DB BR110 Expert-Line

Compatible with Train Simulator 2015

Content

1 Information

1.1 DB BR110

The Class BR110 is a four axle alternating current locomotive and a part of the "Einheitslokomotiven" series that was designed to use standardized parts and techniques to produce a range of identical Locomotives adapted for specific duties. The BR110 itself was originally created for express passenger services. After some decades, with the introduction of more modern designs it was re-deployed to commuter work.

There were over 400 E10/110 built from 1956 to 1968 following on from the 1952 prototypes. There were some variations in the build resulting in some slight differences between batches of locomotives in the class. This resulted in the well known „Bügelfalte" and the later class designations of 110, 113, 115, & 139. Some are still in use by the Deutsche Bahn AG and private railway companies today. But most of them were scrapped in recent years.

1.2 DB BR110 - Functions available in the Simulation

The most important functions are summarised below (Not all functions are listed)

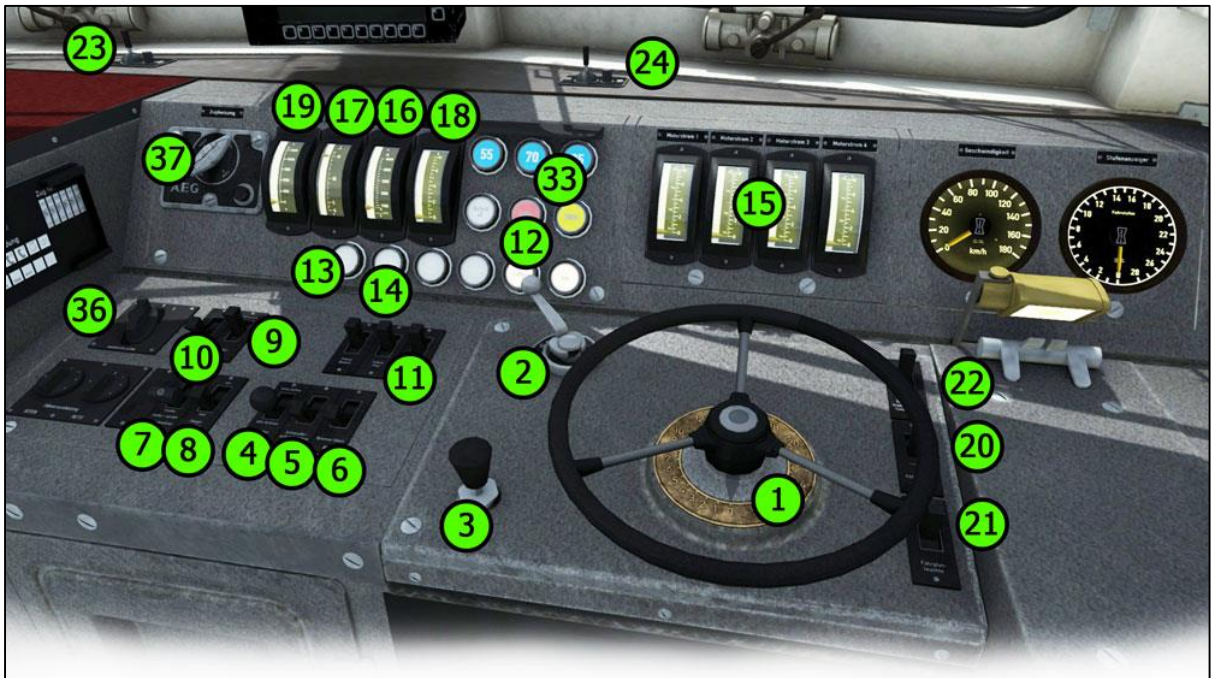
- ✓ Prototypical driving behaviour
- ✓ Tap-changer automatic notching control
- ✓ Manual /automatic Start-Up
- ✓ Monitoring function for important values like Voltage, traction temperature,
- ✓ Manually selection of the pantograph
- ✓ Delayed and smooth regulated E-Break
- ✓ Brake system with overcharging of the main air pipe pressure
- ✓ High braking for the loco brakes
- ✓ Real sounds optimized for EFX
- ✓ Realistic Indusi i60
- ✓ Zeit-Zeit-Sifa
- ✓ Switchable instrument lights
- ✓ Reading lamp and cab light
- ✓ Separately switch-able wipers with speed control
- ✓ Standard TS2015 Effects
- ✓ TS2015 Camera positions
- ✓ Automatic AI wipers with weather detection
- ✓ Light bulp control for player and AI
- ✓ vR ZZA compatible
- ✓ switch-able message language ingame
- ✓ Configuration file

1.3 Technical Data DB BR110

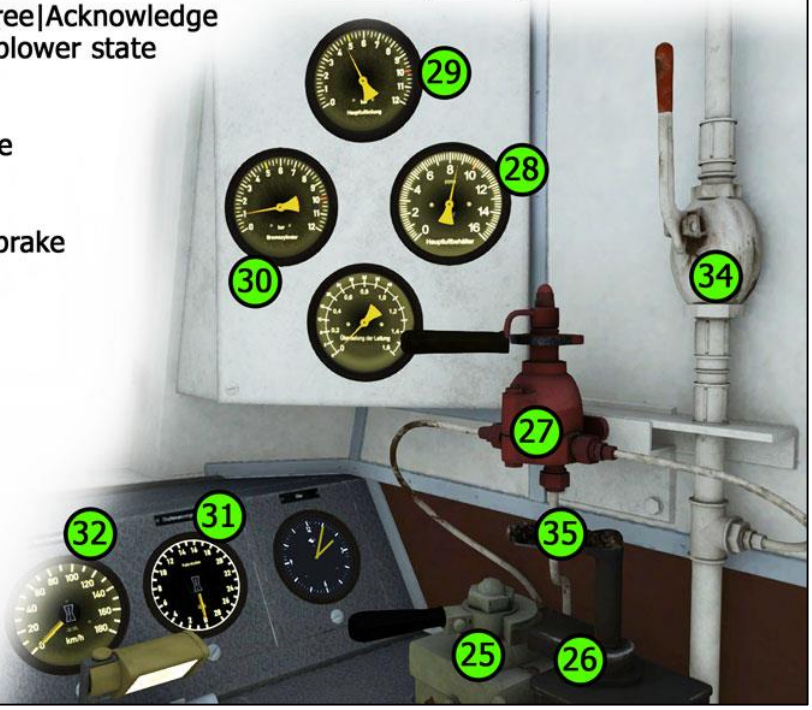
Manufacturer:	Henschel, Krauss-Maffei, Krupp, AEG, BBC, Siemens-Schuckertwerke	**Build Dates**:	1956 - 1969
Type:	Electric	**Wheel arrangement**:	Bo-Bo
Length / buffer:	16.49 m	**Mass**:	85 t
perm. Output:	3700 kW	**Maximum speed**:	140 km/h

2 The Locomotive

3 Cab and Controls



1 - Regulator
2 - Reverser
3 - SIFA reset
4 - Sander
5 - Wheelslip protection brake
6 - Loco brake release
7 - Pantograph
8 - Main power switch
9 - Traction motor blowers
10 - Compressor start
11 - PZB Trio Command|Free|Acknowledge
12 - Lamp traction motor blower state
13 - Lamp main power
14 - Lamp for faults
15 - Traction motor voltage
16 - Ammeter
17 - OHE voltage
18 - Brake force dynamic brake
19 - Heating voltage
20 - Headlights
21 - Desklight / cablight
22 - Instrument lights
23 - Wiper left
24 - Wiper right
25 - Train brake
26 - Dynamic brake
27 - Loco brake
28 - Main reservoir pressure
29 - Brake pipe pressure
30 - Brake cylinder pressure
31 - Tap gauge
32 - Speedometer kph
33 - PZB lamps
34 - Whistle
35 - Dynamic brake decouple
36 - Lamp test
37 - Heating voltage selector



4 How to drive

4.1 Expert-Line and general hints

We are happy to present you with a new locomotive from virtual Railroads in our Expert-Line range. As usual, Expert-Line models are created for customers who are looking for better and more realistic models for TS2015. Once again we have enhanced functions integrated into the locomotive which have never been seen before in other locomotives for TS2015. For example we have implemented the air pipe pressure overcharging behaviour.

Important: This locomotive has no push/pull equipment and is not able to drive in multiple formation. It is possible to couple additional locomotives to your train, but these machines can´t pull or push the train.

TS2015 problems: If more than one locomotive is coupled to your train, the brake pressure may be reduced or divided by the engines present in consist. Please keep that in mind when using the brakes. When driving in reverse with more than one locomotive coupled, there will be no tractive effort shown in the appropriate gauge.

4.2 Start-Up Procedure

Manual Start-Up:

It is necessary to prepare the locomotive for driving. Each step is based on the real life procedure and needs to be done in the right order.

1. Switch on the battery <Shift+B>
2. Release the handbrake (Use the mouse and turn the handbrake until the handle folds away)
3. Check the main pressure reservoir (HLB) it needs to show you 10 BAR
   If not use <Shift+;> for raise pressure.
4. Set the train brake to 4,7BAR (Important: HLB need to be at 10 Bar!)
5. Reverser to M (Fst Ein) <W>
6. Choose the pantograph <Shift+P> (Notches: front, back ,both ,down)
7. Raise the pantograph <P> (wait until the kV value is shown on the vertical gauge)
8. Switch the main switch on <Z> (*Hauptschalter* light should turn off)
9. Switch on SiFa if desired <Shift+7>
10. Switch on Indusi if desired <Shift+8>
11. Switch on the headlight <H> and the instrument lights <I>
12. Set the reverser to V or R

Now the locomotive is ready to drive.

Automatic Start-Up:

We have integrated an automatic Start-Up procedure to help you.
To start the procedure press <Ctrl+Z>. If you already started the manual procedure, the automatic one will not work!
Once initiated the automatic procedure will show you a big message box and some small boxes which show you information about the progress of the procedure.
A big message box will appear at the centre of your display when the procedure has finished. The train security systems (SiFa, Indusi) need to be switched on manually.

Shut down procedure:

Shutting down the locomotive could only be done manually.

1. Switch off the regulator

2. Set the train brake to Emergency position and switch off the E-Brake
3. Set the reverser to M <S> or <W>
4. Switch off the main switch <Z>
5. Lower the pantograph <P>
6. Switch off the security systems Indusi/SIFA
7. Switch off the headlight <Shift+H> and instrument lightning <I>
8. Set the reverser to 0 <S>
9. Switch off the battery <Shift+B>

4.3 Message- and Help system

Messages:

The locomotive has a special message and help system to give you information about events and errors which occur. You can adjust the systems level with <Ctrl+->
The system is switched on by default and has three levels: 1/only errors, 2/errors and further messages, 3/all messages and debug information for log-mate.
Messages which are absolutely necessary can´t be switched off.

Indusi Help system:

The locomotive has a special help system for the security systems Indusi.
If you get an emergency brake due to incorrect operation you will get additional information in a message box.

4.4 Battery and HLB

Battery voltage:

Before you can start driving with the locomotive the battery need to be switched on.
You do this by pressing <Shift+B>. The battery could only be switched on when the locomotive is not moving and the reverser is set to 0 (zero). The battery is always fully charged.

Main pressure reservoir / HLB:

The main pressure reservoir is very important for driving the locomotive.
The breaking system and several other systems make use of the HLB. If you start a scenario the HLB is randomly filled. If the pressure is beneath 8,3BAR you need to start the air compressor manually by <Shift+:> to fill the reservoir.
You can check the pressure at the HLB gauge to the upper. Without sufficient pressure you can´t operate the main switch or raise the pantograph.

4.5 Pantograph and Main Switch

Pantograph pre-selection:

Before raising a pantograph you need to choose one or two. Press <Shift+P> to cycle through the four available options *both down*, *Pantograph 1*, *Pantograph 2* and *raise both.*
Please look at the messages especially when you choose both pantographs.
Choosing a pantograph is only possible when the locomotive is standing still.

Raising and lowering the pantograph:

To raise the selected pantograph the reverser needs to be set to M and the main pressure reservoir / HLB needs enough pressure. To raise the pantograph use the switch in the cab or press <P>. Raising and lowering a pantograph is possible when driving the locomotive.
This might be necessary when you reach a neutral section.

Switching the Main switch On or Off:
After you have raised a pantograph you can turn on the main switch with the appropriate switch in the cab or with <Z>. The main switch can also be operated when the locomotive is being driven. Please keep in mind: the main switch will be set to off (tripped) when the pantographs are lowered or other disturbances happen. Normally you can switch on the main switch again without any problems if not you will be informed by messages why not.

4.6 Regulator

Automatic notching control:
The regulator is used to select the required notch from 0 to 27. The tap changer will then automatically notch up or down to the selected notch at a pre-set speed. If you switch the regulator directly from notch 27 to 0 it will take approx. 14 seconds to reach notch 0. Please keep in mind that selecting too high a notch will result in an overload and the main switch will be tripped. The chosen regulator notch and tractive effort can be checked with the ammeter effort gauge to the left instruments (second gauge from right) It should not exceed 400A to avoid an overload.

Notch 28 is not allowed to use as stated in the original locos manual. If you nevertheless chose to do so, we have implemented a special surprise for you.

Fast power off:
The fast power of button in the middle of the regulator allows you to shut down the applied traction power immediately. But if you do so the error count on the traction motor safety relays will grow up every time. After a fast power off you need to set the regulator to zero to power up again.

Reverser lock:
The reverser is locked when:

- An overload occurred because you selected too high a notch with the regulator
- You used a brake while the reverser is not set to 0 (zero)
- An emergency brake application occurred
- A fault occurred
- The doors of the coaches are open

If the reverser is locked you can´t notch up or down. The regulator is automatically set to notch zero.

Neutral position permission:
To unlock the reverser do the following things:

- ✓ Set the reverser to notch 0 (zero)
- ✓ All brakes need to be released
- ✓ Check no emergency braking is active
- ✓ All faults are cleared
- ✓ The main switch is on
- ✓ The doors are closed

4.7 Brakes

The locomotive has three brake systems**.**

- loco brake (direct brake)
- train brake (automatic brake)
- E-brake (electric rheostatic brake)

Loco brake:
when you enter the cab the loco brake is released. The brake is only used to brake the locomotive and not the train. You can use the brake when starting your train on a hill to prevent the locomotive from rolling back. When you take power, the loco brake should be released.

Train brake:
The train brake is used to brake the whole train. It is a notched brake and can be precisely controlled. Use the brake with care, according to the train weight and track conditions. When you take power the train brake needs to be released.

E-brake:
The E-brake works on all traction motors. If both train brake and E-brake levers are in the release position they are automatically combined when the train brake is used.
To use the E-brake independently from the train brake simple move the E-brake lever.

How to brake:
Braking with this locomotive needs a lot experience. You should drive with caution.
It is necessary to think at least 1000m ahead. Notch down in good time with the regulator.
It is necessary to switch off power before you can use the train brake.
Keep in mind: from notch 27 to 0 it takes nearly 14 seconds until you can use the brakes without getting a fault. Check the traction effort gauge and the transformer voltage gauge to see if power is down to 0 (zero).

Please note: The e-brake decoupling is possible only if the train brake lever is not in the zero position. This is due to a technical problem in TS itself as you can't move two levers at the same time.

High braking:
On block braked high speed locomotives there is a system that uses more pressure to brake the loco itself at higher speeds. Block brakes are not as efficient as disc brakes at higher speeds, so they need more pressure to be effective. Above 60km/h the system activates automatically and de-activates if you come back below 50km/h. There is a lamp on the desk that will show you the actual state of the system. It is called "Hohe Abbremsung". The system works automatically, but be aware that due to the additional pressure applied, the loco brakes will release more slowly than usual. Release the brakes earlier to prevent too much reduction in speed.

Air pipe overcharging, Time reservoir and pressure equalisation:
We have implemented a new function for the brake system. A feature of locomotives equipped with a Knorr D2 self-regulating brake lever system is that you can overcharge the air pipe with more than 5BAR pressure. It is used to release brakes that are dragging. But if you do it too often you may cause a brake system fault where you can't release the brakes anymore. That happens when the pressure in the equalizing reservoir grows too high (greater than 0.4 BAR). Normally the over pressure releases very slowly over time. But not if

the pressure is too high in the whole system. If you reach that state you have two options to get the system working again. First one is to simply wait until the pressure is back to normal, which means the pressure in the equalizing reservoir needs to be zero. Second option is to even up the pressures manually. For that you can use the key command <Shift+A> to speed up the equalizing reservoir air release a bit. This function is equipped with some randomness. In real life the process also involves releasing the excess pressure on the whole train, it is not possible to replicate this in TS.

In Order to initiate overcharging you should hold the train brake against the spring in the max fast release position and watch the pressure gauge. Don't apply overcharging for too long. In real life it is recommended that if possible you do not apply the air brakes again for several minutes after doing this.

4.8 Wheel-slip and Sanding

The locomotive is equipped with a wheel-slip protection brake. To activate it use the switch on the desk called "Schleuderschutz". If activated the locomotive will gently apply the block brakes itself to prevent the axle from slipping.

If you pull a heavy train it is very difficult to prevent the wheels from slipping. If you do not reduce the power, the wheels will keep slipping and the main switch will trip. Before this happens you will hear a warning sound. To master difficult situations like climbing up a hill with a heavy train you can use the sander. Use the switch in the cab or press <X> to switch on the sander. Do not use it for too long because the sand boxes will empty. See the fault section for more information.

4.9 FML (Traction motor blowers)

The locomotive has an automatic traction motor blower system. There may be situations where it is necessary to operate the blowers manually. Mostly when you start your drive with high traction effort and slow speed, e.g. regulator at a notch less than 8.
Then you can switch on the blowers with <Shift+F> and <Ctrl+F>.
See the fault section for more information.

5 SiFa and Indusi

5.1 SiFa (vigilance alarm)

The locomotive has a working Zeit-Zeit-Sifa (vigilance alarm) which can be activated or deactivated with <Shift+7> The purpose of the SIFA is to keep the driver vigilant at all times and to allow the locomotive to come quickly and safely to a stop should the driver become incapacitated or otherwise not be in proper control of the train.

If you switched on the SIFA you have to press the space bar every 30 seconds to reset it.

If you forget to reset the SIFA, the SIFA light will start glowing on the console to remind you to press the SIFA button. If you miss this, after 2 seconds you will hear a warning beep that will last for a further 2 seconds after which the train will begin emergency braking.

The SIFA will pause if you switch to an outside view. So you can have it switched on even if you want to have some route explorations. Back in cab the SIFA timer runs again from 30secs down.

5.2 PZB / Indusi i60 (Automatic train protection & control)

The locomotive has a near realistic build in Indusi i60 system used in Germany for speed control of trains.

Use <SHIFT+8> to switch Indusi on or off.
Indusi train mode you can switch with <Ctrl+8>.

After switching on the Indusi will start a self-test. The Indusi could only be switched on or off when the train is not moving and the reverser is set to M.

Use the following keys to control the Indusi:

- <DEL> = Indusi Befehl / Order40
- <End> = Indusi Frei / Free
- <Page down>= Indusi Wachsam / Acknowledge

Important: The usage of the Indus acknowledge switch will be registered by the Indusi system when the switch is released! That is a prototypical behaviour installed in vR locomotives. You can switch and hold Indusi Wachsam / Acknowledge switch when you pass a 1000Hz magnet, but need to release the switch in between 4sec. to avoid an emergency brake.

PZB / Indusi help system:
The help system will assist you when you have no experience with the PZB.
It tells you in a message box why you have an emergency braking when it occurs.
Switch on or off the help system with <Ctrl+->

Please note: This Indusi system has no restrictive monitoring implemented.

Overview of PZB 90 (note: Indusi i60 has lesser features)

The PZB 90 system is used to ensure that trains are running at correct speeds in certain controlled sections (for example, leading up to signals) and also to ensure that no train can pass a signal at danger.

There are three types of train controlled via the PZB system, these are described as:

Zugart O	Obere (Upper)	Light trains / Passenger trains
Zugart M	Mittlere (Medium)	Heavy trains / Freight trains
Zugart U	Untere (Lower)	Very heavy trains / Freight trains

When you enable PZB with Shift+8 it will start up ready for a Zugart O train.
Zugart could be read in the vR Message window to the right in the cab.
You can use Ctrl+8 to cycle between the train types until you have the one most appropriate for your train. The key differentiators are the maximum speed and the ability to stop, so a long slow heavy freight train should be a Zugart U, for example.

In the descriptions below, the process that is followed is exactly the same regardless of the train type selected, what differs is the speed limits that are enforced.

PZB is implemented by means of three kinds of magnets that are placed on the track; these are described as 500Hz, 1000Hz and 2000Hz. These magnets are only powered if their associated signal is set at a non-clear aspect, if the aspect is clear ('green / green') then the magnets have no effect on the train.

For some controlled element, such as a signal, each of the magnets will be placed in the following order:

- 1000Hz - at some remote point on the track such as the distant signal
- 500Hz - usually 250m before the main signal being checked
- 2000Hz - placed at the signal itself

For this description, a **Zugart O** train is assumed.

Note: In the speed limit descriptions below the line limit always overrides that given in the description. For example, if the description says that you must be below 85km/h and the line limit is 60km/h then this takes precedence.

1000Hz Magnet

A passing train will first meet the 1000Hz magnet and the 1000Hz lamp will light on the PZB display after pressing PZB Wachsam / key Page Down while passing the signal.
On the Train Simulator 2012 HUD, the exclamation point indicator will light up with a wasp black/yellow pattern, but there is no audible indicator. The driver now has four seconds within which to press the PZB Wachsam button (Page Down). Failure to do this will result in emergency brakes being applied.

Having acknowledged the 1000Hz magnet, the driver now has 23 seconds to drop their speed to 85km/h (Note: A different Zugart (M or U) has a different speed) or emergency brakes will apply.

After the train has passed 700m from the 1000Hz magnet the 1000Hz lamp will go out and at this point the driver *may* choose to press PZB Frei (End) to get out of the speed restriction if, and only if, they can clearly see that the controlled signal is now showing a clear aspect. If the driver presses PZB Frei and then runs over an active 500Hz magnet the train assumes the driver has made a mistake and will apply emergency brakes.

500Hz Magnet

On passing the 500Hz magnet, the train must not be exceeding 65km/h or the emergency brakes will be applied. The 500Hz lamp on the PZB display will light up. The train now has 153 meters to reduce speed to 45km/h.

The 45km/h speed limit is now in force for the next 250m. It is not possible to release from this with the PZB Frei button.

2000Hz Magnet

If the train passes an active 2000Hz magnet then it will always apply its emergency brakes as the only time this can happen is if the train is passing a signal at danger.

Other notes

~~If, while under the control of a 1000Hz or 500Hz magnet, the train stops or spends more than 15 seconds at less than 10km/h the enforced speed limit will be reduced by a further 20km/h and this is then called a restrictive speed limit. This is indicated on the PZB display by the speed indicators (the top row) alternating between two lamps (70 and 85).~~
~~Once the magnet lamp goes out you can press PZB Frei (END) to get out of the restrictive speed limit.~~

Befehl40 ('Order 40km/h')

The Befehl40 button (DEL) allows a special case that instructs the train to *ignore* a 2000Hz (red signal) magnets that it comes across. You are put in to an enforced speed limit of 40km/h while this is active, exceeding this limit will cause the emergency brakes to apply.

To pass the red signal press and hold DEL for PZB Befehl40 until the Befehl40 light lights up.

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 153m	~~45km/h constant~~	~~45km/h -> 25km/h In 153m~~
M (Mittlere)	125km/h -> 75km/h in 26 seconds	50km/h -> 35km/h in 153m	~~45km/h constant~~	~~25km/h constant~~
U (Untere)	105km/h -> 55km/h in 34 seconds	40km/h -> 25km/h in 153m	~~45km/h constant~~	~~25km/h constant~~

Further Reading

You can find more recommended reading about the German PZB90 system at these links:

- http://www.marco-wegener.de/technik/pzb90.htm
- http://www.sh1.org/eisenbahn/rindusi.htm

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6 Additional Systems

6.1 Protective section

The package includes special EL-signals. The locomotive can recognize and react to the signals. Two types of signals are included: Main switch off and Pantograph down.

If you miss one of these signals you will get a message about this. If you pass the pantograph down signal with a raised pantograph the scenario will be terminated.

6.2 Door control

The locomotive has a programmed door control that could be used with different passenger wagons from the vR Shop. If you open the doors the T light positioned at the left console will go off and you will hear a beep sound. To close the doors use <Shift+T>.
When the doors are open the regulator is disabled. It may be necessary to engage the loco brake to prevent the train from rolling.

6.3 Destination board control

The locomotive can handle coaches with the vR destination board system.
The E10 itself has no destination boards but those on the coupled coaches can be switched with <0> and <Shift+0> (zero).

6.4 Faults / Observation

Electrical fault:
The maximum voltage the locomotive can handle is 420A. If you move over this value power will trip and power will be switched off automatically. If this happens set the regulator to notch zero and switch back on the main switch. After that you can use the regulator normally. To check the amperage, use the second vertical gauge from right on the left desk. It should not show more than 400A. Keep in mind that every electrical fault gives you a higher error score.

Traction motor heating:
To prevent the tractions motors from overheating it is necessary to keep an eye on the ammeter gauge. Please use these maximum values when notching up the power:

- over 330A maximum 2min.
- over 200A maximum 15min.
- under 200A permanent traction effort

These values are valid when the traction motor blowers are working. You can hear them.

If the blowers are not working because off slow speed the following values are valid:

- over 330A do not try, after 10sec you will get a fault
- over 200A maximum 1:30min.
- under 200A maximum 3min.

To prevent this rapid overheating you can switch on the blowers manually with <Shift+F>.
If you want to switch the blowers back to automatic mode use <Ctrl+F>.
Do not use Off for the blowers to avoid damage to the motors.

If you do not use the blower control properly scenarios will be forced to end.

Traction motor electrical protection:
When the power is switched off it is necessary to break the connection between the electrical power and the traction motors. This is normally done when you switch the regulator from notch 1 to 0 but this needs to be done too when higher notches are selected without causing problems. The higher the electrical power, the higher the possibility for an electrical fault. You will see a message when you can start driving again.

Driving with two raised pantographs:
Normally you use only one raised pantograph. It is allowed to use two raised pantographs in winter when the catenary is heavily iced. Max speed in this case is 110km/h.
There are no other situations which allow the use of two pantographs.
How did we integrate this? When it is winter time and you drive with two raised pantographs slower than 110km/h nothing happens. If you are driving much faster you will get several warnings until the scenario will be forced to end. It is not winter? You will get several warnings. If you do not obey them the scenario will be forced to end.

6.5 AI Wipers and Pantograph selection

There are some special functions for the locomotive when it is used as an AI machine.
If it is raining or snowing the right wiper in driving direction will start automatically.

If you write scenarios by yourself you can now decide which pantograph should be lifted when the locomotive is used as an AI vehicle. Use the listed code in front of the locomotive number in the editors ID field:

- „SA-00-" = no pantograph is raised
- „SA-10-„ = pantograph No. 1 is raised
- „SA-01-„ = pantograph No. 2 is raised
- „SA-11-„ = both pantographs are raised

New: you now can see the result of the preselection in the editor right after entering it into the numbering field.

6.6 Train heating system

We have also implemented the heating voltage control for the coaches. But it has no effect in the simulation. It's just for the eyes. You can select a voltage with the big lever and then switch on the heating with the smaller switch right below. The heating voltage gauge will show the selected value. After each main power loss or OHE voltage loss you need to switch on the heating again.

6.7 Configuration file (Only for experienced users!)

The following pre-selections could be made:

- Light bulp on or off
- AI wiper function on or off
- Message system on or off
- Message system level
- PZB/LZB help system on or off
- Traction motor electrical protection on or off
- Sand box will empty on or off
- Error level for traction motor electrical protection
- Standard language for messages (German or English possible)

The configuration file can be found under Scripts\config\
Please only make changes when you really know what you are doing.
Please do not open the file with Word, Wordpad or any other text word processing editor.
Best use notepad or a LUA compatible editor or Notepad.

7 Key Layout

Function	Key	Key
Automatically Start-Up	Ctrl	Z
Battery Isolating Switch on/off	Shift	B
Compressor on	Shift	´
Pantograph Selection	Shift	P
Pantograph up / down		P
Main switch on/off		Z
Regulator		A / D
Regulator fast up / down	>1sec. press	A / D
Reverser		W / S
Traction motor blower	Shift / Ctrl	F
Air pipe pressure aligning	Shift	A
Train brake		; / ´
E-brake		< / >
E-brake decoupling	Shift	D
Loco brake		[/]
Emergency brake		Backsp (←)
Sander		X
SIFA on/off	Shift	7
SIFA Reset		Space
PZB on/off	Shift	8
PZB Wachsam / Acknowledge		Page down
PZB Frei / Free		End
PZB Befehl40		Del
Horn long		B
Horn short		N
Doors closing	Shift	T
Wiper right		V
Wiper left		C
Wiper right fast	Shift	V
Wiper left fast	Shift	C
Wiper right slower	Ctrl	V
Wiper left slower	Ctrl	C
Cab light and Reading lamp	(Shift)	L
Instrument lights		I
Light Bulp	Shift	End / Pos1
ZZA up		0
ZZA down	Shift	0
Windshield heating elements shown on/off	Ctrl+Shift	- (minus)
Help system on or off	Shift	[
Message level	Ctrl	]

8 Hints for scenario creators

The AI locomotives run through the automatically Start-up process. This needs some time. A good time to be sure that the Start-up process has finished is 30sec.

Please place the locomotives so that cab 1 points into the driving direction.
This will prevent a false detection of the driving direction for placing the driver and raising the correct pantograph.

If you want to use more than one locomotive in your train, the additional locomotives should have their pantographs lowered. Read section 6.5

New scenario save and resuming compatibility: This is the first Expert-Line that is able to follow the save and resume function of TS2015. All important system states are saved so you can save your scenario and resume it later without the need to newly set up the locomotive. Please note that some system values are not stored like an active Indus monitoring. We will work on it to implement more savings to the coming Expert-Line packages.

9 Credits

We say Thank you to all people who helped realizing this locomotive.

Your virtualRailroads Team