant, 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 they control, and the latter must be placed in the order the trains will encounter them**, i.e. the order opposite to the one in which they need to be updated.

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 to clear the right ones **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).

So it remains recommended to first 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.

Automatic signals

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 (unmanned stations, junctions with a prevailing direction).

At the beginning of the simulation the "Set sig. to green" menu command activates the automation and clears all the automatic signals, in reverse order of placement into the layout.

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 signal³. 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.

Directions of signals and tracks

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 an approaching train. For historic reasons only the four "straight" directions are consistent, (0 = W, 1 = E, 16 = S, 17 = N) so **if possible the signals should be assigned only to horizontal or vertical track elements**. The packet itself features shunting signals for the diagonals, but the assignment to curved or diagonal elements may not work in all cases, so it should always be verified.

Departure signals and departure repeaters

Trains stopped in front of a triangle departure signal, a departure repeater or any other signal with the 'Departure' property set 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 trigger the clearing of the signal, this will not happen: the player will have to clear the signal manually.

When triangle departure signals or repeaters are clear, they prevent previous signals to clear towards them, and viceversa. 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. A new script that does so is provided.

Installation

Create a folder for the new package (typically C:\Program Files\Traindir3\Signals_RFI_6.0) and set the chosen folder in the "Path to signal scripts" property of the "Environment" tab⁴ 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 (see the Important Notes before).

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.

Outdated scripts

The following scripts are outdated, as stated in their comments, and shouldn't be used anymore. The macros supporting the outdated 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.

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

⁴ The property supports more than one path: if a layout requires so, other paths can be added, separated by ; (no spaces)

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
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_DB_s.tds	Simple direction indicators for a block section; use rfi_DB.tds
tl_n_DB_s.tds rfi_DB_avv.tds rfi_DB_bi.tds	Direction indicators for a block section; use the new ones (see the specific chapter)
rfi_LM.tds rfi_LM_s.tds rfi_LM_d.tds	Old shunting limits of the normal series; use those of the new “transparent” series
rfi_LM_tronc.tds	Old shunting dead end bumper; use rfi_tronc_m.tds
rfi_TD.tds	Old Facing Point Lock status indicator; use rfi_TD_new.tds
rfi_PL_a.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_partR*.tds	Prototypes of departure repeaters with 1 head and a triangle; use rfi_part_1R*T.tds
rfi_sam_a.tds	High shunting signal working as a distant; use rfi_sam_m.tds

Normal signals

The script name for normal signals follows this scheme: "rfi" (the network manager company), underscore, signal type, underscore, number of heads, head shape, .tds extension. The script names for special signals follow their own scheme (see the following table). All the scripts have comments explaining how they work and how to use them; a set of demonstration layouts illustrating all the features will be available on the site.

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 their scripts. 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.

All main signals (i.e. all that can stop trains) feature the ‘shunt’ aspect for shunting: it’s shown in this cases:

- when the signal is cleared with Ctrl-click (white track)
- when a speed limit lower than 30 km/h or the ‘M’ fake station is detected after the signal
- when the signal is followed by an unlit one

The cleared signal remains red, but the track turns white or green and shunting trains can pass it; if the signal is preceded by departure indicators, shunting signals, move in and/or move on indicators, route continuation indicators, they will show the correct aspect accordingly. Three headed signals will show the correct RYY aspect – “proceed by sight, as the track is occupied before the next signal” – with the ‘I’ indicator to allow joining. Almost all normal signals can become faulty, i.e. unlit: see the specific chapter.

Pure distant signals

While normal signals can both stop a train or control its speed, and simultaneously act as distant of the next signal, pure distant signals cannot show the red aspect to stop trains or force their speed in any way (all the aspects have ‘none’ as action), so they are distinguished by the striped base (in the real world it’s the mast that is striped). They must be followed by a main signal (normal or special) and go off together with it; any other pure distant that follows will be ignored, as according to the Italian rules only one pure distant can exist between two main signals. In special cases when they can be preceded by another kind of distant, for example when the previous signal is shared among more tracks or protects a LC, they must also be preceded by the distant repeter, otherwise they won’t be seen by the previous normal signal.

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).
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<code>rfi_rip_avv.tds</code>	Special signal to be hidden before a pure distant so the previous normal signal can “see” it when another kind of distant (for special purposes) is in between.
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Home signals (also departure signals in some cases)

In Traindir home signals are used also as departure signals when a no stop route is allowed or at least one exit route is straight (see the glossary), as both kinds of signal have the same shape and can show the same aspects. They can stop trains, can be followed by whatever signal (normal or special) and will not clear when followed by a clear departure signal with a triangle or by a signal at ‘fault’. When used as departure signals, set their ‘Departure’ property, so the trains will not move at the departure time if the signal is still unclear, and if no stop routes are not allowed, put the hidden special distant `rfi_avv_part.tds` before them.

A home signal used as departure signal can be shared among more tracks: to simulate that case see the specific chapter later on.

<code>rfi_prot_*.tds</code> <code>rfi_prot_*R*.tds</code>	Home signal or departure signals with 1, 2 or 3 heads: round (N), square (Q) or square with an arrow above (F), eventually with a rappel below (R between the number and the shape of the heads – see the glossary).
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Departure signals with a triangle

When these signals are clear, the triangle under their head(s) should be “seen” as another red head above the visible (not red) ones, so these signals can be used only when no stop routes are not allowed and every exit route has at least one diverging switch, all at the same speed (see the glossary); in any other case a signal without the triangle, and eventually a rappel, must be used. They can stop trains and can be followed by whatever signal (normal or special), but will not clear when followed by a signal at ‘fault’.

This signal and the one before cannot be clear together at the same time (unless the one before is a departure repeater): if one is already clear, the other won’t clear⁵. Furthermore, a train will not move at the departure time if the departure signal is still unclear, so such a train can try to clear it automatically only before stopping; this can happen if it meets the hidden `rfi_auto_clear.tds` distant before reaching the station element.

Departure signals can also be shared among more tracks: to simulate that case see the specific chapter later on.

<code>rfi_part_*.tds</code>	Triangle departure signals with 1 or 2 heads: round (N), square (Q) or square with an arrow above (F) and a triangle below.
<code>rfi_auto_clear.tds</code>	Hidden distant that will try to clear the departure signal that follows when passed by a train; it should be hidden before the station element, so a train can try to clear its own departure signal before stopping.

Departure repeaters with or without triangle

These signals are distinguished by the white rectangle simulating the ‘RIP.’ sign; they precede an “advanced” departure signal at a distance that’s too short to act as its distant, so the aspect of the signal that follows is “repeated”. The repeater replicates the lights of the signal that follows, in this way: if the repeater features one head, it replicates the not red lights, showing Y when they’re more than one; if it features two heads it replicates the lights from the uppermost, showing RY when they’re three (with one exception: RYY is replicated as YY). The repeaters can stop trains and will not clear when followed by a signal at ‘fault’. This signal and the one before cannot be clear together at the same time: if one is already clear, the other won’t clear. These are the only signals that can be cleared when followed by a clear triangle departure signal and in the real world they would be forced to clear together, but in Traindir they clear at shunt if the following signal is still unclear. Trains will not move at the departure time if the repeater is still unclear.

Departure repeaters can be shared among more tracks: to simulate that case see the specific chapter later on.

<code>rfi_part_*R*.tds</code> <code>rfi_part_*R*T.tds</code>	Departure repeater signals (R after the number of heads) without or with a triangle (T after the head type) under the head(s), which can be round (N), square (Q) or square with an arrow above (F).
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⁵ Technically, when no stop route are not allowed through a signal, it can be cleared only if a train is occupying the track circuit before it. This prevents the simultaneous clearing of the signal and the one before.

The prototypes of these signals (`rfi_part_R*.tds`) are outdated and shouldn't be used anymore (use the corresponding `rfi_part_1R*T.tds`); they remain in the package just so the layouts that used them will still work.

Permissive block signals

Block signals that are always permissive feature a white sign with a black P mounted on the mast; 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', together with the pure distant eventually preceding them), as this only means that the block is oriented in the other direction, and will not clear when followed by a clear triangle departure signal or by a signal at 'fault'.

To allow the simulation of block reversal operations, by switching on the signals for the right track and eventually switching off those for the left one (see the specific chapter), permissive signals propagate the switch 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). The clear / unclear state is also propagated to the permissives that follow, including the last permissive before a non permissive one.

At the beginning of the simulation the permissive signals for the right track are not automatic, so they won't clear when the "Set signal to green" command is issued, and are unlit only if the controls to switch them on are present.

<code>rfi_perm_*.tds</code>	Permissive signals (black P in white rectangle under the heads) with 1 or 2 heads: round (N), square (Q) or square with an arrow on top (F).
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Main block signal for the right track of not trivialized lines

This normally unlit signal with 1 square head protects the entry towards the illegal track (see glossary) of a not trivialized line, i.e. a line featuring no or just a few intermediate permissive signals in the illegal direction. This signal is involved in block reversal operations (see later) and when lit it works like a home signal with just one head and two aspects: red and green. Like permissive signals it propagates the switch on / off action to the next signal of the same type, even if usually there aren't present. At the beginning of the simulation it's not automatic, so it will never clear when the "Set signal to green" command is issued, and it's actually unlit only if the controls to switch it on are present. Previous signals clear only at shunt towards this signal.

<code>rfi_imp_b.tds</code> <code>rfi_imp_bf.tds</code>	Main block signal with 1 square head and eventually an arrow above ('f' version), normally unlit if the controls to switch it on are present.
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'_nd' series signals (not diverging)

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`).

<code>rfi_avv_*.nd.tds</code> <code>rfi_prot_*.nd.tds</code> <code>rfi_prot_*.R*.nd.tds</code> <code>rfi_part_*.nd.tds</code> <code>rfi_perm_*.nd.tds</code>	Subset of the series for the normal signals; it doesn't include the departure repeaters and the main block signal for the illegal track, as their logic already ignores the switches position when determining the aspect to show.
<code>rfi_prot_com_*.tds</code> <code>rfi_part_com_*.tds</code> <code>rfi_part_com_*.R.tds</code> <code>rfi_part_com_*.RT.tds</code>	Subset of the series for the departure dwarfs, as they are those who determine and set the aspect to be shown by the shared signal that follows (see the specific chapter); it doesn't include the high shunting signals, as their logic already ignores the switches position when determining the aspect to show.

Signals for radio block lines (ETCS L2)

Radio block is spreading from high speed to normal lines, so the transition from normal signals to these ones and viceversa can now occur almost everywhere (considering that diverging routes protected by ETCS L2 signals will not be "seen" by the preceding normal signals, which will clear at yellow).

The visible part of this system consists in some signs along the line, and normally they're 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.

Traindir cannot simulate a variable length block, so these ‘signals’ work like all the others: a click to clear or unclear them and the length of the protected section that is determined by their position; they can also be faulty and can simulate the block reversal operations, but their aspect never changes. As with the real radio block the maximum train speed is forced according to the length of the clear path in front of the train.

rfi_prot_AV*.tds rfi_prot_Av*n.tds	Main signals for lines equipped with radio block system, placed to the left (s) or to the right (d) of the track they command. They are actually signs that never change aspect, and ‘n’ means they have the new drawing and colour scheme.
rfi_perm_AV*.tds rfi_perm_Av*n.tds	Block signals for lines equipped with radio block system, placed to the left (s) or to the right (d) of the track they command. They are actually signs that never change aspect, and ‘n’ means they have the new drawing and colour scheme.

Shunting signals – normal series

The signals of this series are present since the first versions of the package, where the main shunting dwarves (‘i’ set of the series) and the shunting limits were actually signals like all the other: they stopped all the trains and were not transparent for the non shunting signals when two of the latter were connected by a path formed by one or more clear shunting signals. In other words it wasn’t possible to have a home signal at yellow towards a red departure signal if shunting signals occurred along the path, and a departure signals followed by shunting signals or limits would not have “seen” the aspect of the signals after them.

As many layouts have been designed with the old signals, maybe featuring some automation for the shunting movements that could be disrupted, the situation has been corrected by introducing a new “transparent” series of shunting dwarfs and limits (see next chapter). Version ‘a’ and ‘m’ were kept, and the high shunting signals were also kept, as their being not transparent for the non shunting signal is correct, so it was possible to just correct their working logic (adding new aspects), which was wrong.

The normal series, now enriched by the new ‘s’ set of the dwarfs, remains therefore in use, and only the shunting limits set is now outdated, as it didn’t simulate all the cases. The ‘i’ set of dwarfs remains usable when there’s no interest in simulating their transparency to the non shunting signals, but, as the rules require this transparency in the real world, the authors are encouraged to use the new “transparent” series in their layouts from now on.

All the signals of this series can become faulty, i.e. unlit: see the specific chapter.

Shunting signals (dwarfs or high)

When these signals are not clear the previous ones will “see” a red, but when clear they indicate a shunting path that also normal trains can follow (green track), so they will force ‘shunt’ in the previous non shunting signals⁶. Belonging to the normal series they don’t clear towards a transparent shunting signal if the latter cannot be cleared up to another non transparent signal or, as these are shunting signals, up to the shunting or line limits (the first that occurs). The rules infact don’t allow a train to enter the line performing a shunting movement, with the only exception of a loco sent to rescue a train that is stuck along the line before the next signal. This case can be simulated also in Traindir.

The signals of the “distant” sets ‘a’ and ‘m’ are actually auxiliary signals (see the specific chapter) to be coupled with a normal signal, and clear only together with the latter, but the clearing rules of that signal are usually the same.

The dwarfs of the ‘s’ set are irrelevant (they clear when the track is not black) and so always transparent: they are used to at least visually simulate the dwarfs of the transparent series in layouts where only the normal series is used, or when the simulation doesn’t require shunting movement ending before the signal in question.

High shunting signals can be shared among more tracks: to simulate that case see the specific chapter later on.

rfi_marm_i.tds	Main shunting dwarf: it stops trains when off or not clear, and doesn’t clear if followed by a signal at ‘fault’ or by a transparent shunting signal that cannot be cleared. It can still be followed by a fake ‘X’ station to obtain the flashing aspect that is used to simulate the departure dwarf when a non specific departure signal is shared among more tracks (see the specific chapter, outdated solution 1).
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⁶ To force ‘shunt’ even when this signal is not clear, put a speed limit lower than 30 km/h or a fake ‘M’ station after the previous signal.

<code>rfi_marm_a.tds</code>	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.
<code>rfi_marm_m.tds</code>	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.
<code>rfi_marm_s.tds</code>	Irrelevant shunting dwarf that is transparent to the other signals; its aspect depends only on the color (and direction) of its linked track element.
<code>rfi_marm_*d</code>	Version of the previous sets designed for the right track (commanding to the left).
<code>rfi_marm_*dd</code> <code>rfi_marm_*ds</code>	Version of the 'i' and 's' sets designed for the / and \ diagonal tracks respectively; to be assigned only to horizontal signals (commanding towards East or West).
<code>rfi_sam_*.tds</code>	High shunting signals, to be used isolated ('i') or linked immediately before a non shunting signal ('m'); in the 'm' case this signal clears only when the other shows 'Shunt'. The 'a' version is outdated, as now it works exactly like the 'm' one.

Shunting limits – outdated

They're outdated because they're not transparent to the previous non shunting signals, which in many cases cannot adjust their aspect according to that of the next non shunting signal; use the corresponding signals of the "transparent" series (see later).

They never change aspect, as they simulate the post or the signs that limit shunting movements towards the line, inside or outside of the home signals respectively. They can be cleared for normal trains that should pass them, thus it's recommended to set them as "Intermediate", so they would clear automatically for normal trains together with the previous signal.

When not clear they force the shunting aspects in the previous signals, and they cannot be cleared with ctrl-click towards the line, unless when sending a loco to join and rescue a train that's stuck along the line before the next signal.

<code>rfi_LM.tds</code>	This signal simulates and looks like the shunting limit post, to be used inside of the home signals to stop shunting movements before reaching the plain line. It can be followed (outside of the home signals) by the shunting limit signs described below.
<code>rfi_LM_s.tds</code> <code>rfi_LM_d.tds</code>	These signals simulate and look like the shunting limit signs (placed to the left or to the right of the track, respectively) to be used outside of the home signals to stop shunting movements before reaching the plain line. They are used only on two track lines that feature permissive signals towards these signs, so the last permissive will protect the shunting movements blocked by the signs. These signals can be preceded (inside of the home signals) by the shunting limit post described above.

Shunting signals – transparent series

This new series has been created to simulate the transparency of shunting limits and main dwarfs (the isolated ones) to the non shunting signals, in compliance with the rules. They require that, if a sequence of clear shunting dwarfs or limits arrives to connect two non shunting signals, the shunting ones become transparent to the connected ones⁷, so they "see" each other and the first can adjust its aspect according to that of the second. As the transparency is implemented by turning the shunting signals into pure distant, the non shunting signal that should become visible to the one before cannot be a pure distant itself. If it is, it must be preceded by the hidden distant repeater `rfi_rip_avv.tds`, so it becomes normal and thus visible before.

A new series was created because modifying the 'i' set of the normal one (see before) to implement this feature would have been too risky: too many layouts have used the normal series, maybe featuring some automation to help the player with the shunting movements, and any modification could corrupt their way of working.

All the signals of this series can become faulty, i.e. unlit: see the specific chapter.

New shunting dwarfs

When these signals are unclear the previous signals (transparent or not) will clear towards them only with ctrl-click, unless they can be also be cleared – eventually in a sequence – up to another non transparent signal or, as

⁷ And not only to them: also the driver must ignore them, and obey only the connected non shunting ones.

these are shunting signals, up to the shunting or line limits (the first that occurs); if this clearing is possible, it will occur automatically. All the signals that are cleared in this way become irrelevant, with the exception of the first of the sequence (or the one that is in front of a train as it proceeds), which will remain the only clickable one, to unclear the whole sequence with just one click. If these signals are cleared with ctrl-click, the transparent signals that follow will not clear automatically, but if they also are cleared manually in a sequence, even in this case only the first one or the one in front of the train will remain clickable.

<code>rfi_marm_t.tds</code>	Shunting dwarf that becomes irrelevant when clear after an already cleared signal and becomes clickable again when it is the first in front of an approaching train.
<code>rfi_marm_td</code>	Version of the previous signal for the right track (commanding to the left).
<code>rfi_marm_tdd</code> <code>rfi_marm_tds</code>	Versions designed for the / and \ diagonal tracks respectively; to be used only for horizontal signals (commanding towards East or West only).

New shunting limits

These signals replace those of the normal series (see before) that are now outdated.

They never change aspect, as they simulate the post or the signs that stop shunting movements towards the line, inside or outside of the home signals, respectively. They feature the same transparency mechanism (when concatenated with other clear signals) as the transparent dwarfs of this series (see above), but they cannot be cleared with ctrl-click towards the line, unless when sending a loco to join and rescue a train that's stuck along the line before the next signal.

<code>rfi_marm_tlm.tds</code>	This signal simulates and looks like the shunting limit post, to be used inside of the home signals to stop shunting movements before reaching the plain line. It can be followed (outside of the home signals) by the shunting limit signs described below.
<code>rfi_marm_tls.tds</code> <code>rfi_marm_tld.tds</code>	These signals simulate and look like the shunting limit signs (placed to the left or to the right of the track, respectively) to be used outside of the home signals to stop shunting movements before reaching the plain line. They are used only on two track lines that feature permissive signals towards these signs, so the last permissive will protect the shunting movements blocked by the signs. These signals can be preceded (inside of the home signals) by the shunting limit post described above.

Signals shared among more tracks⁸

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 is present since many versions of the packet, but it works only in one case; as the second solution now covers all cases with no need to adapt any script, the first is now outdated, and the second is always the recommended one. Furthermore, only the specific signals of solution 2 support the move in /move on indicator and the direction indicator correctly.

Solution 1: standard signals (outdated)

This solution is still 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 if at least one of that switches is after the shared signal. Only in this case the latter can be the same triangle departure signal that would be used for each track, while each track needs a dedicated departure dwarf (a shunting dwarf `rfi_marm_i.tds` followed by an 'X' fake station), so the shared signal will clear and unclear automatically together with it. Such departure dwarfs should be preceded by the hidden `rfi_avv_part.tds` distant, so they will not clear together with the previous signals, as if they were triangle departure signals.

Solution 2: specific signals (recommended)

This solution now includes all the scripts needed to cover all cases, so it's always the recommended one; it's shown in the left part of the `Demo_com_RIP.trk` demonstration layout.

⁸ In the real world they have always round heads, and if a no stop route is allowed on only one of the commanded tracks – typically the straight one – the signal is placed to the left of it, as if it commanded only that track.

In this solution the shared signal is a transparent distant to be placed after the confluence of the tracks that share it, and each of them must have the departure dwarf corresponding to the type of signal that track would have had if its signal were not shared. As the commanded tracks converge, only one of the departure dwarfs can be clear at a time, and that signal will both set the aspect of the shared signal that follows and “show” it to the previous signals, so they can adjust their aspect according to it.

When a train passes the shared signal or the player (or a script) unclears the clear departure dwarf, the shared signal will turn back to red, until the next clearing of one of the departure dwarfs preceding it.

Departure dwarfs are actually shunting dwarfs with one aspect more, so their visible aspect will just be _ when they're not setting the aspect of the shared signal, | when they're setting a shunting aspect, flashing | when they're setting a normal aspect.

Obviously the shared signal must be capable of showing the aspects requested by the departure dwarfs, so after the lists of the scripts two tables will describe the combinations that are allowed; if a wrong combination is used, the shared signal will show a flashing red when it's not capable to show the requested aspect.

The shared signals can be preceded by the visible auxiliary signals⁹ (see the specific chapter) and if more than one of them is present, they should all be linked to the same track element, so they don't hide each other.

All the departure dwarfs can become faulty, i.e. unlit, but the shared signal will switch off only as long as it's controlled by a faulty departure signal; for other details about the simulation of a fault, see the specific chapter.

Since the common signal is a distant, its departure dwarf—which determines its aspect—is not able to detect other distant signals that may follow; such distant signals must be made visible as normal signals by placing a distant repeater before them (see the specific paragraph later on).

List of the scripts for the shared signals:

rfi_com_*TR.tds	Shared departure repeater with 1 or 2 round heads and a triangle below
rfi_com_*NR.tds	Shared departure repeater with 1 or 2 round heads and no triangle below
rfi_com_*T.tds	Shared signals with 1 or 2 round heads and a triangle below
rfi_com_*N.tds	Shared signals with 1, 2 or 3 round heads and no triangle below
rfi_com_*RN.tds	Shared signals with 2 or 3 round heads and a rappel below (no triangle)
rfi_com_sam.tds	High shunting signals shared among more tracks

List of the scripts for the departure dwarfs:

rfi_prot_com_**.tds	Departure dwarfs simulating a home signal with 1, 2 or 3 heads and no triangle used as a departure signal (diverging routes at different speeds or no stop route allowed)
rfi_part_com_**.tds	Departure dwarfs simulating a departure signal with 1 or 2 heads and a triangle
rfi_part_com_**R.tds	Departure dwarfs simulating a departure repeater with 1 or 2 heads and no triangle
rfi_part_com_**RT.tds	Departure dwarfs simulating a departure repeater with 1 or 2 heads and a triangle
rfi_sam_**.tds	Departure dwarfs simulating a high shunting signal

For all of them the first * is the number of heads of the simulated signal ('c' when it's a high shunting signal) and, as the type of the simulated heads is not meaningful, the second * indicates the position of the departing dwarf relative to the commanded track: to the left ('S') or to the right ('D').

⁹ Except the shunting dwarfs.

Table of the combinations that are allowed for shared signals with or without a triangle (and eventually a rappel) below

rfi_com_1N.tds	x	x					x*	x*		
rfi_com_2N.tds	x	x	X	x			x	x		
rfi_com_2RN.tds	x	x	x	x			x	x		
rfi_com_3N.tds	x	x	x	x	x	x	x	x	x	x
rfi_com_3RN.tds	x	x	x	x	x	x	x	x	x	x
rfi_com_1T.tds							x	x		
rfi_com_2T.tds							x	x	x	x
rfi_prot_com_1D.tds										
rfi_prot_com_1S.tds										
rfi_prot_com_2D.tds										
rfi_prot_com_2S.tds										
rfi_prot_com_3D.tds										
rfi_prot_com_3S.tds										
rfi_part_com_1D.tds										
rfi_part_com_1S.tds										
rfi_part_com_2D.tds										
rfi_part_com_2S.tds										

Table of the combinations that are allowed for shared repeaters with or without a triangle below and for shared high shunting signals

rfi_com_1NR.tds	x	x	x*	x*							
rfi_com_2NR.tds	x	x	x	x		x	x				
rfi_com_1TR.tds			x	x							
rfi_com_2TR.tds								x	x		
rfi_com sam.tds										x	x
rfi_part_com_1DR.tds											
rfi_part_com_1SR.tds											
rfi_part_com_1DRT.tds											
rfi_part_com_1SRT.tds											
rfi_part_com_2DR.tds											
rfi_part_com_2SR.tds											
rfi_part_com_2DRT.tds											
rfi_part_com_2SRT.tds											
rfi_sam_cd.tds											
rfi_sam_cs.tds											

* The compatibility between signals and repeaters with 1 head and no triangle and the departure dwarfs simulating signals and repeaters with 1 head and a triangle is an exception allowed by the rules for practical reasons (saving the cost of installing a second head). In this case infact the non stop route can be allowed on only one track, so only the departure dwarf of that track will simulate a signal or repeater without a triangle, while the dwarfs on all the other tracks will simulate a signal or repeater with the triangle. Furthermore, the shared signal or repeater must be adjacent to the track that allows the non stop route, so the driver can easily act as if the triangle were present whenever the departure occurs from one of the other tracks.

Auxiliary signals

These distant signals must be ‘coupled’ with a normal signal, by placing them before it with no switches in between, to integrate the aspect of the normal signal with additional informations.

The distant versions (‘a’ and ‘m’) of the high and dwarf shunting signals (see the specific chapter) are also auxiliary signals.

When more than one of the visible auxiliary signals is coupled with the same normal signal, all the former should be linked to the same track element, so they don’t hide each other.

‘Move in’ and ‘Move on’ shunting indicators

These shunting indicators are lit when their signal is clear at shunt, i.e. still red but passable; they flash when the shunting aspect depends on the fact that the signal after their one is faulty (unlit).

If their signal features also the direction indicator, these indicators must be placed before it.

rfi_avanz.tds	“Move in” indicator (two horizontal white lights) to be coupled with a home signal. When lit it tells the driver to enter a station at shunting speed (actually, to proceed up to the next signal in the station, not leaving it), because something along the route prevents the signal he sees from clearing normally.
rfi_avvio.tds	“Move on” indicator (two horizontal light blue lights) to be coupled with a departure signal or repeater, even shared among more tracks. When lit it tells the driver to leave a station at shunting speed, because something along the route prevents the departure signal or repeater from clearing normally.

Direction indicator

This black rectangular panel shows a white alphanumeric character to give one of the following indications: the direction the train will take at a junction (numbers from 0 to 9), the unmanned state of a station (letters A and D), a signal that is temporarily permissive (letter P), a route continuation beyond a red signal (flashing ^ symbol), a train forwarded on an occupied track (letter I); for further details see also the glossary.

The indicator requires a fake station placed after its signal: the station name is the number (in letters) or the letter (uppercase) to be shown; only the I will appear automatically when needed. If present, the letters A, D, P are always lit, while the other indication are lit only when its signal is clear (also in shunt); the ^ symbol requires the latter V and is lit only when its signal is clear at shunt. In case of multiple signalling, i.e. when the junction and consequently the fake stations for the directions are located after two signals, use version 2.

When between the indicator and the fake stations for the directions there is another station that hides them, place the hidden `rfi_avv_ind_dir.tds` between that station and the fake ones, so the direction indicator will “see” them.

rfi_ind_dir.tds	Special pure distant implementing the direction indicator; the fake stations that determine its aspect should be placed after the sign to which it is coupled.
rfi_ind_dir_2.tds	This version of the direction indicator looks for the fake stations two signals ahead, for the cases when the junction is after the signal next to the indicator’s one. This version doesn’t support the hidden distant <code>rfi_avv_ind_dir.tds</code> (see later).

High departure indicator

This indicator (two vertical white lights behind a rectangular screen) is placed in stations near the point where the trains usually stop, when the departure signal or repeater is not visible from there. It is lit when the signal that follows is clear (also at shunt), and flashes if the signal after it is faulty.

rfi_ind_part.tds rfi_ind_part_m.tds rfi_ind_part_av.tds rfi_ind_part_avanz.tds	Departure indicator to be placed before a departure signal or repeater that is not visible from the point of the platform where the trains stop. The ‘m’ version is drawn with the platform, where usually this indicator is. The ‘av’ and ‘avanz’ versions feature an integrated move on or move in indicator.
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Behaviour modifiers (to be hidden)

These ‘signals’ must be placed hidden after an imperative signal to modify its behaviour or simply to allow it to function in particular situations, typically in a station. Unlike visible auxiliaries, these signals must not be connected to the same track element, because their order affects their operation. They can be concatenated, in the order in which they are described here, but only `rfi_avv_tronc.tds` can also be preceded by a normal distant. They cannot be followed by other distant, because they would hide them to the previous signals, and vice versa if they were preceded by other distant they would no longer be visible to the signal they are intended to influence; since this case occurs – typically when shared signals, transparent dwarfs or station LCs (barriers or lights) are present – to make them visible again they must be preceded by the distant repeater (see below), and in this case it is advisable to place them immediately before the next main signal.

<code>rfi_avv_dev.tds</code>	Force diverging aspects: force the previous main signal to show diverging aspects even if all the switches along the route are straight. No switches can appear between this modifier and the next main signal, but the two modifiers described below may follow. It is typically used with the ‘_nd’ signal series (see the specific paragraph) or in bigger stations, to slow down the straight route (see the glossary) – as if it were diverging – without needing to slow down the line speed.
<code>rfi_avv_tronc.tds</code>	Very short block: force the previous main signal to show Yx, YY or RYY instead of G, Y or RY, as if the distance to the next main signal or bumper were less than 600 m; other aspects will consider the actual distance. It’s typically used in head stations, to indicate that the train will be received in the shortest tracks, even if they are longer than 600 m, or along the line in special situations (poor visibility of the next signal). This modifier can be preceded by the modifier described above and/or followed by the modifier described below and if not it’s the only one that can be preceded by a normal distant.
<code>rfi_avv_part.tds</code>	Block no stop routes: prevent previous main signals from clearing when the main signal that follows is clear, and vice versa. It’s used when the departure signal has no triangle (triangle departure signals already behave in this way), but no stop routes aren’t allowed, even if they are straight (see the glossary). No normal distant can precede or follow this signal, but the two modifiers described above can precede it.

Distant repeater (to be hidden)

When a normal distant or one or more of the modifiers described before are preceded by other distant – typically by shared signals, transparent dwarfs or station LCs (barriers or lights) – they will no longer be visible to the preceding main signal. To make them visible again they must be preceded by the distant repeater described here.

<code>rfi_rip_avv.tds</code>	Signal to be hidden before one or more distant to make them visible to the preceding main signal when there are other distant before the repeater, because distant hide other distant that follow to the preceding signals. This repeater becomes a main signal only when the preceding main signal is clear so the latter can “see” the aspects of the hidden distant that follow the repeater, which turns back to a distant again when the train passes the preceding main signal.
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Other special distant to be hidden

These ‘signals’ must be placed hidden before or after a normal signal or distant, to modify or just permit its operation in some particular cases.

<code>rfi_avv_ind_dir.tds</code>	Direction repeater: special pure distant allowing the direction indicator <code>rfi_ind_dir.tds</code> (see before) to “see” the fake stations for the directions, which are placed as usual after the junction, even when another station placed before the junction would hide them. This ‘signal’ must be hidden and linked after that ‘hiding’ station and before the usual fake stations that follow the junction.
<code>rfi_avv_PL_s.tds</code>	Specific distant for LCs: normally used to simulate LCs (see the specific chapter), this signal can also be hidden before any other signal to mask the latter to the previous signals, which will always clear with G or RG.

<code>rfi_auto_clear.tds</code>	Clear the departure signal that follows – if possible – when passed by a train; it should be hidden before the station element, so a train can try to clear its own departure signal before stopping, as afterwards it will not move again until something else has cleared that signal.
<code>rfi_leopolder.tds</code>	<p>Ringbell: this is a distant to be hidden before a home signal, to play a sound whenever that signal is cleared.</p> <p>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 an approaching train: 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 close: people are warned to stop crossing any track until the train has stopped or passed by. Nowadays this bell is antiquated and is being dismissed, as most stations are remotely operated and voice announcements keep warning everyone that crossing a track is always prohibited.</p> <p>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 <code>Leopolder.wav</code> or the customized script and sound must be distributed with every layout that uses them.</p>

Special signals

These 'signals' actually simulate other objects and controls, not always linked to the tracks and sometimes present only on the display of the traffic controller and not in the real world.

Train Announcement (block busy in the entry direction)

This 'signal' indicates that a train has entered the layout (occupying the entry block) and will soon appear from the visible part of an entry point. It should be linked to a visible entry point and should be "cleared" by a trigger placed at the beginning of an auxiliary hidden track section that precedes the visible entry point. This hidden section is the real entry point for the program (the one in the schedule), and its length determines how long the player will see the indicator lit before the train becomes visible. The indicator in fact rings the "leopolder" bell¹⁰ (see before) when cleared, and goes off when the train passes it; it's compatible with the 'Block busy in the exit direction' indicator.

<code>rfi_AT_i.tds</code> <code>rfi_AT_small_i.tds</code>	Scripts to simulate the Train Announcement indicator, normal and small version.
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The other scripts simulating this indicator (`rfi_AT_a.tds` and `rfi_AT_small_a.tds`) are outdated and shouldn't be used anymore; they remain in the package just so the layouts that used them will still work.

Block Busy in the Exit Direction

This 'signal' indicates that a train is going to exit from (signals are clear in the exit direction) or just left the visible part of an exit point, so the block is busy in the exit direction and no trains can enter from that exit point in the opposite direction. It should be placed as 'Intermediate' at the end of an auxiliary hidden track section that follows a visible exit point; the hidden section is the real exit point for Traindir (the one in the schedule) and its length determines how long the block will remain busy before the train really exits the layout. If the signals before the visible exit point are concatenated, place also a hidden 'Intermediate' signal (without a script) at the beginning of the hidden section, so the visible signal before it will show 'Warning' when a train is in that section. If trains have a length and the signal before the indicator is not automatic (a permissive, for example), the track element of the exit point must be assigned the `rfi_sig_up_on_exit.tds` script.

If no trains are entering in the hidden section, the indicator is lit when the signal before is clear towards it; if that signal is automatic it will clear again as soon as the exiting train leaves the layout, so the block will always be busy in the exit direction. This signal is compatible both with the Train Announcement indicator and with block reversal operations on the section that precedes it (see the specific chapter for other details); when the indicator is lit no train can enter the layout from the linked track.

¹⁰ Provided that the sound file `Leopolder.wav` is distributed with the layout.

rfi_OB_new.tds rfi_OB_small.tds	Scripts to simulate the ‘Block busy in the exit direction’ indicator, normal and small version.
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The other scripts simulating this indicator (rfi_OB_auto.tds, rfi_OB_a_small.tds, rfi_OB_bi.tds, rfi_OB_b_small.tds) are outdated and shouldn’t be used anymore; they remain in the package just so the layouts that used them will still work.

Bumpers

These always red “signals” (mark the specific option in the properties) look like a bumper. They should be linked to the last track element of a dead end that is not an exit point, to block the trains that would otherwise exit the layout and derail. For the previous signals the normal bumper is a “red”, while the second (shunting bumper) will force the shunting aspects in them.

rfi_tronc.tds rfi_tronc_m.tds	Script simulating a normal or a shunting bumper, used to prevent trains from exiting the scenario from dead ends that are not exit points.
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The other script simulating the shunting bumper (rfi_LM_tronc.tds) is outdated and shouldn’t be used anymore; it remains in the package just so the layouts that used it will still work.

Signs for temporary speed reductions

These ‘signals’ represent the signs that announce (‘a’), enforce (‘i’) and mark the end (‘f’) of a temporary speed reduction along the line. They are fake distant that do nothing per se, as it’s up to the author of the layout to set the reduced speed and then restore line speed 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.

rfi_rall_a.tds rfi_rall_i.tds rfi_rall_f.tds	Scripts simulating the signs that respectively announce, enforce and mark the end of a temporary speed reduction along the line. They’re completely irrelevant distant.
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Facing point lock status indicator

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 elastic switches (now very rare) are used. In these switches simple springs keep the points in the straight position (the only one allowing facing point movement, at very low speed) but allow trailing point movements also from the diverging track. Most of the switches are never trailable by design, but some may be locked only when needed and this indicator is for them.

rfi_TD_new.tds	Facing point lock indicator: this script should be assigned to the track element adjacent to the points of the switch, and then adapted by inserting the coordinates TD of the TD_off_X.xpm icon, which has been directly placed in the layout near the switch, and the direction D leading to the switch itself: 0 = W, 1 = E, 16 = S, 17 = N.
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The other script that simulated this indicator (rfi_TD.tds) is outdated and shouldn’t be used anymore, it remains in the package just so the layouts that used it will still work.

Simulating faults to signals or tracks

Almost all the signals of the packet feature some ‘unlit’ aspects to simulate a fault to their operation. When faulty the signals are typically unclear (‘off’ aspect) and force the shunting aspects in previous signals, but they can still be cleared with ctrl-click – thus only in shunting – to be passed (‘fault’ aspect). If a faulty signal has been cleared in this way, the previous signal will unclear automatically and won’t clear again until the faulty signal also unclears. Exceptions are the signals for level crossings, which remain clearable and passable forcing a very low speed (see the specific chapter), and the permissive signals, which clear normally even when unlit – showing the ‘disabled’ aspect – as their being unlit just means that the block is oriented in the other direction (see the specific chapter).

Pure distant go off together with the signal that follows, to which they’re electrically wired, showing ‘nothing’ or ‘unlit’.

Track elements can also go faulty: when their colour is blue (out of service) the signals won't clear towards them, thus interrupting the circulation on them.

Only a script can “break down” a signal by setting an “unlit” aspect, or “repair” it by setting a normal aspect again, so the packet features a series of scripts to be assigned to an icon, which becomes a “button” that the player can click to break down or repair a signal or a track element (see the next paragraph).

“Buttons” to “damage” and “repair” a signal or a track element

These scripts must be assigned to an icon (no need to select an image, as each script will set the correct one), to be linked to the signal or track element to “damage”. If linked to a signal, a click on the icon will switch it off or on, and other signals will change their aspects and operation accordingly (see the next chapter for details). If linked to a track element, a click on the icon will change the color of the track from black to blue (or vice versa), and blue will prevent trains from travelling on that track (previous signals won't clear towards it).

The scripts are different for a track element or the different types of signals, but the aspect of the ‘button’ is always ‘lit’ (cyan: signal or track element is faulty) or ‘unlit’ (grey: signal or track element is working).

rfi_spegni_nperm.tds	Script to simulate a fault in a non permissive signal: if it's clear, it will also be uncleared, but when “repaired” it won't clear again.
rfi_spegni_perm.tds	Script to switch off and on a permissive signal: if clear, if it's clear, it will also be uncleared, and when switched on again it will also be cleared, if possible.
rfi_spegni_man.tds	Script to simulate a fault in a transparent shunting dwarf (new): if it's clear, it will also be uncleared, but when “repaired” it won't clear again.
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 specific signals that protect a level crossing, with or without barriers.
rfi_spegni_binario.tds	Script to simulate the interruption of train circulation on a track, for any reason.

Specific signals for Level crossings (LC)

LCs are protected by specific signals only when they're too far from the previous normal signal (more than 2 km) to be protected by the latter; this rule applies independently for each side of each track that is crossed by the road. The packet is able to simulate 3 objects: the LC itself, represented by its barriers or lights for the cars, the specific home signal and the specific distant. On each of the two sides of each track crossed by the road at least the first ‘signal’ must be present, while the other two will be present only when the previous normal signal on that side is too far. It's in fact the clearing of one of the signals towards the LC that determines the closure of the LC itself, and this closure will occur on every side: the specific signals will show ‘LC closed’ on all the sides where they're present. This applies even when there are more than 1 track – unfortunately this case requires to adapt the scripts – i.e. the first approaching train closes the LC, and the latter remains closed if in the meantime another train approaches it on another track; the LC will reopen only when the last train will have passed it.

The signals for LCs with or without barriers use different scripts, but their logic is the same; LCs with barriers can simulate also the lights for the cars, as these lights are usually present on every LC.

All the 3 signals can become faulty, i.e. unlit, and the other signals of the sequence will take this into account; to simulate this case see the specific chapter.

The other scripts related to LCs (rfi_prot_PL_b.tds, rfi_prot_PL_a.tds, rfi_PL_i.tds, rfi_PL_a.tds) are outdated and shouldn't be used anymore; they remain in the package just so the layouts that used them will still work.

1st ‘signal’: barriers or lights for the cars (the LC)

This ‘signal’ is the only one to place – one for each direction of the track – if the LC is protected by normal signals, as it determines 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); these elements must be assigned the script sig_up_on_exit.tds, to detect the end of a train passage, and should be of length 1. If the LC has more than one track, a signal is needed for each direction of each track, and all of them will be an adapted copy of the

script to be distributed with the layout, because each script need to know the coordinates of the control elements on the other tracks, elements to which the signals with the adapted scripts linked. Only in this way the other signals of the sequence will clear all together when one of the control elements is coloured, and unclear all together when the last train leaves the LC, as it happens in the real world. In order to be recognized by the other signals, the name of the adapted copy **must** be with `rfi_avv_pl_##` (pl is lowercase, ## is the LC number), eventually followed by `_cb` or `_sb` if the LC is simulated both with the barriers and with the lights for the cars.

This signal is compatible with the new transparent shunting dwarfs, so station LCs can also be simulated.

<code>fi_avv_PL_cb.tds</code> <code>rfi_avv_PL_sb.tds</code>	Script that simulate a LC, representing the barriers ('cb', when the LC features them) or the lights for the cars ('sb', when the LC has no barriers). The lights can actually be simulated in every LC, i.e. even when the barriers are present.
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2nd signal: the specific home signal

This signal is the one that actually protects the LC, i.e. the one where the train will stop if the LC is not protected (barriers not closed or lights for the cars not lit). A trigger should clear this signal in advance, so it will colour the track elements near the road and close the barriers or switch on the lights for the cars, allowing the signal to show the "Clear" aspect. If the barriers, the lights or this signal are faulty (this can be simulated independently using specific scripts for each direction – see the `Demo_PL_1_bin_AT_OB.trk` demonstration layout), this signal will be "Unclear" or unlit, and the train will pass it at 10 km/h, to simulate the "proceed at man's speed while crossing the road" that these aspects mean. The line speed limits must be set again after the LC, so the trains that has passed it can accelerate again. In case of more than one track each coming train has to clear its own signal in any case, but all the signals will show "Clear" since the first coming train "closes" the LC and until the last passing train "frees" the road, like in the real world.

<code>rfi_prot_PL_i.tds</code> <code>rfi_prot_PL_s.tds</code>	Scripts simulating the specific home signal for LC with barriers ('i') or without ('s'); it's the second signal of the sequence when previous normal signals are too far (more than 2 km) from the LC to protect it.
<code>rfi_prot_PL_big_i.tds</code>	Bigger version of the specific home signal for an LC with barriers.

3rd signal: the specific distant

This signal is the specific distant to be placed before the specific home signal described above, and is the one that determines the aspect of the normal signals preceding it. Usually they will 'see' a clear line (thus showing only G or RG) even when the LC home signal is unclear, but using the type 'i' script they will instead 'see' the "Unclear" aspect of the LC home signal as a red, and show "Prepare to stop" accordingly.

<code>rfi_avv_PL.tds</code> <code>rfi_avv_PL_i.tds</code> <code>rfi_avv_PL_s.tds</code>	Scripts simulating the specific distant for LC with barriers (2 versions) or without ('s') version); it's the third signal of the sequence when previous normal signals are too far (more than 2 km) from the LC to protect it. The 's' version of the script script can be hidden before any other signal to mask it: the previous signals will "see" a clear line and show only G or RG when clear.
<code>rfi_avv_PL_big.tds</code> <code>rfi_avv_PL_big_i.tds</code>	Bigger version of the two special distant for LCs with barriers.

Block direction indication and management (reversal operations)

When a track can be travelled in both directions, there is a safety problem: it should be guaranteed that it can be reserved for a train only in one direction at a time; depending on the number of tracks featured by the line, the actual operation of such a track may vary a lot.

On single track lines both directions are obviously equivalent and traffic is low, so intermediate signals are usually not installed, as the ability to send more trains at close range in the same direction is not worth the longer waiting needed before being able to travel the track in the opposite direction again. On these lines the clearing of a departure signal on one side of the section (not possible if a departure signal on the other side is already clear, or if a train is in the section) determines the orientation of the whole (single) block section, and its occupancy is evident from the presence of a train; there is no need of a specific management of the direction of the (block) section, so the simplest solution offered by the packet – providing just an automatic direction indication, with no control over it – is enough.

On lines featuring more tracks instead, each track has a prevailing direction of use, and permissive intermediate signals are always installed for that direction, so that trains can be queued in that direction at the track maximum capacity. Travelling in the opposite direction can be considered a rare exception, i.e. allowed only in case of problems on the track normally dedicated to that direction, or an “almost normal” case, to allow overtakings, increase temporarily the capacity of the line in one direction, or just avoid some interferences when entering or exiting some stations. Only in the second case the intermediate permissive signals are installed also in the non prevailing direction (maybe in a smaller number), while in the first case only the main block signal is typically present, at the beginning of the section.

On each track of these lines the signals for the non prevailing directions are normally unlit, and are switched on only when the traffic controller decides to “reverse the block” i.e. to reverse the direction that trains will travel on that track.

This operation must occur on the whole section in one shot, therefore no trains can be in the section when its direction is reversed, and the controls to reverse the direction show an indication that the operation is possible (occupancy status).

In Traindir detecting the occupancy status of such a track section is complicated, as the number of intermediate signals to check is not known in advance, and so the control scripts must be a copy of a “model” adapted for each section, resulting in a lot of work for the author of the layout if he/she wants to give the player the ability to control the direction of many sections. However, by omitting the occupancy indication it was possible to provide a simpler but still satisfying solution to be played: leaving the player the responsibility to not reverse the direction when there are trains in the section – by simply visually checking their presence before operating the controls, which indicate only if the signals are on or off – it is possible to manage the switching on or off of the signals of a section (independently for each direction of the track) with “universal” scripts that can be assigned just as they are.

Each of the three solutions mentioned above is described in a dedicated paragraph hereafter.

Simple block direction indicator for a section with no intermediate signals

This arrow shaped ‘signal’ acts as the direction indicator for a section with no intermediate signals, not showing its occupancy status; it’s a distant to be linked to the last track element of the section, which usually is the one before the home signal of the station or junction at the end of the section. The direction of the arrow is opposite to the base of the signal to which the script is assigned.

The indicator lights up when the linked track element is reserved in the direction of the indicator, and goes off when the train leaves the section through that element, provided that the `rfi_sig_up_on_exit.tds` script is also assigned to it.

<code>rfi_DB.tds</code>	Simple direction indicator for a section with no intermediate signals; it’s fully automatic, and no occupancy indication is given. It’s a distant that should be linked to the last track element of the section, and that element must also be assigned the <code>rfi_sig_up_on_exit.tds</code> script.
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The other scripts for the simple block direction indication (`rfi_DB_s.tds`, `tl_n_DB_s.tds`) are outdated and shouldn’t be used anymore; they remain in the package just so the layouts that used them will still work.

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

This script must be assigned to an icon (no need to select an image, as the script will set the correct one), which will then 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)¹¹. 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 and no signal is clear towards it, as this indication is not given. In the real world any of these situations would prevent the operation, but only the complete and complex indicators described in the next paragraph do that check before allowing the operation.

Controls are separate and independent for the two directions of the controlled section (even if both are usually present), so to reverse the block the player has to first switch off the signals for the current direction and then switch on the signals for the opposite one.

¹¹ If other permissive signals follow the first, they will switch on and off with it, so the indication is for all of them.

Both the on/off and the clearing/unclearing actions will propagate, so there is no more need to set all the permissive as “Intermediate”.

<code>rfi_blocco.tds</code>	This script must <u>be assigned to an icon</u> to obtain the control that the player will click to switch on and off the permissive signals that protect the section in the direction of the indicator; such icon must then be linked to the first of those signals.
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Block direction and occupancy indicator (full control)

Each indicator of this kind shows the status of a block section in one of the two directions a train can travel it (another indicator is needed for the other direction); when possible – see the table of the aspects below – it can be clicked to switch on or off the signals that protect the section in the direction in question. It works strictly together with them (permissive signals or main block¹²), so the script is actually only a template: a separate copy of it should be adapted to each section and direction to be controlled, and distributed with the layout; the signal to which each copy is assigned must be linked to an isolated hidden track with the same direction as the one to control.

<code>rfi_ind_blocco.tds</code>	Status indicator for a block section, in the direction of the indicator itself; when clickable it allows to switch off and on the signals for that direction (permissive signals or the main block signal). The script is just a template: a separate copy of it should be adapted to each direction to be controlled (see how below), and distributed with the layout; the signal to which each copy is assigned must be linked to an isolated hidden track with the same direction as the one to control.
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Controls are separate and independent for the two directions of the controlled section (both are usually present), so to reverse the block the player has to first switch off the signals for the current direction and then switch on the signals for the opposite one.

Each copy of the script (a separate one for each direction to control), must be adapted by inserting the names or the coordinates of the controlled signals (S1 – Sn) and the coordinates of two important track elements:

IN: the first track element of the section; when its 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’. This is obtained by assigning the script `rfi_sig_up_on_enter.tds` to this element.

IB: the track element before the first signal of the section in the direction of the indicator (a permissive signal or the main block signal).

If only a main block signal (it will be S1) protects the block, there’s no need to set IN and IB coordinates.

The script `rfi_sig_up_on_exit.tds` must be assigned to the track element before the first non permissive 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.

<u>Aspect</u>	<u>Meaning</u>
<i>disabled</i> (black arrow)	All the controlled signals are off, and the indicator can be clicked to switch them on (if no trains are in the section in the opposite direction, they will also clear).
<i>free</i> (grey arrow)	All the controlled signals are lit and red; the indicator can be clicked to switch them off.
<i>oriented</i> (white arrow)	All the controlled signals are lit and at least one is clear (the direction is locked, but no train is arriving); the indicator can still be clicked to switch them off (the clear ones are uncleared first).
<i>locked</i> (white arrow)	A signal before the block is clear towards it in the controlled direction, so the block cannot be reversed; the controlled signals can be on or off.
<i>busy</i> (orange arrow)	At least one train is in the section in the controlled direction, so the block cannot be reversed; the controlled signals can be on or off.

¹² All cases, including ERTMS signals, are illustrated in the `Demo_blocco.trk` demonstration layout.

NOTES:

Both the on/off and the clearing/unclearing actions will propagate, so there is no more need to set all the permissive as “Intermediate”.

The presence of a train beyond a signal is detected by the signal being red with the automation enabled, so this automation is activated by the script when the signal clears; if the player disables the automation when the signal is clear, the train will not be detected and thus the ‘busy’ aspect will not be shown.

As the clear / unclear status is propagated, the player can manually unclear only the first signal of a direction – if it has not been set as ‘Intermediate’ – and the indicator will detect and show the result of this action.

If the player reverses a train direction while in the section, the indicators will show the correct aspect only after that train passes a signal in the new direction.

The other block direction and occupancy indicators (`rfi_DB_avv.tds`, `rfi_DB_bi.tds`) are outdated and shouldn’t be used anymore; they remain in the package just so the layouts that used them will still work.

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.

<code>rfi_TD_new.tds</code>	See the paragraph “Facing point lock status indicator” above.
<code>rfi_sig_up_on_busy.tds</code>	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.
<code>rfi_sig_up_on_free.tds</code>	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).
<code>rfi_sig_up_on_enter.tds</code>	Script used to update the aspects of the signals when a train enters the track element to which the script is assigned.
<code>rfi_sig_up_on_exit.tds</code>	Script used to update the aspects of the signals when a train’s tail 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 fake stations

‘Fake’ stations are placed in the layout not to stop trains there (it’s recommended to mark their “Shunting trains don’t stop” option), but to give indications to the signals, just to allow their normal operation or to modify it when needed by a particular situation. The list of the recognized fake stations follows:

zero, ..., nine	Make the corresponding number appear on the direction indicator; directions are counted from left to right, and zero is for special ones (yards, depots, etc.), as the not simulated numbers from 10 to 19 (too big to be drawn in a single element of Traindir).
A, D, P	Make the corresponding letters appear on the direction indicator (see the glossary for the meaning).
V	If the previous signal is clear at shunt, make the flashing ^ symbol appear on its direction indicator (intinerary prosecution up to the next signal).
M	Force the previous signal to clear at shunt; it’s typically placed at the entry of a yard or a bundle of secondary tracks to force shunting speed also with the signal aspects. A speed limit lower than 30 km/h would have the same effect.
K	Force diverging aspects (see the glossary) in the previous signal, when the latter doesn’t look at the position of the switches (‘_nd’ series – see the specific chapter) or when a straight path should be considered diverging; the hidden distant <code>rfi_avv_dev.tds</code> would have the same effect..
X	OUTDATED It’s the station used to tell a shunting dwarf (<code>rfi_marm_i.tds</code>) that is acting as the departure dwarf for a shared signal that follows (see the specific chapter); the departure dwarfs of the new series are already specific and don’t require it anymore.

Summary of the demo layouts

They're contained in the `Demo_segnali_rfi_6.0.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, direction indicator, facing point lock status indicator, LCs.
Demo_serie_nd.zip	Example of a junction that features the 'nd' series signals, because not all branches are divergent for the signals; hidden distances 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.
Demo_scalo.zip	Very complicated yard to show almost all the possible ways to combine station LCs and transparent shunting dwarfs with normal and special signals.

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 or more uppercase letters telling the icon type, underscore, lowercase letters describing the aspect (colour sequence, position, size, etc.), underscore, one uppercase letter indicating the direction, `.xpm` extension.

The tables that follow list the types, the aspects and the orientations.

Types

AT, OB	Train Announcement, Block Busy in the exit direction.
AV	"Move in" and "Move on" indicators (see the glossary) or signals for ETCS L2 lines
BL, DB	Block Direction (simple, with basic control or with full control and occupancy status)
ID	Direction Indicator (numbers from 0 to 9 or the letters I, P, A, D, ^)
IP	High departure indicator
PL	Level Crossing barriers position, signs or lights for LCs without barriers
LQ, LT	Specific signals to protect level crossings, with square or triangular head
LM, PLM	Sign or post indicating the shunting limit (beginning of the plain line)
MA, MF	Shunting dwarf, commanding to the right or to the left
MD, MS	Shunting dwarf, commanding to a / or \ diagonal element
MO, MV	Platform element, horizontal or vertical
RL	Signs for temporary speed reductions along the line
SM	High shunting signal
TD	Facing Point Lock Status indicator, controls to switch off single signals
TR	Dead end bumper

AN, AQ, AF	Distant signals (striped base) with round heads, square heads or square heads with an arrow above
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	Main signals, with round heads, square heads or square heads with an arrow above
RN, RQ, RF	Main 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
RPN, RPNT	Departure repeaters with round heads, without or with a triangle.
RPQ, RPQT	Departure repeaters with square heads, without or with a triangle.
RPF, RPFT	Departure repeaters with square heads and an arrow above, without or with a triangle.

Orientation

N,S,W,E,X	The icon is oriented for trains going up, down, to the left, to the right, or in any direction.
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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.
big, sml	Size (for level crossing, train announcement and block busy indicators).
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.
0,1,...,9, off, P,A,D,V, I	Numbers, off, letters, for the direction indicator.

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 signals¹³. In that direction 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 obey the signals and follow the route set by the switches. When a line is trivialized, it’s usually so in both directions.

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 protecting 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 a red light on the topmost head, thus requesting a train to stop at the signal or to reduce its speed from the signal on; most of the signals are of this type.

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 typical example of this kind of signals.

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.

¹³ 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 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.

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 distant, which have a different mast colouring, so main signals are qualified as pure or combined only when necessary, otherwise they’re just main 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 end bumpers, block status, etc.

Auxiliary signals – *segnali ausiliari*

In Traindir, signals that represent and simulate indicators or signs that in the real world are combined with the heads of a single signal, but in Traindir need a separate “signal” object. Examples are the move in, move on, departure and direction indicators.

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 departure signal (with or without triangle), so a sign with a ‘RIP.’ inscription is mounted under the heads 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: it shows the same aspect as the next signal, as far as its number of heads allows (otherwise a more restrictive one is shown). The repeater can feature the “Route continuation” indicator, as in bigger stations with multiple departure signals.

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.

unlit	The not visible signal that follows is unclear (red, unlit or faulty): departure is not allowed.
lit	The not visible signal that follows is clear: departure is allowed when it's time.
flashing	Only in Traindir: the not visible signal that follows is clear towards an unlit or faulty signal.

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 unlit¹⁴. 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 trivialized. 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, up to the distant and home signals of the next station or junction (usually both feature only one head, with a fixed aspect: Y and R respectively). 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 opposite¹⁵, 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 direction¹⁶.

Rappel – *rappel*

A speed reminding indicator placed under the lower head of a main signal that can show diverging aspects (see later), 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.

Direction indicators – *indicatori di direzione*

These indicators consist of a set of white light dots mounted on a black rectangular plate under the signal heads. When lit they show a number, telling the driver which route he will travel. It's up to the driver to check that the route is correct for his train and eventually stop immediately if the route is wrong (even if the signal is clear). Possible routes are counted from left (1) to right and 0 (simulated) or the numbers from 10 to 19 (not simulated) are sometimes used for special routes – towards yards, depots, dead ends, etc.

In Traindir this indicator can also show letters and symbols, while in the real world they would be shown by separate panels, even if they would never be lit together at the same time.

¹⁴ 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.

¹⁵ In Traindir the two switch operations require two separate clicks on the simple or complete controls.

¹⁶ If not, the signals in the current direction remain lit.

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 bottom a signal can in fact have: an arrow, at least one head, the triangle, the “RIP.” sign, the high shunting signal, the move in and/or the move on indicator, a letter, a digit, the rappel, a shunting dwarf at the base of the mast.

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.
- ^ “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.

- 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 redundant¹⁷. 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 redundant¹⁷. 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.
- 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.
- I “Obstruction” (*Ingombro* in Italian). This indicator is shown 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 simulated). The home signal is red because the CTC operator has something to tell the driver, so he should get down the loco and pick up the phone that is always installed near the signal. Nowadays all the drivers are given a mobile phone (restricted to the railway mobile network), so the CTC operator can almost always call them as needed in advance, without forcing them to stop at a signal. Exceptions are secondary mountain lines or long tunnels, where no field of the mobile network is present. This “old” procedure is one of the most feared by the drivers, as the almost never used telephone boxes are perfect places for bees and wasps to build their nest into.

¹⁷ “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 a pass through route is locked in the switches (typically the straight one). On the other hand “Move in” and “Move on” indicators are manually lit by a CTC operator, after checking that the line is clear and possibly that the switches’ position is correct, and can be activated for any route.

“Move in” / “Move on” indicators – segnale di avanzamento / 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 even if unclear. The possible aspects follow:

unlit	The signal featuring the indicator is working: obey its aspect.
lit	Proceed by sight at 30 km/h maximum, as something prevented the signal from clearing, but the line is clear and safe, so a CTC operator forced this aspect in the indicator. In Traindir it's also used to indicate that a red normal signal is actually clear for a shunting movement.
flashing	Proceed by sight at 30 km/h maximum, as something prevented the signal from clearing, but the line is clear and safe, so a CTC operator forced this aspect in the indicator, but the driver must check the switches position for the expected route, and correct it manually if wrong before proceeding ¹⁸ . In Traindir this aspect is used to indicate that a red normal signal is actually clear towards an unlit or faulty signal.

Normal (signal) aspects – aspetti normali

All the 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 driver¹⁹), as the train will follow the straight route (see below).

Restrictive (signal) aspects – aspetti restrittivi

All the aspects when the topmost head is red. They are shown only by main signals, as they request a train to stop at the signal or to reduce its speed from the signal on, and a distant aspect shown by the previous signal must tell the driver what to expect, in order to be prepared to obey the restrictive aspect that follows.

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 geometry²⁰) and specific signal aspects (see later) if line speed is higher than the requested speed. If line speed is not higher, these routes are considered “straight” (see above).

Diverging (signal) aspects – aspetti in deviata

All clear aspects when the topmost head is red or when a triangle is present under the heads (the rest of the aspect is and means the same as a normal aspect). They indicate that the train will follow a diverging route requiring a speed lower than line speed; which speed is told by the triangle, by the rappel (if present, see before) 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

¹⁸ 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).

¹⁹ In Traindir restrictive distant aspects now enforce a speed reduction, as requested by the Italian Train Speed Control System (SCMT): 50 km/h for YY, 110 km/h for Y, YG, YxGx, 150 km/h for Yx/Gx, Yx.

²⁰ 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.

diverging route, normal aspects are used also for that route, and only the direction indicator (see before) will tell the driver which route he'll travel.

Signal aspects for main and distant signals – *aspetti dei segnali imperativi e di avviso*

Normal ²¹	Diverging ²¹	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 at 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 ²²	RYY	“Prepare to stop by sight”. The line is not fully clear, as the route goes towards a very short or already occupied track (for a joining or to occupy the same station track with two short trains); the latter case is distinguished by the new ‘I’ indicator.
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.
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: <ul style="list-style-type: none"> - 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 lower, equal or 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 between more tracks and is now clear for this track. In Traindir it's simulated by the shunting dwarfs, as it would be confused with the high departure indicator.

Shunting dwarf – *segnale basso di manovra* (‘marmotta’ in the jargon)

Dwarfs are placed at ground level, alone or at the base of a high signal (normal or shunting), and are triangular signals featuring 3 white lights arranged in an L shape. Their aspects are meaningful only for shunting trains, i.e. trains that are travelling a path that either starts or ends with one of these signals. 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 dwarf along a shunting path is usually mounted at the base of a high

²¹ See the previous page for further details on these definitions.

²² 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 than 600 m from the previous signal, as if it were R.

signal (normal or shunting), forming a single signal that can show ‘shunt’: the high signal seems unclear but the dwarf shows ‘Clear’. If the normal signal shows a clear aspect, all shunting signals are to be ignored until the next high signal, so they can either show “Clear” or remain at “Stop” and just be ignored²³. Only yards can feature only shunting signals (typically a combination of dwarfs and high).

Shunting aspects for dwarfs – *aspetti dei segnali bassi di manovra*

Aspect	Meaning
–	“Stop”: 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 starts or ends at a shunting dwarf and was commanded by a shunting signal or by a shuntman. If it’s not a shunting movement this aspect can be ignored, as the previous high signal was clear and its aspect is the one to obey.
	“Shunting clear”: 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 should ignore this aspect, as the previous high signal was clear and its aspect is the one to obey. No info is given about the aspect of the next signal (normal or shunting, high or not) as it should be already visible.
_x	“Clear”: this is not a shunting aspect and is shown only by shunting dwarfs that are acting as departure dwarfs ²⁴ (see before). It indicates that the clear high signal that follows is shared between more tracks and is now commanding to this track: proceed obeying the clear aspect of that signal.

– o | show the orientation of the two white lights that are lit; the subscript _x means they flash.

High shunting signal – *segnale alto di manovra*

These signals consist in an hexagonal head with a set of white dots that can show various aspects. It’s a shunting signal, as it allows trains to proceed at shunting speed up to the next high signal (shunting or not), indicating if the latter is already clear or not, but all the trains must obey it. When mounted under the heads of a normal signal, it clears on behalf of the latter when the route is a shunting one, and when it shows a clear aspect all the shunting signals along the route are to be ignored until the next high signal (because this is a high signal), but they will be clear²³. It’s the typical stop signal in yards, and can be shared among more tracks.

Shunting aspects for high signals – *aspetti dei segnali alti di manovra*

–	“Stop”. No train can pass it unless it changes its aspect, unless a shunting dwarf clears at its base, indicating a shunting route that doesn’t reach another high signal, or unless it’s mounted under the heads of a normal signal that is not red (the aspect of the latter is the one to obey, and the route is normal).
_x	“Proceed by sight”, as the track is occupied, before the next high signal (normal or shunting), by another rolling stock, and a merge is to occur. All the shunting signals along the route are to be ignored (up to the rolling stock), but they will be clear ²³ .
	“Proceed at shunting speed” up to the next high signal (normal or shunting), which is unclear. All the shunting signals along the route are to be ignored (up to the next high signal), but they will be clear ²³ .
	“Proceed at shunting speed” up to the next high signal (normal or shunting), which is clear. All the shunting signals along the route are to be ignored (up to the next high signal), but they will be clear ²³ .

– or | or || indicate the pattern shown by the white dots that are lit; the subscript _x means they flash.

Shunting limit – *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 in Traindir is simulated by a special ‘signal’ that can be cleared only for normal trains.

²³ 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 route that its train will follow, so they’re ignored only formally.

²⁴ In Traindir this aspect is shown also by normal shunting dwarfs, when they are clear towards an unlit or faulty signal.

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. In Traindir this sign is simulated by a special ‘signal’ that can be cleared only for normal trains.

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 only when all the train has passed the end sign.

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 many LCs 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 barriers²⁵, but just the flashing red lights for the cars: just read ‘lights’ instead of ‘barriers’ and ‘lit’ instead of ‘closed’ The emergency button is never present in this case.

If normal signals are too far, they will ignore the LC: the closure of the barriers or the switch on of the lights will be triggered by the train itself, through a pedal placed at an appropriate distance, and specific signals or signs (depending on the presence of the barriers) will be installed to protect the LC.

For LCs with barriers the signals are a home and a distant, featuring a square or triangular (respectively) black head with a yellow border and five lights arranged in an upsidedown T shape (3 horizontal red lights for the home signal, 3 horizontal yellow lights for the distant e 2 vertical green lights for both).

For LCs with no barriers the “home” signal 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 sign is a simple yellow triangular sign pointing up, with a black border and ‘PL’ written in black in the triangle.

The way a LC is protected (normal signals or specific signals / signs) is independent on each side of each track that is crossed by the road.

The specific signals or signs for LCs are fully automatic and electrically bound to the position of the barriers or to the switching on of the lights for the cars, so they show the same aspect on each side of each track where they’re present, even if each train will obviously arrive only from one side of each track.

²⁵ LCs without barriers are allowed only along secondary low speed lines with low traffic.

Signal aspects for level crossing with barriers – aspetti dei segnali per i passaggi a livello con barriere

...	“Caution”: the detection mechanism is working, but the closure of the barriers has not been detected by the home signal. Stop the train, then proceed by sight at 30 km/h maximum, to be ready to stop again before any road and then proceed normally if the barriers are actually closed or at 4 km/h until the loco has passed each road. In Traindir a speed reduction to 10 km/h is enforced, from the signal to the first speed limit encountered along the track ²⁶ .
...	“Warning”, the aspect shown by the distant when the home signal shows “Caution” (see above).
:	“Clear”: proceed at line speed, as the barriers are confirmed to be closed. Shown both by the home and the distant signal.
∴ (off)	“Fault”: the detection mechanism is faulty, or the lights of the signal are burned out. If shown by the home signal the driver will consider it a “Caution” (see above), while if shown by the distant he/she will expect “Caution” at the home signal and prepare to stop there. In Traindir both signals show this aspect together, and the speed restriction is enforced, as with “Caution”.

Signal aspects for level crossing with no barriers – aspetti dei segnali per i passaggi a livello senza barriere

• _x	“Clear”: proceed at line speed (which is low), as the red lights for the cars are lit. In any case the driver will blow the horn as necessary to be heard and seen, and will pay close attention that no one is going to cross the track anyway.
• (off)	“Caution”: the signal cannot show “Clear”, for whatever reason (lights for the cars not lit or burned out), so it may be passed at 30 km/h maximum to be ready to stop before any road and then proceed at 4 km/h until the loco has passed each of them. In Traindir a speed reduction to 10 km/h is enforced, from the signal to the first speed limit encountered along the track ²⁶ .

The subscript _x means the light flashes.

²⁶ Usually placed just beyond the signal protecting the level crossing in the opposite direction

Rules for script designers

These rules must be obeyed by normal signals when followed by a special signal listed here (the outdated ones are not listed anymore).

<u>Special signal</u>	<u>Type</u>	<u>Aspects</u>	<u>Rules for preceding normal signals</u>
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	red, no_green, flashing	To be ignored: consider the next one
rfi_ind_part_m	distant	red, no_green, flashing	To be ignored: consider the next one
rfi_ind_dir	distant	off, zero...nine, i, a, d, p, v, nothing	To be ignored: consider the next one
rfi_ind_dir_2	distant	off, zero...nine, i, a, d, p, v, nothing	To be ignored: consider the next one
rfi_avv_ind_dir	distant	nothing	To be ignored: consider the next one
rfi_avv_dev	distant	OnClear, block, thrown, *_thrown	To be intercepted as a special case
rfi_avv_part	distant	block, nothing, red_short	To be intercepted as a special case
rfi_avv_tronc	distant	block, nothing, red_short	To be intercepted as a special case
rfi_tronc	main	red	Already considered (same aspects as a main signal)
rfi_tronc_m	main	off	Already considered (same aspects as a main signal)
rfi_marm_t*	both main and distant	disabled, shunt_*, off, normal aspects	Already considered (same aspects as a main signal)
rfi_marm_i	main	red, off, fault, block, shunt_*, flashing	Already considered (same aspects as a main signal)
rfi_marm_s	distant	red, no_green	To be ignored: consider the next one
rfi_marm_a	distant	red, no_green, flashing, nothing	To be ignored: consider the next one
rfi_marm_m	distant	red, no_green, flashing, nothing	To be ignored: consider the next one
rfi_sam_m	distant	red, shunt, nothing, no_*, flashing	To be ignored: consider the next one
rfi_sam_i	main	red, off, fault, block, shunt_*, flashing	Already considered (same aspects as a main signal)
rfi_sam_c*	main	normal aspects	Already considered (same aspects as a main signal)
rfi_part_com_*	main	normal aspects	Already considered (same aspects as a main signal)
rfi_AT_i	main	red, green	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	To be ignored: consider the next one

<u>Special signal</u>	<u>Type</u>	<u>Aspects</u>	<u>Rules for preceding normal signals</u>
rfi_prot_PL_i	main	unique dedicated aspects	To be preceded and intercepted by rfi_avv_PL or rfi_avv_PL_i
rfi_prot_PL_s	main	unique dedicated aspects	To be preceded and intercepted by rfi_avv_PL_s
rfi_avv_PL	distant	normal aspects	To be intercepted as a normal distant
rfi_avv_PL_s	distant	normal aspects	To be intercepted as a normal distant
rfi_avv_PL_i	distant	normal aspects	To be intercepted as a normal distant
rfi_avv_PL_cb	distant	open, unlit, closed, OnClear	To be ignored, unless preceded and intercepted by rfi_avv_PL or rfi_avv_PL_i
rfi_avv_PL_sb	distant	open, unlit, closed, OnClear	To be ignored, unless preceded and intercepted by rfi_avv_PL_s or rfi_avv_PL_i (hidden)
rfi_leopolder	distant	nothing, sound	To be ignored: consider the next one
rfi_auto_clear	distant	nothing	To be ignored: consider the next one
rfi_rip_avv	both main and distant	normal aspects	Already considered (same aspects as a main signal)
rfi_rall_a	distant	nothing	To be ignored – they should be left unlinked
rfi_rall_i	distant	nothing	To be ignored – they should be left unlinked
rfi_rall_f	distant	nothing	To be ignored – they should be left unlinked

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