

COLOGNE TO KOBLENZ



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1 Route Information



1.1 History

The Cologne to Koblenz or 'West Rhine Railway' is located in the Rhineland-Palatinate area of West Germany.

On February 15th 1844 the earliest section of the line opened between the former station of 'St. Pantaleon Cologne' and Bonn. On January 21st 1856 it was further extended to include Rolandseck station and again in 1859 to include Cologne Central Station.

On January 1st 1857 the line was taken over by the Rhenish Railway Company and the line was further extended through Remagen, Andernach and onto Koblenz over the Moselle River in 1858.

The line is currently used by Regional Express and Regional Bahn Services, Intercity or Intercity Express services and Freight services.

1.2 The Route

The Cologne to Koblenz Railway is a scenic route with electrified track; there are 22 stations along its length.

Travelling from Cologne via Bonn to Koblenz the line runs parallel to the western bank of the river Rhine for much of the journey.

The route is varied; it ranges from busy city areas to quiet picturesque country and riverside views. It also includes numerous freight yards and depots for rolling stock.

1.3 Rolling Stock

The route is served by both the BR146, BR101 passenger stock, and also the BR 266 freight stock.

1.4 Focus Time Period

This Train Simulator simulation is based around the present day route in 2014.

2 Getting Started

2.1 Recommended Minimum Hardware Specification

The Cologne to Koblenz route is highly detailed, feature-rich and incorporates detailed night lighting which will benefit from a higher PC specification.

Minimum specification required for gameplay:

- Windows XP with latest service pack installed / Windows Vista / Windows 7 / Windows 8
- Processor: 2.8 GHz Core 2 Duo (3.2 GHz Core 2 Duo recommended), AMD Athlon MP
- RAM - 2.0GB
- GFX - 512 MB with Pixel Shader 3.0 (AGP PCIe only)
- SFX - Direct X 9.0c compatible

3 SIFA

SIFA is short for Sicherheitsfahrschaltung or “Safety Driving Switch”.

The SIFA vigilance alerter is disabled at startup, but can be activated or deactivated by pressing ‘Shift+Enter(Numpad)’. While activated the SIFA light on the cab dashboard is normally switched off. While the train is moving the driver is required to confirm an alarm every 30 seconds.

When the 30 second alarm is triggered the SIFA light on the cab dashboard will illuminate, after an additional 4 seconds an audible alert will sound. After a further 2.5 seconds the emergency brake will be applied. This can be avoided by acknowledging the alarm at any stage by pressing the ‘Enter(Numpad)’ key.

4 PZB Signalling System

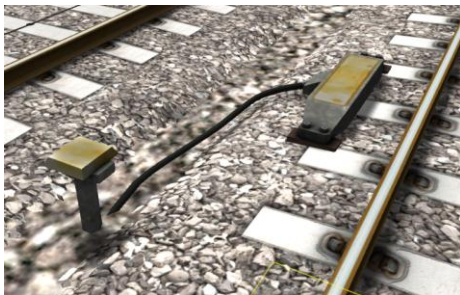
PZB stands for Punktförmige Zugbeeinflussung, loosely translated to English this means “Spotwise Train Control”.

Safe distances between trains are managed conventionally through the use of block-based systems. A given line is broken up in to a series of blocks, and trains are permitted (via green or yellow signals) to enter a block. While a train is present in a block the signal permitting entry is set to red, preventing any more trains to enter.

As railways have developed, more complex control systems and in-cab signalling have been implemented to improve the safety of the railways and to ensure that drivers are fully aware of what is happening around them by requiring them to react in certain ways according to what is happening.

PZB is a complex system and requires that you understand the varying speed limits and the requirement to respond promptly to the signalling system.

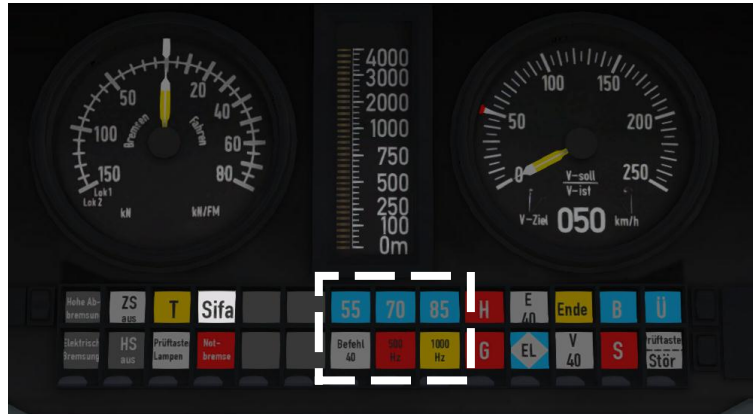
4.1 PZB Track Interface



The PZB system incorporates in-cab signalling, this is where the control desk has indicators, alarms and buttons that will react according to the signalling status on the railway. The mechanism by which this works is a series of “balise” magnets placed on the side of the track. An example of one of these magnets is shown in the image on the left.

4.2 In-Cab Indicators

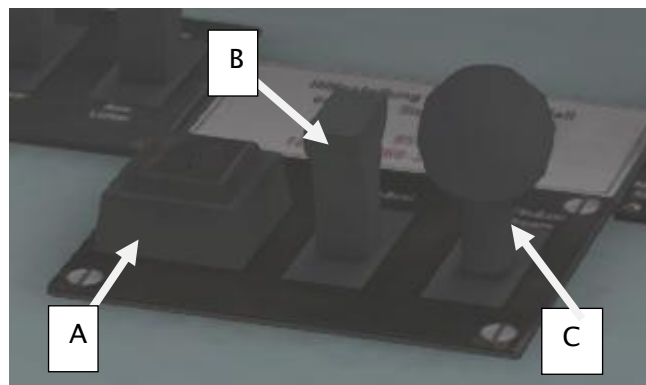
Inside the cab there are lights pertaining to the state of the PZB system as shown in the diagram below:



The white-dashed section shows the lamps related to PZB (BR146 controls would be similar but not identical)

4.3 Cab Controls

There are also three controls on the cab desk that you will need to use in order to interact with the PZB system.



PZB controls on the Cab Desk of a BR101 (BR146 controls would be similar but not identical)

These three controls, to the left of the control desk on the BR101, are named as follows:

- A – German: Befehl40 / English: PZB Override
- B – German: PZB Frei / English: PZB Release
- C – German: PZB Wachsam / English: PZB Acknowledge

4.4 Train Types

The type of train you are driving is important to understanding how PZB actually works and impacts on the speed limits that are imposed while PZB is monitoring your train.

There are three types of train that PZB deals with:

Type O (Obere) - Passenger trains

Type M (Mittlere) – Faster Freight Trains

Type U (Untere) – Slow / Heavy Freight Trains

The implementation of PZB within locomotives supplied with the Cologne to Koblenz route automatically determines the correct type of train based on the train type configuration in the scenario. Once PZB is active you can see this in the PZB lamps as follows:

Type O – Lights up the 85 lamp

Type M – Lights up the 70 lamp

Type U – Lights up the 55 lamp

4.5 Key Controls

Function	Keyboard
Activate/Deactivate	Ctrl+Enter(Numpad)
Acknowledge	Page Down
Release	End
Override	Del

4.6 Example

For this example we are driving a passenger train, which is a Type O service; the speed limits indicated in this example are therefore specific to that kind of service and will be different for other types of service.



There are three primary points noted in the diagram above:

- A – The distant signal, usually around 1.2km from the hazard (such as a converging junction)
- B – A point usually about 250m before the guarding signal
- C – The guarding signal, normally placed around 200m before the hazard.

Let's take a look at what happens in this simple example as you begin on the left hand side of the image above and progress along the track until you get to the guarding signal on the right. We'll assume that in this case there is a converging junction set against us and therefore the guarding signal is at a stop indication.



As you approach point A, the Distant Signal will show a Yellow indication to let you know that the signal it is reflecting (at C) is at red indicating danger.

You will also notice that there is a magnet next to this signal. This is called a 1000hz magnet.

As the signal is at anything other than a green indication the magnet will be energised and the PZB system on-board the train will therefore sense its presence. As the train passes over the 1000hz magnet the driver has up to 4 seconds in which to press the PZB Wachsam / PZB Acknowledge key (Page Down). If the driver fails to do this the PZB system will apply emergency brakes to stop the train.



Note that there is no alert in the cab that we have passed over the 1000hz magnet, the driver is expected to be aware that they have passed a distant signal and react accordingly. Once the PZB Wachsam / Acknowledge control is pressed the display will update to indicate that the locomotive is now in a monitored state. As we are a Type O train, the 85 lamp is lit and the 1000hz lamp lights up.

As we pass the 1000hz magnet we must not be exceeding 165km/h, regardless of the line speed. If we are then there is a good chance we will not be able to fully stop before the signal at point C and therefore the PZB system will apply emergency brakes.

We now have 23 seconds in which to decrease our speed to 85km/h. If after 23 seconds we are exceeding this speed then the PZB system will apply emergency brakes.

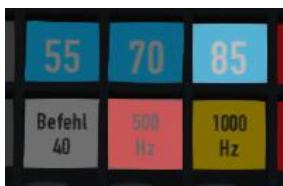
We now continue on towards the guarded signal at no greater than 85km/h.

After 700 meters, the 1000hz lamp will go out and we will no longer be monitored. Now the driver can make a decision based on what they can see. Can you see the guarded signal and is it still at a danger indication?

If it is then we continue slowing down to stop. If the signal is now showing a clear aspect because the hazard has cleared the driver has the option to release the locomotive from monitoring and they will then be permitted to return directly to line speed. Press the PZB Frei / Release button to do this *before* the train reaches point B or further restrictions are put in place.

Caution: Be careful to ensure that you only release when the signal is clear; if you release and the signal is not clear when you reach Point B the system will assume that you are incapable of safely driving the locomotive and will apply the emergency brakes.

Assuming the signal is still at danger and we haven't released from monitoring, we will then reach Point B. At Point B there is another track magnet; the 500hz magnet.



As we pass the 500hz magnet we must have slowed down to 65km/h or else we might not be able to stop in time for the signal and the emergency brakes will be applied. There is no need to acknowledge the 500hz magnet. At this point, the PZB lamps on the control desk will change to light up the 500hz lamp, indicating the restriction we're now in.

After passing the 500hz magnet we must now decelerate to 45km/h within 153 meters.

Having slowed down to 45km/h, we can draw up safely to the red signal and stop.

If the signal changes to a clear aspect while we are approaching the signal then we must continue with the 45km/h speed limit as we are still being monitored. It is not possible to release (PZB Frei) from monitoring while under a 500hz restriction. This restriction will continue for 250 meters, taking you past the guard signal, after which you will be able to return to line speed. This is the primary reason for releasing from monitoring before Point B (if and only if the signal is seen to be clear), otherwise you would be tied to running past the clear signal at the much reduced speed limit for an extra 250 meters instead of being able to return to normal line speed earlier.

If you pull up to the signal and stop because it is still red you may seek to obtain permission from the controller to pass it at danger. If you need to pass a signal that is still showing a red aspect then you will need to use the Befehl40 (Override) key to do so as you approach the red signal.

At Point C the guard signal has the third and final type of magnet, a 2000hz magnet. This magnet will *always* stop the train if passed and is used to stop trains that pass the signal while it is at danger. Pressing and holding Befehl40 (Override) key *stops* the PZB system from reacting to the 2000hz magnet. Once the 2000hz magnet is detected, the Befehl40 lamp comes on and you will then be restricted to a speed limit of 40km/h. You should remain at this speed until either you have travelled for 2km, or you have passed a signal showing a clear aspect. Once either of these conditions pass you can press PZB Frei to release from monitoring and return to line speed.

Alternately Flashing PZB Indicators

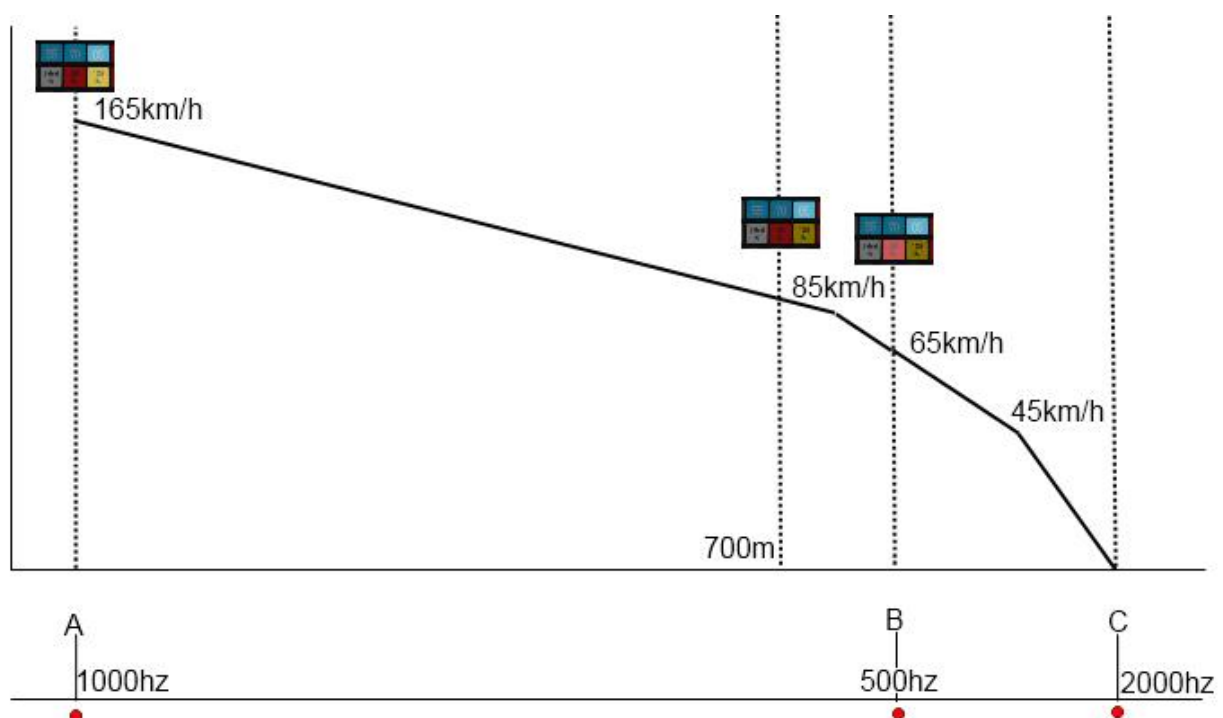
There is an additional state called Restricted Monitoring which may engage while you are travelling under the control of either the 1000hz or 500hz magnets. If you travel below 10km/h for more than 15 seconds or you stop completely at any point, the PZB display will start alternating between two of the speed lamps such as the 70 and 85 lamps, to indicate that restricted monitoring is now in place. Under these circumstances the speed limits to be imposed are reduced further. Full details about speed limits for all types of trains in both normal and restrictive monitoring are below.

PZB Speed Restrictions by Train Type

Type of Train	Normal Monitoring		Restrictive Monitoring	
	1000hz	500hz	1000hz	500hz
O (Obere)	165km/h -> 85km/h In 23 seconds	65km/h -> 45km/h In 153 meters	45km/h constant	45km/h -> 25km/h in 153 meters
M (Mittlere)	125km/h -> 75km/h in 26 seconds	50km/h -> 35km/h In 153 meters	45km/h constant	25km/h constant
U (Untere)	105km/h -> 55km/h In 34 seconds	40km/h -> 25km/h In 153 meters	45km/h constant	25km/h constant

Example Run Graph

Here's a graphical layout of what happened in our example run, indicating the magnets, speed limits and what you would expect to see in the PZB indicator lamps.



5 BR146

5.1 BR146 Background

Produced between 2004 and 2011, the 146 TRAXX (Transnational Railway Applications with extreme flexibility) P160 AC2 is an electric locomotive produced by Bombardier Transportation. This particular variant of the TRAXX series is classified as a 146.2. It has a maximum speed of 160km/h (99 mph), and a power output of 5,600 kW (7,613 bhp). The most notable changes over the original TRAXX are revisions to the locomotive body, enhancing the crashworthiness of the locomotive, and expanding the air conditioner.

5.2 BR146



5.3 BR146 DABpbzkfa

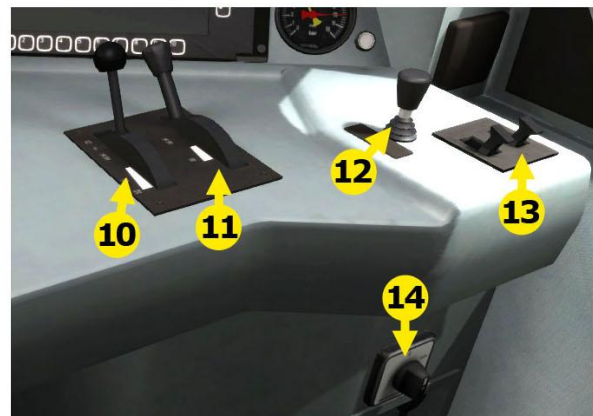
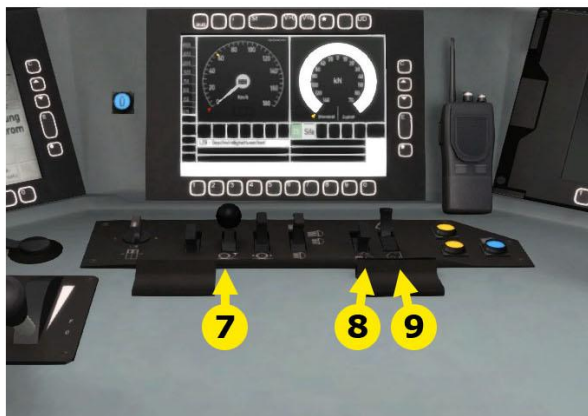


5.4 BR146 DABpza



6 Driving the BR146

6.1 146 Cab Controls



- | | |
|----------------------|-------------------|
| 1. Power Lever | 8. Head lights |
| 2. AFB | 9. Cab Light |
| 3. Direction Control | 10. Train Brake |
| 4. Pantograph | 11. Engine Brake |
| 5. PZB/LZB Controls | 12. Dynamic Brake |
| 6. Emergency Stop | 13. Horn |
| 7. Sander | 14. Wiper |

The Driving Trailer has the same controls and layout in the same position with the exception of the engine brake which is not present in the Driving Trailer.

6.2 AFB Train Power Control

AFB stands for Automatische Fahr- und Bremssteuerung – or loosely translated in to English it means "Automatic Driving and Braking Control".

AFB allows the driver of the locomotive to set the target speed and then the computer in the locomotive will apply the throttle to obtain that speed and then keep applying throttle or brake in order to maintain it. You can almost think of it as a kind of Cruise Control for trains.

To operate AFB, simply follow these steps:

1. Set the AFB control to the desired speed. Note on the speedometer a small red triangle "bug" will slide around to the configured speed.
2. Move the throttle control to the desired level of acceleration, at this point the train will begin moving and accelerate to the configured speed.

All speed changes should be managed with the AFB control, simply change the target speed as required and the AFB Computer will apply throttle and brakes appropriately.

If you wish to come out of AFB control and return to manual control, simply set the target speed to 0km/h and then the throttle and brake controllers will return to normal manual functionality.

6.3 Key Controls

Function	Keyboard
Increase	Y
Decrease	C

7 Scenarios

[146] 1) The Day Shift

Season: Summer

Weather: 3D Cloudy

Description: This is an end-to-end passenger run between Cologne and Koblenz. Keep your eye on the clock to make sure you keep to time.

[146] 2) Winter Journey to Remagen

Season: Winter

Weather: 3D Snow

Description: Driving between Koblenz and Remagen on a snowy winter's morning, this scenario should help you to become more familiar with the southern end of the route.

[146] 3) Stormy Trip to Bonn

Season: Autumn

Weather: Stormy.

Description: Storms are raging through the region and several services have been affected. You are running behind a late service, delaying your journey. Try to work through the adverse weather and complete your shift at Bonn.

[146] 4) Night Drive to Cologne

Season: Autumn

Weather: Stormy

Description: An autumnal drive taking a Regional Express service between Bad Breisig and Cologne. Traffic is fairly light, and although storms are threatening this shouldn't affect your journey tonight.

[101] Container Empties to Cologne

Season: Winter

Weather: 3D Snow

Description: After an unscheduled stop at Lützel to drop off a wagon with a hot box, it's time to resume the journey to Cologne Eifeltor...

[101] Freight to Andernach

Season: Spring

Weather: 3D Rain

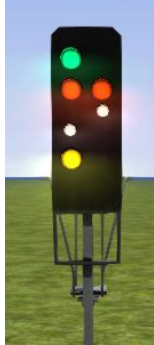

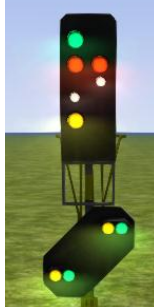
Description: It's a rainy evening and your task is to take a rake of wagons from Eifeltor yard to the sidings at Andernach. The heavy train and poor weather conditions make this run more tricky than it first appears.

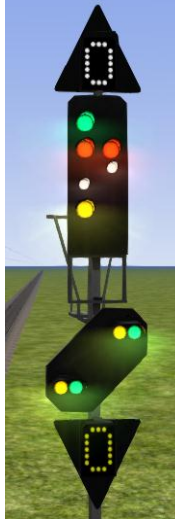


8 Signalling

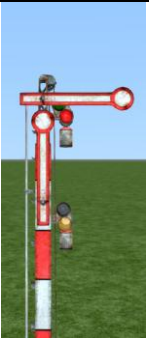

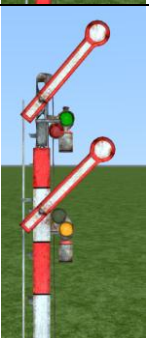
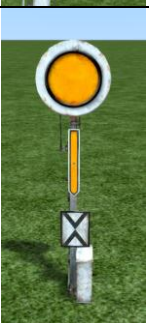

The signalling system employed on German Railways is extremely complex to understand at first; however, in reality each signal you encounter will be composed of one or more straight forward signals to give the final post.





This manual doesn't attempt to cover all the possible signal types and variations, but it should provide sufficient background as to let you work out what each signal post you come across is telling you by explaining the component parts. Note that any signal of a given type that you see should be interpreted the same whether it is on a post, on the ground, on a gantry or in any other position.






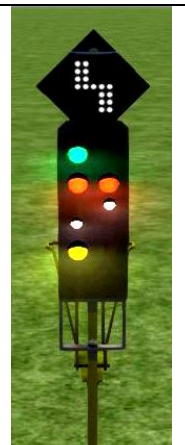
In the examples below, the image shows the signal with all lights on so that you can clearly see where they are. The description of the signal describes the various combinations of lights and what they mean when lit. The small code before the description is the technical name by which that combination of lights is known.

	<p>Signal Type: Hp</p> <p>This signal protects entry to a block.</p> <p>Hp0 – Red, Stop - do not proceed Hp1 - Green: Clear to proceed Hp2 – Yellow and Green: Caution, Proceed at 40km/h Sh 1 – Red and Double White: Shunting permitted</p>
	<p>Signal Type: Vr</p> <p>Vr signals are distant signal types and indicate to you what you should expect the <i>next</i> active signal to be showing.</p> <p>Vr0 – Two Yellow – Caution, expect stop Vr1 – Two Green – Expect Clear Vr2 – Green/Yellow – Expect Caution with 40km/h restriction</p> <p>Note the “X” post board at the bottom, any signal which has this board is indicating that the signal is to be interpreted as a Distant signal. If this sign is not present the signal is at a reduced distance for braking and will display a white light on the top left edge.</p>
	<p>Combined Signal Type: Hp Vr</p> <p>This is an example of a combined signal, in this case the example shown is an “Hp Vr” combination. The functions of the individual signal heads are identical to those explained above but they are placed on the same post.</p>

	<p>Combined Signal Type: Hp Vr Zs3 Zs3v</p> <p>An example of how the signalling can begin to look very complex, however this is simply four signal types combined on to one post. Here you can see:</p> <ul style="list-style-type: none"> • permission to enter the next block on the Hp signal, • indication of the signal state for the next signal on the Vr signal • speed restriction starting from this signal via the Zs3 at the top • speed restriction in place from the next signal via the Zs3v at the bottom
	<p>Combined Signal Type: Vr Zs3v</p> <p>This signal combination combines the distant Vr signal with the speed at the next signal in the Zs3v signal.</p>
	<p>Signal Type: Hp Shunt</p> <p>This very simple signal will often be found as a ground frame or on a small post and is frequently used in yards and sidings. It has two indications:</p> <p>Two Red lights – Stop, do not proceed Two White Lights - Proceed</p>

	<p>Signal Type: Hp</p> <p>This signal protects entry to a block.</p> <p>Hp0 – Red, Stop - do not proceed</p>
	<p>Signal Type: Hp</p> <p>This signal protects entry to a block.</p> <p>Hp1 - Green: Clear to proceed</p>
	<p>Signal Type: Hp</p> <p>This signal protects entry to a block.</p> <p>Hp2 – Yellow and Green: Caution, Proceed at 40km/h</p>
	<p>Signal Type: Vr</p> <p>Vr signals are distant signal types and indicate to you what you should expect the <i>next</i> active signal to be showing.</p> <p>Vr0 –Caution, expect stop</p> <p>Note the “X” post board at the bottom, any signal which has this board is indicating that the signal is to be interpreted as a Distant signal.</p>
	<p>Signal Type: Vr</p> <p>Vr signals are distant signal types and indicate to you what you should expect the <i>next</i> active signal to be showing.</p> <p>Vr1 – Expect Clear</p> <p>Note the “X” post board at the bottom, any signal which has this board is indicating that the signal is to be interpreted as a Distant signal.</p>

	<p>Signal Type: Vr</p> <p>Vr signals are distant signal types and indicate to you what you should expect the <i>next</i> active signal to be showing.</p> <p>Vr2 – Expect Caution with 40km/h restriction</p> <p>Note the “X” post board at the bottom, any signal which has this board is indicating that the signal is to be interpreted as a Distant signal.</p>
	<p>Post Type: Ne4 Chessboard</p> <p>The Ne4 Chessboard is used to tell you that a signal that would normally be at this position has been placed in an alternative location, this could be further away from the track or on the other side of the track.</p> <p>The Ne4 board is always located where the signal would normally be expected to be positioned.</p>
	<p>Post Type: Lf6 Advance Warning Speed Post</p> <p>This speed post provides advance warning that a speed limit change is going to take place. In the example shown, the speed will soon be changing to 40km/h. Following an Lf6 you can expect an Lf7 to mark the start of the new speed limit.</p>
	<p>Post Type: Lf7 Speed Post</p> <p>This speed post marks the beginning of a change in speed limit. The example indicated marks the beginning of a 40km/h speed limit and you should not be exceeding this speed as you pass the post.</p>

	<p>Post Type: Arrow Indicator</p> <p>Where there might be confusion about which track a sign is associated with, a small arrow is placed to indicate which line the information applies to. In this example the Lf7 speed restriction applies to the track on the left of the post.</p>		
	<p>Post Type: Zs10 End of Speed Restriction</p> <p>This post indicates the end of a speed restriction started by a Zs3.</p>		
	<p>Post Type: Zs3 Speed Post</p> <p>New speed limit takes effect immediately from this point. Shows one white number indicating the tenth the speed allowed from this point. This is normally used in conjunction with main signals. Permanent speed restrictions are instead indicated using Lf type signs.</p>		
	<p>Post Type: Zs3v Distant Speed Post</p> <p>Shows one yellow number indicating the tenth of the speed allowed from the point where the following Zs3 signal is found. This plate is normally used in conjunction with distant (e.g. Vr) signals.</p>		
		<p>Post Type: Zs6 Wrong Line Working</p> <p>This track change display is used to indicate that wrong line running (left hand) is to be used from this signal. It is only used in combination with main signals and only on lines where wrong line working is frequent.</p>	

9 Credits

Route Builders:

Laura McConnachie
Duncan McCafferty
Finlay Pearston

Artists:

Lee Wallace
Lauren McKellan
Matthew Price

Track:

Rob Payne

Signals:

Jeffrey Douglas

Scenarios:

Rob Payne
Ade Adeleye
Jordan Searle

Sounds:

Adam Rose

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Dan Barnett
Chris Linington
Peter Why
Gray Poyda
Chris Luck
Ben Jervis
Tom Walters