

Rail Primer

This document shall give you a brief introduction on reading and handling rail plans. You will find various hints how plans need to be read / interpreted and will learn about rail symbols.

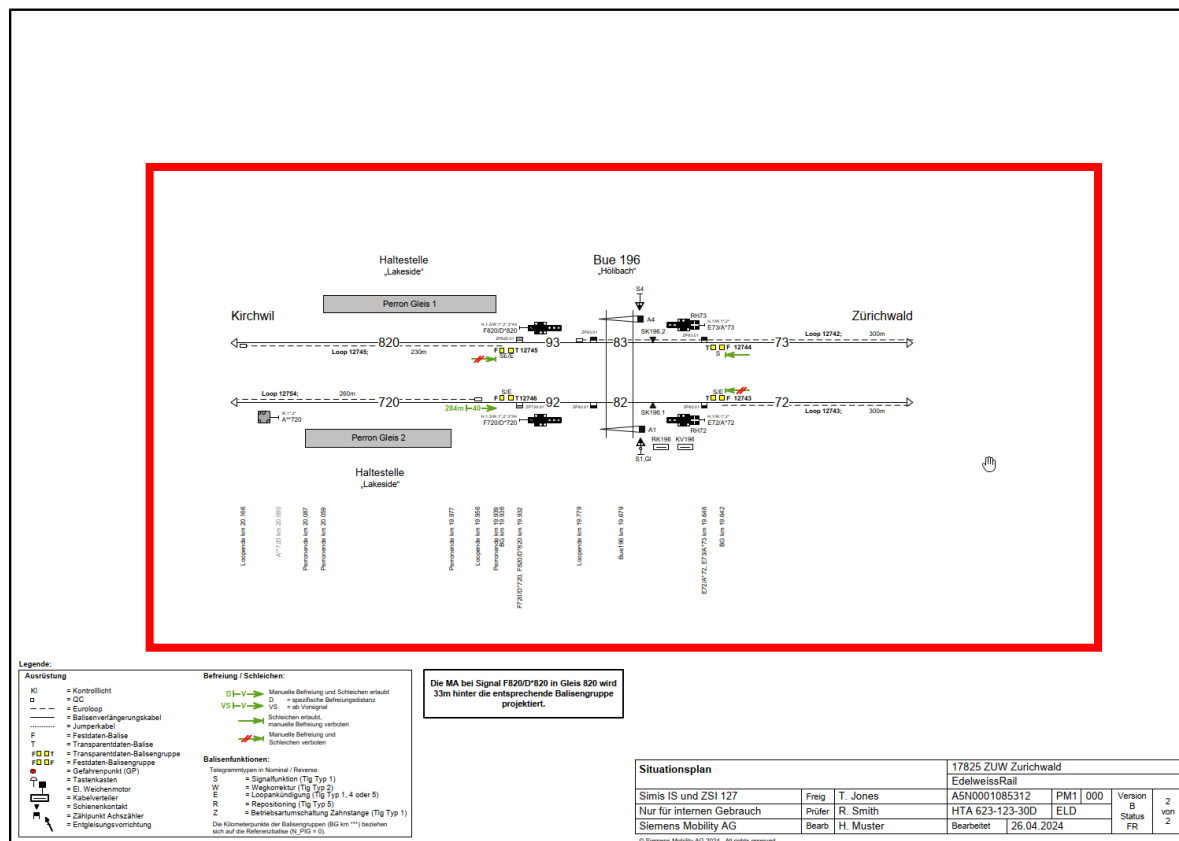
Relevance of Plans

The challenge utilizes the schematic “Situation Plans” of the interlocking and signalling (IXL) systems. IXLs are safety critical. IXLs ensure that train movements are coordinated and safe, preventing conflicting routes from being set simultaneously. The IXL monitors track vacancy, level crossings; it moves points (switches) and sets the signals.

A Situation Plan provides an overview of all the interlocking and signalling relevant elements. The situation plan depicts the actual interlocking equipment found outside at the trackside. The Situation plan may also show interlocking functions and features as well as operational useful information. The Situation plan is not drawn to scale. Tracks are represented simply as single horizontal lines. The elements are arranged in order; the relative distances between elements does not reflect the reality.

Precision in identifying, naming, ordering and assigning all the elements is crucial to ensure accuracy and minimize errors in the engineering process.

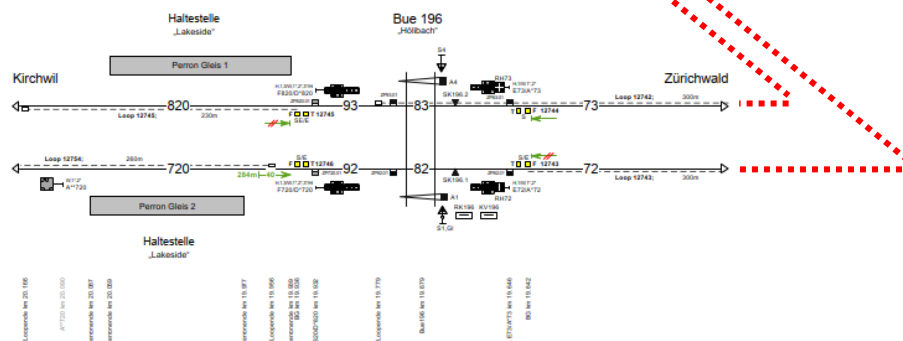
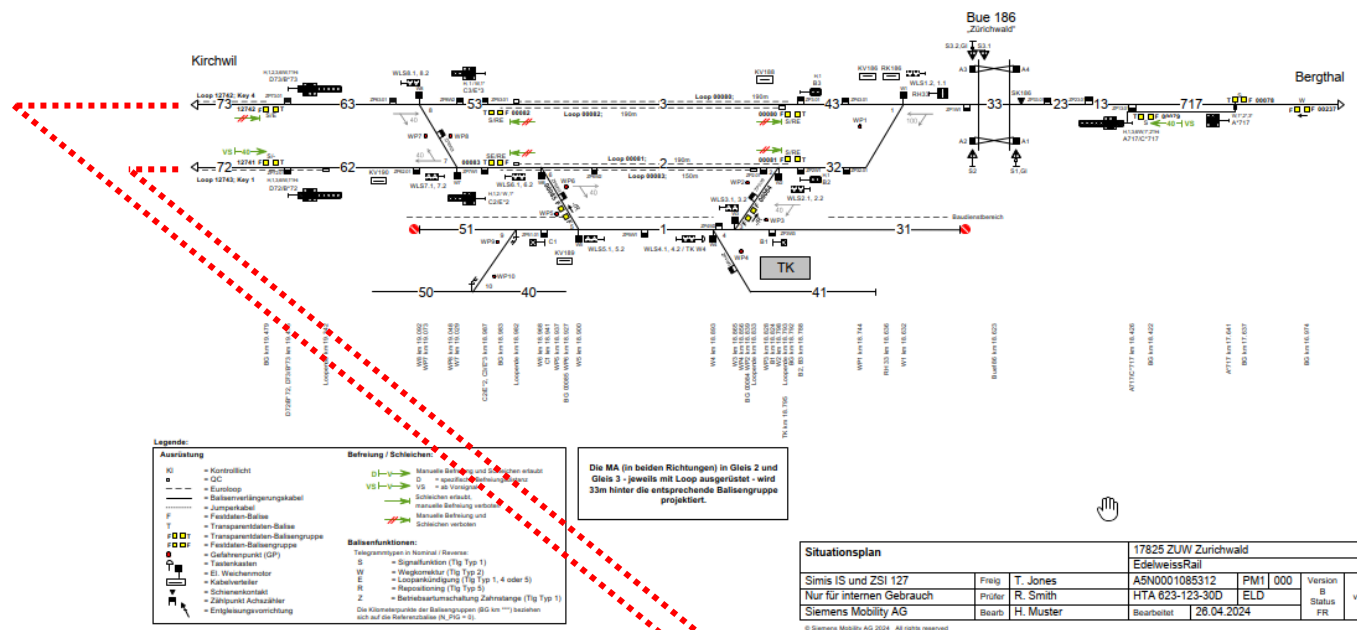
Plan Overview



The relevant area of the situation plan for this challenge is the track layout with all associated elements, including km information. The drawing title block and legend can be ignored; however, it may be useful to lift the interlocking/station name and the Station number from the title block. Additional text blocks can be ignored. Speed profiles and gradient profiles normally drawn above the track layout can also be ignored if not already deleted from the plans.

Stitching of Plans

Situation plans are normally drawn on A3 pages. Larger interlockings are spread across 2, 3 or more A3 pages. The challenge here is to stitch the elements of these sheets together correctly avoiding element duplication

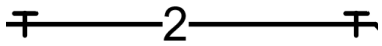
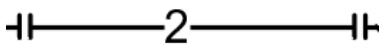
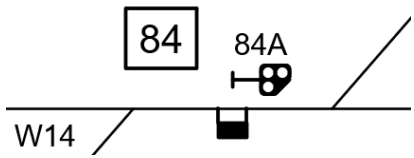
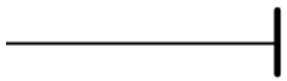
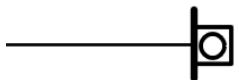


Tracks

Labelling of tracks: Track designations are usually written in large font with a white background in front of the track.

The designation of virtual or fictive tracks - which are needed for operational purposes - are written in a rectangular box.

	Track with track number
	Track with Axle counter:

	Track with insulated rail joints (new symbol acc. Swiss Railway Rule Book RTE)
	Track with insulated rail joint (Old symbol).
	Virtual track.
	Track with buffer stop
	Track with buffer stop and Lamp

Track Vacancy/Occupation



There are two types of track vacancy detection TVD used.

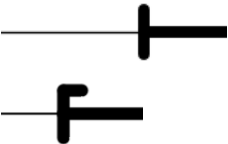


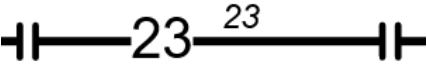
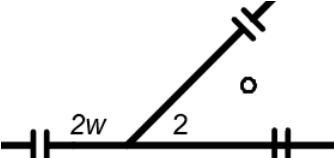
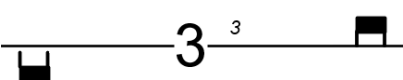

Track circuits/isolated track: These require the insulated rail joints (IRJ) to electrically isolate the track sections. A DC voltage signal is connected to the isolated track rail. The axles of the train create a short circuit between the isolated rail and the grounded rail enabling a train to be detected.

Axle Counters: Uses sensors to count the number of wheels in and the number wheels out of a track section.

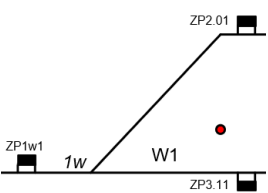
The designation of the TVD section is correctly written in smaller text on or below the line. It is often left away, when the designation is the same as the track designation. In Some plans the TVD Section designation is written in the same format as the track designation.

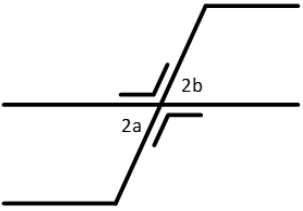
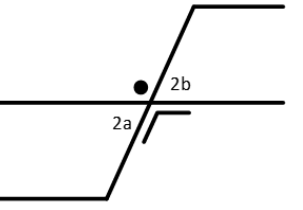
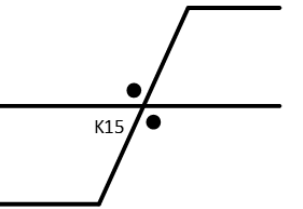
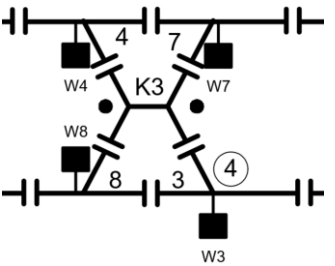


Additionally, for detection of a train at a specific point, rail contacts (wheel detectors) are used.

	Insulated track joint IRJ
	Insulated track joint IRJ

	<p>End insulated track joint IRJ</p> <p><i>In all plans used for this challenge the IRJs do not have a designation. However, rail operators will also give the IRJs a designation number.</i></p>
<p>ZP14.21</p> 	<p>Axle Counter</p> <p>Designation begins with ZP followed by number.</p>
 <p>SK405</p>	<p>Rail contact (wheel detector)</p> <p>Detects presence of a train at a specific point.</p> <p>Designation begins with SK followed by number.</p>
	<p>Track circuit TVD Section with IRJs</p>
	<p>Track circuit TVD of a turnout with IRJs</p>
	<p>TVD Section 3 with axle counters-</p> <p>The orientation of the axle counter (above or below the line) is important for the engineering of the axle counter system.</p>
	<p>TVD Sections 3.1 and 3.2 with axel counters</p>

Turnouts, (Points, Switches), Diamond crossings / Derailers

	<p>Single turnout.</p> <p>The turnout designation usually placed between the two paths.</p> <p>The designation can be with or without the prefix W.</p>
---	---

	Double slip crossing. The turnout motors have not been shown.
	single slip crossing. The turnout motors have not been shown.
	Diamond Crossing. No moving parts
	Scissors crossover. Its four turnouts with a diamond crossing. The turnouts will have a turnout number (sometimes with a prefix W) The crossing in the middle should have a designation: K followed by a number
	Derailers
	Electrical turnout motor (points machine)

Signals





Main Signals

In Switzerland signals normally stand on the left side of the track in the direction of travel. They can, however, in exceptions stand on the right side of the track.

Signal designations consist of a letter and number. The letter is assigned sequentially in the direction of increasing kilometer. The number corresponds to the track on which the

train stands in front of the signal. In older interlockings the signal designations will often only consist of letter.



Signal aspects are written in smaller text above or below or beside the signal designation.

H _{1,2} B1 	Main Signal (mounted on a signal mast)
H _{1,2} A465 	Tunnel Main Signal (mounted on wall fixing)
	Main Signal (mounted on a catenary mast)
	Main Signal (mounted on fixing from above)

Distant Signals



The Distant Signal is the distant signal of a Main Signal. The designation of a Distant Signal includes a letter and a number. The letter corresponds to the associated Main Signal. The number corresponds to the track on which the Distant Signal stands

The signal designation and the signal aspects of distant signals always include a star *,



W, 1*, 2*, 3* A*716 	Distant Signal.
W, 1*, 2*, 3* D*715 	Tunnel Distant Signal



Main Signals and Distant Signals on the same mast.

This signal contains the Main Signal for the section ahead and the Distant Signal of the next signal or group of signals. This signal is often the **entry signal** of the station.

H _{1,2} / W, 1*, 2*, 3* D481 / B*481 	Main Signal and Distant Signal on the same mast.
H _{1,2} / W, 1*, 2*, 3* E645 / D*645 	Tunnel type, Main Signal and Distant Signal on the same mast.

Auxiliary/Permissive signals




 	Permissive signal (Hi or HIS). Permission to pass the signal at danger, at sight speed. Usually installed below the entry signal.
---	---

	Occupied station tracks ahead. Usually installed below the entry signal.
	Permissive and occupied station track signal. Usually installed below the entry signal.



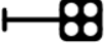


Dwarf signals



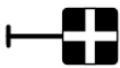
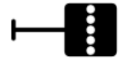
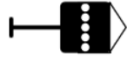
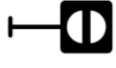


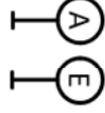
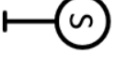
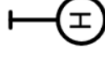

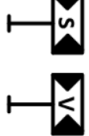

In Switzerland, secured and interlocked shunting routes are signaled with dwarf signals.


The signal designation consists of a number followed by either the letter A or B. The Number corresponds to the track or fictive track in front of the signal. The letter A is assigned to dwarf signals that signal in the direction of increasing km and the letter B for the direction of decreasing km.

1A 	A dwarf signal on track 1 in the direction of increasing km
 1B	A dwarf signal on track 1 in the direction of decreasing km
50B 	A dwarf signal with hat (indicating a manual shunting zone) in direction of decreasing km

Supplementary signals

	Turnout position signal Designation prefix: WLS
	Permission to depart signal. Designation prefix: AS
	Permission to depart and brake test signal Designation prefix BAS
	Proceed Indication signal Designation prefix F or FM. Followed by the associated exit signal designation.
	Limit of movement authority indication board for a group exit signal. (Where the signal is used for more than one track) Designation prefix F or FM. Followed by exit signal designation. Sometimes the signal aspect number relevant for that track is written on a sign above the board.

	Shunting signal: Shunting with caution
	Shunting signal: Shunting allowed
	Indication board: No shunting allowed or no shunting past this point. Designation prefix RH
	In Possession Signal
	In Possession Signal with hat
	In Possession Signal (lantern type)
	Indication board: missing distant signal
	Request stop indicator Designation prefix BH or BHS
	Indication boards: beginning and end of cog rail tracks.
	Indication board: Missing station entry signal
	Indication board: Service Stop on the line between stations (way station).
	Halt board: End of movement authority board.
	Indication boards: ZSi system
	Mechanical, Lower Pantograph Signal

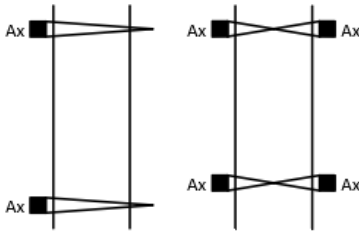


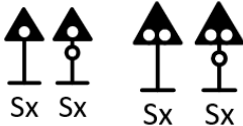
	Mechanical Turnout lantern. Usually mounted on top of turnout motor.
---	--


Balises / ZBS- Magnets

The Balise serve to transmit position, gradients and distance to next signal data to a passing train and/or communicate the status of the next signal (input for the on board safety unit, can trigger e.g. emergency breaks if a signal is passed at red).

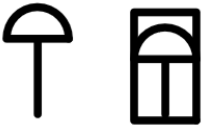

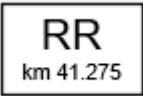



Loop 6805; Key 1 260m □	Euro Loop
F □ □ T	Transparent data Balise Group designation number
F □ □ F	Fixed data Balise Group designation number
○ ●	Train protection magnets ZSI90. Designation usually begins with ZS

Level Crossings

	Level crossings - two barriers and 4 barriers. Each barrier has a motor/drive. Each motor has a designation
BUe 508 „Terzen“	Level crossing designation with level crossing name.
	Level crossing obstacle detection system
	Level crossing control cabinet
	Level crossing road traffic signals: Single flasher and Single flasher with bell. Double flasher and Double flasher with bell.

	Level crossing trackside control signals: Designation usually begins with prefix KL

Other information displayed

	Push button / Push button box Designation usually begins with prefix TK
 KV416	Cable distribution box Designation usually begins with prefix KV
	Computer room
	Main station building
	Platform
	Rhombus: This is not an element. This is just an information on the plan to the rail operator and operations team that the turnout has a longer than standard length of TVD section.