# {\texttt{TikZ-trackschematic}}

A TikZ library for track schematics

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1. Introduction

1.1. About tikz-trackschematic

The TikZ-trackschematic library is a toolbox of symbols geared primarily towards creating track schematic for either research or educational purposes. It provides a TikZ 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. If you want to cite this project please use the following informations: Scheidt, M. (2021). TikZ-trackschematics (Version 0.6.3) DOI: 10.5281/zenodo.5539845

1.3. Requirements

The library uses TikZ and it is based the following packages: tikz, lmodern, xcolor, and etoolbox. Further more it uses the following TikZ libraries: calc, intersections, patterns, and arrows.meta.

1.4. License

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1.5. Alternatives

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

2. Usage

2.1. A complete minimal example

The command \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:

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

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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 inhibit their meaning from reading left to right as forward and relate left/right to that movement.

```
\train[face=forward] at (coordinate) label ();
```

As a shortcut you may also give the option forward 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.

```
\turnout[forward,branch=left] at (coordinate) label ();
```

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}
$\$ load the library
\usepackage{tikz-trackschematic}

\begin{document}
\begin{tikzpicture}
% set the traffic practice
\tikzset{traffic practice=left}
\maintrack (0,1) -- (5,1);
\maintrack (0,0) -- (5,0);
\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}
$\$ load the library
\usepackage{tikz-trackschematic}

\begin{document}
\begin{tikzpicture}
% set the colors
\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 \texttt{\textbackslash tsFullSymbology} is provided. It can be used in a normal \texttt{\LaTeX} environment and will list all symbols of all sublibraries.

```latex
\texttt{\textbackslash 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 \texttt{\LaTeX} environment and will show the named symbol with a length of 6.2 cm and a height of 1 cm.

```latex
\tsSymbol[height](symbol\_name)
```

There is also a table with snippets for various situations. Each snippet and each symbol must be used inside a \texttt{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 principle as drawing a line in TikZ. There are two general options of tracks 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:

\texttt{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:

\texttt{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\}} \textit{\LaTeX{} environment}

\begin{itemize}
  \item \textbf{Buffer stops}
    
    \begin{tikzpicture}
      \draw [thick] (0,0) -- (1,0) -- (1,1) -- (0,1) -- cycle;
    \end{tikzpicture}

    \texttt{\textbackslash bufferstop\{options\} at \{coord\};}

    \textbf{values for options (comma separated)}:
    \begin{itemize}
      \item forward or backward (mandatory)
      \item \texttt{friction=\textit{length unit}} (optional)
      \item \texttt{foreground=\textit{color}} (optional, default: \textit{black})
    \end{itemize}

    Symbology entry as seen at top:
    \texttt{\textbackslash tsSymbol\{bufferstop\}} \textit{\LaTeX{} environment}
    \texttt{\textbackslash tsSymbol\{friction\_bufferstop\}} \textit{\LaTeX{} environment}
\end{itemize}

\begin{itemize}
  \item \textbf{Track closures}
    
    \begin{tikzpicture}
      \draw [thick] (0,0) -- (2,0) -- (2,2) -- (0,2) -- cycle;
    \end{tikzpicture}

    \texttt{\textbackslash trackclosure at \{coord\};}

    \textbf{No options available.}

    Symbology entry as seen at top:
    \texttt{\textbackslash tsSymbol\{track\_closure\}} \textit{\LaTeX{} environment}
\end{itemize}

3.2.2. Turnouts and similar

\begin{itemize}
  \item \textbf{Turnouts}
    
    \begin{tikzpicture}
      \draw [thick] (0,0) -- (2,0) -- (2,2) -- (0,2) -- cycle;
      \draw [thick] (0,0) -- (0,-1); \draw [thick] (2,0) -- (2,-1);
    \end{tikzpicture}

    \texttt{\textbackslash turnout\{options\} at \{coord\} label \{name\};}

    \textbf{values for options (comma separated)}:
    \begin{itemize}
      \item forward or backward (mandatory)
      \item \texttt{branch=left} or \texttt{branch=right} (mandatory)
      \item \texttt{operation=manual} (optional)
      \item fouling point (optional)
      \item \texttt{points=left}, \texttt{points=right}, or \texttt{points=moving} (optional, default: \textit{none})
    \end{itemize}
\end{itemize}
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:
\symbol{turnout_fouling} % TeX environment
\symbol{turnout_manually} % TeX environment

**Diamond crossings**

```
crossing[options] at (coord) label (name);
```
values for options (comma separated):
- 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:
\symbol{diamond_crossing} % TeX environment

**Slip switches or slip turnouts**

```
slipturnout[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, forward points=right, or forward points=moving (optional, default: none)
- backward points=left, backward points=right, or backward points=moving (optional, default: none)
- shift label={ (label-coord) } (optional, default: (0,0))
3. Provided Symbols and their commands

foreground=\textcolor{color}(optional, default: black)

Symbology entry as seen at top:
\texttt{\textbackslash tsSymbol\{slip_turnout\}} \textbackslash \textit{TikZ environment}

\textbf{Derailers}

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

values for options (comma separated):

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

Symbology entry as seen at top:
\texttt{\textbackslash tsSymbol\{derailer\}} \textbackslash \textit{TikZ environment}

\section*{3.3. Vehicles}

\textbf{Parked vehicles}

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

values for options (comma separated):

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

Symbology entry as seen at top:
\texttt{\textbackslash tsSymbol\{parked_vehicles\}} \textbackslash \textit{TikZ environment}
3. Provided Symbols and their commands

**Shunting movements**

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

values for options (comma separated):

- movement (optional)
  - forward or backward (mandatory)
- length=\textbackslash length\ unit (optional, default 4cm)
- operation=\textbackslash manual or operation=\textbackslash 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=\textbackslash color (optional, default: black)
- background=\textbackslash 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 Ti\textbackslash kZ \textbackslash coordinate command.

Symbology entry as seen at top:

\texttt{\textbackslash tsSymbol[train\_shunting]\ TeX\ environment}

**Train runs**

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

values for options (comma separated):

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

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 TiKZ coordinate command.

Symbology entry as seen at top:
\texttt{\textbackslash tsSymbol\{train\_moving\_fast\}}\ TeX environment
\texttt{\textbackslash tsSymbol\{train\_ghost\}}\ TeX environment

3.4. Traffic control

3.4.1. Stationary signals

\textbf{Generic signal command}

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

values for options (comma seperated):

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

\textbf{Distant signal}

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

values for options (comma seperated):

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

foreground=color (optional, default: black)

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

Symbology entry as seen at top:
```
\texttt{\textbackslash tsSymbol[1.4]{}\texttt{(distant_signal)} \textbackslash TeX\ environment}
```

▸ Speed signal/sign

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

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

values for options (comma seperated):

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

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

Symbology entry as seen at top:
```
\texttt{\textbackslash tsSymbol[1.4]{}\texttt{(speed_signal)} \textbackslash TeX\ environment}
```

▸ Block signal

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

values for options (comma seperated):

- \texttt{forward} or \texttt{backward} (mandatory)
- \texttt{speed=\texttt{value}} (optional)
- \texttt{position=left} or \texttt{position=right} (optional, default: \textit{traffic practice})
- \texttt{shift label=} \{ \texttt{(label-coord)} \} (optional, default: \texttt{(0,0)})
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:
\[\text{\textbackslash signal}\{\text{shunting}, \text{options}\} \text{ at } (\text{coord}) \text{ label } (\text{name});\]

Symbology entry as seen at top:
\[	ext{\textbackslash tsSymbol}[1.4]\{\text{shunt\_signal}\}\text{ \textbackslash TeX\ environment}\]

---

**Shunt limit**

\[\text{\textbackslash shunt\_limit}\{\text{options}\} \text{ at } (\text{coord}) \text{ label } (\text{name});\]

values for options (comma separated):
- 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:
\[\text{\textbackslash signal}\{\text{shunt\_limit}, \text{options}\} \text{ at } (\text{coord}) \text{ label } (\text{name});\]

Symbology entry as seen at top:
\[	ext{\textbackslash tsSymbol}[1.4]\{\text{shunt\_limit}\}\text{ \textbackslash TeX\ environment}\]

---

**Berth signal/sign**

\[\text{\textbackslash berth\_signal}\{\text{options}\} \text{ at } (\text{coord}) \text{ label } (\text{name});\]

For the speed signal you may also use the following alias:
\[\text{\textbackslash berth\_sign}\{\text{options}\} \text{ at } (\text{coord}) \text{ label } (\text{name});\]

values for options (comma separated):
- 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:
\[\text{\textbackslash signal}\{\text{berth}, \text{options}\} \text{ at } (\text{coord}) \text{ label } (\text{name});\]

Symbology entry as seen at top:
\[	ext{\textbackslash tsSymbol}[1.4]\{\text{train\_berth\_sign}\}\text{ \textbackslash TeX\ environment}\]
3. Provided Symbols and their commands

3.4.2. Non-stationary locations

► View point

\[\text{Symbol}[\text{viewpoint}][\text{options}]\text{ at } (\text{coord});\]
values for options (comma separated):

- forward or backward (mandatory)
- position=left or position=right (optional, default: traffic practice)
- foreground=color (optional, default: black)

Symbology entry as seen at top:

\[\text{\textbackslash tsSymbol}[1.4][\text{view_point}]\text{ \textbackslashTeX\ environment}\]

► Braking point

\[\text{Symbol}[\text{brakingpoint}][\text{options}]\text{ at } (\text{coord}) \text{ label } (\text{name});\]
values for options (comma separated):

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

Symbology entry as seen at top:

\[\text{\textbackslash tsSymbol}[1.4][\text{braking_point}]\text{ \textbackslashTeX\ environment}\]

► End of movement authority

\[\text{\textbackslash movementauthority}[\text{options}]\text{ at } (\text{coord}) \text{ label } (\text{name});\]
values for options (comma separated):

- forward, backward or bidirectional (mandatory)
- 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)

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

\section*{Danger point}

\begin{itemize}
  \item \texttt{\textbackslash dangerpoint[options] at (coord) label (name)};
\end{itemize}

values for options (comma separated):
  \begin{itemize}
  \item forward, backward or bidirectional (mandatory)
  \item position=left or position=right (optional, default: \texttt{traffic\ practice})
  \item shift label=\{(label-coord)\} (optional, default: (0,0))
  \item foreground=color (optional, default: black)
\end{itemize}

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

\subsection*{3.4.3. Clearing points}

\section*{Generic clearing point}

\begin{itemize}
  \item \texttt{\textbackslash clearingpoint[options] at (coord) label (name)};
\end{itemize}

values for options (comma separated):
  \begin{itemize}
  \item at least one of the following: standard, block and/or route
  \item forward (default) or backward (optional)
  \item position=left or position=right (optional, default: \texttt{traffic\ practice})
  \item shift label=\{(label-coord)\} (optional, default: (0,0))
  \item foreground=color (optional, default: black)
\end{itemize}

\section*{Standard clearing point}

\begin{itemize}
  \item \texttt{\textbackslash standardclearing[options] at (coord) label (name)};
\end{itemize}

values for options (comma separated):
  \begin{itemize}
  \item forward (default) or backward (optional)
\end{itemize}
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 separated):
  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 separated):
  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

3.4.4. Routes

**Route**

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

values for \texttt{options} (comma separated):

- \texttt{forward} or \texttt{backward} (mandatory)
- \texttt{foreground} = \texttt{color} (optional, default: black)

3.4.5. Transmitters

**Generic transmitter command**

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

values for \texttt{options} (comma separated):

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

### Balise

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

**Symbology entry as seen at top:**

\texttt{Symbol{transmitter\_forward}}

### Loop

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

**Symbology entry as seen at top:**

\texttt{Symbol{loop\_transmitter}}

### 3.5. Constructions

#### Platform

\platform[options] \text{at (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:
\begin{verbatim}
\texttt{\textbackslash tsSymbol[1.4][platform]} \texttt{\TeX \ environment}
\end{verbatim}

\begin{itemize}
  \item \textbf{Level crossings}
  \begin{center}
    \begin{tikzpicture}
      \draw (0,0) -- (0,1);
      \draw (1,0) -- (1,1);
    \end{tikzpicture}
  \end{center}

  Symbology entry as seen at top:
  \begin{verbatim}
  \texttt{\textbackslash levelcrossing[options] at (coord)};
  \end{verbatim}

  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:
  \begin{verbatim}
  \texttt{\textbackslash tsSymbol[2.0][level\_crossing]} \texttt{\TeX \ environment}
  \end{verbatim}

  \begin{itemize}
    \item \textbf{Bridge}
    \begin{center}
      \begin{tikzpicture}
        \draw (0,0) -- (0,1);
        \draw (1,0) -- (1,1);
      \end{tikzpicture}
    \end{center}

    Symbology entry as seen at top:
    \begin{verbatim}
    \texttt{\textbackslash bridge[options] at (coord)};
    \end{verbatim}

    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}
  \end{itemize}
\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:

```
\tsSymbol[2.0]{bridge} \ TeX environment
```

▸ Interlocking

```
\interlocking \text{at} \ (\text{coord});
```

No options available.

Symbology entry as seen at top:

```
\tsSymbol{interlocking} \ TeX environment
```

▸ Hump

```
\hump \text{at} \ (\text{coord});
```

No options available.

Symbology entry as seen at top:

```
\tsSymbol[1.4]{hump} \ TeX environment
```

▸ Pylon

```
\pylon[options] \text{at} \ (\text{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:

```
\tsSymbol{pylon} \ TeX environment
```
3.6. Electrics

Distant power off

```latex
\texttt{\textbackslash distantpoweroff[options] \texttt{at (coord) label (name);} }
```

values for options (comma separated):

- forward, backward or bidirectional (mandatory)
- position=left or position=right (optional, default: \textit{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 Ti\textit{k}Z \texttt{coordinate} command.

Symbology entry as seen at top:

```latex
\texttt{\textbackslash tsSymbol[1.4]\{distant\_power\_off\} \texttt{\% TeX environment} }
```

Power off

```latex
\texttt{\textbackslash poweroff[options] \texttt{at (coord) label (name);} }
```

values for options (comma separated):

- forward, backward or bidirectional (mandatory)
- position=left or position=right (optional, default: \textit{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 Ti\textit{k}Z \texttt{coordinate} command.

Symbology entry as seen at top:

```latex
\texttt{\textbackslash tsSymbol[1.4]\{power\_off\} \texttt{\% TeX environment} }
```
3. Provided Symbols and their commands

**Power on**

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

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:

\[\text{\texttt{\textbackslash tsSymbol[1.4]{power_on} \textbackslash\textbackslash}}\]

**Distant pantograph down**

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

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:

\[\text{\texttt{\textbackslash tsSymbol[1.4]{distant_pantograph_down} \textbackslash\textbackslash}}\]
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 \texttt{Ti\kern0.10em kZ \coordinate} command.

Symbology entry as seen at top:

\texttt{\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 \texttt{Ti\kern0.10em kZ \coordinate} command.

Symbology entry as seen at top:

\texttt{\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 seperated):

- 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]{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:

\tsSymbol[2.0]{track_distance} % TeX environment

#### Train berth

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

values for options (comma seperated):

- forward, backward or bidirectional (mandatory)
- length=length unit (optional, default 4cm)
- position=left or position=right (optional, default: traffic practice)
foreground=color (optional, default: black)

Symbology entry as seen at top:
```latex
\tsSymbol{train_berth}\% TeX environment
```

► Measure line
-------------------

```latex
\measureline (coord1) -- (coord2);
\measureline (coord1) -- (coord2) -- (coord3) -- etc.;
```

No options available.  
This command is equivalent to:
```latex
ath[draw=foreground!50!background,dashed,shorten <=0.75cm,shorten >=0.75cm] (coord1) -- (coord2);
```

Symbology entry as seen at top:
```latex
\tsSymbol{measure_line}\% TeX environment
```

► Hectometer

```
\begin{tikzpicture}
\coordinate (hectometer1) at (0,0);
\coordinate (hectometer2) at (1,0);
\coordinate (hectometer3) at (2,0);
\coordinate (hectometer4) at (3,0);

\draw[thick] (hectometer1) -- (hectometer2) -- (hectometer3) -- (hectometer4);
\end{tikzpicture}
```

values for options (comma seperated):

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

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

Symbology entry as seen at top:
```latex
\tsSymbol{hectometer}\% TeX environment
```
3. Provided Symbols and their commands

**Track Marking**

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

color (optional, default: foreground with opacity 40%)

This command is equivalent to:

\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);

Symbology entry as seen at top:

\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>🚅</td>
<td>3.2.1</td>
</tr>
<tr>
<td>2</td>
<td>secondary track</td>
<td>🚅</td>
<td>3.2.1</td>
</tr>
<tr>
<td>3</td>
<td>track label</td>
<td>🚅</td>
<td>3.2.1</td>
</tr>
<tr>
<td>4</td>
<td>bufferstop</td>
<td>🚅</td>
<td>3.2.1</td>
</tr>
<tr>
<td>5</td>
<td>friction bufferstop</td>
<td>🚅</td>
<td>3.2.1</td>
</tr>
<tr>
<td>6</td>
<td>track closure</td>
<td>🚅</td>
<td>3.2.1</td>
</tr>
<tr>
<td>7</td>
<td>turnout</td>
<td>🚅</td>
<td>3.2.2</td>
</tr>
<tr>
<td>8</td>
<td>turnout with fouling point indicator</td>
<td>🚅</td>
<td>3.2.2</td>
</tr>
<tr>
<td>9</td>
<td>turnout operated manually</td>
<td>🚅</td>
<td>3.2.2</td>
</tr>
<tr>
<td>10</td>
<td>turnout with points in right position</td>
<td>🚅</td>
<td>3.2.2</td>
</tr>
<tr>
<td>11</td>
<td>turnout with points in left position</td>
<td>🚅</td>
<td>3.2.2</td>
</tr>
<tr>
<td>12</td>
<td>turnout with moving points</td>
<td>🚅</td>
<td>3.2.2</td>
</tr>
<tr>
<td>13</td>
<td>diamond crossing</td>
<td>🚅</td>
<td>3.2.2</td>
</tr>
<tr>
<td>14</td>
<td>double-slip turnout</td>
<td>🚅</td>
<td>3.2.2</td>
</tr>
<tr>
<td>15</td>
<td>derailer</td>
<td>🚅</td>
<td>3.2.2</td>
</tr>
<tr>
<td>16</td>
<td>parked vehicles</td>
<td>🚅</td>
<td>3.3</td>
</tr>
<tr>
<td>17</td>
<td>train in shunting mode</td>
<td>🚅</td>
<td>3.3</td>
</tr>
<tr>
<td>18</td>
<td>train shunting</td>
<td>🚅</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>
<td><img src="image1" alt="Symbol" /></td>
<td>3.3</td>
</tr>
<tr>
<td>20</td>
<td>train moving slow</td>
<td><img src="image2" alt="Symbol" /></td>
<td>3.3</td>
</tr>
<tr>
<td>21</td>
<td>train moving</td>
<td><img src="image3" alt="Symbol" /></td>
<td>3.3</td>
</tr>
<tr>
<td>22</td>
<td>train moving fast</td>
<td><img src="image4" alt="Symbol" /></td>
<td>3.3</td>
</tr>
<tr>
<td>23</td>
<td>train ghost</td>
<td><img src="image5" alt="Symbol" /></td>
<td>3.3</td>
</tr>
<tr>
<td>24</td>
<td>train operated automatically</td>
<td><img src="image6" alt="Symbol" /></td>
<td>3.3</td>
</tr>
<tr>
<td>25</td>
<td>train operated by human</td>
<td><img src="image7" alt="Symbol" /></td>
<td>3.3</td>
</tr>
<tr>
<td>26</td>
<td>distant signal</td>
<td><img src="image8" alt="Symbol" /></td>
<td>3.4.1</td>
</tr>
<tr>
<td>27</td>
<td>distant signal with speed indicator</td>
<td><img src="image9" alt="Symbol" /></td>
<td>3.4.1</td>
</tr>
<tr>
<td>28</td>
<td>speed signal</td>
<td><img src="image10" alt="Symbol" /></td>
<td>3.4.1</td>
</tr>
<tr>
<td>29</td>
<td>block signal</td>
<td><img src="image11" alt="Symbol" /></td>
<td>3.4.1</td>
</tr>
<tr>
<td>30</td>
<td>route signal</td>
<td><img src="image12" alt="Symbol" /></td>
<td>3.4.1</td>
</tr>
<tr>
<td>31</td>
<td>combined signal (distant, block and route signal)</td>
<td><img src="image13" alt="Symbol" /></td>
<td>3.4.1</td>
</tr>
<tr>
<td>32</td>
<td>shunt signal</td>
<td><img src="image14" alt="Symbol" /></td>
<td>3.4.1</td>
</tr>
<tr>
<td>33</td>
<td>shunt signal locked</td>
<td><img src="image15" alt="Symbol" /></td>
<td>3.4.1</td>
</tr>
<tr>
<td>34</td>
<td>shunt limit</td>
<td><img src="image16" alt="Symbol" /></td>
<td>3.4.1</td>
</tr>
<tr>
<td>35</td>
<td>train berth sign</td>
<td><img src="image17" alt="Symbol" /></td>
<td>3.4.1</td>
</tr>
<tr>
<td>36</td>
<td>view point</td>
<td><img src="image18" alt="Symbol" /></td>
<td>3.4.2</td>
</tr>
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<td>No.</td>
<td>Name</td>
<td>Symbol</td>
<td>See section</td>
</tr>
<tr>
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<td>-------------------------------</td>
<td>--------</td>
<td>-------------</td>
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<tr>
<td>37</td>
<td>braking point</td>
<td><img src="image" alt="braking point symbol" /></td>
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<tr>
<td>38</td>
<td>end of movement authority</td>
<td><img src="image" alt="end of movement authority symbol" /></td>
<td>3.4.2</td>
</tr>
<tr>
<td>39</td>
<td>danger point</td>
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<td>3.4.2</td>
</tr>
<tr>
<td>40</td>
<td>clearing point</td>
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<td>3.4.3</td>
</tr>
<tr>
<td>41</td>
<td>block clearing point</td>
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<td>3.4.3</td>
</tr>
<tr>
<td>42</td>
<td>route clearing point</td>
<td><img src="image" alt="route clearing point symbol" /></td>
<td>3.4.3</td>
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<tr>
<td>43</td>
<td>route</td>
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<td>3.4.4</td>
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<td>direction control</td>
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<td>45</td>
<td>transmitter</td>
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<td>46</td>
<td>transmitter effective forward</td>
<td><img src="image" alt="transmitter effective forward symbol" /></td>
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<td>transmitter bidirectional</td>
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<td>48</td>
<td>loop transmitter</td>
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<td>49</td>
<td>platform</td>
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<td>50</td>
<td>level crossing</td>
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<tr>
<td>51</td>
<td>bridge</td>
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</tr>
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<td>52</td>
<td>hump</td>
<td><img src="image" alt="hump symbol" /></td>
<td>3.5</td>
</tr>
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</tr>
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<td>pylons</td>
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<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>55</td>
<td>distant power off</td>
<td>![Symbol]</td>
<td>3.6</td>
</tr>
<tr>
<td>56</td>
<td>power off</td>
<td>![Symbol]</td>
<td>3.6</td>
</tr>
<tr>
<td>57</td>
<td>power on</td>
<td>![Symbol]</td>
<td>3.6</td>
</tr>
<tr>
<td>58</td>
<td>distant pantograph down</td>
<td>![Symbol]</td>
<td>3.6</td>
</tr>
<tr>
<td>59</td>
<td>pantograph down</td>
<td>![Symbol]</td>
<td>3.6</td>
</tr>
<tr>
<td>60</td>
<td>pantograph up</td>
<td>![Symbol]</td>
<td>3.6</td>
</tr>
<tr>
<td>61</td>
<td>wire limit</td>
<td>![Symbol]</td>
<td>3.6</td>
</tr>
<tr>
<td>62</td>
<td>track distance (in m)</td>
<td>![distance]</td>
<td>3.7</td>
</tr>
<tr>
<td>63</td>
<td>train berth shape</td>
<td>![length]</td>
<td>3.7</td>
</tr>
<tr>
<td>64</td>
<td>Measure line</td>
<td>![Measure line]</td>
<td>3.7</td>
</tr>
<tr>
<td>65</td>
<td>hectometer</td>
<td>![hectometer]</td>
<td>3.7</td>
</tr>
<tr>
<td>66</td>
<td>track marking</td>
<td>![track marking]</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>
<tr>
<td>0.6.1</td>
<td>2021-09-30</td>
<td>MS</td>
<td>removed package requirement lmodern, minor correction in manual, added citation information</td>
</tr>
<tr>
<td>0.6.2</td>
<td>2021-10-15</td>
<td>MS</td>
<td>bug fixing</td>
</tr>
<tr>
<td>0.6.3</td>
<td>2022-02-15</td>
<td>MS, GW</td>
<td>fixed spelling error and documented (slip-)turnout option: points=moving; updated link to signalschablone; automated testing and releasing</td>
</tr>
</tbody>
</table>

Gregor Wehrle (GW), Martin Scheidt (MS)