

BR266 Diesel Locomotive



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1 Background

1.1 History

When British Rail's freight operations were privatised in 1996, a large proportion were bought by “English, Welsh and Scottish Railway” (EWS). Many of the locomotives that EWS inherited were at the end of their useful life and EWS approached General Motors Electro-Motive Division (EMD), to supply a replacement. EMD offered their JT42CWR model which incorporated General Motors' version of (self-steering) bogies that reduce flange wear, improve adhesion and reduce track load. The locomotive design uses standard EMD components of its era including D43 traction motors.

The new JT42CWR locomotives were finally given the Class 66 designation in the British classification system. Two hundred and fifty were initially ordered and built in London, Ontario, Canada.

In 1998, Freightliner placed an order for locomotives. They were followed by GB Railfreight, and then Direct Rail Services. More recent orders for additional locomotives have seen the introduction of low emission version called JT42CWRM.

This most notable feature of this model is the addition of a third door on side allowing access to the locomotive body and for the Euro Cargo Rail variant the addition of an air conditioning unit above the cab. In Germany the Euro Cargo Rail units operated by DB Schenker were numbered as Class 247 however to match other Class 66 locomotives operating in Germany the Eisenbahn-Bundesamt (Federal Rail Authority) re-classified them as Class 266.

1.2 Design & Specification

Builder	Electro-Motive Diesel
Wheel Arrangement	Co-Co
Locomotive Weight	129.9 tonnes
Vehicle Length	21.35 m (70 ft 1 in)
Vehicle Width	2.64 m (8 ft 8 in)
Fuel Capacity	6,400 L (1,700 US gal)
Vehicle Power	2,420 kW (3,250 hp) (total)
Top Speed	120 km/h (75 mph)
Brake Types	Air

2 Rolling Stock

2.1 BR266



2.2 Megafret container wagons

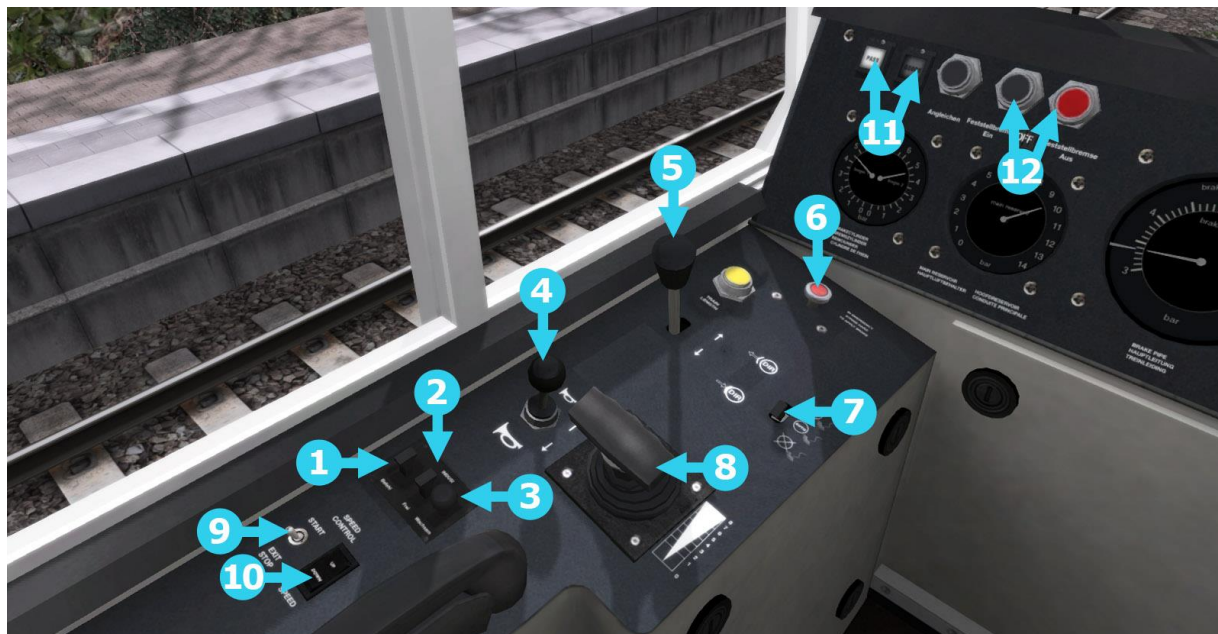




Two wagon variations are included, both in weathered and unweathered condition.

3 Driving the BR266

3.1 Cab Controls



1	PZB Override	10	Set Speed Increase/Decrease
2	PZB Release	11	Passenger / Goods brake mode
3	PZB Acknowledge	12	Parking Brake
4	Horn	13	PZB Indicator
5	Loco Brake	14	Wipers
6	Emergency Brake	15	Engine Start Stop
7	Sander	16	Reverser
8	Power Handle	17	PBL Train Brake
9	Speed Control On/Off		

4 Speed Control

4.1 Speed Control

Speed control allows for the driver of the locomotive to maintain a speed once reached by using the throttle. It also allows for increases and decreases of speed.

To operate the speed control, simply follow these steps.

Use throttle to reach desired speed.

Toggle the Speed Control switch to the “Start” position. (see item 9 in image below)

To adjust speed use the set speed switch to increase or decrease speed. (see item 10 in image below)

To deactivate toggle the Speed Control switch to the “Exit Stop” position.



4.2 Key Controls

Function	Keyboard
Activate/Deactivate	K
Increase Speed	Ctrl + C
Decrease Speed	Ctrl + Y

5 PZB Signaling System

5.1 PZB

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

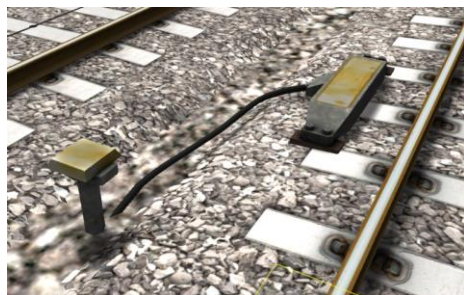
Safe distances between trains are managed conventionally through the use of block-based systems.

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.

5.2 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.

5.3 In-Cab Indicators

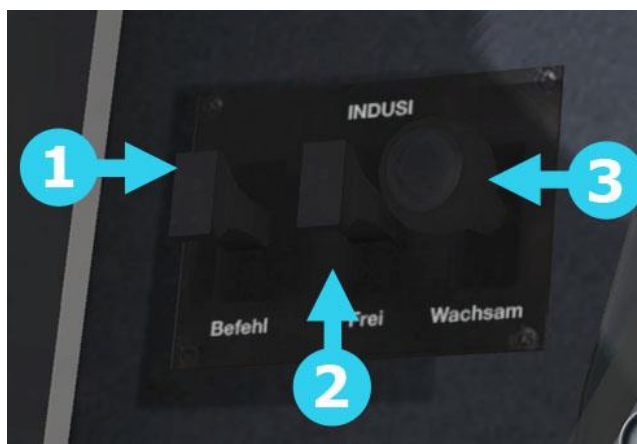
Inside the cab there are lights pertaining to the state of the PZB system as shown in the diagram below:



The white-dashed section shows the lamps related to PZB

5.4 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 BR266

These three controls, to the left of the control desk on the BR266, are named as follows:

- 1 – German: Befehl40 / English: PZB Override
- 2 – German: PZB Frei / English: PZB Release
- 3 – German: PZB Wachsam / English: PZB Acknowledge

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

These modes can be cycled through by pressing Ctrl+Shift

Once PZB is active you can see this in the PZB lamps as follows:

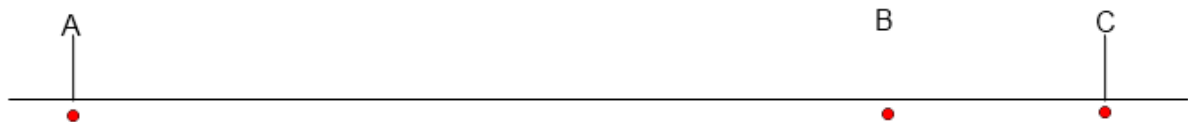
- Type O – Lights up the 85 lamp
- Type M – Lights up the 70 lamp
- Type U – Lights up the 55 lamp

5.5 Key Controls

Function	Keyboard
Cycle PZB modes OFF/ON-U-M-O	Ctrl+Enter(Numpad)/CTRL+Shift+Enter(Numpad)
Acknowledge	Page Down
Release	End
Override	Del

5.6 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 some 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 change 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 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

6 Scenarios

6.1 [266] Cargo Carrier to Koblenz

You have just been coupled to a rake of freshly loaded containers. You will need to drop these off at Koblenz, where they will later be unloaded.

Duration 65 minutes.

6.2 [266] Evening Freight Duties

Collect a group of containers from Brühl and deliver them to Cologne. Harsh weather conditions make this trip a little bit more challenging.

Duration 20 minutes.

6.3 [266] Rush Hour Rescue

You are nearly at Bonn where your containers are due for drop-off. What starts off as a straightforward run encounters a disruption which you are tasked to deal with...

Duration 50 minutes.

7 Acknowledgements

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QA Department and
Beta Testing Team

