German Signalling and Safety Systems
PLEASE NOTE

• This is a somewhat simplified overview!
• Only covering Passenger mode ("PZB Mode O")
• Real Driver Training takes longer than the 1-2 hours we have today
• It’s a bit of an alphabet soup, but you don’t need to get bogged down in it
• Have the confidence to get started and build your knowledge from there!
What are we covering?

- Signals
- PZB
- SIFA
- AFB
- LZB

- Specifically as it relates to Köln Aachen, and to some extent HRR.
Learn the Signals FIRST

• Speed Based
• Lots of information
• Once you understand the signals, PZB makes a lot more sense
• There is more than one signalling system in Germany
• … but they’re basically all telling you the same thing.
• We’ll be focusing on HP and KS systems
• … but they’re basically just telling you the same thing, don’t worry!
Signals Overview

- Primarily two pieces of information relayed by a signal
  - What to do NOW
  - What you should expect NEXT

- KS signals combine these into a single head. HP signals they are two different heads on the same post.
KS Signal Heads (Koln)

Now: STOP
Next: BadThings

Now: GO
Next: GO

Now: GO
Next: SLOW

Now: GO
Next: STOP
HP Signal Heads (Koln, HRR)

Notice - No “NEXT” information on the main signal head for a HP signal
HP Signal Heads 2

Next: STOP
Next: GO
Next: SLOW
Next: STOP
Reduced Distance to Next Signal
Speed Limits

- White digit on the top means a speed limit that applies NOW

- Yellow digit on the bottom means a speed limit that applies NEXT

- Multiply it by 10 to get the speed limit.

- This signal says “Proceed at 70km/h from this signal, reduce speed to 40km/h by the next signal” and the green light is flashing, hence “GO, SLOW”. 
Practice without PZB

• As you approach a signal, interpret it, say it out loud.
• What is it telling you to do NOW
• What is it telling you to do NEXT
• Signal information more important than HUD
• Signal limits are NOT displayed on the HUD
Safety Systems - SIFA

- Simplest system
- Driver Vigilence
- Lights, Audio, Brakes.
- Does not require full stop if tripped
- Don’t turn it on if learning other things!
Safety Systems - PZB

• Broadly aims to make sure the driver is following a simplified set of speed restrictions
• There are no in-cab alarms until you’ve done it wrong
• Entirely based on signals and signs so keep your eyes open
• Lights on the desk and HUD tell you what it is doing
• Seems complex when you first start, but once it clicks it gets much easier
• Talent 2 and ICE 3M have different displays for PZB but they mean the same thing
Safety Systems – PZB – Track Magnets

- PZB interacts with the train through a series of magnets attached to the track and signals
- They are emitting a pulse of either 2000hz, 1000hz or 500hz.
- Each of these is intended to tell the train what is coming and ensure the driver is driving accordingly.
  - **2000hz** – will completely stop the train. These only occur on red signals.
  - **1000hz** – a warning for upcoming speed reduction requirement.
  - **500hz** – final warning before a red light, ensures the train is operating slower and can still stop in time.
Safety Systems – PZB - Overview

- Start Programme
  - Flashing indicator, hold to 45km/h.
  - PZB End if clear, otherwise it will release on its own.

- When to Acknowledge PZB
  - When you pass a signal or a post, you may need to acknowledge depending on what it is telling you and what you are doing
  - If anything on the signal is YELLOW it probably needs acknowledging
  - If it’s telling you to slow down, it probably needs acknowledging
  - There are no penalties for acknowledging unnecessarily, so ack-away!
Safety Systems – PZB – Acknowledging

• When you acknowledge if the 1000hz lights up you MUST take action.
  • Ideally you’d already be expecting it, and be taking that action!
• Reduce speed to 85km/h (lower for freight) within 23 seconds
• That’s all it tracks, if the signal actually wants you to drop lower than that you should do that, but 85km/h is what keeps you going.
• You should even drop to 85km/h if the intended speed is HIGHER than that and once out of 1000hz you can then accelerate again.
Approaching a Red Signal

• You may first get a “GO/SLOW” - Ack! Slow to 85km/h!

• You will likely then get a “GO/STOP” – Ack! Slow to 65km/h!

• Expecting a stop means you should expect a “hot” 500hz magnet

• Stop before the red

• Remain below 45km/h until the 500hz goes out, even if the light changes!
Safety Systems - LZB

- Used for high speed rail as it can see much further ahead than the driver
- Used in combination with AFB to allow the train to operate the speed directly
Safety Systems – LZB – Activation

• Enable it in the switch compartment
• Observe the “B” indicator is now lit telling you it is READY.
• When you pass an LZB sign it will sound an alarm and switch on automatically
• Observe the “” indicator is now lit telling you it is ACTIVE.
• If not using AFB, simply keep your speed below the red target mark on the speedometer.
Safety Systems – LZB - Operation

• While LZB is running if there are any reductions in speed up ahead
  • The bar graph in the middle will count down the distance in meters
  • The speedometer will tell you what it is
  • The red speed target will guide you to that speed gently.
  • The “G” light will light up if you need to slow down
  • If the “G” light starts flashing, you are at risk of an emergency brake!

• This shot tells me my speed limit is 250km/h, but somewhere beyond 9.9km away there is a drop to 160km/h.
Safety Systems – LZB - Ending

- When the LZB ENDE light starts flashing, LZB is about to end.
- You must press PZB FREE (END key on keyboards) to acknowledge this or the train will come to a stop. The LZB ENDE will then go steady to remind you. LZB remains active however.
- Once LZB ENDE light then goes out, LZB is fully disabled and back in the “READY” state.
ICE3M LZF INDICATORS

LZF Ending
LZF Enabled
LZF Active

Steady : Slow
Flashing : Slow more!
AFB – Cruise Control

• Easiest to enable AFB while stationary!
• To enable, on the left hand MFD go to button 9 to get to the AFB screen and then button 6 to enable it.
• Set the AFB lever to the desired target speed, note that it shows up on the HUD.
• When exiting LZB you must fully disable AFB and re-enable it before it can be used again outside of LZB control.
Let’s Drive!