ÖBB 1044
Electric Locomotive

skyhook
GAMES STUDIO

Release Version 1.0

Contents

1 Background

1.1 Loco

The ÖBB 1044 was a class of universal electric locomotives operated by the Austrian Federal Railways (ÖBB). The class was capable of hauling either heavy passenger traffic or goods trains on both lowland and mountainous routes.

At the time of its entry into service, the 1044 was the most powerful class of four-axle locomotives in the world. Until the introduction of the 1016 (Taurus) locomotives, it was the showpiece class of the ÖBB. All members of the class, except its two prototypes, have now been converted into Class 1144 locomotives.

1.2 Design & Specification

Type and origin

Power Type:	Electric
Builder:	BBC / ELIN (de) / Siemens / SGP
Build Date:	**1976 - 1995**
Total Built:	Prototypes: 2
	Series production: 215

Specification

Configuration:	Bo'Bo'
Length:	16,100 mm (52 ft 10 in)
Locomotive Weight:	84 tonnes (185,000 lb)
Gauge:	1,435 mm (4 ft 8 ½ in)
Wheel Diameter:	

Performance Figures

Power Output:	Prototype:	5,200 kW (6,790 hp)
	Series:	5,000 kW (6,710 hp)
Maximum Tractive Effort:	Prototype:	203 kN (45,640 lbf)
	Series:	208.9 kN (46,960 lbf)
Maximum Speed:	160 km/h (99 mph)	

*references from Wikipedia - https://en.wikipedia.org/wiki/%C3%96BB_Class_1044

2 Rolling Stock

2.1 ÖBB 1044

2.2 ÖBB 1044 – Old ÖBB logo

2.3 Hbbills Wagons

6 variants of the Hbbills wagon in DB and ÖBB logos.

3 Driving the ÖBB 1044

3.1 Cab Controls
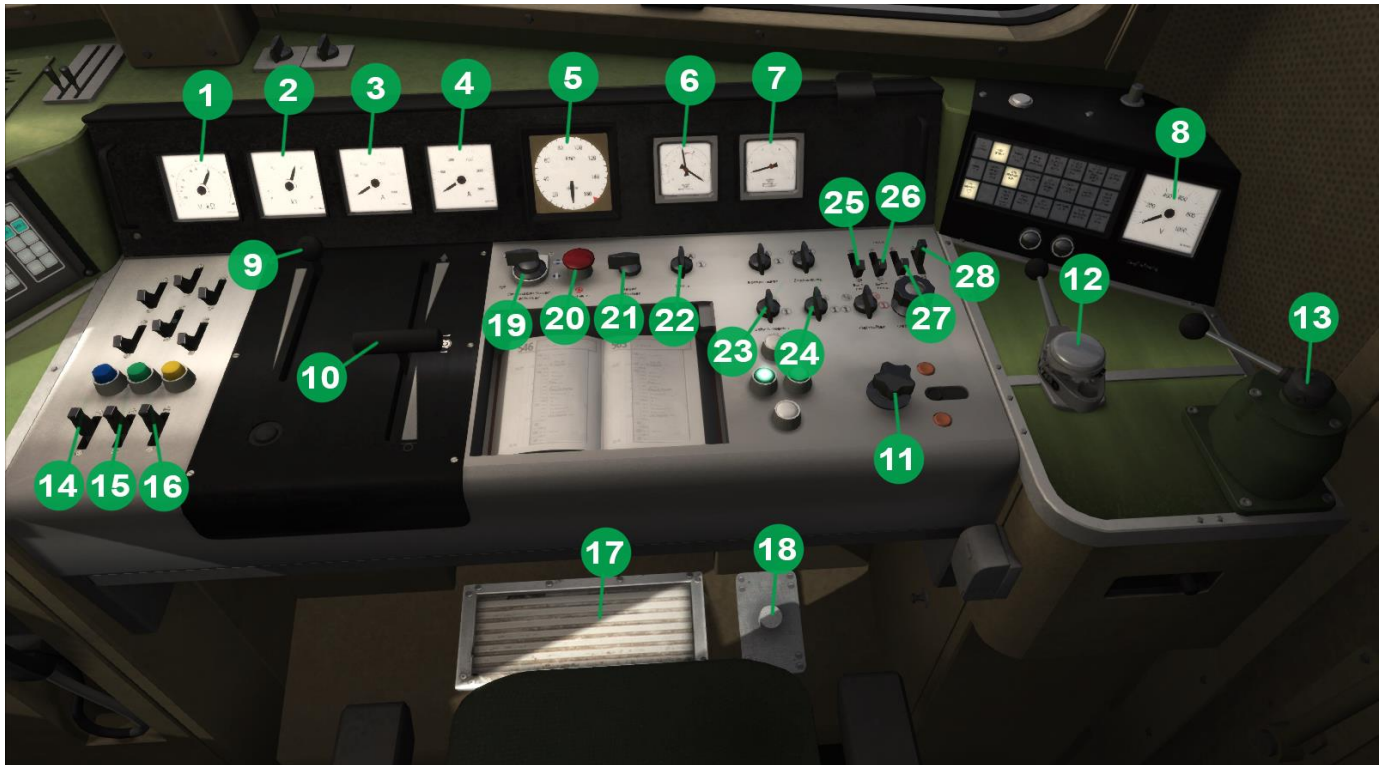
1	Battery Voltage Gauge	15	Indusi Release
2	OHE Kilo Voltage Gauge	16	Indusi Acknowledge
3	Ammeter (A) Gauge	17	Sifa Reset Pedal
4	Ammeter (A) Gauge	18	Horn
5	Speedometer & AFB speed setting (km/h)	19	Pantograph - Up/Down
6	Main Brake Pipe Pressure Gauge	20	Emergency Brake
7	Brake Cylinder Pressure Gauge	21	Main Circuit – On/Off
8	Train Heating Gauge(V)	22	Traction Motion Blowers – Off/Low/High
9	VSoll lever	23	Headlights - On/Off
10	Throttle & E-Brake	24	Train Heating - On/Off
11	Reverser	25	Book Lights - On/Off
12	Train Brake	26	Clipboard Lights - On/Off
13	Locomotive Brake	27	Instrument Lights - On/Off
14	Indusi Command	28	Cab Lights - On/Off

3.2 General Driving

3.2.1 VSoll-Lever

The VSoll lever controls the maximum speed the loco can achieve. With VSoll set to 0, the loco will not move forwards. VSoll can be set from 20 to 160kph, in 5kph steps, with Keyboard, Mouse or Gamepad (Gear Up / Gear Down). The red bug on the outside of the speedometer dial shows the actual setting.

You can move the VSoll lever at any time with only one limitation. If you set it to 0 while driving, the AFB system will stop regulating and the loco will just roll, even if you have set the regulator above 'drive'. Do not set it to 0 while driving forwards. Downhill this will result in over speeding if you do not brake manually. AFB will also pause every time you have a manual or emergency braking. It will come back under some special conditions. (See section below: Regulator.)

3.2.2 Reverser

To move forwards set it to 'Fwd', and the upper lamp besides it will light up. To move backwards you need to set it to 'Bwd', and the lower lamp will light up. You can't move backwards with AFB. The VSoll setting is not relevant while driving backwards. The next section explains further.

3.2.3 Brakes

The locomotive has three brake systems;

- Loco brake (direct brake)
- Train brake (automatic brake)
- Dynamic brake (electric rheostatic brake) – combined regulator and dynamic brake lever.

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

Train brake: As typical on Europe locos it's an independent brake with graduated regulation. There is a quick release position where the brake pipe will refill a bit faster if needed.

Dynamic Brake: The combined throttle and brake lever (the z-Schieber) will apply power or apply the dynamic brake. To use the dynamic brake, the lever needs to be set to the negative positions below 'Dyn Br'. It can be used at any time. The AFB will pause while using it and comes back if you apply power again. Notice the lever locking. The lever need to rest in the 'Off' position until the dynamic brake is off before you can apply power again. To have an idea if the dynamic brake is off, just take a look at the brake lamps at the right. With AFB you normally do not need the EB positions because the AFB will apply full dynamic brake power if needed. If you move backwards the EB will work, but it is better to brake with the train brake.

The dynamic brake will be applied with the train brake in proportion too. If you do brake with the train brake lever, and you need more dynamic brake power, you can set the EB to a higher value than the train brake is, and it will brake more and decouple from the brake lever.
If the train brake is in the release position, and the combined throttle and brake lever is above or equal to 0, they are automatically combined when the train brake is used.

Locking: The combined throttle and brake lever will be locked electronically after a manual braking. To unlock it, set the lever to the 'Off' position until the brake levers are in their 0 positions, so long as no emergency braking or Indusi and SIFA braking are involved. If the loco does not move, set the lever quickly to 'Off', and then back again to the desired value. That applies in both directions, i.e. for power or dynamic braking.

Power: To drive forwards, after setting the VSoll >= 20kph, and the reverser to 'Fwd', move the regulator to a higher value than 'drive', and the AFB regulation will start with a little delay. Start with a lower regulator setting when driving a light engine or lighter train. You can set it to higher values if the train is heavy. The AFB and the regulation system will control the power that is needed and useful.

Notice: To start the loco with a heavier train on a gradient uphill, you need the correct timing while releasing the brakes and applying the power. The best way is to move the brake lever quickly to the release position, and right after that, before the cylinder pressure gauge shows 0, set the throttle to a higher position like 70%. The lever locking is only active when the brake levers are not in 0. The pressure is not relevant for locking the throttle lever, so you can just move it while the brakes hold the train. After the cylinder pressure is gone, the train may roll backwards a little distance, about 2 meters, until the power is built up, and then start the run up the gradient. Don't worry about the short backward movement, that's normal and not a problem. If the train moves too fast backwards, then your timing was bad, or the train weight is too high. With the gradients on the SemmeringBahn for example, your maximum train weight should not exceed 600 tons with only one locomotive.

3.2.4 Pantographs and power switch

These controls effect the pantographs;

> Z toggles the main circuit.
> P toggles the pantographs up or down.
> Shift+P cycles through which pantograph is raised (front – both – rear – both - front).

To select a different pantograph on a second loco you need to switch into their cab. If you lower the pantographs while the main circuit is on, it will be automatically switched off. In expert mode you need to switch it on manually after a pantograph is raised. In Simple mode it will automatically switch on if a pantograph is raised.

AI locos will always select the backwards pantograph in their driving direction, if you haven't preselected a specific pantograph with the editor (see section below). A dead engine will not raise a pantograph.

Notice for scenario creators; AI pantograph preselection:
You can set a specific pantograph to be raised, or not raised, within the scenario edit mode. For this you need to add a term to the number field in the right fly-out window after double clicking on the vehicle. Normally there is only the locomotive's number displayed. If you put the term 'SA' after it, you can change and set the pantograph selection the locomotive will follow on runtime. You will directly see a change in the editor to have an idea what you get on runtime.

Use the following terms to set it up correctly:
- 'SA00' to have both pantographs lowered on runtime, even if the loco is moving.
- 'SA10' to have the front pantograph raised, the rear pantograph lowered.
- 'SA01' to have the rear pantograph raised, the front pantograph lowered.
- 'SA11' to have both pantographs raised (used in winter season only).

4.0 SiFa and PZB Systems

4.1 SiFa (Vigilance alarm)

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

If you switched on the SIFA you have to press <Numpad Enter> or Gamepad <A> within 900 meters to reset its timer.
If you forget to reset the SIFA timer, the SIFA buzzer sound will play to remind you to press the SIFA reset button. If you miss this, after a further 190 meters the train will begin braking automatically until it is at a complete stop.

The SIFA will pause if you switch to an outside view, so you can have it switched on even if you want to have some route explorations. Once back in the cab, the SIFA distance countdown will start again from 900 meters.

4.2 PZB (Indusi) (Train protection & control system)

PZB stands for "Punktfoermige Zugbeeinflussung" (Point based influencing) and is used to ensure that trains are running at correct maximum speeds in certain controlled sections (for example, leading up to signals) and also to ensure that no train can pass a signal at danger. The actual system is very complex. This is only a brief summary that will help you to use it correctly and avoid emergency brakes being applied.

4.3 How does it work?

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

Whenever a signal changes to "stop" or "pass at 60 km/h" the magnet transmits this information via the sensors into the on-board PZB system. If the driver ignores the information or fails to follow the required procedures the system initiates an emergency stop.

4.4 Driving with PZB

To turn on the PZB system press <CTRL + Numpad-Enter>
Change the PZB mode with <SHIFT + CTRL> + Numpad-Enter.

After switching on, or changing the mode, the PZB will start a self-test. The PZB can only be switched on/off, and the train mode changed, when the train is not moving and the reverser is set to neutral. Use the following keys to control the PZB:

<DEL>   = PZB Befehl40 / Command40
<End>   = PZB Frei / Free
<Page down>   = PZB Wachsam / Acknowledge

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

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

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

1000Hz Magnet

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

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

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

500Hz Magnet

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

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

2000Hz Magnet

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

Other notes

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

Befehl40 ('Order 40km/h')

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

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

Type of Train	Normal Monitoring (with active curves)	
	1000Hz	500Hz
O (Obere)	165km/h -> 85km/h in 23 seconds	65km/h -> 45km/h in 153m
M (Mittlere)	125km/h -> 75km/h in 26 seconds	50km/h -> 35km/h in 153m

4.5 Indusi implementation in the 1044

Notes on our implementation of Indusi I60:
The 1044 has an Indusi I60 type. Although not strictly 100% prototypical, the Indusi is more a PZB without restrictive monitoring, but with blinking lamps. These lamps aren't normally used with Indusi I60 on ÖBB locomotives, but we have implemented them here to aid driving.

The Indusi I60 has the following prototypical train modes implemented:

O (Light Trains / Passenger Trains)
M (Heavy Trains / Freight Trains)

You can switch between the modes with key command <Shift+Ctrl+NumpadEnter>. To switch train mode, the Indusi need to be switched on, and the train needs to be on a full stop. You can switch on the Indusi only on a full stop with key command <Ctrl+NumpadEnter>. On each switch on, or change of train mode, a short test will start, then display information about the consist (Mass, Length, Train mode) as messages on screen.

There is no monitoring of brake curves as in the prototypical I60. It has static monitoring at 700m after a 1000hz influence. The monitored 1000hz speeds are 85 kph in mode O, and 70 kph in mode M. If you go over an active 500hz, you need to be below 65 kph in mode O, or 45 kph in mode U.

On passing a red signal (2000hz) you can switch on the Indusi Command and pass over it without braking being applied. There is a continuous buzzer sound if command is active. Use the Indusi command only for shunting duties.

If you exceed the monitored speeds, or pass a signal at danger, an emergency braking to a full stop will be applied and you will hear a continuous buzzer sound. To release the brakes after such a braking, you need to use Indusi Free <End> to release from the braking, and then use the train brake lever to release the brakes itself.

The original I60 does not have a blinking blue light on the desk, but we have added this to give users a bit more information as to whether the monitoring is active or not.

5 Keyboard Controls

Description	FuncKey	Key
Headlights	Shift	H
Pantograph Selection (front – both – rear)	Shift	P
Pantograph up/down		P
Main switch on/off		Z
Regulator / Dynamic brake		A / D
VSoll lever		Y / C Gamepad Gear
Reverser		W / S
Traction motor blower (off – slow – fast)	Shift / Ctrl	F
Train brake		; / ´ Numpad +/-
Loco brake		[/]
Handbrake		/
Emergency brake		Backspace
Sander		X
SIFA on/off	(vR) Shift (DTG) Shift	7 Numpad-Enter
SIFA Reset		Q Numpad-Enter Gamepad A
INDUSI on/off	(vR) Shift (DTG) Ctrl	8 Numpad-Enter
INDUSI train mode selection	(vR) Ctrl Shift+Ctrl	8 Numpad-Enter
INDUSI Wachsam / Acknowledge		Page down
INDUSI Frei / Free		End
INDUSI Befehl40 / Command		Del
INDUSI system information	Ctrl+Shift	8
Horn		Space
Horn alternative		B
Wipers on/off		V
Window left down/up	Ctrl	W
Window right down/up	Shift	W
Blind right up/down		U
Blind left up/down	Shift	U
Lamp test on/off	Shift+Ctrl	L
Cab light on/off		L
Instrument lights on/off		I
Book light on/off	Shift	L
Clipboard light on/off	Shift	I
Help system on/off	Shift	[
Message language selection EN/DE	Ctrl+Shift	M

6 Scenarios

6.1 Introduction to the ÖBB 1044 Locomotive

Description: Academy Tutorial giving a run through of the main principles in driving the 1044.

Duration: Approx 10 Mins   **Difficulty:** Easy

(The following scenarios all take place on the Semmeringbahn route.)

6.2 Freight Across The Pass

Description: Your job on this cold Winter's morning is to take a heavy freight train across the Semmering Pass from Gloggnitz to Mürzzuschlag. Passenger trains have the right of way so keep a close eye on those signals. The weather is good so enjoy the drive.

Duration: Approx 45 Mins   **Difficulty:** Easy

6.3 Picking Up The Pieces

Description: Your job this afternoon is to take a freight service over the pass to Payerbach. An earlier freight service had some brake issues and dropped some of its wagons off in Semmering Yard. You are required to pick them up and take them down to Payerbach.

Duration: Approx 45 Mins   **Difficulty:** Very Hard

6.4 Regional Express - Gloggnitz - Mürzzuschlag

Description: It is an icy cold Winter's night and your job is to drive a REX (Regional Express) train across the pass from Gloggnitz to Mürzzuschlag. You will be following a real world timetable.

Duration: Approx 50 Mins   **Difficulty:** Hard

6.5 Regional Service - Payerbach - Mürzzuschlag

Description: Your job on a late Summer's evening is to drive the regional service from Payerbach to Mürzzuschlag. You will be following a real world timetable (2015/16). The weather is clear, good luck and enjoy the drive.

Duration: Approx 45 Mins   **Difficulty:** Medium

6.6 Regional Service - Semmering - Payerbach

Description: Your job on a clear Summer's evening is to drive a regional service from Semmering to Payerbach. You will be following a real world timetable (2015/16).

Duration: Approx 30 Mins   **Difficulty:** Hard

6.7 Winter Regional Service - Payerbach - Mürzzuschlag

Description: Your job on this cold Winter's evening is to drive the regional service from Payerbach to Mürzzuschlag. You will be following a real world timetable (2015/16). It is snowing and the visibility is poor. Good luck and enjoy the drive.

Duration: Approx 45 Mins   **Difficulty:** Very Hard

7   About Skyhook Games

Skyhook Games Studio is a creative production house based in Liverpool, UK. With over 40 years of games development experience, its founders have jointly worked across a wide range of titles and platforms from Playstation 1 – 4, Nintendo Wii and PC, to name but a few. Many of these titles were licensed products for major brands such as Jim Henson's, Disney and Sony.

They are now producing DLC for Dovetail Games and enjoying the challenge.

http://www.skyhookgames.com/

8 Credits

We would like to particularly thank the following people for their invaluable assistance in developing this locomotive;

- Maik Goltz from virtual Railroads for setup, physics and audio scripting.
- Stefan Lorenz and members of Railworks Austria for localised knowledge and input.
- Phil Teare at Ballaugh Sims.
- DTG for testing, QA and publishing.