BR 145
Expert Manual

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<u>Introduction</u>

From the talent of TSG that brought you the Expert DB BR 101; take on your next challenge and step into the ultimate level of simulation with the Expert DB BR 145! It's time for freight to get its study-level rendition in Train Sim World 6, complete with a whole suite of never-before-seen features!

The 1990s were a period of change for Germany's railways, classic traction was being sidelined by new generations of motive power, and multiple manufacturers with competing ideologies were being merged under Adtranz. While the likes of intercity trains got the BR 101, originally an ABB design, one of the new arrivals for freight haulage was the BR 145, which was derived from an AEG prototype, the BR 128.

A total of 103 BR 145s would be built between 1997 and 2000, their sleek exteriors providing a stark contrast to the boxy standards of the previous generation. Meanwhile under the hood, with modern screens in the cab and powerful asynchronous electric motors, they started the transformation of Europe's cargo-hauling fleet and went on to inspire the design of the iconic TRAXX family.

In Train Sim World 6, TSG's Expert DB BR 145 features everything you love from the 101 including full internal simulation with machine room, interactive fuses and fault simulation, but there's more! **BRAND NEW** to the BR 145, keep yourself busy outside the locomotive too with Expert Coupling; climb between the loco and wagons, pick up the chain and hook it up yourself - don't forget to connect the brake pipes! Temperature simulation also affects the exterior; you may have to unfreeze the brakes in the cold. External fuses are also now simulated.

The BR 145 features not only the standard Deutsche Bahn livery, but RBH blue as well - a new freight brand for Train Sim World. The "NV" variant of DB BR 145 is also included representing their limited use as passenger locomotives. Brand new T3000e container flats also feature, alongside Expert-upgraded versions of existing and commonplace wagons; the Zacns, Habbiins and Sggmrss 90.

Please Note: For the full experience, we recommend you own Bahnstrecke Leipzig - Dresden which is available as a separate purchase.

Disclaimer

Railways are a dangerous place and you should never attempt to replicate or copy the activities you see in-game on the real railways. For your own safety, do not trespass on Railway Property, always follow advice given by railway staff and observe signs and instructions provided at all times.

Train Sim World 6 as well as this manual have been designed to give you the freedom to enjoy your passion from the safety and comfort of your own home.

This manual assumes you know the basics of how to drive a German locomotives within Train Sim World, as well as signalling and the safety systems.

Limitations

- The EBuLa screen, whilst functional, does not feature route or tracking information.
- The advanced simulation of this DLC is not compatible with the "Reset Simulation Physics" function in Train Sim World 5 and may cause unpredictable results.

List of features

- 3 variants of the BR145:
    - DB Cargo Traffic Red Livery.
    - DB with "*Nahverkehrspaket*" Traffic Red Livery with FT95, PIS display and door controls.
    - RBH Livery.

- 4 expert freight wagons:
    - (Brand new) Sdggmrss 738.0, capable of carrying both truck trailers and containers.
        - New brand: DHL.

- Sggmrss 576.0 upgraded with expert features.
- Zacns upgraded with expert features.
- Habbiins 344 upgraded with expert features.

- Realistic physics and sounds.
- Manual coupling, including:
    - Screw couplers to manually set and tighten.
    - Brake hoses.
    - Angle cocks.
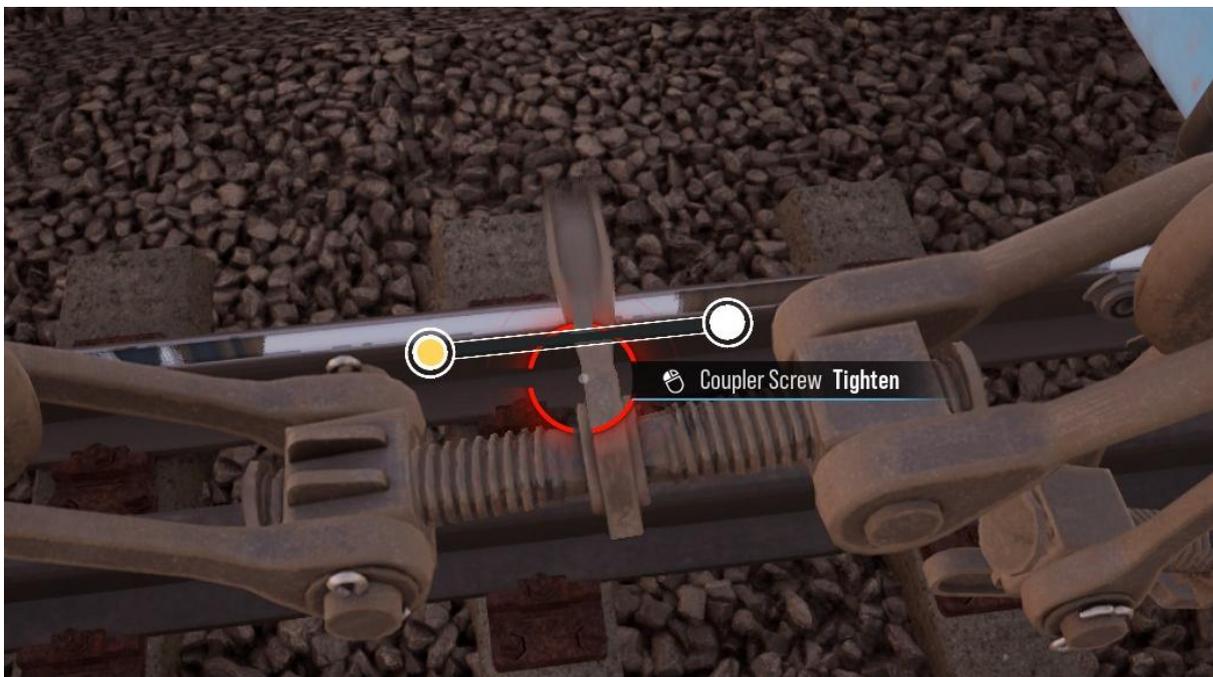
- Full safety system simulation with tests and Train Data.
- Freight Train Preparation features:
    - Kicking brake shoes.

- Using a hammer on the wheels to test their sound.

- Wagon List and Brake Sheet in the cab.
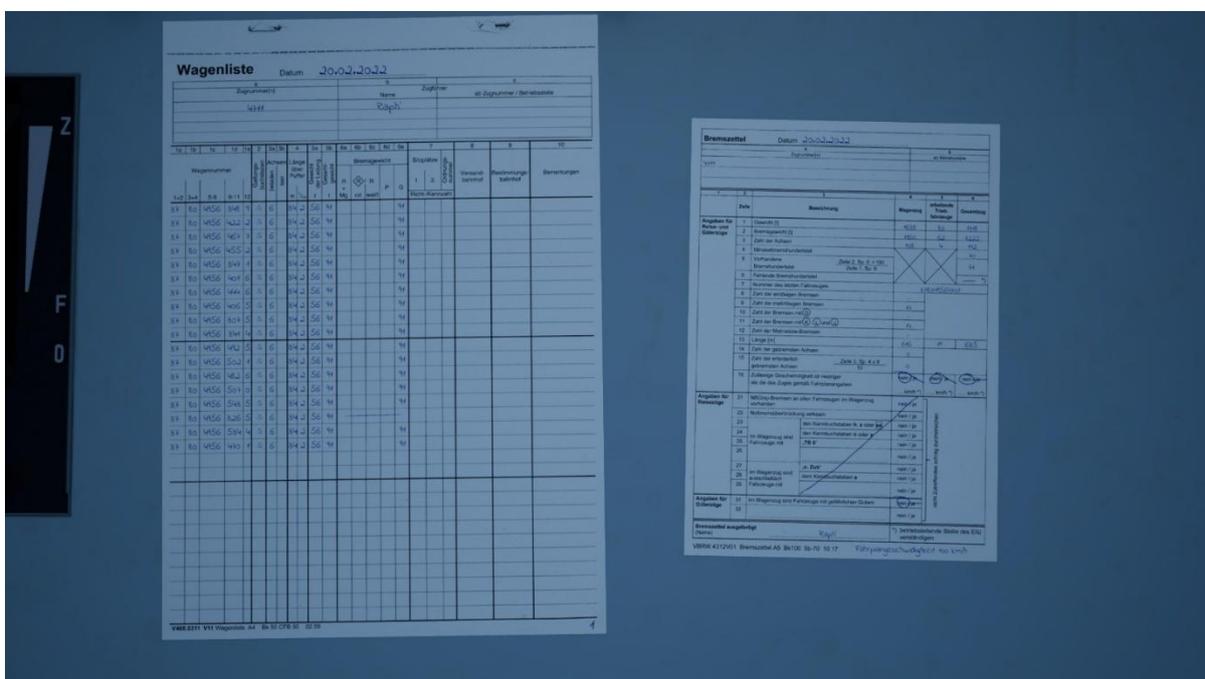
- Simulation Manager to customise the Expert experience.
- 110+ random faults, including:
    - 98 (Standard Version)/100 LSS (With *Nahverkehrspaket* installed) and MSS in the engine room.
    - 2 Battery fuses on the outside of the locomotive.
    - External events such as ice build-up and hot brakes.

Training Modules

5 training modules are available (from the Training Center):

- Introduction
- Setup from Cold & Dark
- Enabling and Disabling Safety Systems
- Fault Diagnosis
- Freight Train Preparations
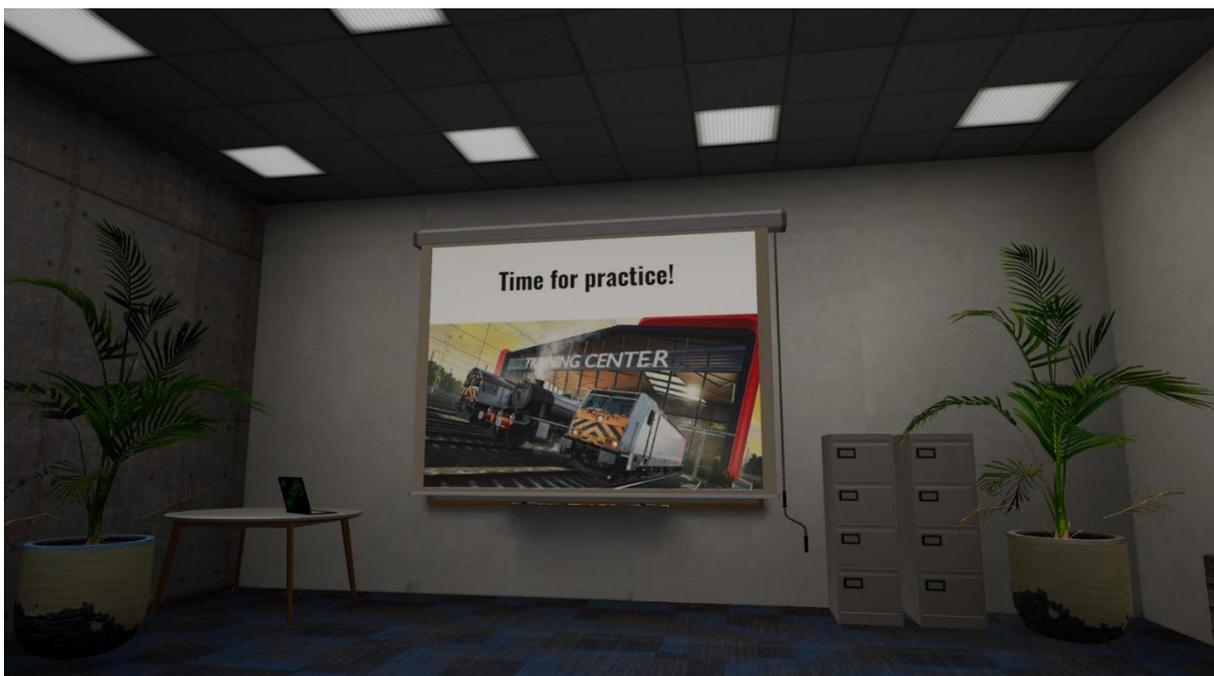
Scenarios for Dresden – Leipzig

Expert. Simply delivered.

It is not always simply delivered. Especially when things break!

Duration: 55 minutes

Nahverker

A freight loco sometimes has to be used elsewhere.

Duration: 75 minutes

Auf Abwegen

Interesting developments.

Duration: 40 minutes

Faulty Friday

Friday turns on us.

Duration: 90 minutes

Timetable

On Dresden – Leipzig's Expert Timetable, 277 services are available.

128 are freight related services:

-   6 are locomotive start-ups
-   18 are locomotive changes
-   4 are locomotive stabling
-   29 services split into more than one part.

149 are passenger services (Nahverkehrspaket only):

-   64x S1 and 43 S2x services including empty moves
-   9x RE15, 8x RE18,17x RB31 and 8x RE50 services (including empty moves)

This timetable also includes 15 services for the BR 101 Expert and 7 for the Cab-Car Expert.

Substitution

The BR 145 can substitute on freight services on the following routes:

-   Nahverkehr Dresden – Riesa
-   Ludwigsbahn: Mannheim – Kaiserslautern
-   Tharandter Rampe: Dresden – Chemnitz
-   Schnellfahrstrecke: Kassel – Würzburg
-   Frankfurt – Fulda: Kinzigtalbahn
-   Bahnstrecke Bremen – Oldenburg
-   Schnellfahrstrecke Köln – Aachen
-   Bahnstrecke Salzburg – Rosenheim
-   Frankfurt S-Bahn: S1, S8 & S9
-   Hauptstrecke Hamburg – Lübeck
-   Hauptstrecke München – Augsburg
-   Hauptstrecke Rhein – Ruhr
-   Main-Spessart Bahn
-   Rhein-Ruhr Osten
-   Ruhr-Sieg Nord

Expert Mode

With Expert Mode, we deliver the most realistic driving experience, with realistic physics, locomotive functionality and system simulation, including realistic faults and other driving related procedures. This was made possible thanks to our cooperation with our licensor and our helpful consultants who work for the railway.

To enable Expert Mode, in the Options menu:

Player assist → Expert Mode (Expert Locos Only): On

The following settings are effected:

- PZB, LZB and SIFA enabled by default.

- Train Data (ZDE) information must be entered manually to set PZB/LZB to the appropriate mode.

- Fault simulation will be activated by default.

NOTE: Enabling/Disabling the Expert Mode during a service without restarting it is not guaranteed to work. Please restart the service after enabling/disabling the Expert Mode option.

Locomotive controls
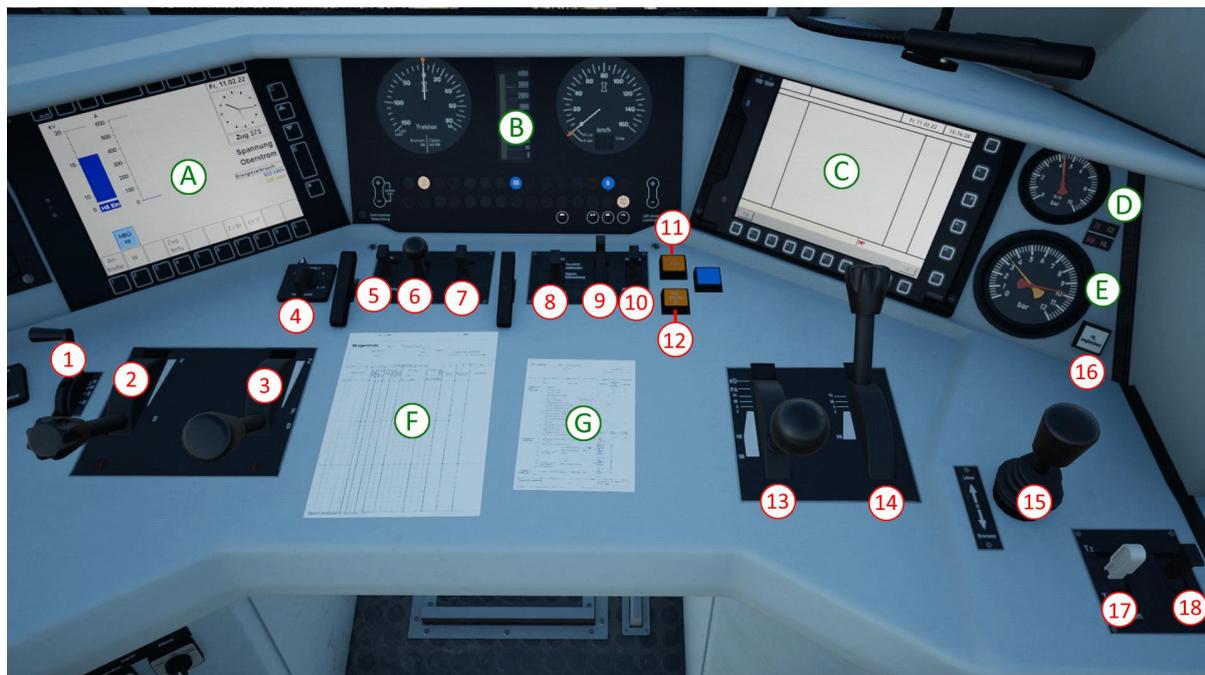
1) Reverser
2) AFB
3) Throttle Handle
4) Door Release
5) Train Lights
6) Sand
7) Brake Release
8) Headlights
9) Signal & Instrument Lights
10) Cab & Timetable Lights
11) *Emergency Call**
12) *Advance Station (PIS)**
13) Train Brake
14) Electric Brake

15) Direct Brake
16) Brake Overcharge
17) Passenger Doors
18) Horn

A) MTD Screen
B) MFA
C) EBuLa screen
D) Bogie Brake Gauge
E) Brake Cylinder Gauge
F) Wagon List
G) Brake Sheet

*With Nahverkehrspaket installed.
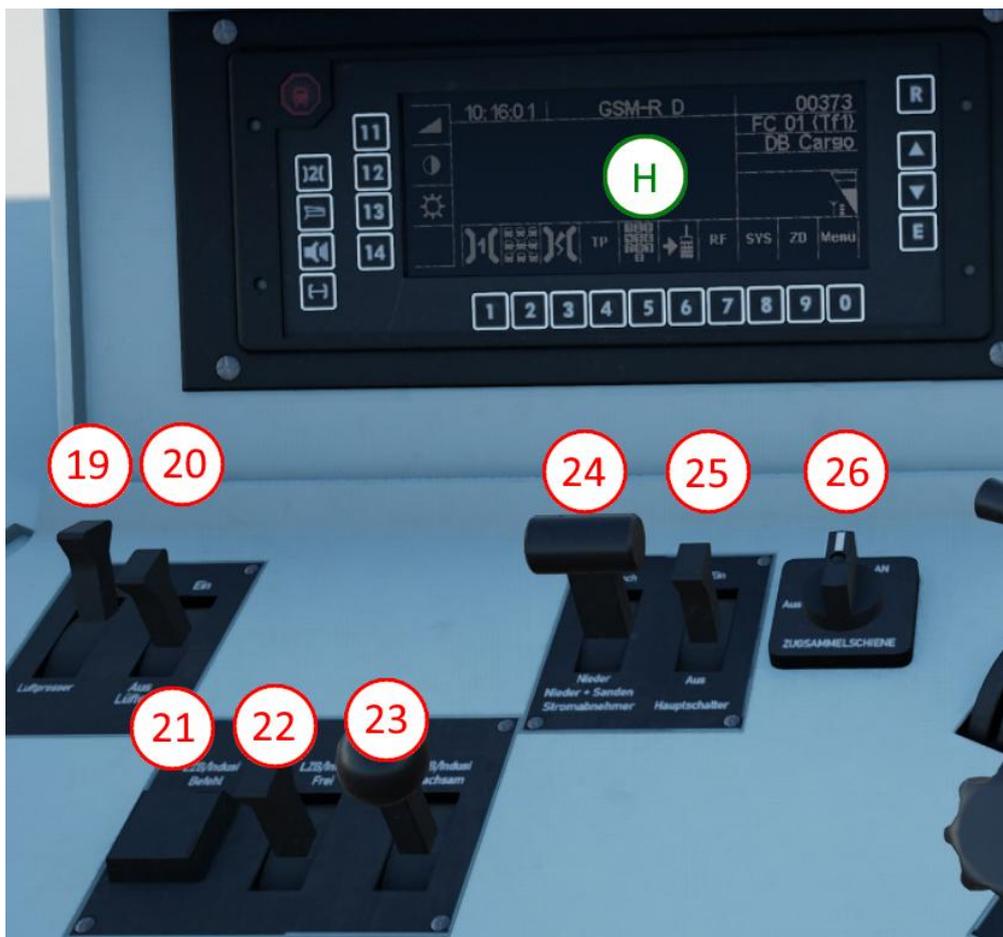
19) Air Compressor
20) Cooling Fan
21) LZB/PZB Override
22) LZB/PZB Release
23) LZB/PZB Acknowledge
24) Pantograph

25) Main Circuit Breaker
26) Electric Train Supply

H) GSM-R

27) Multiple Unit Protocol
28) *Door Control Unit*
    Operating Mode*
29) Signal Lights
30) LZB
31) Battery
32) Pantograph
33) Brake Mode
34) Parking Brake Apply
35) Parking Brake Release

*With Nahverkehrspaket installed.

36) Battery Test
37) NBÜ/ep Switch
38) Brake Valve Cut-Out
39) ZSG Change
40) Indicator Light Test
41) Machine Room Lighting

I) Battery Voltage

Signal Lights, LZB, Parking Brake Apply & Release, NBÜ/ep, Brake Valve Cut-Out, ZSG Change, Indicator Light Test and Machine Room Lighting switches are also present on the backwall of Cab 2.

<u>Circuit Breaker Layout on the backwall (Cab 1 & Cab 2):</u>

Stirscheiben-heizung	Windshield Heating
Fußboden-heizung	Underfloor Heating
Nischen-heizung	Footwell Heating
Scheibenwischer Beimann	Secondman's Side Wiper
Scheibenwischer Lokführer	Driver's Side Wiper
Terminal-lüfter	Computer Fan

42) AFB Main Switch
43) Console Light Dimmer
44) Contact Signaller
45) Windshield Heating
46) Underfloor Heating

47) Footwell Heating
48) Fan Speed
49) Cab Temperature
50) Air Condition Mode
51) Pressure Protection

52) Sifa Pedal
53) Horn
54) Timetable Light Dimmer
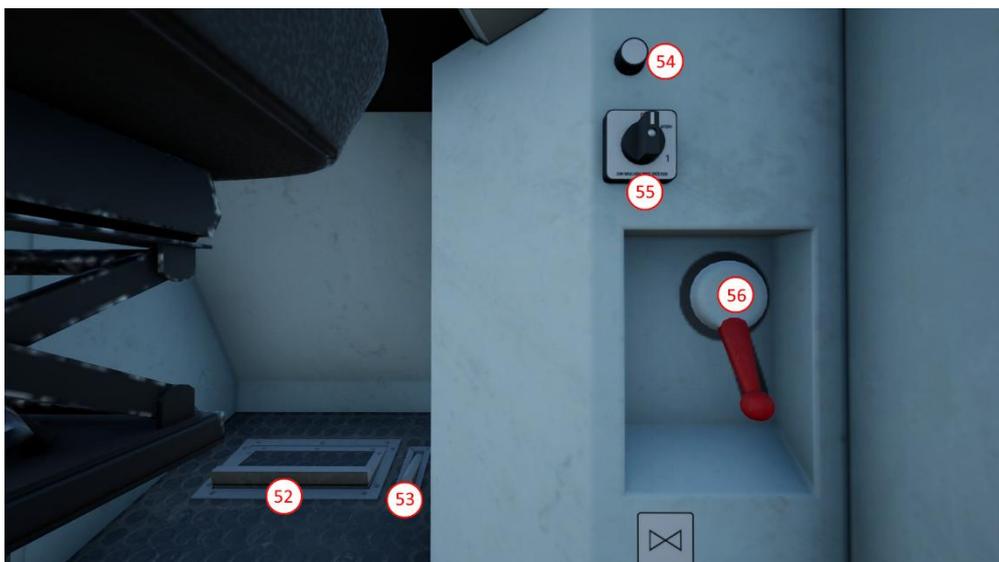
55) Wipers
56) Emergency Brake Valve

Auxiliary Controls

Each cab is equipped with 2 sets of Auxiliary Controls. They are used for shunting or to depart with the driver operating the train from the Cab Window. It comprises:

- A control lever with the positions Emergency Brake, Off, Decrease Traction, Hold and Increase Traction (spring-loaded)
- PZB/LZB Acknowledge and Override
- Auxiliary Control Unlock

To operate the auxiliary controls:

- The Train Brake must be in the Running position.
- The Auxiliary Control handle must be in the 0 position.
- The Throttle must be in the F position.

Unlock the Auxiliary Controls then operate the control lever to start driving.

To transition from Auxiliary Controls to Normal Controls, use the Throttle or the Train Brake. Operation of the Throttle or Train Brake deactivates the Auxiliary Controls. This makes it possible to make the transition without losing the tractive effort obtained through the Auxiliary Control Lever.

Engine room

Access the Engine Room via the door from Cab 1 or Cab 2.

The room houses all the internal machinery of the locomotive as well as its circuit breakers and valves.

Circuit Breakers

Next to Cab 1 is the HBG 1 Cabinet. The Standard version contains 33 Low-Voltage Circuit Breakers (*Leitungsschutzschalter* or LSS) or 35 in with Nahverkerspaket installed and 9 Motor Circuit Breakers (*Motorschutzschalter* or MSS) on the right side of the cabinet, as well as 3 Fault Isolation Switches, and an additional PIS Isolation Switch if the Nahverkehrspaket is installed.

LSS of the right-hand side Cabinet

51F31	Signalbeleucht. FR 1	Signal Light Cab 1
51F32	Signalbeleucht. FR 2	Signal Light Cab 2
52F31	Führerraumbel. FR 1	Cab Lights – Cab 1
52F33	Führerraumbel. FR 2	Cab Lights – Cab 2
52F32	FR 1 MFA/Instr./DSK	Cab 1 MFA/Instrument Lights/DSK
52F34	FR 2 MFA/Instr./DSK	Cab 2 MFA/Instrument Lights
52F35	Maschinenraumbel.	Machine Room Lighting
52F36	Fahrplanleuchte FR1/2	Timetable Light Cab 1/2
63F33	Heiz. Sandung/Lufttr.	Sand Heating & Air Dehumidifier
63F34	Regl. Stirnfensterheiz.	Windshield Heating Control
62F10	Thermofach	Thermobox
71F35	Makrofon	Horn
42F31	GSM	GSM

To access the Motor Circuit Breakers (MSS), open the cabinet.

<u>MSS of the right-hand side cabinet</u>

34Q12	Lüfter HBU 1	Blower HBU 1
34Q18	Elektronik Lüfter HBU 1	Electronic Fan HBU 1
34Q14	Klimaanlage FR 1	Air Conditioner Cab 1
34Q04	Lüfter Kühlturm 2	Cooling Tower 2
34Q05	Fahrmotorlüfter 3	Traction Motor Blower 3
34Q06	Fahrmotorlüfter 4	Traction Motor Blower 4
34Q01	Lüfter Kühlturm 1	Cooling Tower 1
34Q02	Fahrmotorlüfter 1	Traction Motor Blower 1
34Q03	Fahrmotorlüfter 2	Traction Motor Blower 2

LSS of the left-hand side Cabinet

32F82	EBuLa FR1	EBuLa – Cab 1
32F83	EBuLa FR2	EBuLa – Cab 2
32F68	110 V Strg. HBU 1	110 V Control HBU 1
32F69	110 V Strg. HBU 2	110 V Control HBU 2
32F70	DC/DC Wandl. 110/24V	DC/DC Converter 110/24V
32F71	DC/DC Wandl. 110/24V	DC/DC Converter 110/24V
32F74	Mitrac Eingaben	Mitrac Input
32F65	ZMS	ZMS
46F01*	*Fahrgastinformationsanlage**	*PIS**
32F67	Lüfter ES	Electric Cabinet Fan
32F75	UIC und AIZ	UIC & AIZ
32F76	Spurkranzschmierung	Wheel Flange Lubrication
32F77	Sprachausgabe	Voice Output
32F78	Branddetektor	Fire Detector
32F79	Signalausgabe 1	Signal Output – Cab 1
32F80	Signalausgabe 2	Signal Output – Cab 2
43F31	Sifa Steuerkreis	Sifa Control Circuit
32F81	0 V Signalausgaben	0 V Signal Output
33F31	Zugheizsteuerung	Train Heating Control
43F31	Hilfluftpresser	Auxiliary Compressor
45F31	Zugfunk	Train Radio
32F66*	*FrequenzmultiplexeZugsteuerung**	*FMZ**

With Nahverkehrspaket installed.

Left of the HBU 1 Cabinet is the FML 2 Cabinet. It contains 23 LSS.

LSS of the FML 2 Cabinet

21F31	Stromabn. Hauptsch.	Pantograph Main Circuit Breaker
22F32	Fahren FR 1/FR 2	Driving – Cab 1/Cab 2
32F31	Fremdeinspeisung	External Power Supply
32F32	Batterieeinsch.	Battery Contactor
32F33	Hilfswechselrichter	Auxiliary Inverter
32F39	ISG 1	ISG 1
32F40	Stromv. ISG 1 GUSP	Power Supply ISG 1 GUSP
32F41	Stromv. ISG 1 GUSP	Power Supply ISG 1 GUSP
32F50	Stromv. Terminal FR 2	Power Supply Display – Cab 2
32F42	Steuerung DG 1	Control Bogie 1
32F44	Steuerung ISG 1/2	Control ISG 1/2
32F45	ISG 2	ISG 2
32F46	Stromv. ISG 2 GUSP	Power Supply ISG 2 GUSP
32F47	Stromv. ISG 2 GUSP	Power Supply ISG 2 GUSP
32F48	Steuerung DG 2	Control Bogie 2
32F49	Stromv. Terminal FR 1	Power Supply Display – Cab 1
32F52	0 V Terminal FR 2	0-V Display Cab 2
32F56	LZB/Indusi	LZB/Indusi
32F58	HSM Rechn. 1/Gleitsch.	HSM 1/Anti-Skid
32F59	HSM Rechn. 2	HSM 2
32F60	Stromv. EP/UIC	Power Supply ep/UIC
32F61	Steuerung Bremse	Brake Control
32F51	0 V Terminal FR 1	0-V Display Cab 1

Next to Cab 2 is the HBG 2 Cabinet. It contains 2 LSS and 11 MSS behind a cabinet door.

32F35	Steckdose FR 1 + 2	220 V AC Outlet Cab 1 + 2
35F37	Steckdose HBG 1 + 2	220 V AC Outlet HBG 1 + 2
34Q11	Trafo-Ölpumpe 2	Transformer – Oil Pump 2
34Q09	SR-Ölpumpe 2	Traction Converter – Oil Pump 2
34Q17	Lüfter SR 2/1	Blower Traction Converter 2/1
34Q22	Lüfter SR 2/2	Blower Traction Converter 2/2
34Q13	Lüfter HBU 2	Blower HBU 2
34Q19	Elektroniklüft. HBU 2	Electronic Fan HBU 2
34Q10	Trafo-Ölpumpe 1	Transformer – Oil Pump 1
34Q08	SR-Ölpumpe 1	Traction Converter – Oil Pump 1
34Q16	Lüfter SR 1/1	Blower Traction Converter 1/1
34Q20	Lüfter SR 1/2	Blower Traction Converter 1/2
34Q15	Klimaanlage FR 2	Air Conditioner Cab 2

Valves

Around the main compressor behind Cab 1, there are 7 valves.
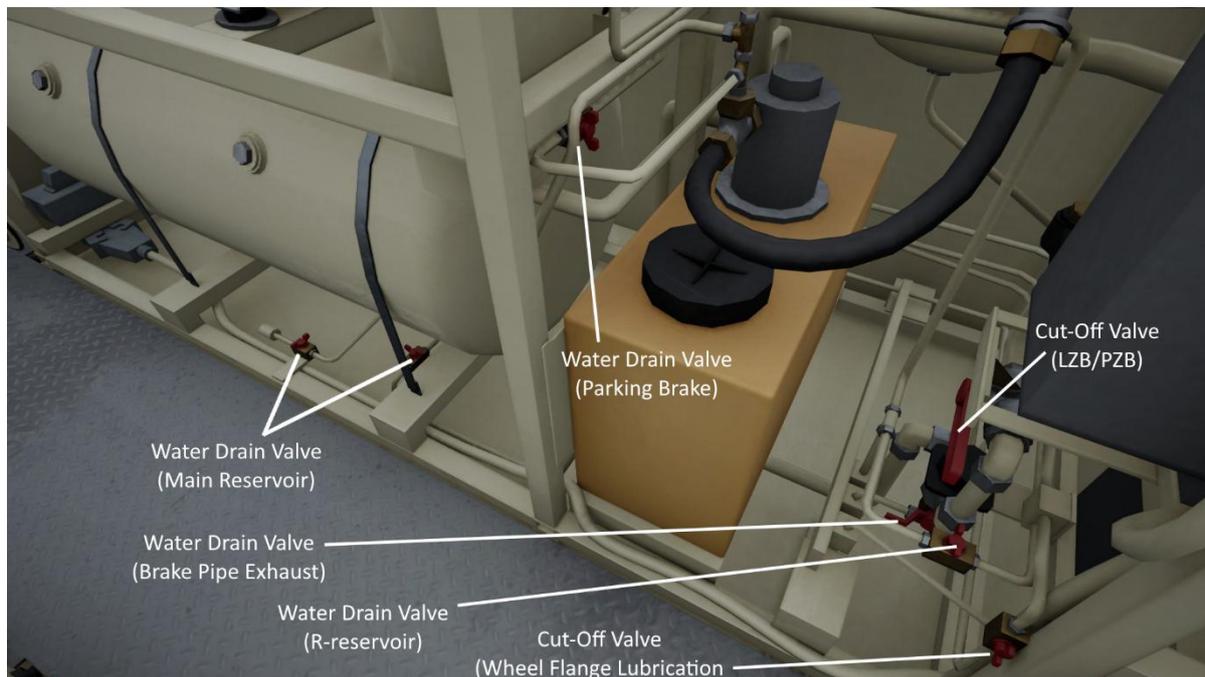
16 valves are arranged in a scaffolding behind the Main Compressor:
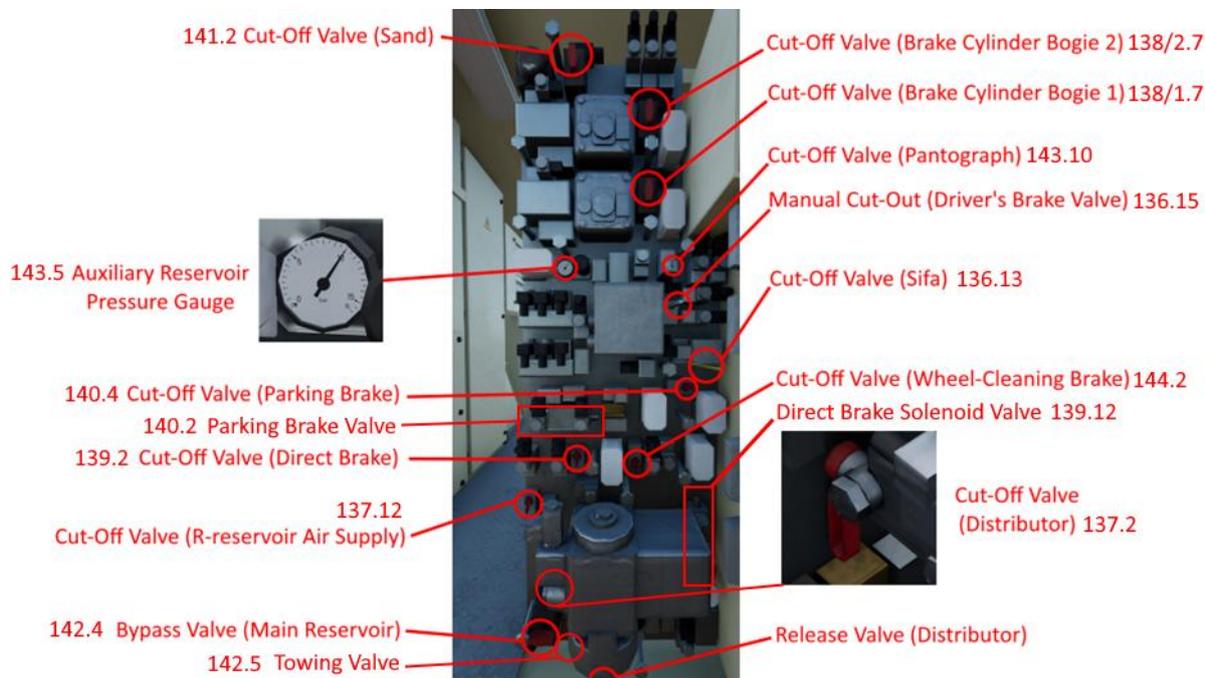
Fault Isolation Switches

On the HBG 1 Cabinet, the following Fault Isolation Switches can be found (in order from left to right):

- SIFA
- LZB
- PZB
- *Passenger Information System (With Nahverkehrspaket installed)*

Use the SIFA Fault Isolation Switch if it fails:

- Close the SIFA Cut-Off Valve.
- Follow Company Guidelines.

Use the LZB Fault Isolation Switch if:

- Required by a Fault Resolution Text.
- A Transmission Failure (Ü-Ausfall) occurs repeatedly.
- The Current Braked Weight Percentage is 65% or lower.
- The formation is a Light Locomotive.

LZB can also be isolated during shunting operations.

When LZB is isolated, the system will switch back to PZB if enabled.

Use the PZB Fault Isolation Switch if:

- Required by a Fault Resolution Text.
- It is not possible to release from a PZB penalty brake.

PZB can also be isolated during shunting operations if they are expected to take more than 30 minutes.

When PZB is isolated, the system will enforce a maximum speed of 100km/h. Follow company operating procedures.

NOTICE:

- If the timetable is set before 2012: The maximum allowed speed without PZB is 100km/h.
- If the timetable is set after 2012: The maximum allowed speed is 50km/h.
- Follow Company Guidelines.

Use the PIS Switch to disable the external destination displays.

Earthing Lever

If Earthing the locomotive is required:

- Apply the Parking Brake, or other necessary brakes to prevent unintentional rolling.
- Open the MCB.
- Lower the Pantograph.
- In the Engine Room, turn the Pantograph Cut-Off Valve Key to the Closed position and remove it.
- Locate the Earthing Lever next to Cab 2 and lower it.
- Turn the Battery Off.

To unearth the locomotive, repeat the above steps in the reverse order.

MTD Screen

English Translation

For accessibility, an English translation of the MTD is provided with this DLC. To activate, press and hold the indicated SoftKey (marked as *).
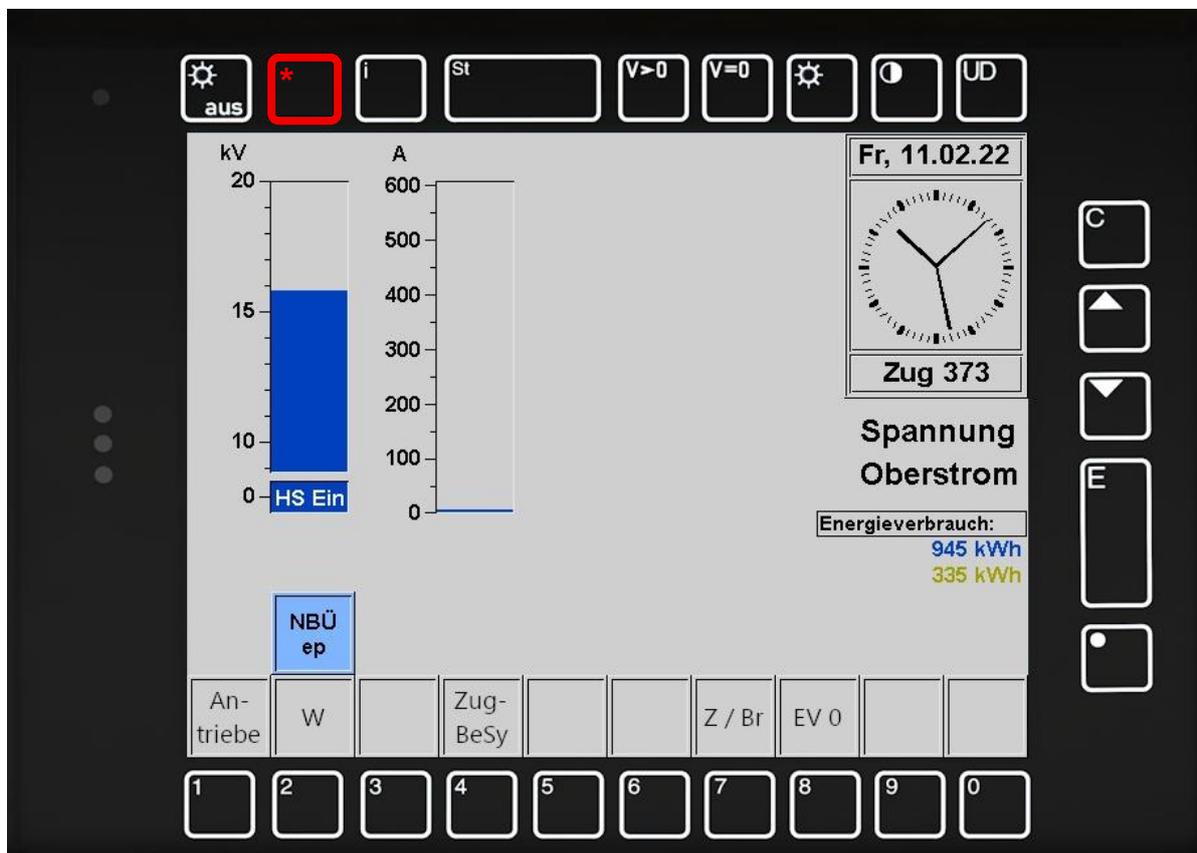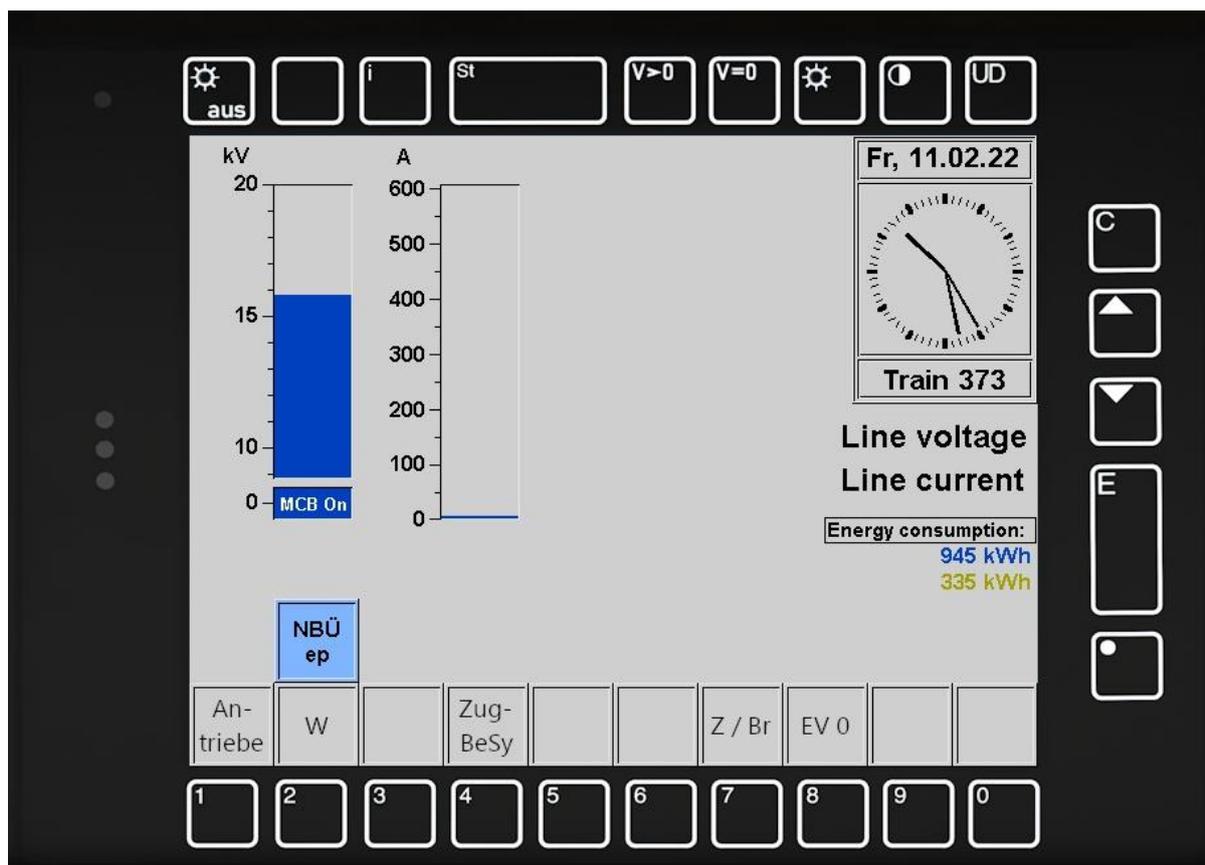
This action translates the text of the entire MTD from the current page into English. The MTD can be switched back to German at any moment by pressing and holding the same SoftKey. This action is possible from any page, including a Fault resolution page. Note: The SoftKey options are only displayed in German.

In the following chapters, this manual will display the original (German) version of any referenced MTD page. For the English translation of each page, please use the in-game translation.

Antriebe

[1] Antriebe

This page is used to enable/disable ASGs or DGs 1 and 2.

After fixing an ASG related fault, enable the previously defective ASG using this screen.

Train Number and Driver ID

[4] Zug-BeSy → [2] Zug-/Tf.Nr.

Enter the Train Number, then press [E] to enter the Driver ID.

EBuLa Screen (Simulation Manager)

Press the SoftKey [St] to open the Simulation Manager.
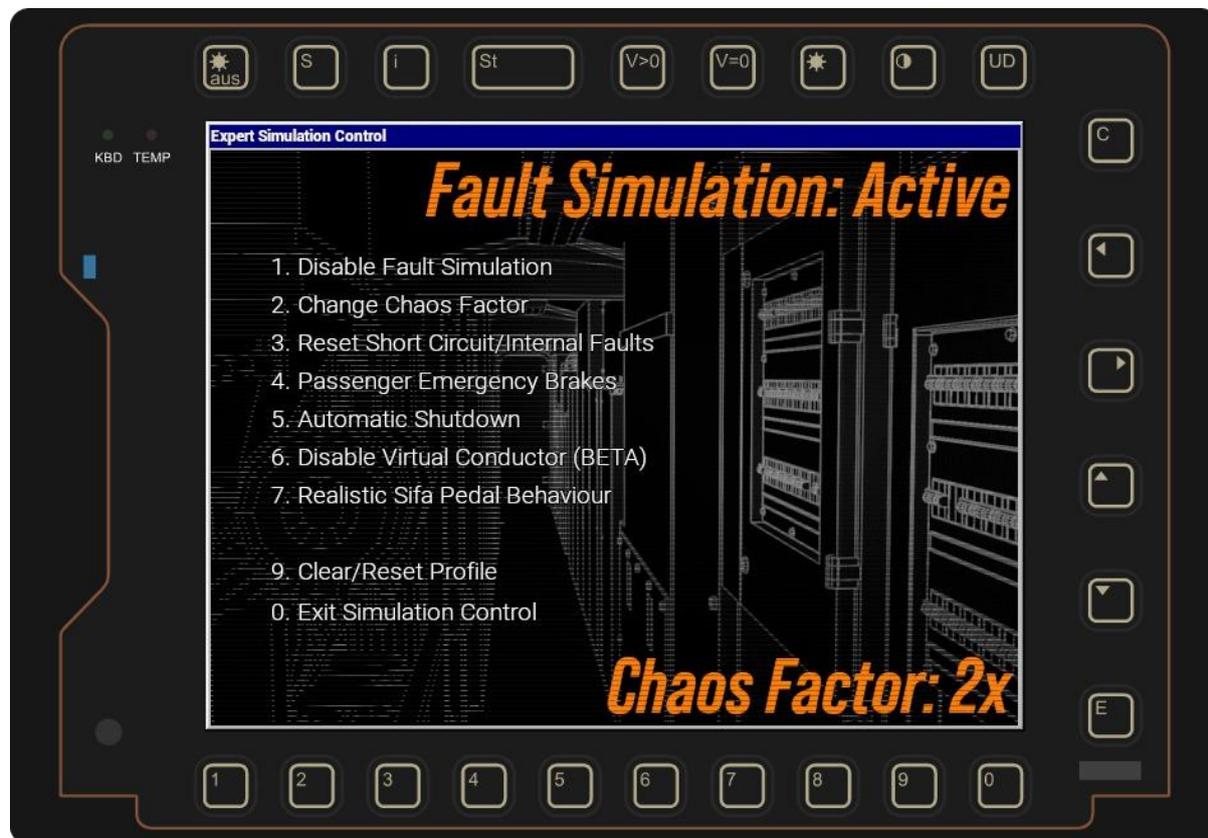
Notes:

- A Chaos Factor of 1x represents real life probabilities of fault and failures.
- Chaos Factor ranges from 1x to 100x.
- When using [3] "Reset Short Circuit/Internal Faults", manually reset any affected circuit breaker.
- SIFA Pedal Behaviour:
    - Standard Behaviour: Always pressed when in motion, press SIFA keybind to release (TSW Default).
    - Realistic Behaviour: Press the SIFA keybind to press the pedal, release to let go of the pedal (Per reality).

Locomotive start-up and shutdown

Full start-up (V1)

Follow this checklist to start-up the BR 145 if completely powered down. Repeat this process if another locomotive is to be part of the consist.

- ☐ Ensure the locomotive is under overhead wires.
- ☐ Ensure at least one brake is applied. This is indicated by a red square with a black dot.
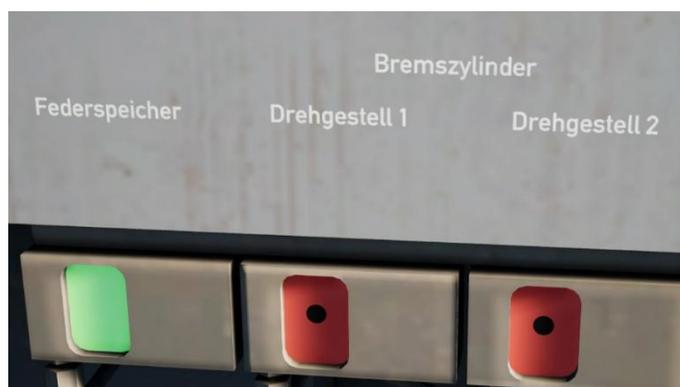
- ☐ Enter the locomotive through Cab 1 and enable the battery.
- ☐ Ensure that all circuit breakers on this backwall are closed.
- ☐ Check the normal position of all of the switches on the backwall. Set headlights as required.

☐ Check that the Auxiliary Controls are off.

☐ Insert the reverser and set it to V (Forward).
☐ Set Signal & Instrument Lights to on.
☐ Ensure AFB is off.
☐ Release the brakes until C-pressure is at 0.5 bar or lower.
☐ Ensure the Parking Brake is on (light illuminated).
☐ In the engine room, ensure every circuit breaker is closed.
☐ Ensure PZB, LZB and Sifa are in their normal position.
☐ Open the Sifa Cut-Off Valve.
☐ Ensure the Pantograph Cut-Off Valve is open.
☐ Ensure the Driver's Brake Cut-Off Valve is closed.
☐ Walk to Cab 2 and check that all circuit breakers are closed.
☐ Check the normal position of all of the switches on the backwall.
   Set headlights as required.
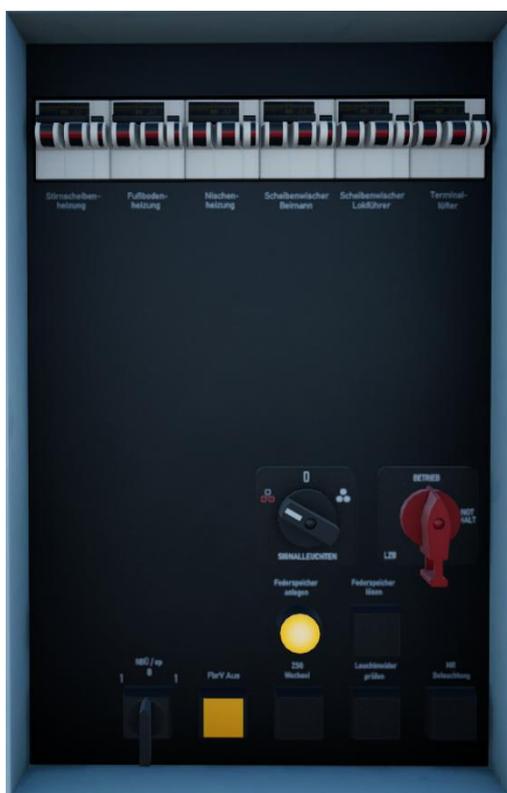
☐ Ensure the Direct Brake is set to the "Hold" position.
☐ Test the Horn Pedal.
☐ Ensure that the Air Compressor Switch is on.
☐ Set Signal & Instrument Lights to on.
☐ Return to Cab 1.
☐ Raise the Pantograph and close the Main Circuit Breaker.
☐ Enable the Air Compressor

Brake System Preparation

☐ Ensure that the Brake Pipe stays at 5 bar.
☐ Move the Reverser to M (Neutral)
☐ Ensure that the Brake Pipe stays at 5 bar.
☐ Move the Reverser to V.
☐ Decouple the Dynamic Brake.
☐ Reduce Brake Pipe Pressure by 0.8 bar with the Train Brake and monitor the Brake Pipe gauge.
☐ Release the brakes.
☐ Go to the "Prüfen" page. [W → Prüfen]

☐ Press SoftKey 5 "BrR 2 Ein" and await the HSM change.
☐ Decouple the Dynamic Brake.
☐ Reduce Brake Pipe Pressure by 0.8 bar with the Train Brake and monitor the Brake Pipe gauge.
☐ Release the brakes.
☐ Apply the Direct Brake and monitor the C-pressure gauge.
☐ Release the Direct Brake and monitor the C-pressure gauge.
☐ Perform a PZB/LZB test and a Sifa test.
☐ Apply the Direct Brake.
☐ Release the Parking Brake.
☐ Turn the Machine Room Lights and Cabin Lighting off if necessary.
☐ Test the Horn Pedal.
☐ Perform a rolling test:
    ☐ Release all brakes.
    ☐ Apply a small amount of power.
    ☐ Roll for a few metres.
    ☐ Reduce power to 0.
    ☐ Apply a medium amount of Direct Brake force and stop.

Before starting a service:

☐ Enter the Train Number on the MTD and GSM-R.
☐ Enter the Train Data.

Taking over a locomotive (V3)

Carry out this procedure if starting a service in an already set-up locomotive.

- ☐ Conduct a handover meeting.
- ☐ Set the Train Radio according to the local regulations.
- ☐ Insert the Reverser and set it to V.
- ☐ Check the MTD for faults.
- ☐ Enter the Train Number if applicable, and driver ID.
- ☐ Enter the Train Data if applicable.
- ☐ Check the SIFA.
- ☐ Check the function of the signal lights.
- ☐ Check the water supply for the Windscreen Wipers.

Shutdown (A1)

To fully shut down a locomotive, follow this procedure:

- ☐ Disable the Train Radio or set the Operating Mode to "C" depending on local regulations.
- ☐ Release the Direct Brake to 0.5 bar of C-Pressure.
- ☐ Apply the Parking Brake, ensuring that the Parking Brake Light illuminates.
- ☐ Spread sand in both travel directions.
- ☐ Walk around the locomotive and check for potential damage.
- ☐ Check the sand supply and the effectiveness of the Sanding.
- ☐ Check the position of inductive magnets, pulse generators, earthing contacts and connecting cables.
- ☐ Head back to Cab 1.
- ☐ Open the MCB and lower the Pantograph.
- ☐ Remove the Reverser.
- ☐ Ensure that all switches are in their default position.
- ☐ Disable the SIFA in the Engine Room.
- ☐ Move to Cab 2.
- ☐ Close all windows and doors.
- ☐ Ensure that all switches are in their default position.
- ☐ Disable the Cab Lighting.
- ☐ Head back to Cab 1.
- ☐ Disable the Machine Room Lights.
- ☐ Check the insulation condition of the battery.
- ☐ Disable the battery.
- ☐ Disable the Cab Lighting.
- ☐ Close all windows and doors.

Handing over a locomotive (A3)

Carry out this procedure when finishing a service and handing over the locomotive to another driver/without shutting it down.

- ☐ Ensure the brakes are applied.
- ☐ Remove the Reverser.
- ☐ Inform the next driver about any special features or faults and hand over the locomotive and its documentation.

Freight Train Preparation + Full Brake Test

A Freight Train Preparation must be performed:

- On a newly assembled consist at least 24 hours before the scheduled departure. A newly assembled consist is defined as:
    - If it was assembled from individual wagons.
    - If the train was coupled by inserting/removing vehicles or vehicle groups at more than two coupling points of the wagon consist.
- If the train has been out of service (Battery off or no filling of the Brake Pipe occurred) for at least 24 hours.
- If the consist remains unchanged for multiple days, then at least once per day (usually before the first service of the day).
- If the timetable mentions "*Betriebsbremsung*" (Service brake).
- If one of the following issues occur:
    - If the braking behaviour performs unexpectedly (applying less braking force than anticipated).

Perform the following tasks in order:
- ☐ Ensure that the Parking Brake and any Hand Brake (if required) are applied to prevent rolling during this procedure.
- ☐ In the cab, ensure that the NBÜ/ep switch is set to 0.
- ☐ Fill the Brake Pipe to 5 bar.
- ☐ Walk to the first wagon and ensure the brakes are released on this wagon. To check for a released brake:
    - ☐ Kick at least one Brake Shoe of the first bogie. The Brake Shoe should move to indicate a released brake.
    - ☐ Alternatively, use a Hammer on at least one wheel of the first bogie and listen for a bright, long ring.
- ☐ Return to the cab and set the Reverser to M (Neutral) to cut-off the Driver's Brake Valve.
- ☐ Monitor the Brake Pipe Pressure. The pressure reduction must not exceed 0.5 bar in 60 seconds on a freight train (0.3 bar on a passenger train). A pressure reduction exceeding 0.5 bar (0.3 bar) in 60 seconds indicates an air leak.

- ☐ If the test indicates an air leak, walk down the train to find the source.
    - ☐ Listen to the sound of air hissing. A hissing sound is a clear indicator of an air leak.
    - ☐ Alternatively, use soap on the brake hoses. Bubbles forming indicates a leak.
    - ☐ When the air leak is located:
        - ☐ If the air leak is not located on the last wagon, cut out the Distributor Cut-Off Valve and vent the control reservoir using the Distributor Release Valve for 1 minute.
        - ☐ If the air leak is located on the last wagon, remove this wagon from the consist and stable it.
    - ☐ When the air leak is corrected, restart the brake test from the beginning.
- ☐ Set the Reverser to V.
- ☐ After letting the Brake Pipe Pressure rebuild to 5.0 bar, reduce Brake Pipe Pressure to at most 4.2 bar.
- ☐ Walk around one side of the train and check:
    - ☐ The brakes are applied. To check for an applied brake:
        - ☐ Kick at least one Brake Shoe per bogie. The Brake Shoe should <u>NOT</u> move to indicate an applied brake.
            - ☐ If the external temperature is 2°C or lower, test <u>EVERY</u> Brake Shoe.
        - ☐ Use a Hammer on at least one wheel per bogie and listen for a dry, short sound.
        - ☐ If a hand brake is applied on this wagon, release it, then check that the brake is applied again, then reapply the hand brake.
        - ☐ If the brakes on a wagon did not apply, check for any leak. If the brakes still do not apply, close the Distributor Cut-Off Valve then restart the brake test from the beginning.
    - ☐ The load (if any) and general condition of each wagon.
    - ☐ The Screw Couplers are connected and fully tightened.
    - ☐ The unused Screw Couplers are secured on the dedicated hook.

- ☐ The Brake Hoses are connected.
- ☐ The Angle Cocks are fully opened.
- ☐ The Distributor Cut-Off Valves are opened.
- ☐ The Hand Brakes are released unless needed to secure the train.
- ☐ <u>DO NOT</u> operate the Brake Mode Selectors or Load Selectors with brakes applied.
- ☐ When reaching the rear of the train, check:
  - ☐ The Angle Cock is closed.
  - ☐ The Brake Pipe hose's gladhand is secured on the dedicated hook.
  - ☐ The Screw Coupler is secured on the dedicated hook.
  - ☐ The End of Train signals (Zg2) are present.
- ☐ Return to the cab.
- ☐ Release the Train Brake by filling the Brake Pipe back to 5.0 bar.
- ☐ Walk around the other side of the train and check:
  - ☐ The brakes are released. To check for a release brake:
    - ☐ Kick at least one Brake Shoe per bogie. The Brake Shoe should move to indicate a released brake.
      - ☐ If the external temperature is 2°C or lower, test <u>EVERY</u> Brake Shoe.
    - ☐ Use a Hammer on at least one wheel per bogie and listen for a bright, long ring.
    - ☐ If the brakes of a wagon did not release, and this wagon's Distributor Cut-Off Valve is open, head back to the locomotive.
    - ☐ Press and hold the Overcharge button until the brake pipe pressure reaches 5.3-5.5 bar.
    - ☐ If the brakes are still not released, operate the Distributor Release Valve until the brakes release.
    - ☐ Walk back to the locomotive. Apply the brakes, check their application, then release the brakes and check this wagon's brakes again.
    - ☐ If the brakes still do not release, close the Distributor Cut-Off Valve then operate the Distributor Release Valve until the brakes release.

- ☐ Repeat this procedure. If any other wagon is found to have brakes applied, then restart the brake test from the beginning.
- ☐ The Brake Mode and Load Selectors are set according to the Wagon List.
- ☐ The Hand Brakes are released unless needed to secure the train.
- ☐ At the rear of the train, perform a continuity test:
  - ☐ Open the Brake Pipe Angle Cock for 15 seconds.
  - ☐ On one axle the last wagon, check that the brakes are applied.
  - ☐ Wait for the brakes to release.
  - ☐ Check that the brakes are released.

Simplified Brake Test

This test must be performed:

- After a locomotive change if a Full Brake Test has already been conducted with a different locomotive.
- If the current consist has been temporarily separated.
- If the train has been out of service (Battery off or no filling of the Brake Pipe occurred) for less than 24 hours.
    - If the train has been stabled for less than 1 hour, an In-Cab Brake Test from the locomotive is sufficient.
- If an angle cock has been opened (Locomotive switch, coupling to a working or rescue locomotive, temporary opening of the angle cock of the Main Reservoir pipe).
- If the brake mode of a wagon was switched to R + mg.
- If a wagon's brake pipe must be connected during a shunting manoeuvre.

Perform the following tasks in order:
- ☐ Ensure that the Parking Brake and any Hand Brake (if required) are applied to prevent rolling during this procedure.
- ☐ In the cab, ensure that the NBÜ/ep switch is set to 0.
- ☐ Set the Reverser to V.
- ☐ After letting the Brake Pipe Pressure build to 5.0 bar.
- ☐ Walk to the rear of the train and check if:
    - ☐ The Angle Cock is closed.
    - ☐ The Brake Pipe hose's gladhand is secured on the hook.
    - ☐ The Screw Coupler is secured on the dedicated hook.
    - ☐ The End of Train signals (Zg2) are present.
    - ☐ Check if the brakes are released on at least one axle of each bogie of the last wagon.
- ☐ Perform a continuity test:
    - ☐ Open the Brake Pipe Angle Cock for 15 seconds.
    - ☐ On one axle the last wagon, check that the brakes are applied.
    - ☐ Wait for the brakes to release and check that they have released.

In-Cab Brake Test

This test can be performed:

- After a cab change.
- If a consist has been parked for less than 1 hour.
- If taking one of the locomotives out of service on a consist using 2 locomotives as a double-header.
- For the first service after using a *Luftbremskopf* (device used by a shunter to brake the train directly via the Brake Pipe hose).
- For freight trains before the first journey after the completion of a Simplified Brake Test.

Perform the following tasks in order:
- ☐ In the cab that is currently in use, make a Full Service brake application.
- ☐ Remove the Reverser without releasing the brakes.
- ☐ Move to the cab to be used for the next journey.
- ☐ Insert the Reverser and set it to V.
- ☐ Release the Train Brake.
- ☐ Ensure that the Brake Pipe fills to 5.0 bar.
- ☐ Reduce Brake Pipe Pressure to 4.2 bar.
- ☐ Release the brakes.
- ☐ Assist the brake release by overcharging the Brake Pipe to 5.3 bar.

PZB/LZB Test

After starting the locomotive, PZB and LZB must be tested to ensure its proper function.

To start a PZB/LZB Test, perform the following tasks:

☐ The reverser must be inserted with a selected direction (V or R).
☐ The train brake must be released.
☐ The train must be on a level surface. Otherwise, apply the Direct Brake or Parking Brake.
☐ Begin the PZB/LZB Test.

To test the PZB, use the left MTD screen:

ZugBesy [4] → Prüfen [8] → Beginning of the test.

If this option is unavailable, a back-up is provided on the MFA panel.

The test will perform the following tasks:
-   A test of the indicators: The right half of the MFA indicators must all light up synchronously.
-   2 successive emergency brake applications: The Brake Pipe must fully empty, then refill before moving to the next step.
-   LZB indicators calibration: The LZB indicators must show the following values:
    -   1200 on the distance numerical counter.
    -   1000 on the distance indicator bar.
    -   120 on the V-Ziel indicator.
    -   The target speed bug ▼ must point to 115km/h.

Once the test is completed, the appropriate PZB indicator light will illuminate again.

SIFA Test

To Test SIFA's function, carry out the following procedure:

- ☐ The reverser must be inserted with a selected direction (V or R).
- ☐ Apply the Direct Brake
- ☐ Hold the SIFA Pedal for 35 seconds.
    - ☐ 30 seconds after pressing the pedal, the SIFA Light should illuminate.

- ☐ 2.5 seconds later, the voice-output must say "Sifa, Sifa, Sifa"
- ☐ 2.5 seconds later, an emergency brake application is performed.
- ☐ Check that the Brake Pipe is empty.
- ☐ Release the SIFA Pedal.
- ☐ Ensure that the Brake Pipe fills up.

Train Data (ZDE)

To set up PZB and LZB in the correct mode, the Train Data must be entered. On the BR 145, the Train Data Entry screen (ZDE or Zugdateneinstellung) is found on the left MTD Screen:

ZugBesy [4] → ZDE [1]

The ZDE consists of 4 values:
- **BRA**: Brake Mode (**BR**ems**A**rt)
- **BRH**: Braked Weight Percentage (**BR**ems**H**undertstel)
- **ZL**: Train Length (**Z**ug**L**änge)
- **VMZ**: Max Speed (**Vm**ax **Z**ug)

To obtain the information to enter on this screen, refer to the Brake Sheet and the Wagon List. A translated version of the Brake Sheet and Wagon List can be found from the next page.

After entering the train data, press the SoftKey [E] two times, then press the PZB Acknowledge Switch for at least one second to enter the data.

Brake Sheet (Bremszettel)

	Row	Designation		Wagons	Active Locos	Train Total
General Train Data (Freight & Passenger)	1	Weight [t]				
	2	Braked Weight [t]				
	3	Number of Axles				
	4	Min. Braked Weight Percentage		✕	✕	
	5	Current Braked Weight percentage		✕	✕	
	6	Braked Weight Deficit		✕	✕	*)
	7	Wagon Number of Last Wagon				
	8	Nr. Direct Rel. Ctrl. Valves				
	9	Nr. Graduated Rel. Ctrl. Valves				
	10	Nr. Disk Brakes				
	11	Nr. K, L or LL Composite Brakes				
	12	Nr. Mastrassow Brakes				
	13	Length [m]				
	14	Number of Braked Axles				
	15	Required number of Braked Axles				
	16	Formation Speed Limit is Lower than Timetable Speed Limit		no/yes …. km/h*)	no/yes …. km/h*)	no/yes …. km/h*)
Passenger Train Data	21	NBÜ/ep Brakes Avail. on all wagons		no/yes		
	22	Emergency Brake Override (NBÜ) Enabled		no/yes		
	23	Contains Wagons with	Secondary letters h, z or ee	no/yes		
	24		Secondary letters n or y	no/yes		
	25		TB 0	no/yes		
	26		………………………..	no/yes		
	27	Exclusively contains wagons with	ZUB	no/yes		
	28		Secondary letters a	no/yes		
	29		………………………..	no/yes		
Freight Train Data	31	Train carries dangerous goods		no/yes		
	32	……………………………………………..		no/yes		

Note in right margin: Strikethrough all non applicable Items diagonally

In game, click on the Current Braked Weight Percentage to convert the Brake Sheet from Timetable Class R/P to Timetable Class G.

Wagon List (Wagenliste)

1a	1b	1c	1d	1e	2	3a	3b	4		5a	5b	6a	6b	6c	6d	6e	7			8	9	10
Wagon Number					Wagon Main Letters	Number of axles		Length Over Buffers		Cargo Weight	Total Weight	Braked Weight					Number of Seats			Origin Station	Destination Station	Wagon Remarks
													◇R / R						Order Number			
												R + MG	red	white	P	G	1.	2.				
																	Reference/ID Number					
1+2	3+4	5-8	9-11	12		Loaded	Empty	m	$^1/_{10}$	t	t											

Brake Mode

There are 3 brake modes: R, P and G.

Use Brake Mode R for passenger trains and light locomotive runs.

For freight trains, Brake Modes P and G are set depending on the Wagon Train Weight, or the type of Brake Sheet. The Wagon Train Weight [t] consists of the combined weight of all wagons and inactive locomotives (if any).

- If the Brake Sheet uses the Timetable Class G, the entire consist (Locomotive(s) + wagons) must be set to G Mode.

- If the Brake Sheet uses the Timetable Class R/P, set the Brake Mode Selectors to P or G according to the following rules:

    - If the Wagon Train Weight is lighter than 800t, the entire consist can be set to P mode.

    - If the Wagon Train Weight is between 801t and 1,200t, then the Active Locomotive(s) must be set to G mode. The rest of the consist can be set to P mode.

    - If the Wagon Train Weight is between 1,201t and 1,600t the Active Locomotive(s) as well as the first 5 wagons of the consist must set to G mode. The rest of the consist can be set to P mode.

    - If the Wagon Train Weight is heavier than 1,601t, all locomotives and wagons must be set to G mode.

NOTICE: If a wagon contains multiple Brake Mode Selector levers (such as the Sdggmrss 738.0 or Sggmrss 576.0), then all selectors of that wagon must be set to the same Brake Mode.

For example:

- If a train consists of 20 Sdggmrss 738.0 wagons and the Wagon Train Weight is heavier than 1,200t, then the first 6 Brake Mode Selectors behind the Active Locomotive(s) must be set to G mode.

Enter the following values in the ZDE depending on the locomotive's Brake Mode.

- R = 9
- P = 4
- G = 2

Braked Weight Percentage

The Braked Weight Percentage is obtained by converting the Current Brake Percentage using the ZDE Sheet found in the next page.

Example:

4	Min. Braked Weight Percentage		105
5	Current Braked Weight percentage		**85**
6	Braked Weight Deficit		25 *)

The Current Braked Weight Percentage value is 85%. Using the sheet below:

Calculated Brh	BRH Setting Value	Max Speed (VMZ) Setting Value according to the BRA setting		
		2	**4**	**9**
76 – 95	**080** (070)	140 (120)	140 (120)	140 (120)

(Values between parentheses) Special settings for Berlin – Hamburg and Berlin – Halle/Leipzig.

A Calculated Brh between 76 and 95% converts to a BRH Setting Value of 080.

Enter the BRH Setting Value in the ZDE page.

BR 145 ZDE Sheet

Calculated Brh	BRH Setting Value	Max Speed (VMZ) Setting Value according to the BRA setting		
		2	**4**	**9**
Up to 65	050	100 (no LZB operation)		
66 – 75	070 (060)	120 (100)	120 (110)	120 (110)
76 – 95	080 (070)	140 (120)	140 (120)	140 (120)
96 – 100	080	140	140	140
101 – 110	100	-	140	140
111 – 119	120	-	140	140
120 – 134	120	-	-	140
135 – 144	130	-	-	140
145 – 162	140	-	-	140
163 – 183	150	-	-	140
184 – 205	180	-	-	140
206 – 227	200	-	-	140
228 – 250	220	-	-	140

(Values between parentheses) Special settings for Berlin – Hamburg and Berlin – Halle/Leipzig.

Train Length

The Train Length is obtained from Brake Sheet.

Example:

Row	Designation	Wagons	Active Locos	Train Total
13	Length [m]	514	19	**533**

Enter the Total Train Length (ZL in the ZDE page) by rounding this value up.

Example: 533m → Enter 54 (Rounded up to 540m)

Max Speed

To obtain the Max Speed of the train, check the Formation Speed Limit.

Example:

Row	Designation	Wagons	Active Locos	Train Total
16	Formation Speed Limit is Lower than Timetable Speed Limit	~~no~~/yes 100 km/h*)	no/~~yes~~ …. km/h*)	~~no~~/yes **100** km/h*)

If a Train Total Speed Limit is filed in this row, enter it as the VMZ in the ZDE page.

If this row remains empty, check the Timetabled Speed Limit at the bottom of the Brake Sheet.

Example: Fahrplangeschwindigkeit 120km/h

Enter this value as the VMZ in the ZDE page.

Special Configurations

The three special configurations are: Base Data (Grunddaten), Replacement Train Data (Ersatzzugdaten) and Light Locomotive Data (Triebfahrzeugfahrt).

BR 145	BRA	BRH	ZL	VMZ	PZB Mode	Minimum required brh in train	
						PZB	LZB
Base Data	6	040	700	100	U	-	-
Replacement Train Data	9	120	700	140	O	111	111
Light Locomotive Data	9	140	020	140	O	-	-

Base Train Data:

This Train Data is active when starting the locomotive or changing cabs. The [55] and [Stör] indicator lights should flash simultaneously. **LZB Operation is not possible**.

Replacement Train Data:

For trains with:

- A Brh < 66% OR
- With the locomotive using Brake Mode G and a defective MTD

→ Do not use the Replacement Train Data.

If one MTD fails and the Replacement Train Data is required, open the LSS "Power Supply Display" for the other cab.

With both MTDs (Cab 1 & Cab 2) disabled, activate the Replacement Train Data by setting the reverser to R for 12 to 18 seconds, then back to V. The [55][70][85] indicator lights should illuminate and the [Stör] indicator light should flash.

Check the effective Train Data and PZB mode by simultaneously holding the PZB Acknowledge and PZB Release switches (the [85] indicator light illuminates during this check).

If a drive is to be made using the Replacement Train Data and the Brh in Train is higher than 111%:

- If PZB Operation is not available, isolate LZB with the Fault Isolation Switch. PZB remains active but should be considered failed.
- If LZB Operation is not available or:
    - The BRA is lower than 9
    - The ZL is higher than 700
    - The VMZ is lower than 140

  Isolate LZB with the Fault Isolation Switch.

Light Locomotive Data

Manually enter the data in the ZDE if the service is to be operated as a light locomotive.

If more than one locomotive is active, match the ZL to the total length of the consist.

The VMZ value must not exceed the Timetabled Speed.

FT95 Passenger Information System

FT95 (FahrerTerminal 95) is the main Passenger Information system used on Germany's railways. Each cab features one display overhead of the driver's desk.

Entering a destination

To manually enter a destination in the FT95 panel, press the [L/R] button.

Use the List of destination IDs to enter a custom destination.

To select a destination station from the current service, press the [L/R] button again.

This pulls a list of available IDs for this service as well as the custom destinations. Use the ^ or v arrows to select a destination. The IDs starting with 7 as their first digit include all stations for the line the train is currently service.

For example: If driving an RE 50 on Dresden – Leipzig, all stations of the RE 50 service can be selected as a destination using this menu.

List of destination IDs

0		*Anzeiger loeschen*
1		Nicht einsteigen
2		Ersatzzug
3		Sonderzug
4		Leerzug
5		Dienstzug
6		Extrazug
7		Fahrschule
8		Sonderfahrt
9		Leerfahrt
11	DB	Dienstfahrt
12		Probefahrt
13		Werkstattfahrt
14		Testfahrt
15		Vereinsfahrt
20		Güterzug
41		DB Cargo
42		Deutsche Bahn
43		www.bahn.de
44		RBH
45		BR143-NV 2004
46		BR145
51		Moin Moin
52		Moin!

53		Servus
54		Hallo
55		GaLiGrü
56		Tschüss
57		Guten Morgen
58		Guten Abend
60		Zug müde, Zug muss schlafen
61		Psst! Zug schläft
62		Zug fährt schlafen
63		Zug träumt
64		Zug will nach Hause
65		Ich will nach Hause :(
66		Ich steh hier nur so
67		Mahlzeit!
68		Feierabend
69		Feierabendexpress
70		Pause
71	RE	von hier nach dort
72	RB	von hier nach dort
73	SE	von hier nach dort
74	IRE	von hier nach dort
75	S	von hier nach dort
76		Fahrt ins Blaue
77		Güter gehören auf die Schiene
78		Du fährst gut Ich fahr Güter

79	Wo du Wolle? Fahre Memphis!
101	Frohe Weihnachten
102	Merry Christmas
103	Frohes Neues
104	Frohes Neues Jahr
105	Happy new year
106	Guten Rutsch
107	Frohe Ostern
108	Schönen Feiertag
109	Frohes Fest
110	Oktoberfest
111	Karnevalszug
112	Partyzug
113	Discozug
114	Technotrain
115	Spacetrein
116	Bücherwurm
117	Straßenersatzverkehr
118	Zeitmaschiene
119	Hallo Mädels!
120	Girls-Day
121	Zug nach Pankow
122	Fresskiste
123	Imbiss
124	Döner mit alles on board

125	Snack Zone
126	Choo Choo Chew
127	Spätzle City
130	Suttgart International
131	Esslingen(N)International
132	Tübingen International
133	Trainy McTrainface
134	Fährste quer siehste mehr
135	Meddl Leude
136	Ok Brudi muss los
137	Schnupperradar auf Schnupperkurs
138	Kurz auf Klo
139	Kehrwoche
140	Moped
141	:)
142	Zwangsbremsung :c
150	Einziganders
151	uwu
152	uwu :3
153	trans rights
501	Atlantis
502	Laa an der Thaya
503	Madrid
504	Paris
505	Palma de Mallorca

506		Praha hl.n.
507		Rijeka
508		Roma
509		Stein
510		Ziegelstein
901		AW Dessau
902		AW Chemnitz
903		Bw Hanau BPH
904		Train Sim World
1000	S1	Meißen Triebischtal
1001	S1	Meißen
1002	S1	Schöna
1003	S1	Bad Schandau
1004	S1	Dresden Hbf
1005	S2	Prina
1006	S2	Dresden Flugh
1007	S2	Dresden Hbf
1008	S3	Tharandt
1009	S3	Freiberg (Sachs)
1010	S3	Dresden Hbf
1011	RE50	Leipzig Hbf
1012	RE50	Dresden Hbf
1013		Bücherwurm Leipzig Messe
1014		Bücherwurm Dresden Hbf
1030	RB31	Elsterwerda-Biehla

1031	RB31	Dresden Hbf
1032	RB31	Coswig
1033	RB31	Großenhain
1041	RE18	Cottbus
1042	RE18	Dresden Hbf
1051	RE15	Hoyerswerda
1052	RE15	Dresden Hbf
1101	RE	Bremen Hbf
1102	RE	Hannover
1103	RE	Göttingen
1104	RE	Uelzen
1105	RE	Hildesheim
1106	RE	Wolfsburg
5000		*Train Sim World route dependant destinations*
7000		*Train Sim World route dependant destinations with Service Mode dependant line number*
9999		Nicht einsteigen
900400		Softwareversion

Special Announcements

To access Special Announcements, press the following buttons:

Service Functions (Between [9] and [OK]) → [C] → [4] "Sonderansagen"

There are 23 announcements across 8 pages. To play an announcement, for each **[**page**]**, press [1], [2] or [3].

List of announcements

Name		Situation
Ausstieg links	1	*Exit to the left*
Alle aussteigen	2	*All passengers must leave the train*
Ausstieg rechts	3	*Exit to the right*
Aus dem Tuerberei	4	*Stand clear of the doors*
Warten auf Anschl	5	*Waiting for a connecting train*
Gegenzug	6	*Waiting for a train from the opposite direction*
Gegenzug verspaet	7	*Waiting for a delayed train from the opposite direction*
Ueberholung	8	*Waiting for an overtaking train*
Signalstoerung	9	*Delay due to a signal fault*
Streckenabschnitt	10	*Delay due to the track ahead being occupied*
BUe-Stoerung	11	*Delay due to a level crossing fault*
ausserplanmaessig	12	*Unplanned stop*
Verzoegerung allg	13	*Generic delay announcement*

|			
Hinweis Bauarbeit	14		*Generic construction work notice*
Polizei Ermittlun	15		*Delay due a police investigation*
Abstand Bahnsteig	16		*Mind the gap between the train and the platform.*
Fahrzeugstoerung	17		*Delay due to a train fault*
Tuerstoerung	18		*Delay due to a door fault*
Baum im Gleis	19		*Tree on the tracks*
Streckensperrung	20		*Line closure: Train ends at the next station*
Streckensperrung	21		*Unexpected closure: Train ends at the next station. Use Replacement Buses.*
Vorankuendigung z	22		*Early notice for construction work*
Baustelle SEV	23		*Construction: Train ends at the next station. Use Replacement Buses.*

Locomotive Operation

Coupling

To couple two vehicles, follow this procedure:

- Approach the locomotive/consist to the other vehicle until their buffers gently come into contact (up to 5km/h).

- Pass one of the vehicle's Screw Couplers on the hook of the other vehicle. If coupled a wagon to a locomotive, use the wagon's Screw Coupler.
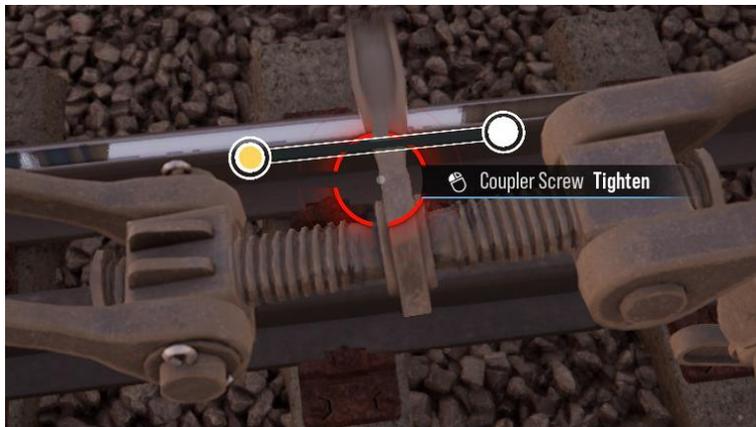
- Connect the Brake Pipe hoses' gladhands and open the Brake Pipe Angle cocks.

- Connect the Brake Reservoir hoses' gladhands and open the Brake Reservoir Angle Cocks if necessary.

Multiple Unit Protocols

There are three Multiple Unit Protocols which can be selected with this Switch:

- ZWS (*Zeitmultiplexe Wendezugsteuerung*): For remote control by a Cab-Car.
- ZDS BR120 (*Zeitmultiplexe Doppeltraktionssteuerung*): A standardised Double-Traction Protocol introduced with the BR 120 which allows multiple operation between a larger variety of locomotives.
- ZMS (*Zeitmultiplexe Mehrfachtraktionssteuerung*): A Multiple Unit Protocol allowing up to 4 locomotives of the same manufacturer to operate together. The BR 145 can operate in Multiple Unit with the BR 146.0 and the BR 185.1 using ZMS.

Preparation for ZWS Operation

After V1:

☐ Set the Multiple Unit Protocol Switch to ZWS.
☐ Set the Signal Lights to Tail Lights.
☐ Apply the Brakes until maximum Brake Pipe Pressure is reached.
☐ Set the reverser to 0 and remove it.
☐ Set the Train Brake to Running.
☐ Release the Parking Brake.
☐ Switch off the Train Radio.
☐ Check the Tail Lights, then move to the Cab-Car.

Preparation for ZDS/ZMS Operation

Carry out a V1 on all locomotives to be part of the consist, then (on all locomotives):

- ☐ Move the locomotives to coupling distance.
- ☐ Enable the parking brake.
- ☐ Open the MCB and Lower the Pantograph.
- ☐ Remove the Reverser.
- ☐ Couple the locomotives.

On the trailing locomotive(s):

- ☐ Set the Multiple Unit Protocol Switch to ZDS or ZMS as required.
- ☐ Set the Pantograph Switch to the Auto position if no special configuration is required.
- ☐ Set the Brake Mode Selector to the required Brake Mode.

On the leading locomotive:

- ☐ Set the Multiple Unit Protocol Switch to the same Protocol as the trailing locomotive(s).
- ☐ Set the Pantograph Switch to the Auto position if no special configuration is required.
- ☐ Set the Brake Mode Selector to the required Brake Mode.
- ☐ Insert the Reverser and set it to V.
- ☐ Raise the pantographs.
- ☐ Check the MTD to see if the pantographs of all locomotives have made contact with the Overhead Wire.
- ☐ Close the MCB.
- ☐ Set the Air Compressor to on.
- ☐ Release the Parking Brake.
- ☐ Ensure that the Parking Brake Pressure remains at 5 bar.
- ☐ Set the Reverser to M.
- ☐ The Brake Pipe Pressure must not rise nor fall for 10 seconds.
- ☐ Reduce Brake Pipe Pressure to 4.2 bar and monitor the Brake Pipe gauge.
- ☐ Release the brakes and monitor the Brake Pipe gauge.
- ☐ Apply the Emergency Brakes.
- ☐ Remove the Reverser.
- ☐ Set the Train Brake to Running.
- ☐ Move to the next locomotive.

In the next locomotive:
- ☐ Check that the brakes are applied on the brake gauge.
- ☐ Insert the Reverser and set it to V.
- ☐ Check that the brakes release.
- ☐ Remove the Reverser.
- ☐ If necessary, set the tail lights.
- ☐ Release the Parking Brake.
- ☐ Repeat this process for any other trailing locomotive in the consist.

In the leading locomotive:
- ☐ Insert the Reverser and set it to V.
- ☐ Check that the brakes are released.
- ☐ Reduce Brake Pipe Pressure to 4.5 bar.
- ☐ Enable the Headlights.
- ☐ Release the Parking Brake.
- ☐ Sound the Horn to call for attention.
- ☐ Release the Direct Brake
- ☐ Perform a rolling test: Apply a small amount of power.
- ☐ Coast and let the locomotive roll without power.
- ☐ Apply a medium amount of Direct Brake to stop the locomotive.

AFB and LZB Operation

Notes about AFB:

- Enable AFB with the AFB switch and reset the throttle. Then move then move the AFB lever to the desired position.
- AFB limits the train's acceleration to 0.5m/s^2.
- If the AFB Target Speed (V$_{soll}$) is set below the train's current speed, AFB will brake with a constant deceleration rate of:
    - 0.3m/s^2 for a freight train.
    - 0.5m/s^2 for a passenger train.

CAUTION: Ensure that AFB does not apply and release the brakes in quick succession. This risks having the Brake Distributor Valves get stuck in their current position. If this happens:

- Override AFB by manually applying the brakes to maintain the current speed OR
- Disable AFB.

When AFB is used in combination with LZB:

- When approaching an LZB stop signal, ensure that AFB applies sufficient braking to remain under the LZB Braking Curve. Do not let AFB stop the train by itself.
- If the Train/Electric Brake is applied, manual control is regained and the locomotive will not intervene (except for Penalty Brake). To recover traction, reset the throttle.
- When exiting LZB, cycle the AFB lever to 0, then back to the desired Target Speed.
- If the AFB Target Speed is lower than the LZB Target Speed, only the latter is displayed on the MFA. To check the AFB Target Speed, press the button shown below.

Towing

System Information

To tow the BR 145, the battery must be switched off.

The following occurs after a battery switch off:

- The Direct Brake applies automatically.
- Brake Computer 1 (HSM 1) remains energised with its monitoring functions still active.
- After 5 minutes, the Brake Pipe Pressure reduces to 1 bar and the Direct Brake is disabled.
- After another 20 minutes, the HSM 1 switches to stand-by mode.
- If the Brake Pipe Pressure rises to over 1.8 bar, the HSM 1 is awakened so that its brake monitoring functions are active in towing mode.

TOWING NOTES:

- The towing procedure must be less than 8 hours long with HSM 1 enabled.
- If the towing procedure is expected to take longer than 8 hours or HSM 1 is inactive, special precautions must be taken when preparing for towing.

HSM 1 has the following functions:

- Anti-slip protection
- Hose Rupture monitoring
- Parking brake monitoring

Preparing the locomotive for towing

<u>If the locomotive is active</u>:

- Apply the Parking Brake. If the Parking Brake cannot be applied:
    - Couple the locomotive to a secured vehicle.
      OR
    - Place Wheel Chocks between the wheels.
- Open the MCB.
- Lower the Pantograph.
- Remove the Reverser.
- Disable the battery.
- Disable SIFA.

<u>When the locomotive's battery is shut down or if the locomotive is already parked but the HSM 1 is active</u>:

- Couple the Rescue Locomotive.
- Connect the Brake Pipe Hoses.
- Connect the Brake Reservoir Hoses if available.
- Do not enable the battery.
- If the unit was parked, the Parking Brake light should illuminate approx. 40 seconds after filling the Brake Pipe.
- Release the Parking Brake.
- Set the required brake position.
- If the Brake Reservoir is not coupled, open the Towing Valve.
- If necessary, attach the End of Train Signals (Zg2) on the towed locomotive.

- Conduct a Brake Test.
- The locomotive can be towed.
    - If the HSM 1 is enabled: Max. Towing time: 8 hours.

Fault: Brake Application caused by the towed locomotive:

If the towed locomotive applies brakes on the train, follow these procedures only until the brakes release:

1. Set the Brake Mode to P. If Brake Mode G is required:
    a. Open the Brake Cylinder Bogie 1 and 2 Cut-Off Valves.
    b. NOTICE: The brakes on this locomotive are not operational.
2. Open the Direct Brake Cut-Off Valve.
3. Perform the following:
    a. Secure the locomotive against unintended movement.
    b. Open the Parking Brake Cut-Off Valve.
4. Open the LSS 32F58 "HSM 1/Anti-Skid".

If all of the above procedures have been performed, the braking system is no longer monitored.

If the HSM 1 is disabled:

- Secure the locomotive against unintended movement.
    - Couple the locomotive to a secured vehicle.
      OR
    - Place Wheel Chocks between the wheels.
- Set the Brake Mode to P. If Brake Mode G is required:
    - Open the Brake Cylinder Bogie 1 and 2 Cut-Off Valves.
    - NOTICE: The brakes on this locomotive are not operational.
- Open the Direct Brake Cut-Off Valve.
- Open the Parking Brake Cut-Off Valve.

Parking the towed locomotive

To park the locomotive:

- Apply the Parking Brake. NOTE: The parking brake indicator on the side of the locomotive may remain green.
- Completely vent the Brake Pipe.
- If necessary, close the Towing Valve.

Shunting two locomotives

If two locomotives are to be used during shunting, only one locomotive is required if the procedure is to last up to 1 hour. To set up the trailing locomotive for shunting:

- Open the MCB and lower the Pantograph.
- Remove the Reverser.
- Do not disable the Battery.
- Release the Direct Brake.

Pantograph rules

If hauling freight of certain cargo types behind the locomotive:

- Exposed sensitive goods (cars, truck trailers)
- Tank wagons, canister wagons or tank containers
- Cargo covered by tarpaulin
- Dangerous goods Class 1 or 3

Alternatively, if directly attached to:

- Another locomotive
- A Cab-Car with the windscreen facing the locomotive

Raise the Front Pantograph. If using a double header configuration, raise the Front Pantograph on both locomotives.

<u>Faults and Failures</u>

The BR 145 and the included Freight Wagons feature fault simulation. To activate it, use the <u>EBuLa screen</u>.

If a fault occurs in the BR 145, use the MTD screen to get the steps to resolve that fault. Use the <u>English Translation</u> if needed. If a fault has been fixed, in the [St] menu, press the Softkey [St] or [E] to refresh the page and confirm that the fault was cleared.

This manual lists the faults and failures not covered by the MTD screen as well as external faults to the included Freight Wagons.

The included faults are:

- <u>0V Power Unit Fault (Multiple fault pages)</u>
- <u>Battery Related Faults</u>
- <u>Distributor Release Valve stuck in current position</u>
- <u>Warm and Hot Brakes</u>
- <u>Ice/Snow Accumulation</u>
- <u>LZB Transmission Failure</u>

<u>Call a Rescue Locomotive/Terminate this service</u>

If the steps to fix a fault were not successful, and the indications are to:

- Call a Rescue Locomotive
- Terminate this service

First, open the MCB and Lower the pantograph, then disable the battery.

After waiting a few seconds, enable the battery, and attempt to fix the fault again.

If still not successful, this service is not able to continue.

The Fault Simulation offers the option to continue by opening it with [St], then [3] (Reset Shot Circuit/Internal Faults). Remember to manually reset any LSS/MSS as they are not automatically reset by this option.

Special cases

0V Signal Output

If several pages of faults appear on the MTD, accompanied by:

- A shutdown of the GSM-R
- MCB opening and Pantograph dropping
- ASG 1 and 2 failure
- Brake Failure

These are the indications of a 0V Power Output Failure.

To fix the fault, reset the LSS 32F81 in the Engine Room.

If not successful, cycle the battery (disable then enable after waiting a few seconds), then reset LSS 32F81.

Battery related faults

If the displays and the MFA extinguishes, the MCB opens and the Pantograph drops and the emergency brakes apply, these are indications of a Battery related fault.

If a Battery fault occurs, stop the train. Once stopped, head to the Engine Room and look for the LSS 32F32 Battery Contactor. If it is open, reset it.

If the LSS 32F32 is still closed, disable the battery switch, then walk around the locomotive and locate the Battery Fuse Boxes.

Example of a healthy Battery Fuse (left) and a burnt Battery Fuse (right):

If a Battery Fuse burnt, replace it with a new one.

⚠ CAUTION: Do not replace the fuse without first switching the Battery Switch off and without wearing the appropriate gloves!

Distributor Brake Valve stuck in current position

A Distributor Brake Valve can become stuck in its current position if it fails or if the brakes are mishandled. A stuck Distributor Brake Valve can cause the brakes/axles of the affected bogie to become Warm or Hot.

Key notes:
- Do not "fan the brakes". After braking, wait at least 10 seconds before releasing them.
- "Dako" type brakes (written as DK-GP-A or DK-GP on the side of the wagons) are particularly sensitive to brake mishandling.
- "Dako" type brakes do not respond with a Brake Pipe reduction of less than 0.6 bar.

If a Distributor Brake Valve is stuck in its current position, attempt the following actions:

- Make a Full Service brake application.
- After releasing once, apply the Emergency Brake.
- Stop the train, then use the Distributor Release Valve.

If not successful:
- Cut-Out the Brake Distributor.
- Release the brake with the Brake Distributor Release Valve.
- If necessary, divert to the next suitable station and remove the wagon from the consist.

Warm and Hot Brakes

If brakes are applied during an extended train movement, the friction will cause their temperature to rise.

There are two states of high temperature: Warm () and Hot ().

Hot Brake Detectors will alert the signaller of a Warm/Hot Axle/Brake and then inform the Train Driver via GSM-R (Emergency Call in case of a Hot Brake):

- If a Warm Brake is detected, stop at the next station.
- If a Hot Brake is detected, stop at the next possible signal.
- Walk down the train and locate the hot axle. A heat haze is a visual indication of a hot brake.

Follow the steps to a release a Distributor Brake Valve stuck in its current position to solve the issue.

Ice/Snow Accumulation

Under Freezing Conditions (>0°C or >32°F), there is a significant risk of Ice/Snow Accumulation between the wheels and the brake shoes of the train. An Ice/Snow Accumulation can cause a loss in Brake Performance.

To prevent Ice/Snow Accumulation:

- Before departing, make an emergency brake application with the train brake (Schnellbremsung).

- Every 20 minutes, reduce Brake Pipe Pressure by 0.5 bar for 10 seconds without using the Electric Brake.

LZB Transmission Failure

The signs of an LZB Transmission Failure (Ü-Ausfall) are:

- The [Stör] Indicator Light illuminates.
- The [Ü] Indicator Light starts flashing.
- The Target Distance indicator bar extinguishes.
- The voice-output calls out "*Zugbeeinflussung*" twice.
- If AFB is enabled, its target speed will automatically be set to 0km/h.

The procedure is as follows:
- Press the PZB/LZB Release Switch in less than 10 seconds.
- Make a Full Service brake application.
- If the V-Ziel displayed a speed higher than [000]km/h:
    - Slow down to the maximum speed for the current PZB's mode Monitored mode (O = 85km/h, M = 70km/h, U = 55km/h).
    - Press the PZB/LZB Release Switch to revert to PZB.
- If the V-Ziel displayed a speed of [000]km/h:
    - Stop the train.
    - Obtain permission from the signaller to continue.

GSM-R

General

The **G**lobal **S**ystem for **M**obile communications - **R**ailway is part of an ERIENE (European Integrated Railway Radio Enhanced Network) system, building on top of the foundation of the existing public GSM systems used around the world and implements existing GSM services, such as the Follow Me Service (FM), Voice Group Call Service (VGCS), Voice Broadcast Service (VBS) and Enhanced Multi-Level Precedence and Pre-emption (eMLPP) priority system to provide railway specific functionality such as Functional Addressing, Emergency Calls and shunting groups.

GSM-R was created to clear another barrier in regard to European railway interoperability. It is set to be replaced by the 5G-based Future Rail Mobile Communications Standard (FRMCS) in the future.

The BR 145 features a MESA 23 Mobile Trains Radio Station (MTRS) and MMIS cab unit manufactured by Funkwerk GmbH.

Cab Radio

Key Layout

1)	Emergency (Hardkey)	Emergency Call
2)	]2[(Hardkey)	Contact Secondary Controller (Signaller)
3)	Zub (Hardkey)	Call Chief Conductor (Train Guard)
4)	Public Address (Hardkey)	Public Address
5)	Intercom (Hardkey)	Intercom
6)	11/12/13/14	Softkeys
7)	1/2/3/4/5/6/7/8/9/0	
8)	Reset (Hardkey)	Reset (Hold for 3 seconds to power cycle MTRS)

9)   Up (Hardkey)   Navigate Up

10)   Down (Hardkey)   Navigate Down

11)   Enter (Hardkey)   Enter/Accept Selection

Display

The screen of the cab unit is a 360 x 128 pixel 1-bit display.
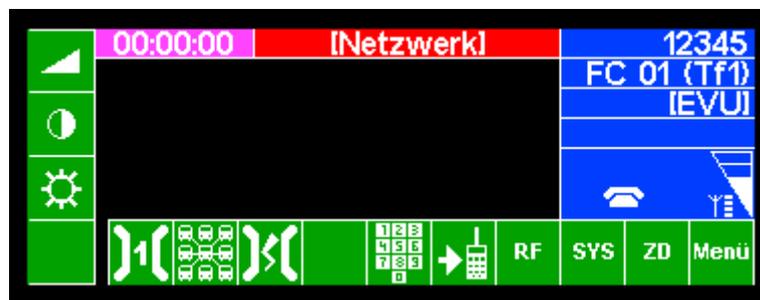
Clock   - Time of day
Softkey Mapping   - Function assigned to each softkey
Title   - Menu title or current network
Status Display   - Globally displayed status information

Number Entry

Softkeys 0-9   Enter a digit
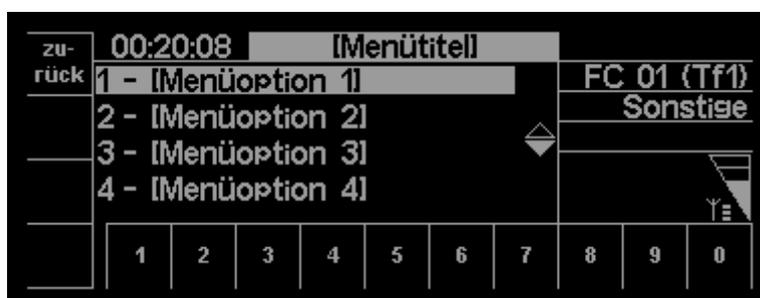
Softkey 14   Backspace (Hold to clear number)

Upon reaching the maximum length the caret narrows.

List Menu
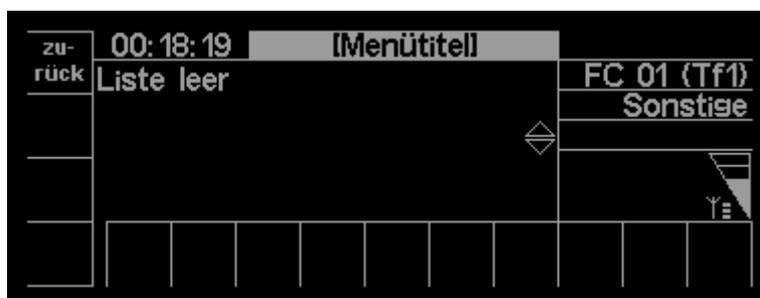

Up/Down   Navigate list up or down

Softkeys 0-9   Jump to index in list

Most menu navigation is done through list menus. An empty list is displayed as "Liste leer".

Status Displays

Train Data

The top right of the screen displays the current state of the train data consisting of the train number (TN), function code (FC), train operating company (TOC), and its registration state.

The registration state is indicated by either a flashing or static display of all elements of the train data status display. A static display indicates registered train data while flashing indicates a deregistered state. The train operating company display is not affected by the train data registration state and the displayed TOC is always the active TOC whether or not it is flashing.

Train Number   - Currently entered train number

Function Code   - Currently entered function code

Train Operating Company   - Active Train Operating Company

Volume

The bottom right of the screen features a gradient shape split into five sections denoting volume through the number of filled sections. The volume display is always relevant to the current output device (handset/cab speaker).

Connectivity

To the left of the volume indicator, a small cell tower icon with four rectangles to the side indicates the connection strength to a GSM (GSM-R or P-GSM) network. If no connection is present at all or GSM is not in use this indication is hidden. The number of rectangles indicates the strength of the connection where more the better.

Ringing Call

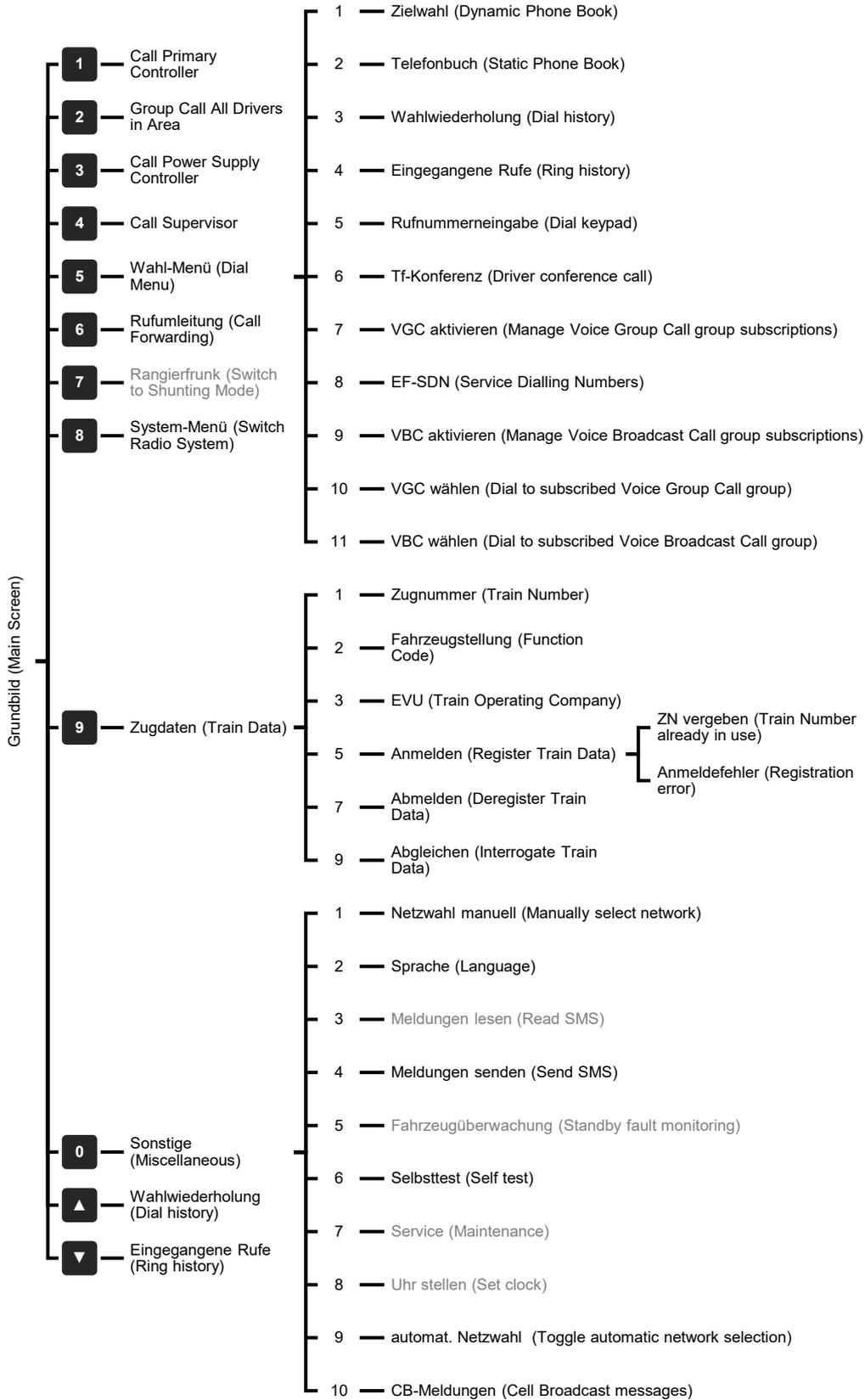A flashing phone symbol indicates an additional ringing call if another call is already active.

Sidebar

On pages where the softkeys 11 through 14 are not occupied by other actions a general sidebar is available providing the following actions

Softkey 11 (Single Press)   - Enter Volume Change Mode

Softkey 12 (Single Press)   - Invert Contrast

Softkey 12 (Hold)   - Enter LCD Contrast Change Mode

Softkey 13 (Single Press)   - Enter Brightness Change Mode

Softkey 14 (Single Press)   - Softkey Action (if available)

In the volume, brightness, or LCD contrast change modes the relevant softkey icon is flashing. The related property can be changed with the Up/Down arrow keys and the changes accepted with the Enter key or by pressing the related softkey 11 through 13 again. All other softkeys are blocked and interacting with them yields a warning tone.
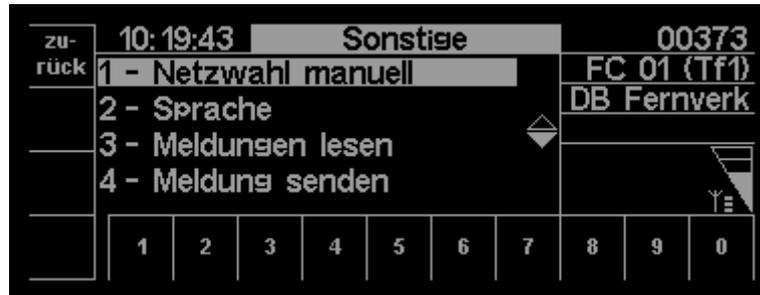
Pages

1 Call Primary Controller	1 —	Zielwahl (Dynamic Phone Book)
2 Group Call All Drivers in Area	2 —	Telefonbuch (Static Phone Book)
3 Call Power Supply Controller	3 —	Wahlwiederholung (Dial history)
4 Call Supervisor	4 —	Eingegangene Rufe (Ring history)
5 Wahl-Menü (Dial Menu)	5 —	Rufnummerneingabe (Dial keypad)
6 Rufumleitung (Call Forwarding)	6 —	Tf-Konferenz (Driver conference call)
7 Rangierfrunk (Switch to Shunting Mode)	7 —	VGC aktivieren (Manage Voice Group Call group subscriptions)
8 System-Menü (Switch Radio System)	8 —	EF-SDN (Service Dialling Numbers)
	9 —	VBC aktivieren (Manage Voice Broadcast Call group subscriptions)
	10 —	VGC wählen (Dial to subscribed Voice Group Call group)
	11 —	VBC wählen (Dial to subscribed Voice Broadcast Call group)

Grundbild (Main Screen)

9 Zugdaten (Train Data)	1 —	Zugnummer (Train Number)
	2 —	Fahrzeugstellung (Function Code)
	3 —	EVU (Train Operating Company)
	5 —	Anmelden (Register Train Data) — ZN vergeben (Train Number already in use) / Anmeldefehler (Registration error)
	7 —	Abmelden (Deregister Train Data)
	9 —	Abgleichen (Interrogate Train Data)

0 Sonstige (Miscellaneous)	1 —	Netzwahl manuell (Manually select network)
	2 —	Sprache (Language)
	3 —	Meldungen lesen (Read SMS)
	4 —	Meldungen senden (Send SMS)
	5 —	Fahrzeugüberwachung (Standby fault monitoring)
	6 —	Selbsttest (Self test)
▲ Wahlwiederholung (Dial history)	7 —	Service (Maintenance)
▼ Eingegangene Rufe (Ring history)	8 —	Uhr stellen (Set clock)
	9 —	automat. Netzwahl (Toggle automatic network selection)
	10 —	CB-Meldungen (Cell Broadcast messages)

Grundbild (Main Screen)

Softkey 1	Call Primary Controller (Dial 1200)
Softkey 2	Group Call All Drivers in Area (Dial Group ID 200)
Softkey 3	Call Power Supply Controller (Dial 1400)
Softkey 4	Call Supervisor (Dial number associated with the active train operating company, unavailable under TOC "Sonstige" and "Version 3.0")
Softkey 5	"
Softkey 6	Rufumleitung (Call Forwarding)
Softkey 7	Rangierfrunk (Switch to Shunting Mode) [INOP]
Softkey 8	System-Menü (Switch Radio System)
Softkey 9	Zugdaten (Train Data)
Softkey 0	Sonstige (Miscellaneous)
Up	Wahlwiederholung (Dial history)
Down	Eingegangene Rufe (Ring history)

Sonstige (Miscellaneous)

1.	Netzwahl manuell	- Manually select network
2.	Sprache	- Language
3.	Meldungen lesen	- Read SMS
4.	Meldungen senden	- Send SMS
5.	Fahrzeugüberwachung	- Standby fault monitoring
6.	Selbsttest	- Self test
7.	Service	- Maintenance
8.	Uhr stellen	- Set clock
9.	automat. Netzwahl	- Toggle automatic network selection
10.	CB-Meldungen	- Cell Broadcast messages

Managing Train Data

Zugdaten (Train Data)
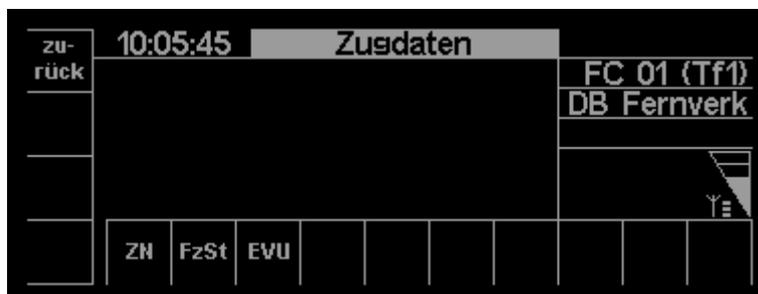
Softkey 1   Zugnummer (Train Number)

Softkey 2   Fahrzeugstellung (Function Code)

Softkey 3   EVU (Train Operating Company)

Softkey 5   Anmelden (Register Train Data)

Softkey 9   Abgleichen (Interrogate Train Data)

The option to register train data is only available if the train number is not blank and no train data is already registered.

The option to interrogate train data is only available if the train number is not blank.

Softkey 7   Abmelden (Deregister Train Data)

Softkey 9   Abgleichen (Interrogate Train Data)

The option to deregister train data is only available if train data has been registered.

The option to interrogate train data is only available if the train number is not blank.

Zugnummer (Train Number)

Number Entry for the train number. Maximum length 8 digits. If a train number shorter than 5 digits is entered the entered number is padded with zeros to a length of 5.

If train data is already registered, pressing Enter will automatically deregister the old and register the new train data.

Fahrzeugstellung (Function Code)
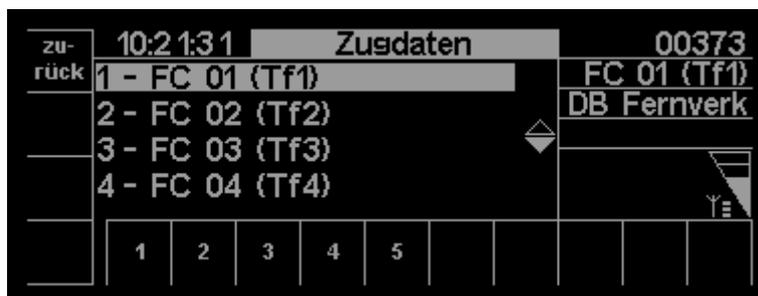
List selection for the function code under the to be registered train number. The following table lists the usage for the available function codes.

FC 01 (Tf1)	Leading driver
FC 02 (Tf2)	Second driver
FC 03 (Tf3)	Third driver
FC 04 (Tf4)	Fourth driver
FC 05 (Tf5)	Banking driver

If train data is already registered, pressing Enter will automatically deregister the old and register the new train data.

EVU (Train Operating Company)

List selection of all the TOCs available on the SIM-card.

Pressing Enter with already registered train data does not trigger a re-registration of the train data. The change of TOC takes effect immediately.

Anmelden (Register Train Data)

During train data registration the message "Zugdaten werden angemeldet..." is displayed. Upon successful registration the message "Anmeldung ist erfolgt!" is displayed and the flashing of the train data status fields seizes.

Errors

ZN vergeben (Train Number already in use)
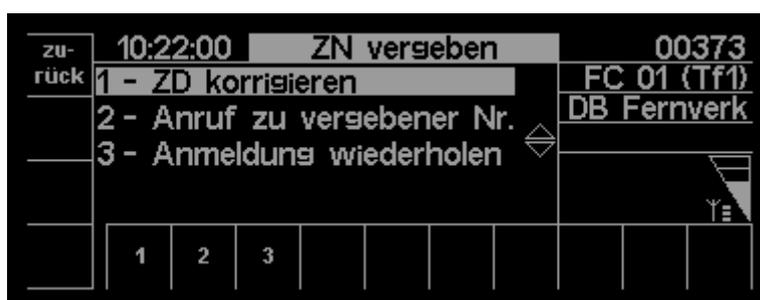
1. ZD korrigieren   - Correct train data

2. Anruf zu vergebener Nr.   - Call in use number

3. Anmeldung wiederholen   - Retry registration

Retrying the registration force deregisters the party currently registered to the entered train number. Upon force deregistration the deregistered party will see the following screen:
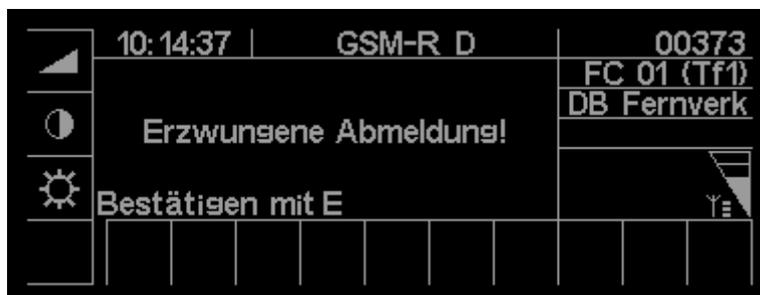
This screen needs to be confirmed with the Enter key.

Anmeldefehler (Registration error)
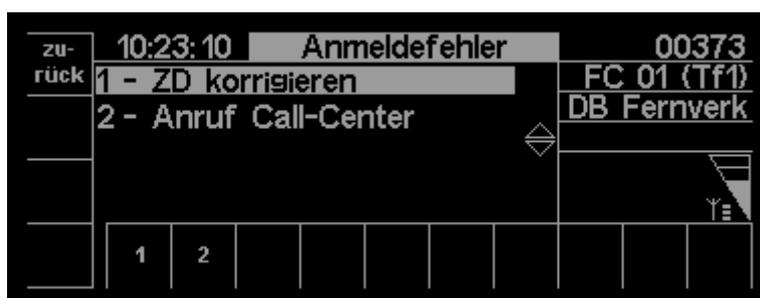
All other errors during registration are indicated by a generic registration error.

1. ZD korrigieren   - Correct train data
2. Anruf Call-Center   - Call Call-Center

Abmelden (Deregister Train Data)

Train data deregistration is indicated with the message "Zugdaten werden abgemeldet...". Successful deregistration is only indicated through the flashing of the train data status fields.

Abgleichen (Interrogate Train Data)

Interrogating the train data checks that the train data registration state cached onboard the train matches the state of the functional registration on the side of the network.

During interrogation, the message "Zugdaten werden abgeglichen..." is displayed. Successful interrogation is indicated with the message "Gültige Registrierung!". Failed interrogation is indicated by the following screen:

This screen needs to be confirmed with the Enter key.

Managing Networks

Netzwahl manuell (Manually Select Network)
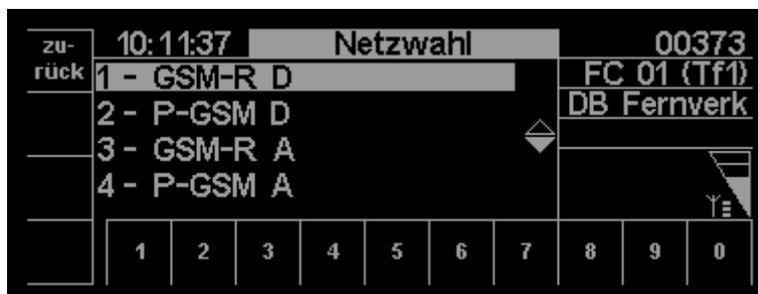
List selection of all networks the SIM-card is authorised to connect to with the home network being the first entry in the list.

GSM-R D	Germany
P-GSM D	
GSM-R A	Austria
P-GSM A	
GSM-R CH	Switzerland
P-GSM CH	
GSM-R NL	Netherlands
P-GSM NL	
GSM-R B	Belgium
P-GSM B	

The Enter key starts the process of switching networks.

P-GSM (Public-GSM) networks are a fallback in case the GSM-R network is unreachable, using public infrastructure instead of purpose-built GSM-R cell towers and cells. The public networks do not support the Voice Group Call Service, Voice Broadcast Service and eMLPP and therefore group and broadcast calls including railway emergency calls are unavailable. Additionally, due to the cell layout, short dial codes (e.g. 1300 for the signaller responsible for the current area) are not possible and also unavailable. All calls previously routed with short dialling codes must be dialled through their long form functional numbers under "Wahl-Menü", "Rufnummerneingabe".

Netzwechsel (Network Switching)

While switching networks the message "Netzwechsel wird ausgeführt..." is displayed. The GSM-R stays connected to the initial network while seeking for the target network. Upon successful connection to the target network the message "Netzwechsel ist erfolgt!" is displayed. Train data is automatically re-registered.

Softkey 11   Cancel network change

If the target network is not reachable the error "Netz [Target Network] nicht verfügbar!" is displayed. You now have the option to continue searching for the target network, change the selection for the target network or cancel the network change.

Softkey 11   Cancel network change

Softkey 13   Force continue searching

Softkey 1   Select target network

Kein GSM-R-Netz (No GSM-R Network)

This error message is displayed if the connection to a GSM-R network is lost. Some actions requiring a network connection are blocked and an ongoing error tone is triggered by this message, which can be acknowledged with the Enter key.

System-Menü (Switch Radio System)
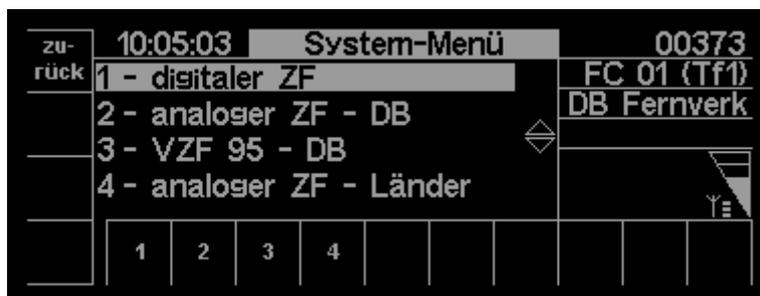
List selection for different radio systems.

|			
1.	digitaler ZF	- digital radio (GSM-R)
2.	analoger ZF – DB	- DB analogue radio [INOP]
3.	VZF 95 - DB	- DB simplified analogue radio [INOP]
4.	analoger ZF - Länder	- International analogue radio [INOP]

Starting Calls

Wahl-Menü (Dial Menu)
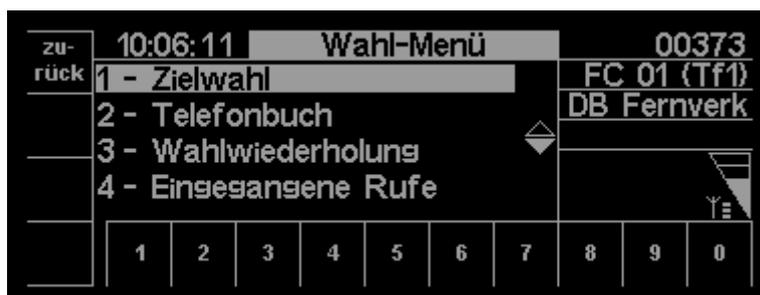
1.	Zielwahl	- Dynamic Phone Book
2.	Telefonbuch	- Static Phone book
3.	Wahlwiederholung	- Dial history
4.	Eingegangene Rufe	- Ring history
5.	Rufnummerneingabe	- Dial keypad

6.   Tf-Konferenz   - Driver conference call

7.   VGC aktivieren   - Manage Voice Group Call group
                               subscriptions

8.   EF-SDN   - Service Dialling Numbers

9.   VBC aktivieren   - Manage Voice Broadcast Call group
                               subscriptions

10. VGC wählen   - Dial to subscribed Voice Group Call group

11. VBC wählen   - Dial to subscribed Voice Broadcast Call
                               group

Zielwahl (Dynamic Phone Book)
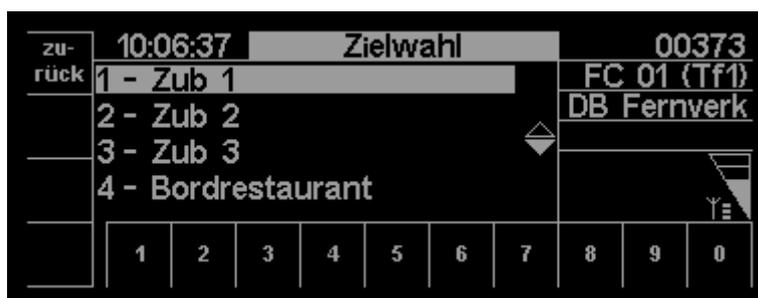
This page lists contacts where the destination number may change
depending on the train data or train operating company.

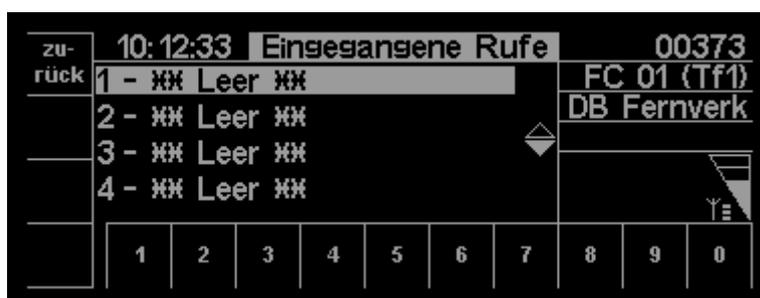## Telefonbuch (Static Phone Book)
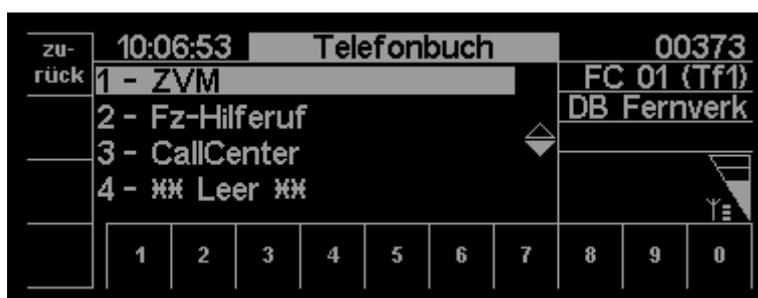
This page lists contacts stored on the SIM-card.

Wahlwiederholung (Dial history)
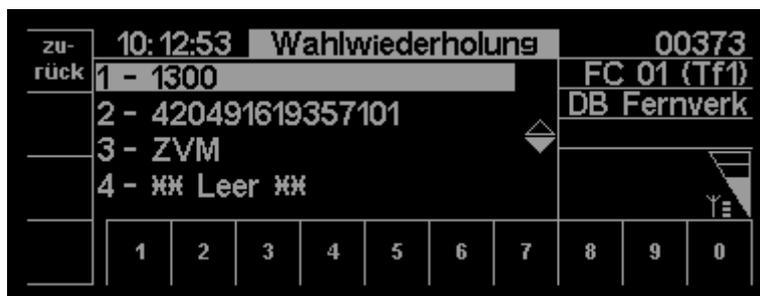
Up to 10 numbers dialled from the cab radio are stored in the dialling history with each number only stored under their most recent dial. The list is cleared when the MTRS loses power.
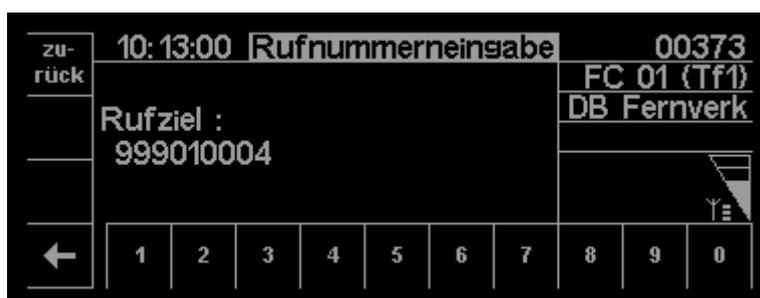
Eingegangene Rufe (Ring history)

The 10 most recent ringing numbers (accepted as well as missed) are stored in the ring history. The list is cleared when the MTRS loses power.
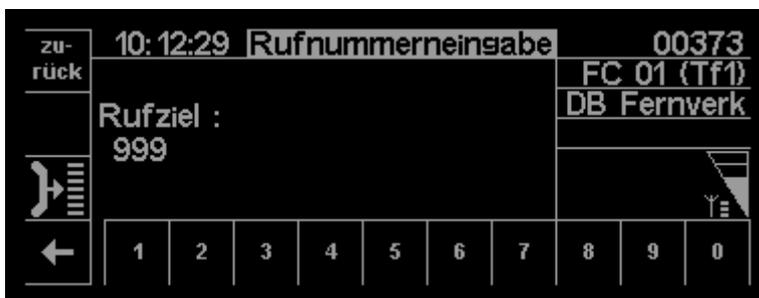
Rufnummerneingabe (Dial keypad)

See the section Phone numbers for details on phone numbers themselves.

Enter   Dial number

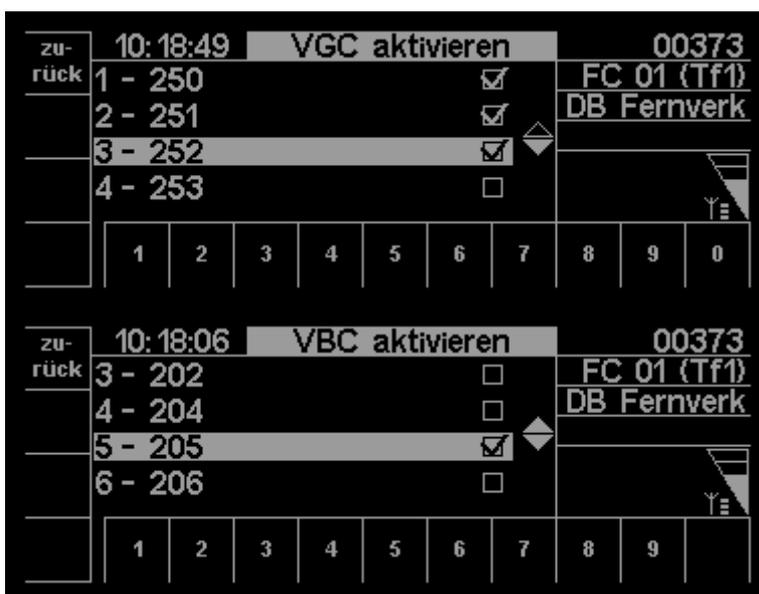Softkey 13   Start Group Call

Enter   Dial number

With exactly three digits entered softkey 13 can be used to start a Voice Group Call with the entered destination as the Group ID.

VGC/VBC aktivieren (Manage Voice Group/Broadcast Call group subscriptions)

Enter   Toggle subscription state on selected Group ID

Listed are all manually manageable Voice Group/Broadcast Call group subscriptions by their Group ID sorted by increasing number. The state of the subscription is indicated with a checkbox on the right.

VGC/VBC wählen (Dial to subscribed Voice Group/Broadcast Call group)

Enter   Dial selected Group ID

Listed are all subscribed Voice Group/Broadcast Call group subscriptions by their Group ID sorted by increasing number.

Managing Calls

Caller Icons

During calls the active call displays a large icon matching the type of call or the other caller's function. Below is a table of possible icons.
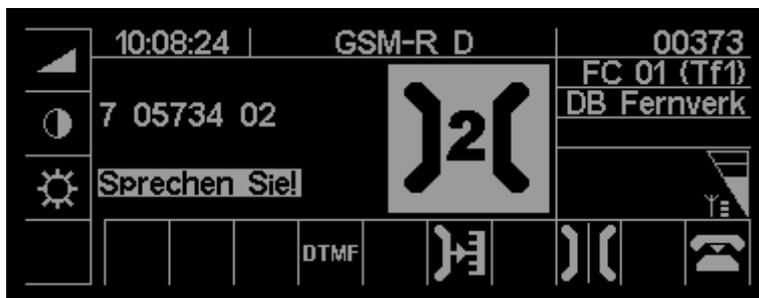

Function	Icon
Emergency Call	
Primary Controller *Dispatcher / "Betriebszentrale"*	
Secondary Controller *Signaller / "Fahrdienstleiter" / "Weichenwärter"*	
Power Supply Controller *"Zes"*	
Supervisor *"Transportleitung"*	
Drivers in the same area Drivers in a given area	

Function	Icon
Shunting Group Call *"Rangiergruppenruf"*	
Established Group Call	
Dialling Group Call	
Established Call	
Dialling Call	
Ringing Call	

Single Call

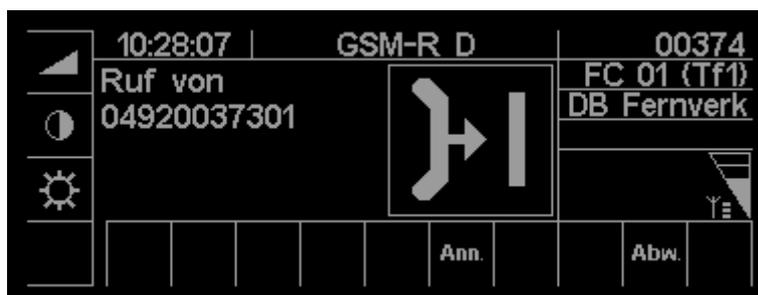### Dialling Call
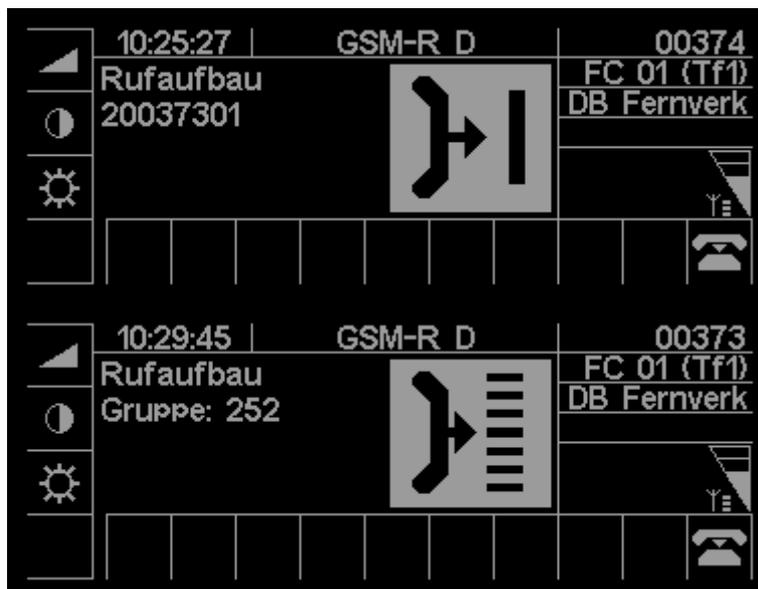
Softkey 0   Cancel dialling process

The dialling process is indicated by the message "Rufaufbau" above the destination number, Group ID, or Group Name. While dialling the ringing tone can be heard every 5 seconds.

Ringing Call

Softkey 6   Accept ringing call

Softkey 9   Reject ringing call

An incoming ring is indicated by the message "Ruf von" above the calling number alongside a flashing caller icon.
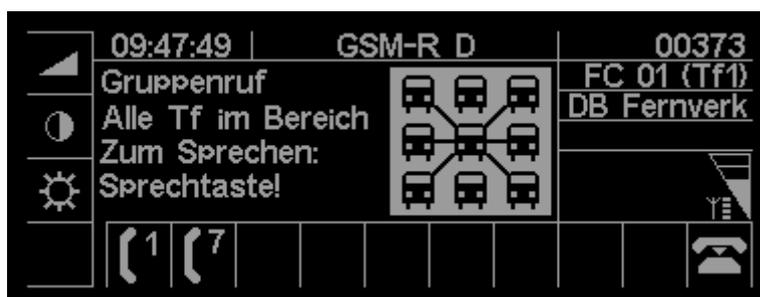
After 15 seconds a ringing call is automatically rejected.

Established Call

Softkey 4	Open Dual Tone Multi-Frequency tone (DTMF) menu
Softkey 6	Start conference call [INOP]
Softkey 8	Start a second call
Softkey 0	Leave call

Established Group/Broadcast Call

Softkey 1	Awaken Dispatcher with Short Dialling Code [INOP]

Softkey 2   Awaken Dispatcher with long form number
   [INOP]

Softkey 0   Leave call

An established Group Call is indicated by the message "Gruppenruf" and
a Broadcast Call by the message "Sammelruf" above the Group ID or
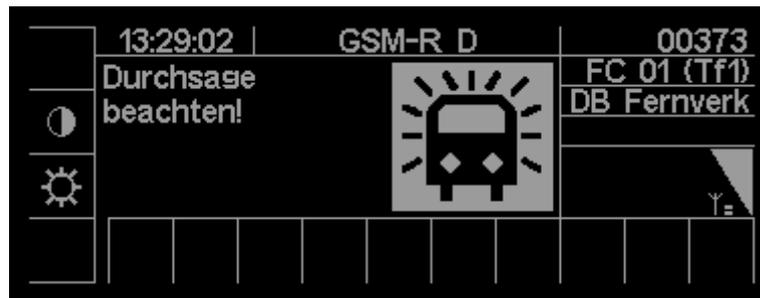Group Name.

Emergency Call

Railway Emergency Calls are Group Calls with Group ID 299 and priority
0 (highest). When an Emergency Call is established the initiating cab
radio plays an alert tone.

Outbound Emergency Call
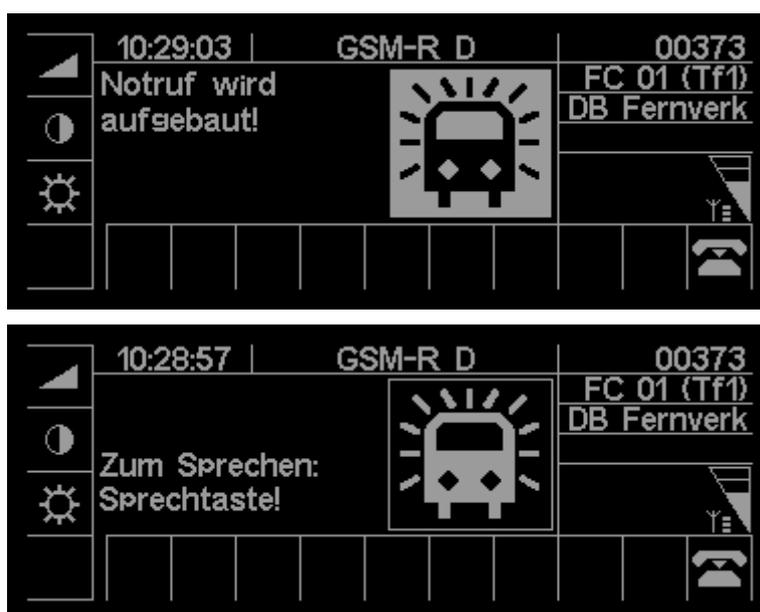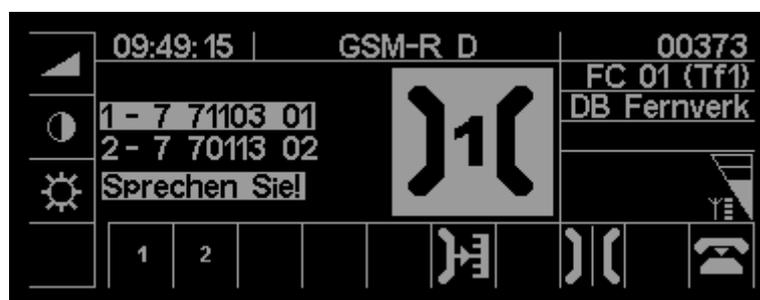

Softkey 0   Terminate Emergency Call

Inbound Emergency Call

Incoming Emergency Calls cannot be left and can only be terminated by the initiating party or a special authorised party.

Two Calls

Softkey 1	Leave first call
Softkey 2	Leave second call
Softkey 6	Start conference call [INOP]
Softkey 8	Switch between calls
Softkey 0	Leave both calls

The currently active call is highlighted and has the associated icon displayed.

An incoming ring as the second call is displayed with a flashing background and can be rejected with softkey 2 or accepted by switching to it with softkey 8.

Phone Numbers

National EIRENE Numbers consist of the single digit call type and the User Number. The User Number works differently for each Call Type. Below numbering schemes relevant to drivers are outlined.

Call Type 1 – Short Dialling Codes

Short Dialling Codes (SDCs) are 4-digit numbers forwarding the call to different destinations based on geographical location. This feature is used for example for the Call Secondary Controller hardkey on the cab radio, dialling the SDC '1300', which redirects to the responsible signaller for the train's current area.

Important Short Dialling Codes in Germany are:

1200	Primary Controller *Dispatcher / "Betriebszentrale"*
1300	Secondary Controller *Signaller / "Fahrdienstleiter"*
1300+	(if applicable) Secondary Controller *Additional Signallers*
1350+	(if applicable) Secondary Controller *Switchman / "Weichenwärter"*
1400	Power Supply Controller *"Zes"*

Call Type 2 – Train Function Number

Train data registration allows for functional addressing based on train number. In operation this is achieved through Call Type 2 where numbers are built up as follows:

2	[Train Number]	[Function Code]
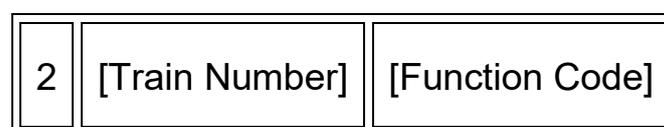
Example functional number for the first driver of train 6498: ***2 06498 01***

Call Type 3 – Engine Function Number

If available, a GSM-R radio on board a train will register its 8-digit engine number with its home network when powered up. Engine numbers are reserved for powered units only and combine the class number with the unit number, padding additional zeros at the start if the number is shorter than 8-digits otherwise.
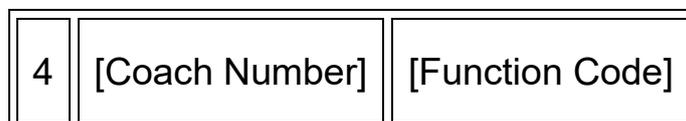
3	[Engine Number]	[Function Code]

Example functional number for the first driver of BR 145 066-7 (91 80 6145 066-7): ***3 00145066 01***

Call Type 4 – Coach Function Number

Every GSM-R radio on board a train will register its 9-digit coach number with its home network when powered up. Coach numbers derive from the UIC number every rail vehicle is assigned by removing the check digit at the end as well as the country code.

Examples for deriving a coach number:

UIC Number	61 80 80-91 147-1	91 80 6145 060-0
	61 ~~80~~ 80-91 147~~-1~~	91 ~~80~~ 6145 060~~-0~~
Coach Number	618091147	916145060

4	[Coach Number]	[Function Code]

Example functional number for the first driver of BR 145 066-7 (91 80 6145 066-7): ***4 916145066 01***

Call Type 7 – Train Controller Number

Train controllers (e.g. dispatchers, signallers) are assigned phone numbers consisting of a 5-digit location number and a 2-digit function

code. These function codes are different from the function codes used by the railway undertaking (e.g. drivers).

Relevant function codes under Call Type 7 are:

FC	Function Description
01	Primary Controller
02	Secondary Controller
03	Power Supply Controller

The National EIRENE Number is built up as follows:

| 7	[Location Number]	[Function Code]
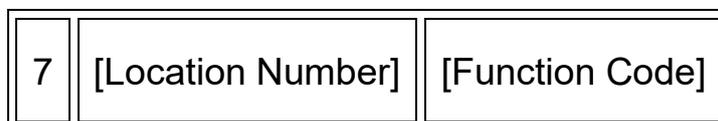
*Example functional number of a secondary controller: **7 00417 02***

Call Type 9 – Breakout Codes

Breakout Codes are used to route the call to a different phone network.

For international calls **International EIRENE Numbers** consist of the Breakout Code to other GSM-R networks (**900**) and International Code are prefixed to the National EIRENE Number.

900	[International Code]	[National EIRENE Number]
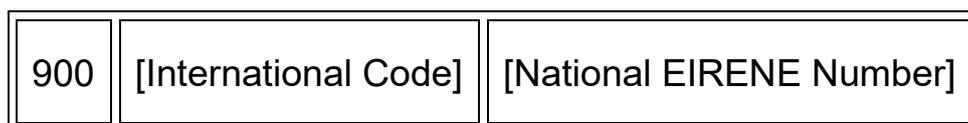
Relevant International Codes may be:

GSM-R Network	Country	International Code
GSM-R A	Austria	043
GSM-R B	Belgium	032
GSM-R CH	Switzerland	041
GSM-R CZ	Czechia	420

GSM-R D	Germany	049
GSM-R DK	Denmark	045
GSM-R E	Spain	034
GSM-R F	France	033
GSM-R GB	UK	044
GSM-R HU	Hungary	036
GSM-R I	Italy	039
GSM-R L	Luxembourg	352
GSM-R N	Norway	047
GSM-R NL	Netherlands	031
GSM-R PL	Poland	048
GSM-R S	Sweden	046
GSM-R SI	Slovenia	386
GSM-R SK	Slovakia	421

Zugvorbereitungsmeldung (ZVM - Train Preparation Notice)

In order to inform the signaller that a train starting a new service at a station is prepared for said service, the driver gives a Zugvorbereitungsmeldung (Train Preparation Notice; henceforth ZVM) in Germany. Today this is done with the help of a computer system triggered by calling the number **999010004**, also stored as the contact "ZVM" on DB Fernverkehr's GSM-R units.

The system uses the EIRENE functional registration feature to map the ZVM to a train number, so before dialling the ZVM number, the train data must first be registered. If not the error "Keine funktionale Registrierung erkannt" ("No functional registration detected") can be heard.

If the ZVM is successful "Ihre Zugvorbereitungsmeldung wird jetzt bearbeitet" ("Your train preparation notice is being processed") can be heard.

There may be special rules for when the ZVM is supposed to be sent per station. Commonly in larger station there is a limited time frame for sending the ZVM (e.g. between 5 and 3 minutes before departure) or that after longer dwell times (e.g. 10 minutes) a ZVM should be sent even if a train is not starting a service at this station.

Call Forwarding

Nr. Rufumltg. (Set Number for Call Forwarding)

Enter	Start Call Forwarding

Number entry for setting the number for call forwarding. The previously entered number is remembered.

Rufumleitung (Call Forwarding)

Softkey 6	End Call Forwarding

Status page indicating active Call Forwarding. All calls via UIC cable, VGCS "All drivers in area" and all emergency calls are not forwarded. Initiating an emergency call is still possible through the hardkey.

# <u>Annex: Expert Features for Custom Timetables</u>

For users creating custom timetables and want to fully utilise all the features of the BR 145 Expert and the included wagons, there are specific steps that need to be followed.

<u>Spawn Configurations</u>

Locomotives and Whole Formations

5 Spawn configurations are available:

- **ZDS**: Spawns the locomotive with the TDM switch set to "ZDS".

- **ZWS**: Spawns the locomotive with the TDM switch set to "ZWS".

- **ZMS**: Spawns the locomotive with the TDM switch set to "ZMS".

- **PZB**: Spawns the locomotive with the "LZB Fault Isolation" pressed.

- **NV** (For the Nahverkehrspaket only):
  - The Brake Mode will be set to R.
 - The NBÜ/ep switch will be set to 1.
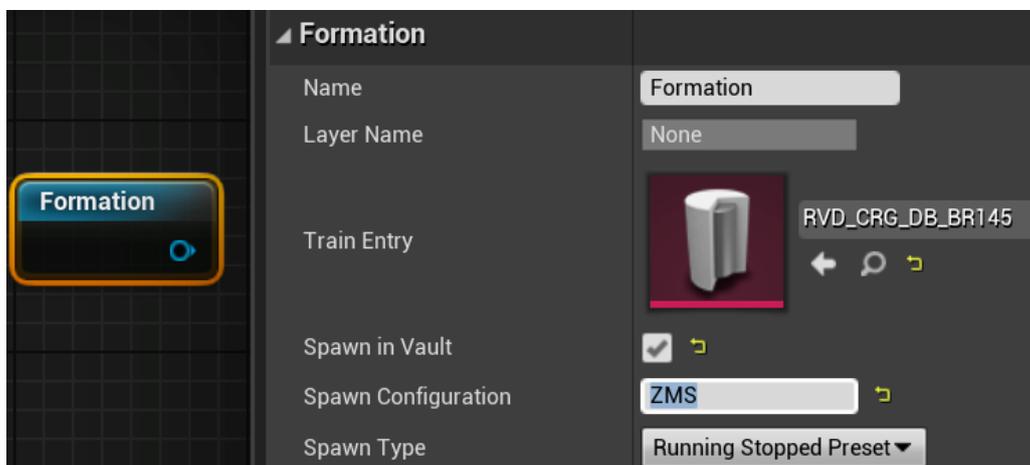
Individual Wagons

- **BrakeCutout**: Forces a wagon's brakes to be Cut-Out.
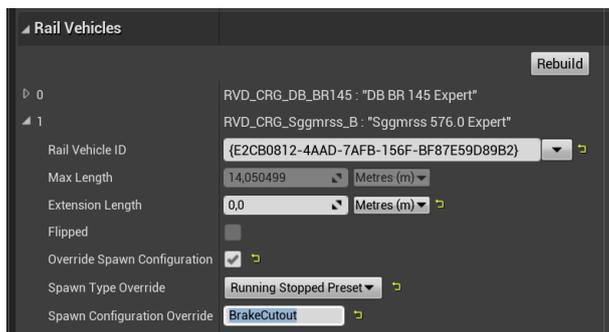
Cold and Dark Startup

For services where it is intended that the player performs a full startup of the locomotive but where it is necessary that the Simugraph Preset is not "**Parked**" (for AI behaviour) timetable authors can add the string "**BeginShutdown**" to the end of the service name and the locomotive will instantly transition to a cold and dark state once players spawn in to the service.
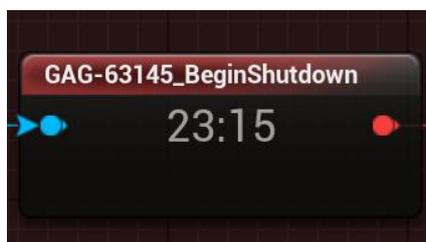
Train Preparation

If the player train couples to wagons with the service name including "**BeginShutdown**" or "**Shunting**" the freight wagons will be set up to simulate that the train has been shunted together recently, requiring a full brake test. This means that the player will have to check for angle cocks that are incorrectly closed, empty/loaded lever in the wrong position, brakes cut out when not intended, hand brakes applied as well as setting up the Zg2 and brake mode selectors manually.

If the service name ends with "**YardDeparture**" the same logic as above will apply for when a player spawns into the service directly, rather than starting with the previous cold and dark startup, or shunting service. The logic will not apply twice, so it is safe to have a service with "**YardDeparture**" follow directly from a service with "**Shunting**" or "**BeginShutdown**".

<u>Index</u>

A

Adhäsion   Adhesion

AFB   *Automatische Fahr- und Bremssteuerung*

                    Automatic traction and brake control

AIZ   *Automation im Zug*

                    In-train Automation

ALTÜ   *Achslagertemperaturüberwachung*

                    Axle bearing temperature monitoring

Anz   *Anzahl*

                    Count

ASG   *Antriebssteuergerät*

                    Traction control computer

Aus   Off

B

BPA   Brake Pipe Accelerator

BRA   *Bremsart*

                    Brake type

BRH   *Bremshundertstel*

                    Braked weight percentage

D

DG   *Drehgestell*

                    Bogie

DTMF   Dual-tone multi-frequency

E

EBuLa   *Elektronischer Buchfahrplan und Verzeichnis der
                      Langsamfahrstellen*

                      Electronic book timetable and temporary speed
                      restriction index

Ein   On

EIRENE   European integrated railway radio enhanced
                      network

ep   *elektro-pneumatisch*

                      electro-pneumatic

Ersatzzugdaten   Replacement train data

ES   *Elektronikschrank*

                      Electrical cabinet

ETCS   European Train Control System

EV 0   *Energieverbrauch auf 0*

                      Reset energy consumption counter to 0

EVU   *Eisenbahnverkehrsunternehmen*

                      Train operating company

F

Fbrv   *Führerbremsventil*

                      Driver's brake valve

FC   Function Code

FM   *Fahrmotor*
                      Traction motor

FR   *Führerraum*

                      Cab

Fspbr   *Federspeicherbremse*
                 Spring (parking) brake

Fz   *Fahrzeug*
                 Vehicle

G

Grunddaten   Base train data

GSM-R   Global System for Mobile communication - Railway

GUSP   Gate Unit Power Supply

H

HB   *Hauptluftbehälter*
                 Main reservoir

HBG   *Hilfsbetriebgerüste*
                 Auxiliary Scaffolding

HBL   *Hauptluftbehälterleitung*
                 Main reservoir pipe

HBU   *Hilfsbetriebeumrichter*
                 Auxiliary Inverter

HL   *Hauptluftleitung*
                 Brake pipe

HS   *Hauptschalter*
                 Main circuit breaker

HSM   Driver's brake valve

HVAC   Heating Ventilation Air Conditioning

I

IFZ   *Intigrierter Fahrzeug-Zubringerbus*

Integrated vehicle input bus

INDUSI   *Induktive Zugsicherung*

≙ PZB

ISG   *Intergrierten Steuergerät*

Integrated Control Unit

L

LP   *Luftpresser*
Air compressor

LSS   *Leitungsschutzschalter*
Low-current circuit breaker

LZB   *Linienzugbeeinflussung*

M

MCB   Main Circuit Breaker

MFA   *Modulares Führerraumanzeigegerät*
(Analogue) modular cab display device

MFD   *Modulares Führerraum-Display*
Modular cab screen

Mg-Bremse   *Magnetschienenbremse*
Magnetic track brake

MGS   *Microprozessor-gesteuerter Gleitschutz*
Microprocessor controlled slip protection

MITRAC   *Product name of AdTranz*

MR   *Maschienenraum*
Machine room

Pantograph

SB   *Schnellbremsung*

Emergency brake

SIFA   *Sicherheitsfahrschaltung*

Vigilance system

SIM card   Subscriber Identity Module card

SR   *Stromrichter*

Rectifier

SSTF   *Seitenselektive Türfreigabe Fernverkehr*

Side-selective door release Fernverkehr

St   *Störung*

Fault

Stör   *Störung*

Fault

Sys   *System*

System

T

TB0   *Türblockierung 0km/h*

Door lock 0km/h

Tf   *Triebfahrzeugführer*

Train driver

TN   Train Number

TOC   Train operating company

TP   *Transportleitung*

Supervisor

TSys	*Teilsystem*	
	Subsystem	

V

V-ist	Current speed
V-soll	
V-ziel	

VB	*Vollbremsung*
	Full service brake application

VBC	Voice broadcast call

VGCS	Voice group call service

VMZ	*V-max Zug*
	Max consist speed

VZF 95	*Vereinfachter Zugfunk 95*
	Simplified train radio 95

Z

Z-Steller	Throttle

Z/Br	*Zug- / Bremskräft*
	Tractive / braking effort

ZBK	*Zug- / Bremskraft*
	Tractive / braking effort

ZbrV	*Zusatzbremsventil*
	Direct brake valve

ZD	*Zugdaten*
	Train data

ZDE	*Zugdateneingabe*

Train data entry

ZDS   *Zeitmultiplexe Doppeltraktions-Steuerung*

Time division multiplexed double header control

ZE   *Zielentfernung*

Target distance

Zes   *Zentralschaltstelle*

Power supply controller

ZF   *Zugfunk*

Train radio

ZL   *Zuglänge*

Train length

ZMS   *Zeitmultiplexe Mehrfachtraktions-Steuerung*

Time division multiplexed multi-traction control

ZN   *Zugnummer*

Train number

ZS   *Zugsammelschiene*

Electric train supply

ZSG   *Zentrales Steuergerät*

Central control unit

Zub   *Zugbegleiter*

Train guard

ZVM   *Zugvorbereitungsmeldung*

Train preparation notice

ZWS   *Zeitmultiplexe Wendezug-Steuerung*

Time division multiplexed push-pull train control

Credits

Developers:

- William Green
- Lukas Klimczyk
- Fabian Leymann
- Madeline Stockhausen

Modelling:

- Eric Wegener

Technical consultant:

- Dominik Mertins aka "Hazawa"

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- GER/JUSI Lp
- Jodler
- Josef Kudláček
- León Lenßen aka. Chill_LP
- Moooritz
- Lennard Schenkl aka "Redstoneia"
- Jiří Švehla
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