Type	Train Simulator Classic Add-on
Author	Benjamin Ebrecht
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Contact	ebrecht@trainteam.berlin

Foreword

Dear Customer,

Thank you very much for your interest in our vehicles for the "Berlin JWD" add-on. Following the "Berlin Ringbahn" project, the rail network is being expanded by several branches, using the same approach: while virtualTracks is responsible for track construction, TrainTeamBerlin is providing a train set. In keeping with the route extension to BER Airport, this is the Airport Express (FEX), consisting of a drivable BR 147.0 locomotive and a set of various double-decker cars (including a control car, which, however, cannot be driven by the player in this add-on).

The 147.0 series is a fleet of 20 locomotives operated by DB Regio from the Traxx3 locomotive family. As usual, the implementation includes a fully functional locomotive with numerous details and additional programmed functions. Among the new features compared to previous models are, this time, extensive dynamic displays in the cab (Human Machine Interfaces, HMI), the recreation of an electric locomotive control system including the specifics of catenary operation and reversible train control, as well as the implementation of a fully-fledged point-based train control system.

Nevertheless, this release is intended as the first iteration of a locomotive type from the Traxx3 family. While not yet concretely planned, it is fundamentally prepared and expected that additional variants of this locomotive type will be developed in a separate add-on with expanded functional capabilities.

It's worth checking our forum "www.trainteam.berlin/forum" or our Facebook page https://www.facebook.com/TrainTeamBerlin regularly. With that in mind, we hope you enjoy this add-on at least as much as we enjoyed creating it.

TrainTeamBerlin
Berlin, March 2026

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The Team and Acknowledgments

Here, the team is proud to present and introduce itself:

Software programming: TrainTeamBerlin
Distribution: TrainTeamBerlin

Benjamin Ebrecht	3D models, programming, sounds
Nick Zimmermann	3D models
Raphael Finn Arnold ("mid-pulse timing")	Sounds
User "Hilfslokomitive"	Sound recordings

We would also like to extend our heartfelt thanks to all other (some anonymous) contributors and licensors who helped make this add-on a success! A very special thank you goes out to all the tireless beta testers and supporters who helped ensure the attention to detail in this add-on.

One or more textures on 3D models used in this add-on have been created with images from CGTextures.com. These images may not be redistributed by default; please visit www.cgtextures.com for more information.

Class 147.0

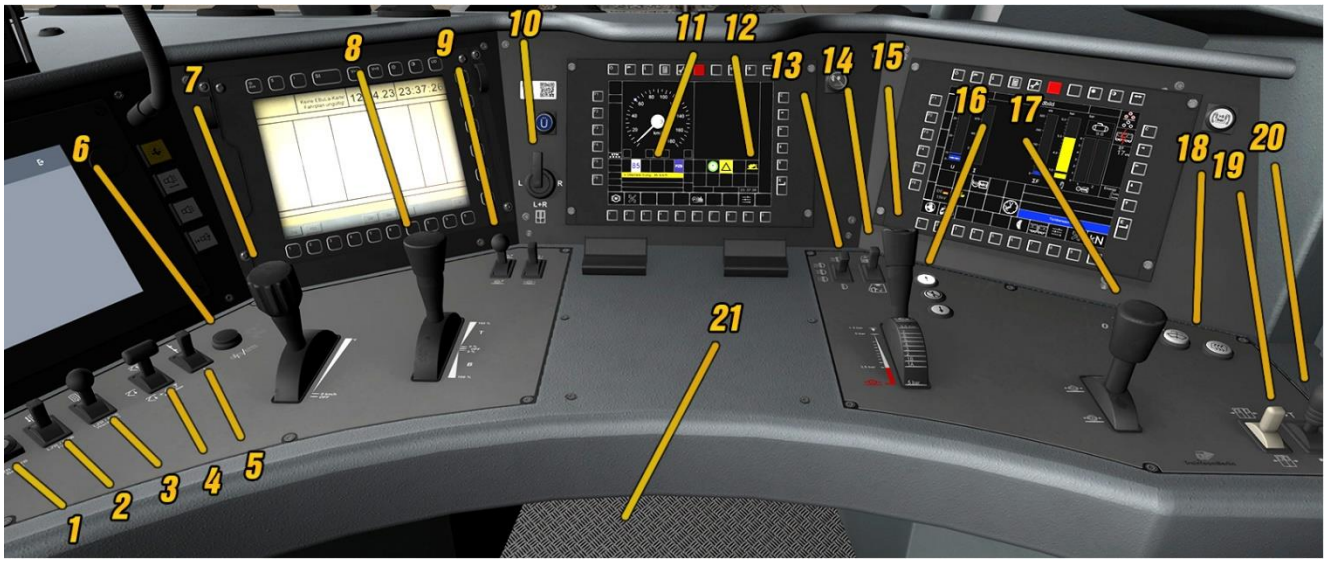
The following sections provide an overview of the Class 147.0 locomotive available to players. From a quick start guide to detailed descriptions and instructions for modders and scenario creators, all important information about the locomotive is compiled here.

Quick Start

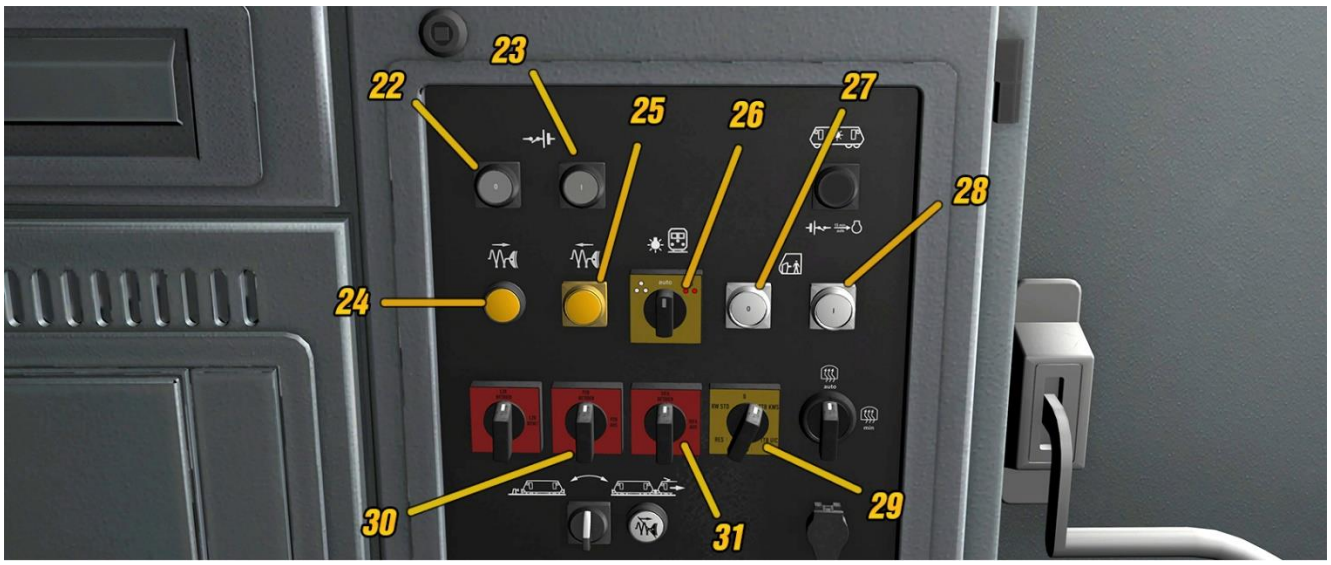
- B - Turn on battery
- K - Unlock control panel
- O - Raise pantograph
- (Shift + O - lower or select pantograph)
- Ctrl + Z - HS on
- Shift + N - Release spring storage
- W – Drive forward
- A – Increase traction

Basic concept of the key mapping: the special key mappings introduced with the BR 481 and BR 483 TTB add-ons have been retained with as few changes as possible. Other systems are based on the standard mapping in Train Simulator Classic. Only a few controls have been redesigned to deviate from this, such as the pantograph control.

Overview of the cab



(1) PZB Command Button	(12) MFD: Sifa indicator light
(2) PZB Clear button	(13) Signal light selector switch
(3) PZB Vigilance button	(14) Switch for timetable/cab light
(4) Pantograph up/down button	(15) Driver's brake valve
(5) Main switch on/off button	(16) Three buttons for selecting the direction of travel
(6) Pushbutton for train busbar on/off	(17) Auxiliary brake valve
(7) Speed preselection (V-setpoint control)	(18) Rotary switch for windshield wipers
(8) Drive/brake lever	(19) Door buttons
(9) Sanding button	(20) Microphone up/down button
(10) Side selector switch for passenger doors	(21) Sifa foot switch
(11) MFD: PZB indicator light and text display	



(22) Battery off button	(27) Deactivate driver's cab button
(23) Battery on button	(28) Press the driver's cab activation button
(24) Press the spring-applied brake button	(29) Mode selector switch
(25) Spring-applied brake release button	(30) PZB on/off rotary switch
(26) Rotary switch for signal light mode	(31) Sifa on/off rotary switch

Setting the vehicle up

By default, the locomotive starts the game in an unupgraded state. Follow these steps to upgrade the locomotive

- Insert battery (B or [23])
- Activate the control panel (K or [28]) *(unlocks various controls)*
- Raise pantograph (O or [4]) *(if necessary, first preselect pantograph with Shift + O)*
- As soon as catenary voltage is displayed: Turn on the main switch (Ctrl + Z or [5])
- Before driving: Release the spring-loaded brake (Shift + N or [25])

The upgrade procedure can also be run automatically. Start the automatic upgrade with the Z key. Alternatively, the locomotive can be configured by the scenario creator at the start of the game to be fully upgraded or partially upgraded; see instructions.

Driving

Driving is simple:

- Select the direction of travel using the three buttons “V” (forward), “N” (neutral), or “R” (reverse) (keys W/S or [16])
- Use the throttle/brake lever to select traction (keys A/D or [8])

Traction is only applied if there is no traction lock (symbol “kN” in MFD/MTD). The traction lock engages, among other things,

- If the locomotive is not fully equipped
- When the spring-applied brake is engaged
- The air brake is applied
- When the passenger doors are open
- After an emergency/quick/forced braking

Cruise control

Using the setpoint selector (Shift + W or Shift + S or [7]), a target speed can be preselected in 5 km/h increments. If a speed greater than 0 is selected, the cruise control automatically activates when a traction force is preselected (display of the corresponding status indicator light in the MTD) and regulates the target speed. Resetting the setpoint selector to 0 km/h deactivates cruise control again.

Note: This is a cruise control function that also controls the brakes—however, only the electric brake is used. The AFB function is not approved for the BR 147.0 and is therefore not implemented.

Note: The traction force must be preselected according to the train mass. Excessively high traction forces can cause the target speed to be exceeded.

Brakes

The locomotive has several braking systems that can be used in different ways.

- Parking brake
  - Spring-applied brake as parking brake
  - Apply the spring-loaded brake: N key or [24]
  - Release the spring-loaded brake: Shift + N key or [25]
- Electric brake
  - Equipped with an electrodynamic brake
  - Prototype-accurate braking characteristics, including decreasing braking force below 15 km/h
  - Electric brake is activated:
    - Via the throttle/brake lever (keys A/D or [8])
    - Via the driver's brake valve, if not disengaged (keys Ä/Ö/Ü or [15])
    - Via the cruise control
  - The electric brake operates via traction motors switched to generator braking. This converts kinetic energy into electrical energy. Surplus energy, after supplying auxiliary systems, is fed back into the overhead line (yellow grid connection column in the MTD)
  - The total amount of energy fed back is displayed on the MTD's kWh meter
- Air brake
  - Indirect brake ("train brake")
    - The indirect brake is controlled by the driver's brake valve (Fbrv) (buttons Ä/Ö/Ü or [15])
    - The Fbrv is locked in place and labeled accordingly
    - The Fbrv is coupled with the electric brake.
    - This coupling is always active after starting from a standstill and can be turned on/off using the Fbrv button (Ctrl + Ä or the top button of [15])
    - Brake blending is implemented, i.e., different target brake values are applied depending on the brake mode.
  - Direct brake ("locomotive brake")
    - The direct brake is controlled via the auxiliary brake valve (Zbv) (keys , / . or [17]).
    - The Zbv is implemented in the simulator with pulsed operation.
- Quick/Emergency/Forced Braking
  - Emergency braking: Set Fbrv to the highest position
  - Emergency brake: Press the momentary switch (Back key or [unlabeled]). To release, return the momentary switch to its initial position (Shift + Back key or [unlabeled]).
  - Forced braking: Sifa and PZB can trigger forced braking. These can be identified by the corresponding voice output.
  - To release these brakes, the drive/brake lever must also be in the center position (mandatory neutral position).
- Brake position
  - By default, the locomotive operates in brake position R+E. The corresponding brake behavior is defined in the vehicle script.

Prepare for parking

In general, the complete disarming procedure for parking the locomotive follows the reverse order of the arming procedure:

1. Set the drive and brake controllers as well as cruise control to the neutral position.
2. Set the direction switch to 0 using the button [16].
3. Apply the spring-loaded brake using button N [24].
4. PZB and Sifa can be switched off, but this is not mandatory.
5. Turn off the main switch (Shift+Ctrl+Z [5]).
6. Lower the pantograph [Shift+O key [4]).
7. Deactivate the control panel [Shift+K [27]).
8. Turn off the battery (Shift+B [22]).

Switching Cabs

The locomotive has 2 cabs (FST 1 and FST 2).

Switching within the vehicle: Secure the vehicle

1. Set the speed and brake controls as well as cruise control to the zero position.
2. Set the direction switch to 0 using the button [16].
3. Apply the spring-loaded brake using button N [24].
4. If necessary, change the mode of the signal lights for the current cab before switching
5. Deactivate the control panel with Shift + K [27]

and then switch between FST1 and FST2 and partially re-equip the new FST accordingly.

Switching to other vehicles (e.g., control car):

1. Set the throttle and brake controls as well as cruise control to the zero position.
2. Set the direction switch to 0 using the button [16].
3. Set the appropriate operating mode (e.g., reversible train control) [29]
4. If necessary, activate the Zg2 tail signal: Ctrl + H [26]
5. If necessary, move the pantograph to the desired position (first turn off the main switch with Ctrl + Shift + Z [5] and, if necessary, press Shift + O / O [4] several times)
6. Then turn the main switch back on: Ctrl + Z [5]
7. Release the direct brake with the . key [17]
8. Release the spring accumulator with Shift + N [25]
9. Set the driver's brake valve to the full brake position [15]
10. Deactivate the control panel with Shift + K [27]

Switching from other vehicles (e.g., control car) to the locomotive:

1. Set up the locomotive as usual
2. If necessary, move the pantograph to the desired position (then first turn off the main switch with Ctrl + Shift + Z [5] and, if necessary, press Shift + O / O [4] multiple times)
3. Then turn the main switch back on with Ctrl + Z [5]
4. If necessary, switch signal light mode: Ctrl + H / Ctrl + Shift + [26]
5. Set operating mode to “0” (e.g., reversible train control) [29]

Please note that due to a limitation, Train Simulator Classic loads only one keyboard layout per game. This means that if you start a scenario with a control car, you cannot use keyboard shortcuts that differ from those of the control car after switching to the locomotive; instead, you must use the mouse.

Push-pull train operation

The locomotive has several operating modes that can be set using the operating mode switch [29]. In the JWD add-on, only the preset operating mode "0" is relevant for locomotive operation.

The locomotive is pre-equipped with several reverse-train control modes, including "TTB ZWS." It is planned that the BR147.0 can also be used in the simulator as a reverse-train pusher locomotive with a control car from TrainTeamBerlin. Currently, the TTB operating modes are not yet ready for productive use. Please check the website, especially the forum, for further developments.

Furthermore, the "RW STD" operating mode has been implemented in Railworks/Train Simulator Classic for reversible train operation with standard vehicles. This mode is actually intended for using control cars with standard locomotives in push-pull operation. However, it can also be tested experimentally beyond this at your own risk: the TTB BR 147.0 JWD version can be controlled in "RW STD" mode by a simple control car (which does not have a separately implemented reversible train control system).

It is recommended to load the control car as the lead vehicle of the train set at the start of the game. The locomotive is then configured as follows (using mouse controls):

1. Switch to locomotive
2. Turn off the battery with [23].
3. Activate the control panel with [28].
4. Preselect the pantograph to the desired position and raise it [4]
5. Turn on the tail signal (in the rear cab) [26]
6. Release the spring-applied brake [25]
7. If necessary, set the destination display *(currently not available via mouse control)*
8. Deactivate the control panel with Shift + K [27]
9. Switch back to the control car

Multiple-unit operation

The BR 147.0 fleet consists of 20 locomotives, two of which are equipped for multiple-unit operation in the original. Since double-unit operations are practically nonexistent, the implementation of a double-unit control system (ZDS) was omitted.

Display Screens (HMI)

The locomotive features highly functional monitors (HMI, Human Machine Interface) that provide a wealth of information in the game. A brief overview:

- FIS Monitor
  - Contains passenger information
  - In the simulation, this is intended only for displaying values, not for input
  - The following are displayed
    - Date, time
    - Line, train number
    - Destination, current and next station
  - In order for the FIS monitor to display values, these must be passed in the scenario via triggers or vehicle parameters (see instructions below)
- Ebula
  - Monitor for the electronic timetable
  - Can be turned on and off by clicking the On/Off button in the top left corner (press for 3 seconds)
  - Switch between day and night views using the contrast button in the top right corner
  - Display of train number, date, and time
  - No display of specific timetable data
  - In order for Ebula to display data, it must be passed to the scenario via triggers or vehicle parameters (see instructions below)
- MFD (Multifunction Display)
  - Contains the speedometer, indicator lights, and other information
  - Speedometer:
    - Digital speedometer needle display with a fixed update frequency (hence the slight jumping typical of the prototype) and an additional speed display in the center.
    - Also swings out during skidding.
    - When cruise control is activated, a purple diamond indicates the preselected speed
  - Indicator lights
    - "T": Door loop
    - "kN": Traction control active
    - Yellow foot on button: SiFa indicator light
    - PZB: Indicator light and additional text displays (see PZB explanation)
  - In addition, the time and train number can be displayed
  - In order for the MFD to display train number data, this data must be passed via triggers or vehicle parameters in the scenario (see instructions below)
- MTD (Machine Technical Display)
  - U: Display of contact wire voltage including main switch status
  - I: Display of power supply
    - Blue: Power draw from the overhead wire
    - Yellow: Regenerative charging to the overhead line
  - ΣF: Traction force display
    - Blue: Traction

        - Yellow: Electric brake
    - Brake indicators
        - Main air line pressure as a bar graph (yellow)
        - Brake cylinder pressure (C1 and C2) as bars
        - Main air reservoir pressure as text display
    - Text slot outputs: indicate necessary steps during setup or conditions for driving
    - Additional text displays:
        - Total traction forces (right)
        - Energy: Total grid power consumption and feed-in in kWh
    - Indicator lights and symbols
        - Ep/NBÜ: Brake settings (fixed)
        - DE 15 kV: Traction power system and train control (fixed)
        - "kN": Traction lock active
        - Spring with brake shoe: Status of spring-loaded brake
        - Blue high-beam indicator light, if active
        - Speedometer symbol, if cruise control is active

Headlights

By default, the signal lights are activated in automatic mode according to the following rules:

- Zg 1a ("white") on the occupied cab, all others without signal lights
- Zg2 ("red") at the rear of the train, if reversible train control is active and the locomotive is controlled externally

Automatic mode can be deactivated using the rotary switch on the rear wall of the cab to force Zg 1a ("white") or Zg 2 ("red"). The setting applies to the currently active cab and can be set independently in either of the two cabs. This means that to force Zg 2 ("red") at the rear end of the train, you must first switch to the rear cab and change the mode switch there.
For signal Zg 1a ("white"), there is a 5-position selector switch on the driver's console:

- 0 – off
- 1 – Signal lights (dimmed)
- 2 – Signal lights (standard)
- 3 – High beam (level 1)
- 4 – High beams (level 2)

The status of the signal lights in both cabs is indicated by symbols on the MTD. In addition, a high-beam symbol appears on the MTD when one of the high-beam levels is activated.

Driver's Cab Lighting

There is a switch on the driver's console that controls the cab lighting and timetable light. It has the following positions:

- -1 – Cab light on
- 0 – both off
- 1 – Timetable light on

The switch is controlled using the J (up) and Shift + J (down) keys [13].

Safety driving switch (Sifa)

The locomotive is equipped with a safety driving switch (SiFa) that must be confirmed at regular intervals via a button; otherwise, an emergency brake application will follow after a visual and audible warning.

- The SiFa is disabled by default when the add-on is first launched
- While driving, the system first prompts for confirmation via the indicator light, followed by a voice prompt.
- During this confirmation phase, the Sifa must be operated using the hand-held button or the foot pedal.
- Otherwise, an emergency braking maneuver will be initiated
- In the file ..\railworks\Assets\virtualTracks\S45\Rollmaterial\TTB_TRAXX3\Scripts\Options\TTB_Traxx3-Options.lua, you can set the default so that the SiFa is disabled at the start of the game.

Automatic train protection (PZB)

The vehicle is equipped with a full implementation of point-based train control (PZB), type PZB 90. PZB can be (de)activated while stationary. The vehicle operates in train mode O. Key assignments:

- Ctrl + Enter (Num) [30]: Activate PZB
- Ctrl + Shift + Enter (Num) [30]: Deactivate PZB
- Del [1]: PZB command
- End [2]: PZB Clear
- Image off [3]: PZB Alert

The 147.0 series features an implementation of PZB within the Ebicab onboard system and is integrated into the screen displays. The following features are worth noting:

- After activation, a test program runs:
  - 3-second flash of all indicator lights
  - 2x Initiating and releasing an emergency brake
- Additional PZB indicator light (blue): illuminates when PZB is active
- Additional indicator light G (red): Speed exceeded by more than 5 km/h (light flashing), emergency service braking following speed violation (light on)
- Additional indicator light S (red): Emergency braking active
- Additional text display system below the row of indicator lights
  - Display of information regarding system status and ongoing monitoring, as well as triggers for forced braking
- Alternating flashing is achieved by inverting the indicator light

- In the file ..\railworks\Assets\virtualTracks\S45\Rollmaterial\TTB_TRAXX3\Scripts\Options\TTB_Traxx3-Options.lua, you can preset whether PZB should be disabled at the start of the game and whether additional text prompts should be displayed in-game as assistance.

Note: A complete explanation of the PZB function in general would go too far at this point. Please also refer to the publicly available DB Infrago corporate guidelines (Ril), which explain the functionality of the PZB (Series Ril 483 "Operating Train Control Systems"). In particular, the specific principles of the Ebicab implementation of PZB are explained in Ril 483.0100 Z14.

Passenger Door Control

The locomotive is operating in TAV door control mode. The following operating procedures are used

- An indicator light for the door status is displayed on the MFD
  - LM "T" lit: Doors locked, driving mode possible
  - LM "T" is not lit: at least one door is open, traction lock is active
  - Indicator light "T" is flashing: Door closing in progress, traction lock active
- Release doors
  - Select a door side using the selector (keys P or * [10])
  - Release the doors using the door button (button T [19])
- Close doors
  - Once passenger boarding is complete, door release is canceled by setting the selector to position "0" (adjust using the P or * [10] keys)
  - If any passenger doors are still open, they will close in Train Simulator

Note: The locomotive can be used without issues with passenger cars from third-party developers, provided the third-party scripts for the cars do not expect control outside the Train Simulator standard.

Train Destination Displays

The locomotive is equipped with a train destination display system (ZZA) based on the "RegionalPakete" scheme and includes the display packages VBB1 and VBB2 (see separate RegionalPakete manual). During gameplay, the locomotive's ZZA can be changed using the following keys:

- 0: ZZA off (within a line)
- `: ZZA on (within a line)
- Ctrl + 0: Line up
- Ctrl + `: Line down

The available displays are listed in the appendix following the key assignments.

Horn

The locomotive is equipped with a two-tone microphone as an acoustic warning system.

- Horn up: M key [20]
- Horn low: Shift + M [20]

Windshield wipers

The locomotive is equipped with a windshield wiper system.

- The windshield wipers are turned on and off with V or Shift + V [18].
- The following positions are available:
  - Off
  - Interval
  - Continuous
  - Fast continuous wiping

Sand

The locomotive is equipped with a sanding system.

- The sanding system is operated using the X [9] button.
- The sanding system is automatically activated when the anti-skid system is triggered, as well as during emergency and forced braking.
- The sanding system has a limited capacity; that is, when the reservoir is empty, the sanding system no longer functions.
- The Sander buffer can be preset in scenarios (see below).

Power Supply and Train Busbar

The BR 147.0 is implemented with several power-related features. It has a train busbar:

- The train busbar is a power supply line that is connected between the locomotive and the cars or between the cars themselves. It supplies power to the (power) electronics of the train via the locomotive.
- When the main switch is turned on, the train busbar is also turned on by default.
- The train busbar can be manually switched on and off while the main switch is engaged [6].
- When the train busbar is switched on, a power consumption value is determined for the attached train.
- This depends on the season; in summer it will be high (air conditioning operation) and in winter very high (heating operation).

Furthermore:

- The catenary voltage (U_OL) is not constant at 15 kV, as in reality, and fluctuates during gameplay
- Depending on U_OL, the grid current draw is calculated; that is, it can fluctuate depending on the overhead line voltage even at the same power output
- The locomotive itself has its own auxiliary power consumption. When the train busbar [6] is switched on, power consumption is also determined for the attached car set.

- The total auxiliary power consumption is indicated by a visible current draw in the grid power consumption display on the MTD, even when the train is stationary.
- The required energy for the vehicle's traction unit is also determined and displayed in the MTD's grid power consumption.
- Efficiency chains are taken into account to determine realistic consumption values.
- The grid current draw and the amount of energy fed back (after supplying the auxiliary systems and deducting efficiency losses) are displayed separately in the MTD.

Operating Modes

The locomotive has an operating mode switch [29] on the rear wall of the cab and is pre-equipped for reversible train operation.

- For use in reversible train operation, the respective operating mode must be set after upgrading
  - Implemented: 0, RW STD, TTB KWS, TTB ZWS
  - TTB KWS, TTB ZWS: Reversible train control for TTB vehicles *(for future applications)*
  - RW STD: Use of standard locomotives without specific reversible train control as a pusher locomotive in Train Simulator
  - RES: Additional positions reserved for possible future operating modes
- The operating mode switch is not relevant for operation in the JWD add-on; operation is performed in the default mode "0".
- In the file ..\railworks\Assets\virtualTracks\S45\Rollmaterial\TTB_TRAXX3\Scripts\Options\TTB_Traxx3-Options.lua, you can preset which operating mode should be activated at the start of the game.

Language selection, options, and logger

- Language selection
  - In the options file listed below, you can select the language used for in-game output and in the log files.
  - German and English language packs are included; German is the default.
  - Additional language packs can be created and integrated via the options file.
- Options
  - The file ..\railworks\Assets\virtualTracks\S45\Rollmaterial\TTB_TRAXX3\Scripts\Options\TTB_Traxx3_Options.lua contains several option entries with explanations that can be adjusted as needed.
  - The options determine how the vehicle behaves during the game and which default settings are applied at the start of the game
  - Examples of available settings
    - Language pack for output
    - Should log files be saved?
    - Sifa enabled at game start?
    - PZB enabled at game start?

- Logger
  - If the option is enabled in the options file (see above), the vehicle can record output related to the trip in-game and/or in a log file
  - Output in the game is displayed via a text window at the top right of the screen
  - File outputs are saved as .txt files named according to the vehicle number in the directory ..\RailWorks\Assets\virtualTracks\S45\Rollmaterial\TTB_TRAXX3\Scripts\Logs
  - If you encounter problems operating the vehicle, reviewing the actions in the log files may be helpful
  - Logs from previous runs are automatically deleted when a new scenario is started

Notes on creating scenarios and customizing

This section provides additional information that is not directly relevant to the locomotive's operation. Among other things, it serves as guidance for creating your own scenarios in which the locomotive can be further configured.

Setting the machine automatically up

- In the game
  - Pressing the Z key starts the automatic upgrade process. Once complete, you can select the direction of travel, release the brake, and start driving.
- Starting with a pre-upgraded locomotive
  - Scenario creators can control the ControlValue "AutoSetupByScript" via a scenario script to start the player's locomotive in specific upgrade states or to initiate the process
    - Value 1: Start the automatic upgrade process
    - Value 2: Fully upgrade the locomotive immediately
    - Value 3: Upgrade the locomotive and park it safely (spring-applied brake engaged and control panel deactivated).

Vehicle parameters

For scenario creators: Parameters can be appended to the vehicle number in the scenario editor (prefixed with "_" and separated by "_" when multiple are listed) that influence the locomotive's behavior. Possible parameters:

- TN=<x>
  - Set the train number. Displayed on the FIS, Ebula, and MFD screens
- DATE=<x>
  - Sets the date of the current scenario
  - Display on the FIS and Ebula screens
  - Input format: yyyy-mm-dd
- SANDERRES=<x>
  - Sand supply. Specifies the remaining sand time in seconds.

Trigger

The locomotive can be partially configured in scenarios using additional triggers:

- TTB Trigger EL 1 Check
  - Placed at a potential hazard location after Signal El 1
  - Checks whether the player has turned off the main switch
  - If not: Main switch trips
- TTB Trigger EL 4 Check
  - Placed at a potential hazard area after signal EL 4
  - Checks whether the player has lowered the current collector
  - If not:
    - The pantograph is lowered (default)
    - Optional: Pantograph is torn off, game ends
    - Option can be preset in the vehicle's options file
- TTB Trigger EL 6 Check
  - Placed at the end of the contact wire after signal El 6
  - Checks whether the player has lowered the pantograph
  - If not: Pantograph is lowered
- TTB Trigger FIS Line
  - Option to enter a line for display in the FIS HMI
  - Up to 6 characters are displayed (e.g., "FEX" or "RB 32")
  - Umlauts can be masked in free text (see below)
  - Enter in the right-hand text field of the signal flyout at the right edge of the screen
  - Takes effect
    - When passing over
    - At the start of the game, if the trigger is placed less than 50 m from the vehicle in the direction of travel
- TTB Trigger FIS Stations
  - Option to enter station information for “Current Station,” “Next Station,” and “Destination” for display in the FIS HMI
  - Enter in the right text field of the signal flyout at the right edge of the screen
  - Three input modes
    - “<Station>”: Specify the next station; the previous “next” station becomes the “current” station
    - “<Station>;<Station>”: Specify the current and next stations, separated by a semicolon
    - “<Station>;<Station>;<Station>”: Specify the current and next stations as well as the destination, separated by semicolons
  - Specifications for <Station>

        - DS100 codes for stations along lines FEX, RB24, and RB32 are automatically translated
        - Alternatively, enter free text (min. 6 characters); up to 20 characters are displayed per station
    - Umlauts can be masked in free text (see below)
    - Applies
        - When passing over
        - At the start of the game, if the trigger is placed less than 50 m from the vehicle in the direction of travel
- TTB Trigger Train Number
    - Option to enter a train number for display in the HMI FIS, Ebula, and MFD
    - Up to 5 digits are accepted as the train number
    - Enter in the right-hand text field of the signal flyout at the right edge of the screen
    - Takes effect
        - On crossing
        - At the start of the game, if the trigger is placed less than 50 m from the vehicle in the direction of travel
- Masking of umlauts
    - Instead of umlauts, special characters that mask the corresponding free text fields are entered
    - The following replacements then occur in the game:
        - ~→ Ä
        - @→ Ö
        - „→ Ü
        - $→ ä
        - %→ ö
        - &→ ü
        - ?→ ß

Modifications ("Mods") and paint schemes ("Repaints")

Modifications ("Mods") and paint schemes ("Repaints") for BR 147 vehicles and double-decker cars may be created for private use at will. If the repaints are to be published, written consent from TrainTeamBerlin (www.trainteam.berlin) is required prior to publication. Approval is decided on a case-by-case basis. Consent is generally granted in accordance with the Bonus Pack program, which can be accessed here: https://trainteam.berlin/forum/index.php?/topic/1514-railworks-bonuspack-programm/. If you intend to publish a mod or repaint, it is recommended that you contact the team well in advance.

Keyboard Layout

Automatic Upgrades	Z
Battery switch on	B [23]
Battery switch off	Shift + B [22]
Activate control panel	K [28]
Deactivate control panel	Shift + K [27]
Raise pantograph	O [4]
Lower pantograph / Preset	Shift + O [4]
Main switch on / off	Ctrl + Z [5]
Apply spring-loaded brake	Shift + N [24]
Release the spring-loaded brake	Shift + N [25]
Mode switch	[29]
RES <> RES <> RW STD <> 0 <> TTB KWS <> TTB ZWS	
Select direction of travel	W / S [16]
Drive/brake lever up/down	D/A [8]
V-setpoint adjuster up/down	Shift + S / Shift + W [7]
Master brake valve (Fbrv) up/down	Ö/Ä/Ü [15]
Fbrv + E-brake coupling on/off	Ctrl + Ä [15]
Apply/release direct brake	, / . [17]
Sander	X [9]
Raise microphone	M [20]
Microphone down	Shift + M [20]
Sifa on/off	Ctrl + Space / Ctrl + Shift + Space [31]
Sifa pushbutton	Space
Sifa foot switch	Shift + Space [21]
PZB on/off	Ctrl + Enter (Num) / Ctrl + Shift + Enter (Num) [30]
PZB Alert	Clear screen [3]
PZB Clear	End [2]
PZB Command	Del [1]
Passenger doors Left/right selector switch	P / * [10]
Passenger doors release	T [19]
Windshield wipers up/down	V / Shift + V [18]
(Off) <> Interval <> Duration <> Fast	
Spotlight up/down	H / Shift + H [13]
Off <> Dimmed <> (Signal light) <> High beam 1 <> High beam 2	
Headlight mode up/down	Ctrl + H / Ctrl + Shift + H [26]
Zg1 <> (Auto) <> Zg2	
Driver's Cab Lighting	J / Shift + J [13]
Driver's cab lighting <> (0) <> Console lighting	
Train destination displays (ZZA)	
ZZA line up/down	Ctrl + 0 / Ctrl + ´
ZZA within line up/down	0 / ´
Train busbar on/off	[6]

Selectable train destinations

The following train destinations can be controlled using the above commands from the BR 147.0 locomotive:

- No line
  - [empty destination]
  - Please do not board
  - Replacement train
  - Special train
  - RB Regional Train
  - RE RegionalExpress
  - Usedom Express
  - DB Regio Northeast
  - Culture Train
  - Cherry Blossom Express
- FEX
  - [empty destination]
  - BER Airport
  - Berlin-Gesundbrunnen
  - Berlin Central Station
  - Berlin Südkreuz
  - Berlin-Charlottenburg
- RB24
  - Eberswalde
  - Berlin-Lichtenberg
  - Lübbenau
  - Senftenberg
  - Wünsdorf-Waldstadt
- RB32
  - Ludwigsfelde
  - BER Airport T1-2
  - Oranienburg

"FEX" double-decker wagons

→ Unlock in the Scenario Editor: **virtualTracks \ S45**
→ 3 double-decker car types with original sounds

Several double-decker cars are included to match the locomotive, allowing you to recreate a train set of the Berlin Airport Express "FEX."

The following car types are available:

- DBpza 780.7
  - Type 2003, low-floor
  - 2nd-class middle car
  - for FEX service with additional bicycle and luggage storage space
- DABpbza 757.7
  - 1997 model, low-floor
  - 1st/2nd-class middle car with barrier-free multipurpose area on the lower deck, not only for FEX services
- DBpzfa 763.5
  - 1997 model, low-floor
  - 2nd-class control car
  - including for FEX service with additional bicycle and luggage storage areas
  - (Series in 2nd numbering)

The cars can be used equally in player-controlled train formations and in computer-controlled traffic (AI traffic). The control car is not drivable by the player. If the control car is to lead in AI trains, the separate car version, which is designated as a "locomotive," must be used, and the locomotive driver symbol must be placed on the pusher locomotive.

Door control: The cars have been modernized and feature the authentic, TSI-compliant flashing and beeping when the doors open and close, even in-game. When used with the BR 147.0 included in the " ," the doors will not close until the door release is retracted. Use with locomotives from third-party add-ons is possible without issues—in such cases, the doors may close automatically once passenger boarding is complete.

Train destination displays: The cars feature prototypical train destination displays (ZZA) in a yellow-orange LED design. Implementation is via the "RegionalPakete" system (see separate manual). The ZZA can be labeled in-game
Player train:
Use with the BR 147.0 from the JWD add-on: By setting the DDD in the locomotive, the entire train set is displayed accordingly.
Use with TTB locomotives including IBIS: The settings in the player locomotive's IBIS also label the entire train set *(planned for the future, not yet available)*
Use with third-party add-on locomotives: ZZA labeling must be ensured via scenario scripts (see separate RegionalPakete manual).
AI Traffic
When used in computer-controlled traffic, the destination displays are organized by the scenario creator. They can be set individually for each car by appending the parameters "_ZZA=*" and "_RP=*" (see separate RegionalPakete manual)
Optionally, the scenario creator can use scenario scripts to ensure that the ZZA changes during the simulation period.

FEX Logos: The cars represent the modernized state of the cars from the end of 2022 in FEX service as part of the "Elbe-Spree" local transit network. Between 2020 and 2022, non-modernized double-decker cars with large "FEX" logos were used on the FEX line. As a semi-fictional implementation, the large logos can also be applied to the modernized cars if desired. This is done by the scenario creators by appending the parameter "_FEX" to the respective car number in the scenario editor.

AI Locomotive Class 147

→ Unlock in the Scenario Editor: **virtualTracks \ S45**
→ 1 Class 147 locomotive with original sound
→ The specific vehicle number is set via DynamicNumbering for each delivered variant
→ Versions included:
- TTB BR147 VR DB Regio NO KI Traffic red, DB Regio Northeast

→ Setting the pantograph position is done via DynamicNumbering—the last digit of the vehicle number is a character combination—this can be used as follows:
- "p0" – pantograph lowered
- "p1" – front pantograph 1 raised
- "p2" – rear pantograph 2 raised (default)
- "p3" – both pantographs raised

→ Display of the third, green data port ("Colibri") automatically based on the serial number

→ Train destination display (ZZA)
- Locomotives with destination displays feature the "TTB Regional Packages" system
- The two packages "VBB1" and "VBB2" are included, featuring pre-configured destination displays that can be controlled in a standardized manner
- Setting a destination display at game startup is possible by appending parameters to the vehicle number
    - Selecting the regional package: append *"_RP=<RP abbreviation>"* to the vehicle number
    - Example: Selecting regional package VBB2: *"91806_112_108-6____p2_a_RP=VBB2"*
    - Select the display from the chosen regional package: append *"_ZZA=<ZZA abbreviation>"* to the vehicle number
    - Example: Selecting ZZA with code letter "y": *"91806_112_108-6____p2_a_ZZA=y"*
    - Combined selection example: *"91806_112_108-6____p2_a_RP=VBB2_ZZA=y"*
- Switching during gameplay is possible via control from the scenario script
    - Set the ControlValue "SetZzaRegionalPackage" to switch regional packages
    - Set the ControlValue "SetZzaCode" to switch ZZA within the regional package

- Example call in the script:
  - *SysCall ("91806_112_108-6____p2_a:SetControlValue", "SetZzaCode", 0, 13);*
- See also the separate manual on ZZA regional packages

→ The vehicle has the following additional functionalities (see separate documentation below):
- Warning whistle when approaching
- Horn greeting when meeting oncoming traffic
- Immediate activation of the horn
- Flash of headlights

Documentation of cross-functional features of AI vehicles

The following section presents various functions of AI vehicles that are built into several vehicles in this package and may influence one another. Please note that this documentation is only relevant for scenario builders.

Warning whistle upon starting

Some vehicles can emit a warning whistle when starting from a standstill. Depending on the specific train in a scenario, this can occur randomly, be triggered in every instance, or be suppressed entirely. The probability of occurrence can be adjusted as follows:

- **Global occurrence probability:** First, a frequency can be set that is used as the default value (including for different vehicle series). This is defined in the file *..\RailWorks\Assets\TrainTeamBerlin\TTB_KI_Config\TTB_KI_Options.lua*. The value options.SHORT_HORN_AT_KICKOFF_PROBABILITY contained therein is the probability with which the locomotive emits a warning whistle via the microphone when starting (values between 0 and 1).

- **Occurrence probability per vehicle:** it is possible to override the global default setting for a specific vehicle operating in a scenario. To do this, a parameter is appended to the vehicle's assigned vehicle number, which is processed at the start of the game. The parameter is **"_HSP=<x>"**, where <x> is a value between 0 and 1. Example: Extending a vehicle number "143_245" to "143_245_HSP=0.75" sets the probability of the warning whistle—only for this vehicle in the scenario—to 75% upon departure, regardless of the default setting in the global settings file.

Makfrofon greeting when approaching

Some vehicles can emit an audio greeting through the microphone when passing another train. Depending on the specific train in a scenario, this can occur randomly, be triggered in every instance, or be suppressed entirely. The probability of occurrence can be adjusted as follows:

- **Global occurrence probability:** First, a frequency can be set to serve as the default value (also for different vehicle series). This is defined in the file *..\RailWorks\Assets\TrainTeamBerlin\TTB_KI_Config\TTB_KI_Options.lua*. The value options.HORN_ON_APPROACH_PROBABILITY contained therein is the probability with which the locomotive will sound a greeting via the microphone when approaching another train (values between 0 and 1).

- **Occurrence probability per vehicle:** it is possible to override the global default setting for a specific vehicle operating in a scenario. To do this, a parameter is appended to the vehicle's assigned vehicle number, which is processed at the start of the game. The parameter is **"_HAP=<x>"**, where <x> is a value between 0 and 1. Example: Extending a vehicle number "143_245" to "143_245_HAP=0.75" sets the probability of the greeting whistle—only for this vehicle in the scenario—to 75% when passing, regardless of the default setting

in the global settings file.

Immediate Triggering of the Microphone

The horn can be triggered immediately for a specific vehicle in the scenario:

- Short warning horn: The warning horn can be triggered at any time in the scenario for a specific vehicle by setting the ControlValue "TriggerHornShort" to 1. This is only possible via the scenario script and requires basic knowledge of scenario creation. Example: The command SysCall ("143_245:SetControlValue", "TriggerHornShort", 0, 1); immediately triggers the warning horn for the vehicle with the number "143_245" in the scenario.
- Longer greeting or warning signal with the megaphone: same procedure as for the warning beep, but the ControlValue "TriggerHornGreeting" is set to 1.

Headlight flash

It is possible for vehicles to emit a greeting using their headlights (illumination). Unfortunately, it is currently not technically possible to trigger this automatically when encountering oncoming traffic. Therefore, the headlight flash must always be triggered manually.

To do this, the ControlValue "TriggerLightHorn" is generally set to a value greater than 0. This is only possible via a scenario script and requires basic knowledge of scenario creation.

The following modes of the headlight flash have been implemented:

- 1: Flash high beams for a long time
- 2: Flash high beams twice briefly
- 3: Flash high beams long + short
- 4: Turn off the high beams for a long time
- 5: Turn off the high beam twice briefly
- 6: Turn off the horn for a long time + briefly

If the ControlValue TriggerLightHorn is set to a value between 0 and 1, one of the greeting modes is selected at random. During the day, the high beams are preferred, while at night the horn is primarily turned off to avoid glare.

By setting a value between 1 and 6, a specific greeting mode can be activated.

Example: The command SysCall ("143_245:SetControlValue", "TriggerLightHorn", 0, 0.5); immediately triggers the headlight flash for the vehicle with the number "143_245" in the scenario.

Additional notes

→ Note: You can launch Train Simulator with the startup parameter `EnableAsyncKeys` —this allows you to use the time-lapse feature in the game. This can, for example, be used to shorten longer stops at stations.

Once Train Simulator has been launched with the EnableAsyncKeys startup option, the keyboard shortcuts Ctrl + Shift + 1 through Ctrl + Shift + 5 to adjust the set the playback speed from normal to five times faster. Use the Ctrl + Shift + 5 to speed up the game to five times the normal speed, and then Ctrl + Shift + 1 to slow it back down to normal playback speed .

If you're not sure how the startup parameter EnableAsyncKeys (without a leading hyphen!) should be entered into a shortcut, you can also do this directly in Steam : To do this, go to "View Game Library" under "Games" in the main menu. In the list on the left, you will find Train Simulator Classic ("Train Simulator"). Right-click on it and select "Properties" from the menu. This The Properties window opens with the "General" tab. Here you will find the "Launch Options" section. In the corresponding text field, you can enter launch parameters: Enter EnableAsyncKeys (without a leading hyphen!) here. You can now now launch Train Simulator from Steam and use the fast-forward function in the game.

→ For further questions, the developer team's support forum is available at http://www.trainteamberlin.de/forum.