Bernina Pass – St.Moritz to Poschiavo

      Release Version 1.0

1 Route Information

1.1 Route Overview

The Bernina Pass is a 2,328m (7,638 ft.) high mountain pass in the Swiss canton of Graubünden (Grisons) in south eastern Switzerland. It connects St. Moritz in the Engadine valley with the Italian-speaking Val Poschiavo.

The Bernina railway is a single-track metre gauge railway line forming part of the Rhaetian Railway (RhB). It links St. Moritz and Samedan, in the Swiss Canton of Graubünden, with the Italian town of Tirano. Reaching a height of 2,256 metres (7,403 ft.) above sea level at Ospizio Bernina, it is the third highest railway in Switzerland. It also ranks as the highest adhesion railway in Europe. With inclines of up to 7% it is one of the steepest adhesion railways in the world.

On the 7th July 2008, the Bernina Railway and the Albula Railway, which also forms part of the RhB network, were awarded UNESCO World Heritage Site status. The whole site is regarded as a cross-border joint Swiss-Italian heritage area.


1.2 History

In 1904 the Bernina-Bahngesellschaft (BB) was established, with the objective of opening a railway line between St Moritz and Tirano, via the Bernina Pass. In 1906 the BB obtained a concession for the line and opened the route in stages from 1908 onwards. On 1st July 1908 the first sections between Pontresina and Morteratsch, and between Tirano and Poschiavo were completed. On 18th August of the same year the line was extended from Pontresina to Celerina. Then on 1st July 1909 the line reached St Moritz and extended south to Bernina Suot. It took until 5th July 1910 for the whole line to be opened. The construction of the most difficult section of the line was between Bernina Suot and Poschiavo (the highest section of the line over the Bernina Pass. The line was planned and built as an electrified route operating from DC current from the outset. In 1935 the voltage was increased from 750 to 1000 volts.

The Bernina Railway was originally planned to operate only in the summer, but in 1913/14 the BB commenced winter operations on the line. This required further construction of avalanche barriers, snow sheds and galleries.

Release Version 1.0

1.3 **Route Map**

Release Version 1.0
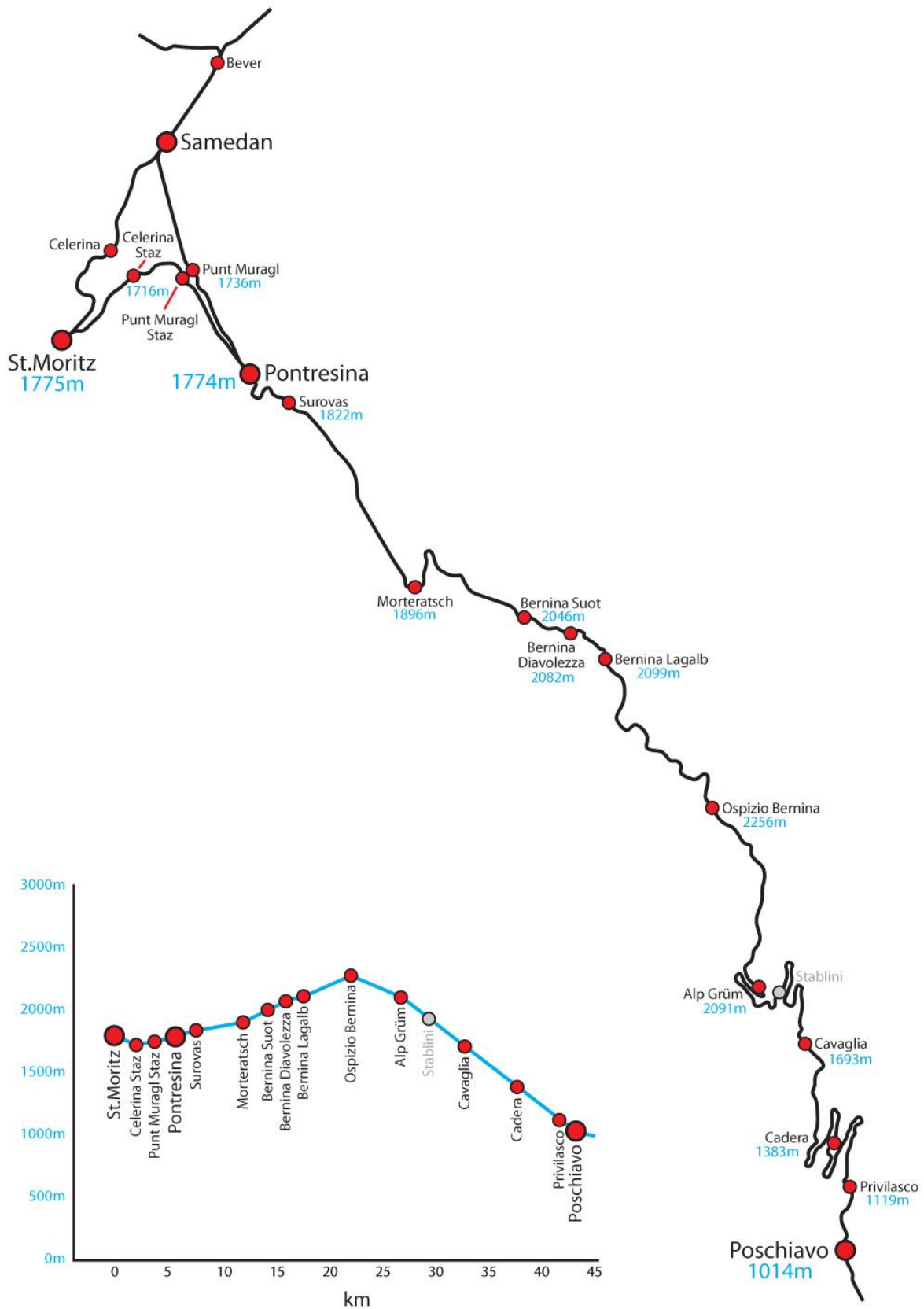
1.4 **Rolling Stock and Services**

Since their introduction in 2010 the ABe 8/12 Allegra multiple units provide the main traction on the Bernina railway. These were to replace the ABe 4/4I and ABe 4/4II railcars although some series II railcars still survive. The more modern ABe 4/4 III railcars acquired in 1998 and 1990 also operate services (usually running in multiple). There are also two Gem 4/4 locomotives that can operate either from the DC overhead catenary or from their own diesel-generator.

This fleet of railcars also hauls freight traffic. Freight wagons can be added to passenger trains up to the maximum hauling capacity of 140 tonnes. For safety reasons other freight trains are operated as freight only services. The Bernina Railway freight services mainly comprise heating oil, fuels, timber and containerised goods.

1.5 **Route Features**

- Metre gauge track system with 3D sleepers, animated junction levers and illuminated indicators covering the 45 km line.
- Spring, Autumn and Winter snow effects including deep track snow at high altitude in Winter with dynamic snow ploughs on trains.
- RhB signalling system with custom designed signal models and features including:
    o Group signals unique to this line
    o Animated Brake Test and "Abfahrbefehl" (departure indicators)
    o Operating "Besetztes Gleis" indicators for entering occupied platforms
    o Three state ground signals that function correctly between main signals
    o ZSI-90 Safety System track magnets and in-cabin equipment
- New random request stop features designed especially for the Bernina Pass route.
- Over 100 overhead line equipment and catenary models.
- Dynamically operating pantographs for the Abe 8/12 Allegra. Player locomotives have pantographs that dynamically follow the height of the overhead wires and lower through tunnels.
- Custom bridge, tunnel portal and snow gallery models designed to accurately represent the stunning engineering of the route.
- Highly detailed station models designed from our survey of the route in late 2017 along with many other feature models along the line.
- Animated ski lift models in Celerina.
- Detailed rock face models to capture the breath-taking scenery of the route.
- Passenger view for the EWA coach of the Allegra where you can take in the breath-taking scenery and observe the driver's cabin through the glass partition.
- 4 x Bernina Express coach types including first class passenger view.
- Lb-v container wagons and Sp-w timber wagons are included.
- Route fully configured for Quick Drive scenarios.
- 3 x Railfan mode scenarios.
- 8 x Career scenarios including a guided tutorial for the ABe 8/12 Allegra train and two new Passenger Mode journeys.

Release Version 1.0

2 The ABe 8/12 Allegra

2.1 Train History

The Rhaetian Railway ABe 8/12 is also known as an Allegra. It is a dual voltage, metre gauge, 3-car multiple unit. The Swiss locomotive and railcar classification system dictates the train name with ABe 8/12 denoting an electric railcar train with first and second class compartments, and a total of 12 axles, eight of which have powered traction motors.

The ABe 8/12 trains were delivered between 2009 and 2011. They have been built for routes with steep inclines such as the Arosa line, the Bernina Railway, and the line from Landquart to Davos. They are dual voltage trains, to enable them to run on both the Rhaetian Railway's core network, which is electrified at 11 kV AC, and on the Bernina Railway, which is electrified at 1,000 V DC.

The first class compartment at the front and rear of each set offers a view of the driver's cabin and line ahead.

On the 5th of December 2009, during regular testing in the Vereina Tunnel, an Allegra set a new metre gauge railway speed record of 139 km/h.

2.2 Design & Specification

Number Range	**3501 - 3515**
Coach Wheel Arrangement	Bo-Bo
Weight	106 tonnes
Set Length	49.5 m
Width	2.65 m
Power Output	AC: 2,800 kW
	DC: 2,400 kW
Max Speed	100 km/h

2.3 Additional Keyboard Controls

L – Toggle Cab Light On / Off	**V** – Toggle Wipers On / Off
I – Increase Instrument Lights	**SHIFT**+**P** – Select Centre Pantograph
SHIFT+**I** – Decrease Instrument Lights	**CTRL**+**P** – Select Outer Pantographs
Q – ZSI Acknowledge	**P** – Toggle Main Switch (Drop/Raise Pantos)
Y – Increase Vsoll Lever Position	**X** – Toggle Sander
C – Decrease Vsoll Lever Position	

Release Version 1.0

2.4 **Cabin Controls**

1	Combined Throttle and Dynamic Brake	18	Train Braking Force Indicator
2	Vsoll Lever (Speed Control Select)	19	Differential Traction Force Indicator
3	Reverser	20	Catenary Voltage Indicator
4	Main Switch (Drop/Raise Pantographs)	21	Train Status and Clock Display
5	Warning Whistle	22	Sun Visor
6	Headlights Selector Switch	23	Train Vacuum Brake Lever
7	Instrument Lights Dimmer	24	Unit Air Brake and Parking Brake Lever
8	Outer Pantographs Selector	25	Emergency Brake
9	Inner Pantograph Selector	26	Cabin Lights Button
10	Wiper Switch	27	Doors Open Indicator Lamps
11	ZSI Acknowledge Button	28	Request Stop Halt Indicator Lamp
12	ZSI System Lamps	29	Current Destination / Route Display
13	Vsoll Speed Selected Indicator	30	Destination Select Buttons
14	Speedometer KPH	31	Opening Cabin Door
15	Train Vacuum Braking Pressure Indicator	32	Opening Cabin Door Window
16	Brake Pipe Pressure Indicator	33	Opening Cabin Window
17	Brake Cylinder / Main Reservoir Indicator	34	Sander Button

Refer to the illustrations on this page and on page 8.

Release Version 1.0
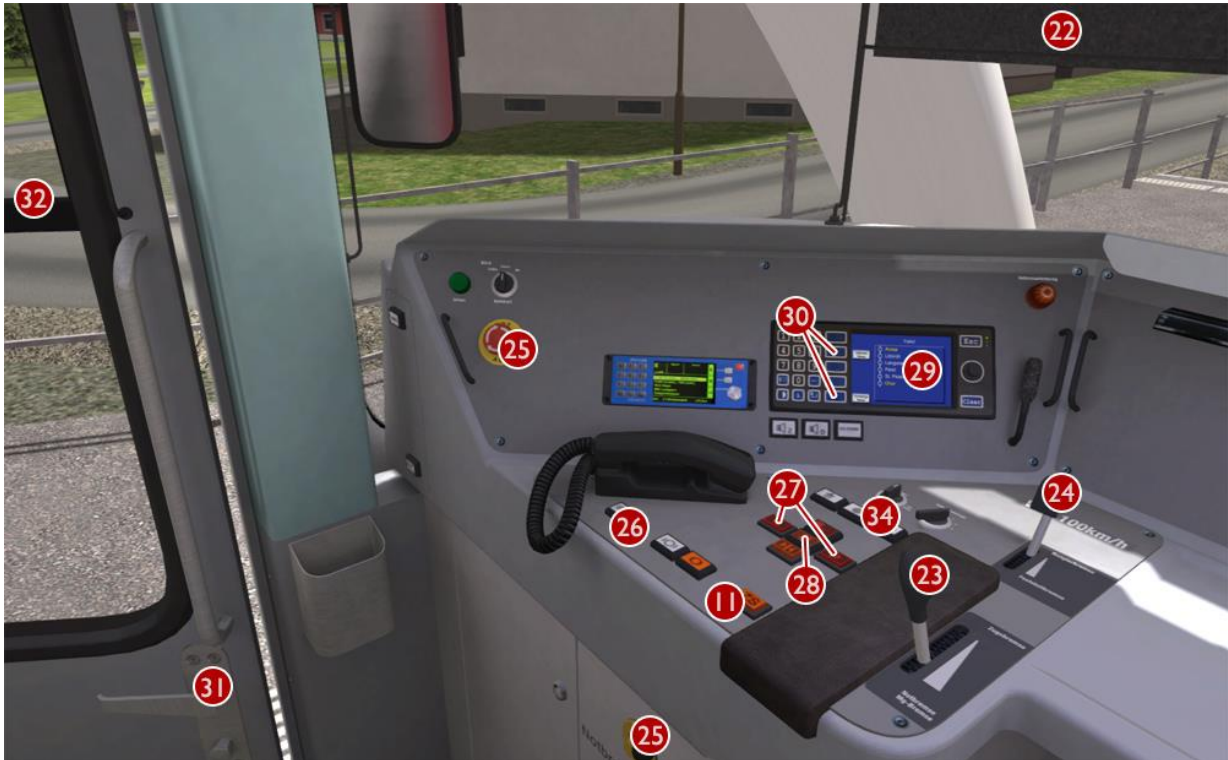
Note: Controls that are not identified above have no function even if they are animated.

2.5 **Vsoll Lever and Speedometer Indicator (Speed Control System)**

The Allegra is equipped with automatic speed control. The desired maximum speed for the line ahead should be selected using the Vsoll Lever and this will be indicated by the moving Vsoll Speed Indicator on the Speedometer. Speed selection can be made in 5 km/h increments from 5 to 100 km/h. There is also an additional selection of 33 km/h provided specially for the Arosa Line.

This system makes use of the power provided by the driver's throttle selection and cannot exceed this level. The driver must gradually increase the throttle when starting to move the train. If the Allegra is hauling coaches and wagons then the level of the throttle will need to be higher than normal.

When hauling coaches and wagons the driver must also supplement and balance the system by manually applying the Train Vacuum Brake and/or the unit Air Brake. This is especially important when braking at lower speeds as the speed control system only uses the dynamic brake and this is much less effective at lower speeds.

Release Version 1.0

2.6 **ZSI-90 Safety System**

You are alerted by the ZSI safety system when you pass a distant signal (Vorsignal) that is displaying a warning. The ZSI Acknowledge Button and ZSI Warnung Lamp will start to flash accompanied by an audio beep. You must press the ZSI Acknowledge Button immediately otherwise the emergency brakes will be applied automatically. Once pressed there will be five further lamp and audio alerts to remind you that you are driving under a distant signal caution. *A ZSI alert will also be activated when you pass a main signal displaying Aspect 6 (Short Journey – Expect Obstruction)*.

2.7 **Air Brake and Parking Brake**

The Allegra Air Brake and Parking Brake are combined on a single lever. The unit's Air Brakes are applied gradually as the lever is moved back towards the driver. The Parking Brakes (Handbrakes) are applied once the lever is moved back to the maximum position. This should be done if stopped at a station or while you are changing cabins. The Parking Brakes <u>**MUST**</u> be fully applied before opening passenger doors.

2.8 **Running Numbers**

If you wish to make use of the Allegra in your own scenarios, it is possible to customise the initial Pantograph selection and Destination Displays for the player and AI trains during the creation of a scenario. There are fifteen valid sets of running numbers as follows:

	EWA					EWB	
Set	**Panto**	**Vehicle**	**Name**	**Route**	**MWC**	**Vehicle**	**Name**
3501	A or D	35001	a … o	A … N	35601	35101	a … o
3502	A or D	35002	a … o	A … N	35602	35102	a … o
3503	A or D	35003	a … o	A … N	35603	35103	a … o
3504	A or D	35004	a … o	A … N	35604	35104	a … o
3505	A or D	35005	a … o	A … N	35605	35105	a … o
3506	A or D	35006	a … o	A … N	35606	35106	a … o
3507	A or D	35007	a … o	A … N	35607	35107	a … o
3508	A or D	35008	a … o	A … N	35608	35108	a … o
3509	A or D	35009	a … o	A … N	35609	35109	a … o
3510	A or D	35010	a … o	A … N	35610	35110	a … o
3511	A or D	35011	a … o	A … N	35611	35111	a … o
3512	A or D	35012	a … o	A … N	35612	35112	a … o
3513	A or D	35013	a … o	A … N	35613	35113	a … o
3514	A or D	35014	a … o	A … N	35614	35114	a … o
3515	A or D	35015	a … o	A … N	35615	35115	a … o

Release Version 1.0

There are fourteen RhB routes provided for destination and internal train displays:

Route Letter	
A	Blank Display
B	Chur - Tirano (Bernina Express)
C	Tirano - Chur (Bernina Express)
D	Chur - St. Moritz (Regio Express)
E	St. Moritz - Chur (Regio Express)
F	St. Moritz - Tirano (Regio)
G	Tirano - St. Moritz (Regio)
H	Filisur - Davos Platz (Regio)
I	Davos Platz - Filisur (Regio)
J	Chur - Arosa (Regio)
K	Arosa - Chur (Regio)
L	Chur - Davos Platz (Regio Express)
M	Davos Platz - Chur (Regio Express)
N	Allegra: Please Do Not Board

We will use the following example of an Allegra three coach consist to explain the configuration:

| Set | EWA | | | | MWC | EWB | |
	Panto	Vehicle	Name	Route		Vehicle	Name
3504	D	35004	d	F	35604	35104	d

This gives us the following running numbers for the three vehicles:

EWA = D35004dF   MWC = 35604   EWB=35104d

This train initialises as set 3504 with DC (outer coach pantographs) and "St.Moritz to Tirano" as the displayed destination. For six coach Allegra consists it is essential that the same **Panto** and **Route** selections are entered for both EWA vehicles to avoid errors.

The system also allows players to select destinations while driving Quick Drive scenarios.

Release Version 1.0

3 Bernina Express Panoramic Coaches

3.1 Destination and Coach Number Displays

If you wish to make use of the coaches in your own scenarios, it is possible to customise the Destination Display and Coach Number during the creation of a scenario.

In order to display a specific destination and coach number, the correct value must be entered into the vehicle properties window. This number consists of a 7 digit value containing both numbers and a letter.

The 7 digit value is arranged like so: **VVVVCCD**

VVVV   = the Vehicle number (the white number displayed on the side of the coach)
CC   = the Coach number (the two digit coach number displayed on the LED screens)
D   = the Destination (the destination text displayed on the LED screens)

Example shown above: 129134C *(where "C" is for Tirano to Chur) – see valid destinations below:*

A   **Chur to St.Moritz**
B   **St.Moritz to Chur**
C   **Tirano to Chur**
M   **Tirano to St.Moritz**
N   **Pontresina to Tirano**
P   **Tirano to Pontresina**
R   **Reserved**
S   **Tirano to Samedan**
T   **St.Moritz / Samedan to Tirano**
U   **Chur to Tirano**
W   **Bernina Express Welcome**
X   **Blank**

Release Version 1.0

4 Signals

4.1 **Signal Heads and Permissible Speeds**

Swiss railways use two main families of signalling - the "L" system and the "N" system. The RhB (Rhaetian Railway) network is signalled with the "L" system with alterations to the speeds that relate to the signal aspects compared to those that apply to standard gauge signal aspects on SBB routes for example. In Switzerland signals are normally positioned on the left hand side of the track unlike Germany and Austria. Where there is reduced visibility or multiple tracks they can be also positioned on the right hand side of the track.

RhB signals use separate main and distant heads as shown below and these can be mounted either individually to form a main signal (Hauptsignal) or a distant signal (Vorsignal) or both heads mounted on the same signal post (Combined Signal).

Distant signals provide advanced warning of a speed reduction commencing from the next main signal and usually provide ZSI Safety System protection as described on page 8. Main signal aspects indicate either that the line is blocked or the line is clear at the current line speed or display a reduced speed that must be achieved by the driver before passing the main signal.

There are also some additional signal indicators and the following examples illustrate the most common combinations along with an explanation of their use.

This is a main signal (Hauptsignal) that is currently showing Aspect 3 to alert the driver that 45 km/h is the maximum permissible speed allowed beyond this point.

Head 1 is the Main Signal Head

Head 3 is a co-acting Ground Shunt Signal
(These are explained on page 15)

Head 4 is a Brake Test / Departure Indicator

If vehicles are uncoupled or coupled to a train then it is essential that the driver carries out a brake test before departure. During the brake test the ground staff communicate with the driver using this indicator as follows:

Apply Brakes
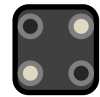
Release Brakes

Brake Test Successful

Ready for Departure (Abfahrbefehl)

These indicators are animated in this simulation for effect but do not need to be obeyed while driving a scenario.

Release Version 1.0

This is a combined signal that is currently showing Aspect 3 on the Main Signal Head to alert the driver that 45 km/h is the maximum permissible speed allowed beyond this point. The Distant Signal Head is showing that the next signal ahead is displaying Aspect 0 (Stop).

Head 1 is the Main Signal Head

Head 2 is the Distant Signal Head

Distant signals usually provide ZSI protection as described on page 9.
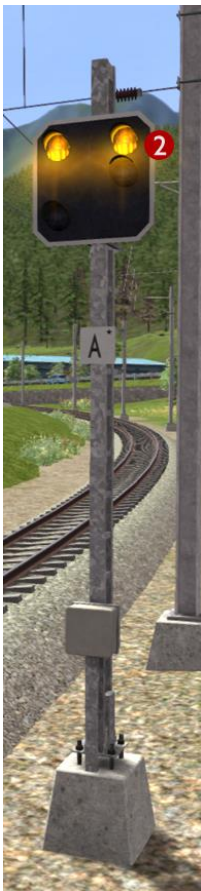
This is a Distant Signal that is currently showing that the next signal ahead is displaying Aspect 0 (Stop).

Head 2 is the Distant Signal Head

Distant signals usually provide ZSI protection as described on page 9.

Release Version 1.0

This is a Distant Repeater Signal that is currently showing that the next signal ahead is displaying Aspect 0 (Stop).

A Repeater Signal can be identified by having a smaller Distant Head. These signals are located between a Main Signal and its preceding Distant Signal at locations where visibility is restricted such as on tight curves or where bridges obstruct the view.

Head 5 is the Distant Repeater Signal Head

Repeater signals **DO NOT** *provide ZSI protection.*

This combined signal on approach to a station has an additional Occupied Track Indicator.

If you need to proceed past a signal showing a Stop aspect in to an occupied track then you will need to press TAB during the scenario to ask the signaller for permission. If permission is granted then the signaller will set the Main Signal Head to the aspect shown here. The Main Signal Head will display Aspect 2 to limit your speed to 30 km/h and the Occupied Track Indicator (Besetztes Gleis) will illuminate with four horizontal lights. The Distant Signal Head will go dark.

Head 6 is the Occupied Track Head (Besetztes Gleis)

If the Main Signal Head does not have the lights necessary to display Aspect 2 then Aspect 0 (Stop) will continue to be displayed and the Occupied Track Indicator will illuminate with four diagonal lights instead meaning you have consent to overrun the signal.
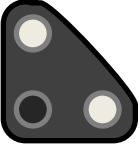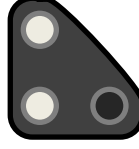
Release Version 1.0

This table illustrates the signal aspects and associated permissible speeds that are used on the RhB network.

Note: All shunting operations should take place at a maximum of 30 km/h in station areas.

Aspect	Meaning	Distant Signal (Vorsignal)	Main Signal (Hauptsignal)
Aspect 0	**Stop**		
Aspect 1	**Clear** – Maximum speed is as shown on relevant speed signs		
Aspect 2	**30 km/h** Maximum Speed		
Aspect 3	**45 km/h** Maximum Speed		
Aspect 6	**30 km/h** Maximum Shunting Speed (Short Journey – Expect Obstruction) You are alerted by the ZSI safety system when you pass the distant signal *__and__* the main signal that is displaying Aspect 6.		

Release Version 1.0

4.2 **Ground Shunt Signals**

These signals are normally mounted on short ground posts, however at stations they are sometimes mounted below the platform canopy. When they are located alongside a Main Signal they co-act and display the appropriate aspect according to the aspect the Main Signal is set to.

| Aspect	Meaning	Ground Shunt Signal
Stop	Stop at this signal	
Warning	The next Main Signal or Shunt Signal is at Stop or you are entering a siding / end of line	
Clear	The next signal is displaying a proceed aspect	

4.3 **Clear Track Signals**

At St. Moritz there are only two main departure signals, one that applies to Bernina Line departures and a second for all departures in the direction of Samedan. If the main departure signal applies to a specific platform then the associated Clear Track Signal displays four vertical white lights. If the main departure signal does not apply to a platform then the associated Clear Track Signal displays four horizontal white lights and the driver must not pass the indicator.

Release Version 1.0

4.4 **Group Signal Stopping Points**

At locations where one departure signal is shared between multiple tracks, a Group Signal Stopping Point is used on each track with a sign showing a downwards pointing arrow. This arrow sign tells the driver where to stop if the shared main departure signal does not currently apply to his/her track. There are different types of Group Signal configurations, some with additional indicators mounted on the main departure signal; however these other types are not used on this route.

On the Bernina Line some Group Signal Stopping Points have been installed that illuminate with a white arrow to indicate that the departure signal currently applies to this track and that the driver has permission to proceed up to the departure signal. If it is not illuminated then the driver must stop at the arrow sign.
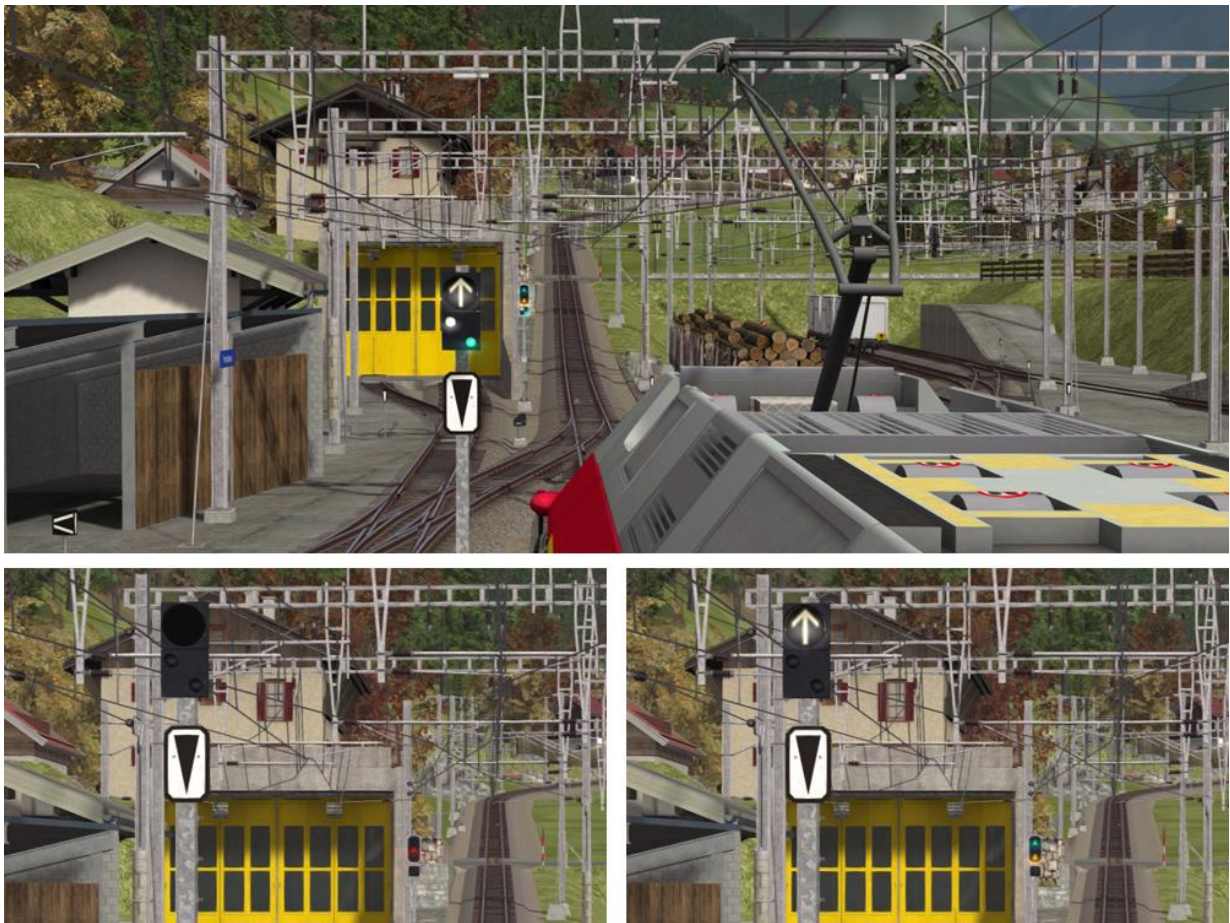
4.5 **Level Crossings without Barriers**

The signal shown below indicates whether the level crossing road signals are activated to protect the level crossing ahead. If the crossing road signals are flashing red then this indicator flashes a single yellow light to advise the train driver. If this signal is dark then the train must not proceed over the level crossing.

4.6 **Request Stops**

The signal shown above right is provided at the approach to request only stations. It is activated by passengers at the station by pressing a button at the information point. When activated the two white lights on the signal board flash together to indicate to the driver that passengers wish to board their train.

The driver must also check the Request Stop Halt Indicator Lamp on the cabin desk on approach to a request stop. If this is illuminated then a passenger wishes to leave the train and has already pressed one of the onboard request stop buttons.
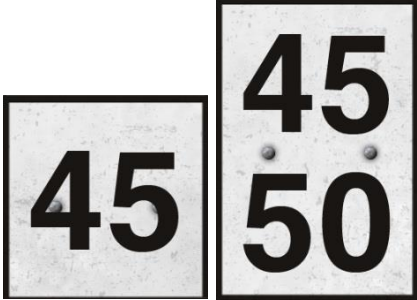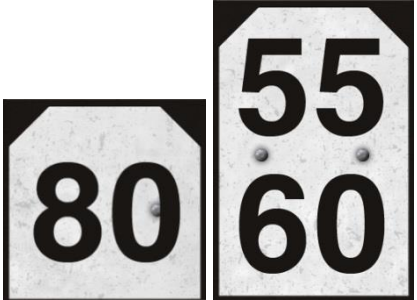
The white circular trackside sign with a black "H" shown above left advises the driver that the next station is a request stop that is not fitted with a request stop signal. Pick up passengers on sight.

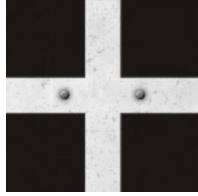Make sure that at least one passenger door opens on the Allegra when making a request stop.

Release Version 1.0

5 Trackside Signs

5.1 **Speed Signs**

The line speed on RhB routes is advised using track speed signs. For a reduction in speed the driver first sees a reduce speed sign that indicates the target speed. The driver must then reduce his speed before passing a commencement sign situated ahead of the first sign. Main Signals always override any speed indicated by a trackside sign.

	Meaning	Signs
Reduce Speed	Reduce your speed to that shown on this sign before you reach the next speed restriction commencement sign. *If the sign shows two speeds the higher speed applies to passenger trains and the lower speed to freight trains.*	
Speed Restriction Commencement Sign	Your train must have reduced speed to that advised at the previous Reduce Speed Sign before passing this sign.	
End of Speed Restriction Sign	If the speed restriction is on a short section of the line then this sign indicates that the driver can return to the speed prior to the speed restriction once the rear wagon or coach has passed this sign.	
Increase Speed	This sign indicates that the driver can increase the train speed once the rear wagon or coach has passed this sign to the speed shown. *If the sign shows two speeds the higher speed applies to passenger trains and the lower speed to freight trains.*	

Release Version 1.0

5.2 **Other Signs and Signals**

	Meaning	Signs
Whistle Sign	The driver should sound his whistle or warning horn at this sign.	
Level Crossing Sign	This sign is mounted on signal posts prior to a level crossing.	
Limit of Shunting Sign	Outside station areas these signs indicate the limit of shunting operations. During scenarios you do not need to obey these signs as they are only positioned for visual completeness.	
End of Electrification Sign	Where the overhead catenary wires end, these signs are used to alert the drivers of electric trains to proceed no further than the sign. They are suspended from the catenary wires or mounted on the junction indicators where only one route ahead in not electrified as shown below.	

6 Procedural Flora

This route has been designed making full use of the simulator's procedural flora functionality. We have designed all new ground textures that feature shrubs and grasses. To make these visible and get the best visual experience of the route we advise that you turn this feature on in the main settings menu as shown below. If you are running a less powerful computer you may get an increase in performance if you turn this setting off.

Release Version 1.0

7 Content Creators - Terms and Conditions

7.1 End User License Agreement (EULA)

This product is published by Railsimulator.com Ltd (trading as Dovetail Games) and distributed by Valve through their "Steam" online stores and distribution system. By purchasing and using this product you are bound by Valve's Software License. In addition to these terms, Thomson Interactive Ltd prohibits any commercial use or involvement of their products in third party commercial products unless prior written consent is sought and granted.

7.2 Commercial Add-ons and Scenario Packs

Thomson Interactive Ltd. Do not allow the development or sale of any commercial add-ons or associated products including but not limited to:

- Scenario Packs
- Route Enhancement Patches
- Audio Enhancement Packs

If you are interested in working with us please contact us through our web site.

7.3 Workshop and Freeware Scenarios

We encourage the non-commercial creation of scenarios for our routes. We prefer these to be distributed through the Steam Workshop so that they are easily available to all players. However non-commercial (Freeware) scenarios may be distributed via other channels as long as there is no commercial charge or gain for the author.

7.4 Acknowledgements

We would like to thank the Rhaetian Railway for their assistance in developing this route and for permission to use their branding on models included with this product.

We also wish to thank the Dovetail Games third party partner team and beta testers for their help and support.

- end -

Release Version 1.0