A TikZ library for track schematics

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1. Introduction

1.1. About tikz-trackschematic

The Ti\kZ\-trackschematic library is a toolbox of symbols geared primarily towards creating track schematic for either research or educational purposes. It provides a \Ti\kZ\ frontend to some of the symbols which maybe needed to describe situations and layouts in railway operation. The library is divided into four sublibraries: topology, trafficcontrol, vehicles, constructions, electrics, and measures.

1.2. Acknowledgement

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 826347.

1.3. Requirements

The library uses Ti\kZ\ and it is based the following packages: \texttt{tikz}, \texttt{lmodern}, \texttt{xcolor}, and \texttt{etoolbox}. Further more it uses the following Ti\kZ\ libraries: \texttt{calc}, \texttt{intersections}, \texttt{patterns}, and \texttt{arrows.meta}.

1.4. License

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1.5. Alternatives

Apart from this library, there is also a \texttt{Signalschablone} with german (Deutsche Bahn) symbols for MS Visio.

2. Usage

2.1. A complete minimal example

The command \texttt{\usepackage{tikz-trackschematic}} will load the library; place it somewhere in your preamble. Here is a complete working minimal example which will produce a single PDF file with the figure on the right:

```
\documentclass{standalone}
% loading the library
\usepackage{tikz-trackschematic}
\begin{document}
% draw a track
\maintrack (0,0) -- (6,0);
% place a train on the track
\train[forward] at (5,0) label ();
\end{tikzpicture}
\end{document}
```
2. Usage

2.2. Placement

To place symbols in a track schematic, they need to be placed and oriented correctly. The placement is done through the given TikZ coordinate. There are a few assumptions made about the placement:

1. Parallel tracks are drawn at a distance of 1 cm (which is the base unit of TikZ).
2. Tracks are only drawn at an angle of \( n \cdot 45^\circ \).

2.3. Orientation system

The orientation is controlled via given TikZ options or pgfkey. The orientation options/pgfkeys are named in relation to orientation-based coordinates, which inhibit their meaning from reading left to right being forward and relate left/right to that movement.

The main option/pgfkey is the `face` option to control in which direction an object will face. The key can take one of the following two values: `forward`, and `backward`.

\begin{verbatim}
\train[face=forward ] at (coordinate) label ();
\end{verbatim}

\begin{verbatim}
\train[face=backward] at (coordinate) label ();
\end{verbatim}

As a shortcut you may also just give the option `forward` or `backward` without the `face=` in front of it. If you have objects which branch either to the left or the right you have to give the `branch` option which takes one of the following two values: `left`, and `right`.

\begin{verbatim}
\ turnout[forward ,branch=left ] at (coordinate) label ();
\end{verbatim}

\begin{verbatim}
\ turnout[forward ,branch=right] at (coordinate) label ();
\end{verbatim}

\begin{verbatim}
\ turnout[backward,branch=left ] at (coordinate) label ();
\end{verbatim}

\begin{verbatim}
\ turnout[backward,branch=right] at (coordinate) label ();
\end{verbatim}

There is no shortcut and the key `branch=` must be given contrary to the key `face=`.

2.4. Left- and right-hand traffic

The traffic practice to divide bidirectional traffic has impact mostly on traffic control. The default traffic practice for this library is right-hand traffic. You can change it either globally or locally with
the key `traffic practice=left`. There is also the alias `position` for single local entries.

```latex
\documentclass{standalone}
\begin{document}
\begin{tikzpicture}
\tikzset{traffic practice=left}
\maintrack (0,0) -- (5,0);
\maintrack (0,1) -- (5,1);
\routesignal[forward] at (2,1) label (left);
\routesignal[forward,position=right] at (2,0) label (right);
\end{tikzpicture}
\end{document}
```

### 2.5. Colors: background and foreground

The two main colors `white` and `black` are set for the `background` and `foreground` keys by default. If you want to change them, provide a new value for the keys. For example like this:

```latex
\documentclass{standalone}
\begin{document}
\begin{tikzpicture}
\tikzset{background=lightgray,foreground=violet}
\maintrack (0,0) -- (6,0);
\train[forward] at (5,0) label (grey train);
\end{tikzpicture}
\end{document}
```

### 3. Provided Symbols and their commands

#### 3.1. overview

To get a table with all symbols the command `\tsFullSymbology` is provided. It can be used in a normal `\LaTeX` environment and will list all symbols of all sublibraries.

`\tsFullSymbology`

Each symbol provides a reference name for a symbology entry if there is the need to create an own table with the symbols. It can be used in a normal `\LaTeX` environment and will show the named symbol with a length of 6.2 cm and a width of 1 cm.

`\tsSymbol[width](main_track)`

There is also a table with snippets for various situations. Each snippet and each symbol must be used inside a TikZ environment. Each sublibrary provides different symbols. The following section will go through each symbol their command and options.
3. Provided Symbols and their commands

3.2. Topology

3.2.1. Tracks

Drawing a track follows the same principal as drawing a line in TikZ. There are two general options of track with different commands: main tracks and secondary tracks.

► Main track

\maintrack (coord1) -- (coord2);
\maintrack (coord1) -- (coord2) -- (coord3) -- etc.;

No options available. This command is equivalent to:

\path[draw=foreground, line width=2pt] (coord1) -- (coord2);

Beware of the placement assumption by the library (see Section 2.2).

Symbology entry as seen at top:

\Symbol{main_track}\% TeX environment

► Secondary track

\secondarytrack (coord1) -- (coord2);
\secondarytrack (coord1) -- (coord2) -- (coord3) -- etc.;

For the secondary track you may also use the following alias:

\sidetrack (coord1) -- (coord2);

No options available. The command is equivalent to:

\path[draw=foreground, line width=0.7pt] (coord1) -- (coord2);

Beware of the placement assumption by the library (see Section 2.2).

Symbology entry as seen at top:

\Symbol{secondary_track}\% TeX environment

► Track number or track label

\tracklabel at (coord) label (number);

No options available. This command is equivalent to:

\node[fill=background, text=foreground] at (coord) {number};
3. Provided Symbols and their commands

Symbology entry as seen at top:
\texttt{\textbackslash tsSymbol\{track\_label\} \ TeX environment}

▶ Buffer stops

\texttt{bufferstop[options] at (coord)};

values for options (comma separated):
- forward or backward (mandatory)
- friction=length unit (optional)
- foreground=color (optional, default: black)

Symbology entry as seen at top:
\texttt{\textbackslash tsSymbol\{bufferstop\} \ TeX environment}
\texttt{\textbackslash tsSymbol\{friction_bufferstop\} \ TeX environment}

▶ Track closures

\texttt{trackclosure at (coord)};

No options available.

Symbology entry as seen at top:
\texttt{\textbackslash tsSymbol\{track\_closure\} \ TeX environment}

3.2.2. Turnouts and similar

▶ Turnouts

\texttt{\textbackslash turnout[options] at (coord) label (name)};

values for options (comma separated):
- forward or backward (mandatory)
- branch=left or branch=right (mandatory)
- operation=manual (optional)
- fouling point (optional)
- points=left or points=right (optional)
3. Provided Symbols and their commands

shift label={ (label-coord) } (optional, default: (0,0))
foreground=color (optional, default: black)

Symbology entry as seen at top:

\tsSymbol{turnout_fouling} % TeX environment
\tsSymbol{turnout_manually} % TeX environment

► Diamond crossings

\crossing[options] at (coord) label (name);

values for options (comma seperated):

branch=left or branch=right (mandatory)
fouling point (optional)
shift label={ (label-coord) } (optional, default: (0,0))
foreground=color (optional, default: black)

Symbology entry as seen at top:

\tsSymbol{diamond_crossing} % TeX environment

► Slip switches or slip turnouts

\slip turnout[options] at (coord) label (name1)(name2);

values for options (comma seperated):

branch=left or branch=right (mandatory)
slip=double (default), slip=none, slip=left or slip=right (mandatory)
operation=manual (optional)
fouling point (optional)
forward points=left or forward points=right (optional)
backward points=left or backward points=right (optional)
shift label={ (label-coord) } (optional, default: (0,0))
foreground=color (optional, default: black)
3. Provided Symbols and their commands

Symbology entry as seen at top:
\texttt{Symbol{slip_turnout}\textbackslash{}TeX\ environment}

\section*{Derailers}

\texttt{derailer[options] at (coord) label (name)};

values for options (comma seperated):

- \texttt{forward} or \texttt{backward} (mandatory)
- \texttt{branch=left} or \texttt{branch=right} (mandatory)
- \texttt{shift label=\{\texttt{(label-\texttt{coord})}\}} (optional, default: (0,0))
- \texttt{foreground=\texttt{color}} (optional, default: black)

Symbology entry as seen at top:
\texttt{Symbol{derailer}\textbackslash{}TeX\ environment}

\subsection*{3.3. Vehicles}

\section*{Parked vehicles}

\texttt{parkedvehicles[options] at (coord) label (name)};

values for options (comma seperated):

- \texttt{length=\texttt{length unit}} (optional, default 4cm)
- \texttt{label at=\{\texttt{(label-\texttt{coord})}\}} (optional, default: center)
- \texttt{label align=left} or \texttt{label align=right} (optional, default: center)
- \texttt{foreground=\texttt{color}} (optional, default: black)
- \texttt{background=\texttt{color}} (optional, default: white)

The value for \texttt{(label-\texttt{coord})} is relative to \texttt{(coord)}. An absolute \texttt{(label-\texttt{coord})} can be specified with the Ti\textbackslash{}kZ \texttt{\textbackslash{}coordinate} command.

Symbology entry as seen at top:
\texttt{Symbol{parked\_vehicles}\textbackslash{}TeX\ environment}
3. Provided Symbols and their commands

► Shunting movements

\[\text{\texttt{\textbackslash shunting[options] at (coord) label (name);}}\]

values for options (comma separated):

- movement (optional)
- forward or backward (mandatory)
- length=\textit{length unit} (optional, default 4cm)
- operation=manual or operation=automatic (optional)
- bend left at=\{(bend-coord)\} (optional, default: none)
- bend right at=\{(bend-coord)\} (optional, default: none)
- label at=\{(label-coord)\} (optional, default: center)
- label align=left or label align=right (optional, default: center)
- foreground=color (optional, default: black)
- background=color (optional, default: white)

The value for \{(label-coord)\} and \{(bend-coord)\} is relative to \{(coord)\}. An absolute \{(label-coord)\} or \{(bend-coord)\} can be specified with the \texttt{\textbackslash coordinate} command.

Symbology entry as seen at top:
\[\text{\texttt{\textbackslash tsSymbol\{train\_shunting\}}} \text{\texttt{\textbackslash \texttt{T e X \texttt{\textbackslash environment}}}}\]

► Train runs

\[\text{\texttt{\textbackslash text{\texttt{\textbackslash train[options] at (coord) label (name);}}}\}}\]

values for options (comma separated):

- run=slow, run=normal or run=fast (optional)
- forward or backward (mandatory)
- length=\textit{length unit} (optional, default 4cm)
- operation=manual or operation=automatic (optional)
- ghost (optional)
- bend left at=\{(bend-coord)\} (optional, default: none)
- bend right at=\{(bend-coord)\} (optional, default: none)
- shift label=\{(label-coord)\} (optional, default: (0,0))
3. Provided Symbols and their commands

- \texttt{label align=left} or \texttt{label align=right} (optional, default: center)
- \texttt{foreground=color} (optional, default: black)
- \texttt{background=color} (optional, default: white)

The value for \texttt{(label-coord)} and \texttt{(bend-coord)} is relative to \texttt{(coord)}. An absolute \texttt{(label-coord)} or \texttt{(bend-coord)} can be specified with the Ti\textit{k}Z \texttt{coordinate} command.

Symbology entry as seen at top:
\begin{verbatim}
\texttt{\MakeIndex{train_moving_fast}} % TeX environment
\texttt{\MakeIndex{train_ghost}} % TeX environment
\end{verbatim}

3.4. Traffic control

3.4.1. Stationary signals

**Generic signal command**

\begin{verbatim}
\texttt{\\textbackslash signal[options] at (coord) label (name);}
\end{verbatim}

values for options (comma seperated):

- at least one of the following: distant, speed type, block, route, shunt limit, shunting and/or berth
- forward or backward (mandatory)
- \texttt{speed=value} (optional)
- \texttt{distant speed=value} (optional)
- \texttt{locked=false} (default) or \texttt{locked=true} (optional)
- \texttt{position=left} or \texttt{position=right} (optional, default: \textit{traffic practice})
- \texttt{shift label={ (label-coord)}} (optional, default: \texttt{(0,0)})
- \texttt{foreground=color} (optional, default: black)

**Distant signal**

\begin{verbatim}
\texttt{\\textbackslash distantsignal[options] at (coord) label (name);}
\end{verbatim}

values for options (comma seperated):

- forward or backward (mandatory)
- distant speed=value (optional)
- position=left or position=right (optional, default: \textit{traffic practice})
- shift label={ (label-coord)} (optional, default: \texttt{(0,0)})
3. Provided Symbols and their commands

foreground=color (optional, default: black)

This command is equivalent to:
\signal[{distant, options}] at (coord) label (name);

Symbology entry as seen at top:
\tsSymbol[1.4]{distant_signal}\ TeX environment

**Speed signal/sign**

\speedsignal[options] at (coord) label (name);

For the speed signal you may also use the following alias:
\speedsign[options] at (coord) label (name);

values for options (comma seperated):
  - forward or backward (mandatory)
  - speed=value (optional)
  - position=left or position=right (optional, default: traffic practice)
  - shift label={(label-coord)} (optional, default: (0,0))
  - foreground=color (optional, default: black)

This command is equivalent to:
\signal[speed type, options] at (coord) label (name);

Symbology entry as seen at top:
\tsSymbol[1.4]{speed_signal}\ TeX environment

**Block signal**

\blocksignal[options] at (coord) label (name);

values for options (comma seperated):
  - forward or backward (mandatory)
  - speed=value (optional)
  - position=left or position=right (optional, default: traffic practice)
  - shift label={(label-coord)} (optional, default: (0,0))
3. Provided Symbols and their commands

foreground=color (optional, default: black)

This command is equivalent to:
\signal[block,options] at (coord) label (name);

Symbology entry as seen at top:
\tsSymbol[1.4]{block_signal} % TeX environment

\route signal

\routesignal[options] at (coord) label (name);

values for options (comma seperated):
- forward or backward (mandatory)
- speed=value (optional)
- locked=false (default) or locked=true (optional)
- position=left or position=right (optional, default: traffic practice)
- shift label={(label-coord)} (optional, default: (0,0))
- foreground=color (optional, default: black)

This command is equivalent to:
\signal[route,options] at (coord) label (name);

Symbology entry as seen at top:
\tsSymbol[1.4]{route_signal} % TeX environment

\shunting signal

\shuntsignal[options] at (coord) label (name);

values for options (comma seperated):
- forward or backward (mandatory)
- locked=false (default) or locked=true (optional)
- position=left or position=right (optional, default: traffic practice)
- shift label={(label-coord)} (optional, default: (0,0))
- foreground=color (optional, default: black)
3. Provided Symbols and their commands

This command is equivalent to:
```
\signal[shunting,options] at (coord) label (name);
```

Symbology entry as seen at top:
```
\tsSymbol[1.4]{shunt_signal} \TeX\ environment
```

**Shunt limit**

```
\shuntlimit[options] at (coord) label (name);
```

values for options (comma seperated):
- `forward` or `backward` (mandatory)
- `position=left` or `position=right` (optional, default: `traffic practice`)
- `shift label={ (label-coord) }` (optional, default: (0,0))
- `foreground=color` (optional, default: black)

This command is equivalent to:
```
\signal[shunt limit,options] at (coord) label (name);
```

Symbology entry as seen at top:
```
\tsSymbol[1.4]{shunt_limit} \TeX\ environment
```

**Berth signal/sign**

```
\berthsignal[options] at (coord) label (name);
```

For the speed signal you may also use the following alias:
```
\berthsign[options] at (coord) label (name);
```

values for options (comma seperated):
- `forward` or `backward` (mandatory)
- `position=left` or `position=right` (optional, default: `traffic practice`)
- `shift label={ (label-coord) }` (optional, default: (0,0))
- `foreground=color` (optional, default: black)

This command is equivalent to:
```
\signal[berth,options] at (coord) label (name);
```

Symbology entry as seen at top:
```
\tsSymbol[1.4]{train_berth_sign} \TeX\ environment
```
3. Provided Symbols and their commands

3.4.2. Non-stationary locations

► View point

\textbf{viewpoint}[\text{options}] at (coord);

values for \text{options} (comma seperated):

- \text{forward or backward} (mandatory)
- \text{position=left or position=right} (optional, default: \textit{traffic practice})
- \text{foreground=\textcolor{\text{color}}{\text}color} (optional, default: \textcolor{\text{black}}{\text{black}})

Symbology entry as seen at top:

\texttt{\textbackslash tsSymbol[1.4][view\_point]}% TeX environment

► Braking point

\textbf{brakingpoint}[\text{options}] at (coord) label (name);

values for \text{options} (comma seperated):

- \text{forward, backward or bidirectional} (mandatory)
- \text{position=left or position=right} (optional, default: \textit{traffic practice})
- \text{shift label=\{(label-coord)\}} (optional, default: (0,0))
- \text{foreground=\textcolor{\text{color}}{\text}color} (optional, default: \textcolor{\text{black}}{\text{black}})

Symbology entry as seen at top:

\texttt{\textbackslash tsSymbol[1.4][braking\_point]}% TeX environment

► End of movement authority

\textbf{movementauthority}[\text{options}] at (coord) label (name);

values for \text{options} (comma seperated):

- \text{forward, backward or bidirectional} (mandatory)
- \text{position=left or position=right} (optional, default: \textit{traffic practice})
- \text{shift label=\{(label-coord)\}} (optional, default: (0,0))
foreground=color (optional, default: black)

Symbology entry as seen at top:
\texttt{\textbackslash{Symbol}[1.4]\{end\_of\_authority\}} \texttt{\\hspace{2cm} \textbackslash{TeX} environment}

### Danger point

\hspace{1cm} \texttt{\dangerpoint[options] \hspace{1cm} \texttt{\textbackslash{TeX} environment}}

<table>
<thead>
<tr>
<th>values for options (comma separated):</th>
</tr>
</thead>
<tbody>
<tr>
<td>forward, backward or bidirectional (mandatory)</td>
</tr>
<tr>
<td>position=left or position=right (optional, default: \textit{traffic practice})</td>
</tr>
<tr>
<td>shift label={\texttt{(label-coord)}} (optional, default: (0,0))</td>
</tr>
<tr>
<td>foreground=color (optional, default: black)</td>
</tr>
</tbody>
</table>

Symbology entry as seen at top:
\texttt{\textbackslash{Symbol}[1.4]\{danger\_point\}} \texttt{\\hspace{2cm} \textbackslash{TeX} environment}

### 3.4.3. Clearing points

#### Generic clearing point

\hspace{1cm} \texttt{\clearingpoint[options] \hspace{1cm} \texttt{\textbackslash{TeX} environment}}

<table>
<thead>
<tr>
<th>values for options (comma separated):</th>
</tr>
</thead>
<tbody>
<tr>
<td>at least one of the following: standard, block and/or route</td>
</tr>
<tr>
<td>forward (default) or backward (optional)</td>
</tr>
<tr>
<td>position=left or position=right (optional, default: \textit{traffic practice})</td>
</tr>
<tr>
<td>shift label={\texttt{(label-coord)}} (optional, default: (0,0))</td>
</tr>
<tr>
<td>foreground=color (optional, default: black)</td>
</tr>
</tbody>
</table>

#### Standard clearing point

\hspace{1cm} \texttt{\standardclearing[options] \hspace{1cm} \texttt{\textbackslash{TeX} environment}}

<table>
<thead>
<tr>
<th>values for options (comma separated):</th>
</tr>
</thead>
<tbody>
<tr>
<td>forward (default) or backward (optional)</td>
</tr>
</tbody>
</table>
3. Provided Symbols and their commands

position=left or position=right (optional, default: traffic practice)
shift label={ (label-coord) } (optional, default: (0,0))
foreground=color (optional, default: black)

This command is equivalent to:
\clearingpoint[standard,options] at (coord) label (name);

Symbology entry as seen at top:
\tsSymbol{clearing_point} \TeX environment

Block clearing point

\blockclearing[options] at (coord) label (name);

values for options (comma seperated):
forward (default) or backward (optional)
position=left or position=right (optional, default: traffic practice)
shift label={ (label-coord) } (optional, default: (0,0))
foreground=color (optional, default: black)

This command is equivalent to:
\clearingpoint[block,options] at (coord) label (name);

Symbology entry as seen at top:
\tsSymbol{block_clearing_point} \TeX environment

Route clearing point

\routeclearing[options] at (coord) label (name);

values for options (comma seperated):
forward (default) or backward (optional)
position=left or position=right (optional, default: traffic practice)
shift label={ (label-coord) } (optional, default: (0,0))
foreground=color (optional, default: black)

This command is equivalent to:
\clearingpoint[route,options] at (coord) label (name);
3. Provided Symbols and their commands

Symbology entry as seen at top:
\texttt{\textbackslash tsSymbol\{route\_clearing\_point\}}\ TeX environment

### 3.4.4. Routes

#### Route

\texttt{\textbackslash route[options] at (coord);}

values for options (comma separated):
- forward or backward (mandatory)
- foreground=color (optional, default: black)

Symbology entry as seen at top:
\texttt{\textbackslash tsSymbol\{route\}}\ TeX environment

#### Direction control

\texttt{\textbackslash directioncontrol[options] at (coord);}

values for options (comma separated):
- forward, backward or bidirectional (mandatory)
- foreground=color (optional, default: black)

Symbology entry as seen at top:
\texttt{\textbackslash tsSymbol[1.4]\{direction\_control\}}\ TeX environment

### 3.4.5. Transmitters

#### Generic transmitter command

\texttt{\textbackslash transmitter[options] at (coord) label (name);}

values for options (comma separated):
- type=balise or type=loop (mandatory)
- forward, backward or bidirectional (optional)
- position=left or position=right (optional, default: \textit{traffic practice})
- shift label={\texttt{(label-coord)}} (optional, default: (0,0))
- foreground=color (optional, default: black)
3. Provided Symbols and their commands

### Balise

\[ \textbf{Balise} \]

\balise[options] \text{ at } (\text{coord}) \text{ label } (\text{name}) ;

values for options (comma separated):

- forward, backward or bidirectional (optional)
- position=left or position=right (optional, default: traffic practice)
- shift label=\{(label-coord)\} (optional, default: (0,0))
- foreground=color (optional, default: black)

This command is equivalent to:

\transmitter[type=balise,options] \text{ at } (\text{coord}) \text{ label } (\text{name}) ;

Symbology entry as seen at top:

$\text{Symbol{transmitter\_forward}}$  \(\text{ TeX environment}\)

### Loop

\[ \textbf{Loop} \]

\trackloop[options] \text{ at } (\text{coord}) \text{ label } (\text{name}) ;

values for options (comma separated):

- position=left or position=right (optional, default: traffic practice)
- shift label=\{(label-coord)\} (optional, default: (0,0))
- foreground=color (optional, default: black)

This command is equivalent to:

\transmitter[type=loop,options] \text{ at } (\text{coord}) \text{ label } (\text{name}) ;

Symbology entry as seen at top:

$\text{Symbol{loop\_transmitter}}$  \(\text{ TeX environment}\)

### 3.5. Constructions

#### Platform

\[ \textbf{Platform} \]

\platform[options] \text{ at } (\text{coord}) ;

values for options (comma separated):
3. Provided Symbols and their commands

side=left, side=right or side=both (mandatory)
length=length unit (optional, default 4cm)
width=length unit (optional, default 0.5cm)
foreground=color (optional, default: black)

Symbology entry as seen at top:
\texttt{\symbol{1.4}{platform}}% Tex environment

\begin{itemize}
  \item Level crossings
\end{itemize}

\begin{center}
\begin{tikzpicture}
  \draw (0,0) -- (1,0) node[midway,above] {$\uparrow$} -- (1,1) node[midway,above] {$\downarrow$} -- (0,1) node[midway,above] {$\downarrow$};
\end{tikzpicture}
\end{center}

\texttt{\levelcrossing[options] at (coord)};

values for options (comma seperated):
  \begin{itemize}
  \item barrier=none (default), barrier=semi or barrier=full (optional)
  \item side=both (default), side=left or side=right (optional)
  \item road width=length unit (optional, default 0.4cm)
  \item width=length unit (optional, default 0.5cm)
  \item no road (optional)
  \item foreground=color (optional, default: black)
  \end{itemize}

Symbology entry as seen at top:
\texttt{\symbol{2.0}{level_crossing}}% Tex environment

\begin{itemize}
  \item Bridge
\end{itemize}

\begin{center}
\begin{tikzpicture}
  \draw (0,0) -- (1,0); \draw (0,1) -- (1,1);
\end{tikzpicture}
\end{center}

\texttt{\bridge[options] at (coord)};

values for options (comma seperated):
  \begin{itemize}
  \item length=length unit (optional, default 4cm)
  \item width=length unit (optional, default 0.5cm)
  \item shift left=length unit (optional, default 0cm)
  \end{itemize}
3. Provided Symbols and their commands

- **shift right=length unit** (optional, default 0cm)
- **side=both** (default), **side=left** or **side=right** (optional)
- **foreground=color** (optional, default: black)
- **background=color** (optional, default: white)
- **no background** (optional)

Symbology entry as seen at top:
\[\text{Symbol}[2.0](\text{bridge})\] TeX environment

**Interlocking**

\[\text{interlocking} \text{ at (coord);}\]

No options available.

Symbology entry as seen at top:
\[\text{tsSymbol[interlocking]}\] TeX environment

**Hump**

\[\text{hump} \text{ at (coord);}\]

No options available.

Symbology entry as seen at top:
\[\text{tsSymbol}[1.4](\text{hump})\] TeX environment

**Pylon**

\[\text{pylon}[\text{options}] \text{ at (coord);}\]

values for options (comma separated):
- **side=right** (default), **side=left** or **side=both** (optional)
- **foreground=color** (optional, default: black)
- **background=color** (optional, default: white)

Symbology entry as seen at top:
\[\text{tsSymbol[pylon]}\] TeX environment
3.6. Electrics

Distant power off

\distantpoweroff[options] at (coord) label (name);

values for options (comma separated):

- forward, backward or bidirectional (mandatory)
- position=left or position=right (optional, default: traffic practice)
- signal color=color (optional, default: ts-signal-blue)
- shift label=(label-coord) (optional, default: (0,0))
- foreground=color (optional, default: black)
- background=color (optional, default: white)

The color ts-signal-blue is defined as HTML: 013ADF. The value for (label-coord) is relative to (coord). An absolute (label-coord) can be specified with the TikZ \coordinate command.

Symbology entry as seen at top:

\tsSymbol[1.4]{distant_power_off} \text{TeX environment}

Power off

\poweroff[options] at (coord) label (name);

values for options (comma separated):

- forward, backward or bidirectional (mandatory)
- position=left or position=right (optional, default: traffic practice)
- signal color=color (optional, default: ts-signal-blue)
- shift label=(label-coord) (optional, default: (0,0))
- foreground=color (optional, default: black)
- background=color (optional, default: white)

The color ts-signal-blue is defined as HTML: 013ADF. The value for (label-coord) is relative to (coord). An absolute (label-coord) can be specified with the TikZ \coordinate command.

Symbology entry as seen at top:

\tsSymbol[1.4]{power_off} \text{TeX environment}
3. Provided Symbols and their commands

---

### Power on

\texttt{\textbackslash poweron\{options\} at (coord) label (name);}

values for options (comma separated):

- forward, backward or bidirectional (mandatory)
- position=left or position=right (optional, default: traffic practice)
- signal color=color (optional, default: ts-signal-blue)
- shift label=\{ (label-coord) \} (optional, default: (0,0))
- foreground=color (optional, default: black)
- background=color (optional, default: white)

The color \textit{ts-signal-blue} is defined as \textit{HTML: 013ADF}. The value for (label-coord) is relative to (coord). An absolute (label-coord) can be specified with the \textit{TikZ \coordinate command.}

Symbology entry as seen at top:

\texttt{\textbackslash tsSymbol[1.4]\{power_on\} \textit{\textbackslash TeX\ environment}}

---

### Distant pantograph down

\texttt{\textbackslash distantpantographdown\{options\} at (coord) label (name);}

values for options (comma separated):

- forward, backward or bidirectional (mandatory)
- position=left or position=right (optional, default: traffic practice)
- signal color=color (optional, default: ts-signal-blue)
- shift label=\{ (label-coord) \} (optional, default: (0,0))
- foreground=color (optional, default: black)
- background=color (optional, default: white)

The color \textit{ts-signal-blue} is defined as \textit{HTML: 013ADF}. The value for (label-coord) is relative to (coord). An absolute (label-coord) can be specified with the \textit{TikZ \coordinate command.}

Symbology entry as seen at top:

\texttt{\textbackslash tsSymbol[1.4]\{distant_pantograph_down\} \textit{\textbackslash TeX\ environment}}
3. Provided Symbols and their commands

**Pantograph down**

\pantographdown[options] at (coord) label (name);

values for options (comma separated):

- forward, backward or bidirectional (mandatory)
- position=left or position=right (optional, default: traffic practice)
- signal color=color (optional, default: ts-signal-blue)
- shift label={ (label-coord) } (optional, default: (0,0))
- foreground=color (optional, default: black)
- background=color (optional, default: white)

The color ts-signal-blue is defined as HTML: 013ADF. The value for (label-coord) is relative to (coord). An absolute (label-coord) can be specified with the TikZ \coordinate command.

Symbology entry as seen at top:

```latex
\tsSymbol[1.4]{pantograph_down} \% TeX environment
```

**Pantograph up**

\pantographup[options] at (coord) label (name);

values for options (comma separated):

- forward, backward or bidirectional (mandatory)
- position=left or position=right (optional, default: traffic practice)
- signal color=color (optional, default: ts-signal-blue)
- shift label={ (label-coord) } (optional, default: (0,0))
- foreground=color (optional, default: black)
- background=color (optional, default: white)

The color ts-signal-blue is defined as HTML: 013ADF. The value for (label-coord) is relative to (coord). An absolute (label-coord) can be specified with the TikZ \coordinate command.

Symbology entry as seen at top:

```latex
\tsSymbol[1.4]{pantograph_up} \% TeX environment
```
3. Provided Symbols and their commands

### Wire limit

\wirelimit[options] at (coord) label (name);

values for options (comma separated):

- forward, backward or bidirectional (mandatory)
- position=left or position=right (optional, default: traffic practice)
- signal color=color (optional, default: ts-signal-blue)
- shift label=\{(label-coord)\} (optional, default: (0,0))
- foreground=color (optional, default: black)
- background=color (optional, default: white)

The color ts-signal-blue is defined as HTML: \texttt{013ADF}. The value for (label-coord) is relative to (coord). An absolute (label-coord) can be specified with the Ti\textsc{k}Z \texttt{\coordinate} command.

Symbology entry as seen at top:

\texttt{\tsSymbol[1.4]{wire\_limit}} % TeX environment

### 3.7. Measures

#### Track distance

\trackdistance between (coord1) and (coord2) distance (value);

No options available.

Symbology entry as seen at top:

\texttt{\tsSymbol[2.0]{track\_distance}} % TeX environment

#### Train berth

\berth[options] at (coord) length (value);

values for options (comma separated):

- forward, backward or bidirectional (mandatory)
- length=length unit (optional, default 4cm)
- position=left or position=right (optional, default: traffic practice)
3. Provided Symbols and their commands

foreground=color (optional, default: black)

Symbology entry as seen at top:
\texttt{\textbackslash tSymbol\{train\_berth\}} \texttt{\TeX\ environment}

\begin{itemize}
  \item \texttt{\textbackslash measure\line\{coord1\} -- \{coord2\};}
  \item \texttt{\textbackslash measure\line\{coord1\} -- \{coord2\} -- \{coord3\} -- etc.;}
\end{itemize}

No options available.
This command is equivalent to:
\texttt{ath\{draw=foreground!50!background,dashed,shorten <=0.75cm,shorten >=0.75cm\} \{coord1\} -- \{coord2\};}

Symbology entry as seen at top:
\texttt{\textbackslash tSymbol\{measure\_line\}} \texttt{\TeX\ environment}

\begin{itemize}
  \item \texttt{\textbackslash hectometer\{options\} at \{coord\} mileage \{name\};}
\end{itemize}

values for options (comma separated):

- \texttt{hectometer base=\{(base-coord)\}} (mandatory)
- \texttt{orientation=left} or \texttt{orientation=right} (mandatory)
- \texttt{shift\ label=\{(label-coord)\}} (optional, default: \{(0,0)\})
- \texttt{hectometer color=color} (optional, default: foreground!50!background)

The value for \texttt{(base-coord)} and \texttt{(label-coord)} is relative to \texttt{(coord)}. An absolute \texttt{(base-coord)} or \texttt{(label-coord)} can be specified with the \texttt{TikZ \coordinate} command. Specify a common hectometer base and orientation if you have to place multiple hectometers, i.e. with: \texttt{\tikzset{hectometer base=\{(base-coord)\},orientation=right};}

Symbology entry as seen at top:
\texttt{\textbackslash tSymbol\{hectometer\}} \texttt{\TeX\ environment}
3. Provided Symbols and their commands

Track Marking

rackmarking[color] (coord1) -- (coord2);

\textit{color (optional, default: foreground with opacity 40\%)}

This command is equivalent to:

\begin{verbatim}
\path[
draw, 
line width=8pt, 
opacity=0.4, 
arrows= {
  Bar[line cap=round, line width=1pt, width=12pt]-
  Bar[line cap=round, line width=1pt, width=12pt}
}, 
shorten >=1pt, shorten <=1pt ] (coord1) -- (coord2);
\end{verbatim}

Symbology entry as seen at top:

\texttt{\textbackslash tsSymbol\{track\_marking\}} % TeX environment
## A. Symbology

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Symbol</th>
<th>See section</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>main track</td>
<td>![Symbol]</td>
<td>3.2.1</td>
</tr>
<tr>
<td>2</td>
<td>secondary track</td>
<td>![Symbol]</td>
<td>3.2.1</td>
</tr>
<tr>
<td>3</td>
<td>track label</td>
<td>![Symbol]</td>
<td>3.2.1</td>
</tr>
<tr>
<td>4</td>
<td>bufferstop</td>
<td>![Symbol]</td>
<td>3.2.1</td>
</tr>
<tr>
<td>5</td>
<td>friction bufferstop</td>
<td>![Symbol]</td>
<td>3.2.1</td>
</tr>
<tr>
<td>6</td>
<td>track closure</td>
<td>![Symbol]</td>
<td>3.2.1</td>
</tr>
<tr>
<td>7</td>
<td>turnout</td>
<td>![Symbol]</td>
<td>3.2.2</td>
</tr>
<tr>
<td>8</td>
<td>turnout with fouling point indicator</td>
<td>![Symbol]</td>
<td>3.2.2</td>
</tr>
<tr>
<td>9</td>
<td>turnout operated manually</td>
<td>![Symbol]</td>
<td>3.2.2</td>
</tr>
<tr>
<td>10</td>
<td>turnout with points in right position</td>
<td>![Symbol]</td>
<td>3.2.2</td>
</tr>
<tr>
<td>11</td>
<td>turnout with points in left position</td>
<td>![Symbol]</td>
<td>3.2.2</td>
</tr>
<tr>
<td>12</td>
<td>turnout with moving points</td>
<td>![Symbol]</td>
<td>3.2.2</td>
</tr>
<tr>
<td>13</td>
<td>diamond crossing</td>
<td>![Symbol]</td>
<td>3.2.2</td>
</tr>
<tr>
<td>14</td>
<td>double-slip turnout</td>
<td>![Symbol]</td>
<td>3.2.2</td>
</tr>
<tr>
<td>15</td>
<td>derailer</td>
<td>![Symbol]</td>
<td>3.2.2</td>
</tr>
<tr>
<td>16</td>
<td>parked vehicles</td>
<td>![Symbol]</td>
<td>3.3</td>
</tr>
<tr>
<td>17</td>
<td>train in shunting mode</td>
<td>![Symbol]</td>
<td>3.3</td>
</tr>
<tr>
<td>18</td>
<td>train shunting</td>
<td>![Symbol]</td>
<td>3.3</td>
</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>Symbol</td>
<td>See section</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------</td>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>19</td>
<td>train</td>
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</tr>
<tr>
<td>20</td>
<td>train moving slow</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.3</td>
</tr>
<tr>
<td>21</td>
<td>train moving</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.3</td>
</tr>
<tr>
<td>22</td>
<td>train moving fast</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.3</td>
</tr>
<tr>
<td>23</td>
<td>train ghost</td>
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<td>3.3</td>
</tr>
<tr>
<td>24</td>
<td>train operated automatic</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.3</td>
</tr>
<tr>
<td>25</td>
<td>train operated by human</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.3</td>
</tr>
<tr>
<td>26</td>
<td>distant signal</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.4.1</td>
</tr>
<tr>
<td>27</td>
<td>distant signal with speed indicator</td>
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<td>3.4.1</td>
</tr>
<tr>
<td>28</td>
<td>speed signal</td>
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<td>3.4.1</td>
</tr>
<tr>
<td>29</td>
<td>block signal</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.4.1</td>
</tr>
<tr>
<td>30</td>
<td>route signal</td>
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</tr>
<tr>
<td>31</td>
<td>combined signal (distant, block and route signal)</td>
<td><img src="image" alt="Symbol" /></td>
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<tr>
<td>32</td>
<td>shunt signal</td>
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<td>3.4.1</td>
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<td>34</td>
<td>shunt limit</td>
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<td>3.4.1</td>
</tr>
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<td>35</td>
<td>train berth sign</td>
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</tr>
<tr>
<td>36</td>
<td>view point</td>
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</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>Symbol</td>
<td>See section</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------</td>
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<td>-------------</td>
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<tr>
<td>37</td>
<td>braking point</td>
<td>![braking point symbol]</td>
<td>3.4.2</td>
</tr>
<tr>
<td>38</td>
<td>end of movement authority</td>
<td>![end of movement authority symbol]</td>
<td>3.4.2</td>
</tr>
<tr>
<td>39</td>
<td>danger point</td>
<td>![danger point symbol]</td>
<td>3.4.2</td>
</tr>
<tr>
<td>40</td>
<td>clearing point</td>
<td>![clearing point symbol]</td>
<td>3.4.3</td>
</tr>
<tr>
<td>41</td>
<td>block clearing point</td>
<td>![block clearing point symbol]</td>
<td>3.4.3</td>
</tr>
<tr>
<td>42</td>
<td>route clearing point</td>
<td>![route clearing point symbol]</td>
<td>3.4.3</td>
</tr>
<tr>
<td>43</td>
<td>route</td>
<td>![route symbol]</td>
<td>3.4.4</td>
</tr>
<tr>
<td>44</td>
<td>direction control</td>
<td>![direction control symbol]</td>
<td>3.4.4</td>
</tr>
<tr>
<td>45</td>
<td>transmitter</td>
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<td>3.4.5</td>
</tr>
<tr>
<td>46</td>
<td>transmitter effective forward</td>
<td>![transmitter effective forward symbol]</td>
<td>3.4.5</td>
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<tr>
<td>47</td>
<td>transmitter bidirectional</td>
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<td>3.4.5</td>
</tr>
<tr>
<td>48</td>
<td>loop transmitter</td>
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<td>3.4.5</td>
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<tr>
<td>49</td>
<td>platform</td>
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<tr>
<td>50</td>
<td>level crossing</td>
<td>![level crossing symbol]</td>
<td>3.5</td>
</tr>
<tr>
<td>51</td>
<td>bridge</td>
<td>![bridge symbol]</td>
<td>3.5</td>
</tr>
<tr>
<td>52</td>
<td>hump</td>
<td>![hump symbol]</td>
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</tr>
<tr>
<td>53</td>
<td>interlocking</td>
<td>![interlocking symbol]</td>
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</tr>
<tr>
<td>54</td>
<td>pylons</td>
<td>![pylons symbol]</td>
<td>3.5</td>
</tr>
</tbody>
</table>
### A. Symbology

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Symbol</th>
<th>See section</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>distant power off</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.6</td>
</tr>
<tr>
<td>56</td>
<td>power off</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.6</td>
</tr>
<tr>
<td>57</td>
<td>power on</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.6</td>
</tr>
<tr>
<td>58</td>
<td>distant pantograph down</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.6</td>
</tr>
<tr>
<td>59</td>
<td>pantograph down</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.6</td>
</tr>
<tr>
<td>60</td>
<td>pantograph up</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.6</td>
</tr>
<tr>
<td>61</td>
<td>wire limit</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.6</td>
</tr>
<tr>
<td>62</td>
<td>track distance (in m)</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.7</td>
</tr>
<tr>
<td>63</td>
<td>train berth shape</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.7</td>
</tr>
<tr>
<td>64</td>
<td>Measure line</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.7</td>
</tr>
<tr>
<td>65</td>
<td>hectometer</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.7</td>
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<tr>
<td>66</td>
<td>track marking</td>
<td><img src="image" alt="Symbol" /></td>
<td>3.7</td>
</tr>
</tbody>
</table>
B. Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Author(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>2018-09-14</td>
<td>MS</td>
<td>Basic concept of a library with railway topology symbols and some examples.</td>
</tr>
<tr>
<td>0.2</td>
<td>2018-12-19</td>
<td>MS</td>
<td>Added transmitters and minor improvements.</td>
</tr>
<tr>
<td>0.3</td>
<td>2019-04-04</td>
<td>MS</td>
<td>Moved snippet folder to root folder and defined and used color foreground and background.</td>
</tr>
<tr>
<td>0.4</td>
<td>2019-07-21</td>
<td>MS</td>
<td>Reworked library for common tikz library layout.</td>
</tr>
<tr>
<td>0.5</td>
<td>2020-01-14</td>
<td>MS</td>
<td>Introducing new syntax and providing a documentation.</td>
</tr>
<tr>
<td>0.5.1</td>
<td>2020-02-10</td>
<td>MS</td>
<td>Modified symbol &quot;end of movement authority&quot;; added symbols &quot;braking point&quot; and &quot;danger point&quot;.</td>
</tr>
<tr>
<td>0.6</td>
<td>2021-01-02</td>
<td>MS</td>
<td>Added symbols for &quot;direction control&quot;, &quot;track marking&quot;, &quot;pylons&quot; and electric wiring; changed symbol for &quot;friction bufferstop&quot;; created an encapsulating package for future flexibility - changed load command for library to \usepackage{tikz-trackschematic}.</td>
</tr>
</tbody>
</table>

Martin Scheidt (MS)