



Tie-FenLock 100 Depot Control System

FS-DES-STD-01
Version 2.0

1 ABBREVIATIONS & ACRONYMS

2 INTRODUCTION

- 2.1 Executive Summary
- 2.2 Overview of Benefits

3 OPERATIONAL OVERVIEW

- 3.1 Example of Operation

4 SYSTEM OVERVIEW

- 4.1 System Characteristics
- 4.2 System Architecture
 - 4.2.1 Equipment Housing
 - 4.2.2 Point Machine
 - 4.2.3 Points Position Indicator (PPI)
 - 4.2.4 VDU/Control Panel
 - 4.2.5 Signals
 - 4.2.6 Train detection
 - 4.2.7 Movement Authority
 - 4.2.8 Cable Routing
 - 4.2.9 Power Supply
 - 4.2.10 Points Heating

5 FURTHER INFORMATION AND READING



1. Abbreviations & Acronyms

Term	Definition
EMC	Electromagnetic Compatibility
EU	European Union
GRIP	Governance for Railway Investment Projects
LED	Light Emitting Diode
LOPS	Locally Operated Point System
O&M	Operational and Maintenance
PPI	Points Position Indicator
PSP	Point Setting Panel
REB	Relocatable Equipment Building
RSP	Route Setting Panel
SIL	Safety Integrity Level
Vac	Volts, alternating current
Vdc	Volts, direct current

2. Introduction

2.1 Executive Summary

This document provides the system description for the Tie-FenLock 100 Depot Control System (DCS) for use in depots, yards and other non-mainline applications. The Tie-Fenlock 100 DCS is the entry level system of the Tie-Fenlock series, providing a simple and compact depot control solution.

Tie-FenLock	Description
100	Tie-FenLock Point Machines operated by individual plungers located by each set of points, combined with a Points Position Indicator (optional).
200	Tie-FenLock Point Machines operated from a Point Setting Panel, one switch per point. Position of points indicated on panel. Points Position Indicators provided with optional plunger to operate points locally.
300	Tie-FenLock Point Machines operated centrally from a Route Setting Panel (RSP) or VDU. Points in a route operated by a single button. Optional PPIs, axle counters for train detection plus limited interlocking e.g. for an interface to a mainline system, provision of a slot or Shunters Acceptance.
400	Tie-FenLock Point Machines, standard NR GPL signals controlled from a Route Setting VDU. Axle counter train detection provided to give a full but simplified interlocking, e.g. signals won't clear unless points in correct position and axle counter sections clear. Able to relay interface with NR signalling functions, other Depot Protection Systems, CCTV systems etc. Suitable for remote operation. Additional features.



Fenix Signalling is the sole provider for all Tie-FenLock DCS in the UK, working in partnership with Fenix Rail Systems to deliver a range of services and solutions for UK depots. Some existing UK installations are:

- British Steel, Scunthorpe. Tie-FenLock 100 installation with 350 point ends (1989-90)
- Bombardier Central Rivers Depot, near Derby. Tie-FenLock 400 installation incorporating 29 point ends, point position indicators throughout and axle counters (2001)
- Siemens Southampton Depot. Tie-FenLock 400 installation incorporating 10 points indicators and approximately 25 axle counters (2002)
- ABP Immingham Depot. Tie-FenLock 400 installation incorporating 10 points and 1 Route Setting Panel (2002)
- Alstom Morden Depot, London. Tie-FenLock 400 installation .A London Underground application with 32 point ends (2004)
- Chilterns Wembley Depot. Tie-FenLock 400 installation incorporating 8 point ends (2004)
- Alstom Golders Green Depot, London. A London Underground application (2006)
- Chilterns Banbury Depot, Banbury. Tie-FenLock 400 installation with 7 point ends, fully interlocked with signals and interfaced to the mainline (2016-17)
- Bombardier Central Rivers extension. Modification to an existing Tie-FenLock 400 installation (2001) to provide an additional stabling road (2018)



Fenix Signalling recommend the Tie-FenLock 100 DCS for small, simple depot layouts where a centralised control system is deemed unnecessary and plungers can be safely and easily accessed.

2.2 Overview of Benefits

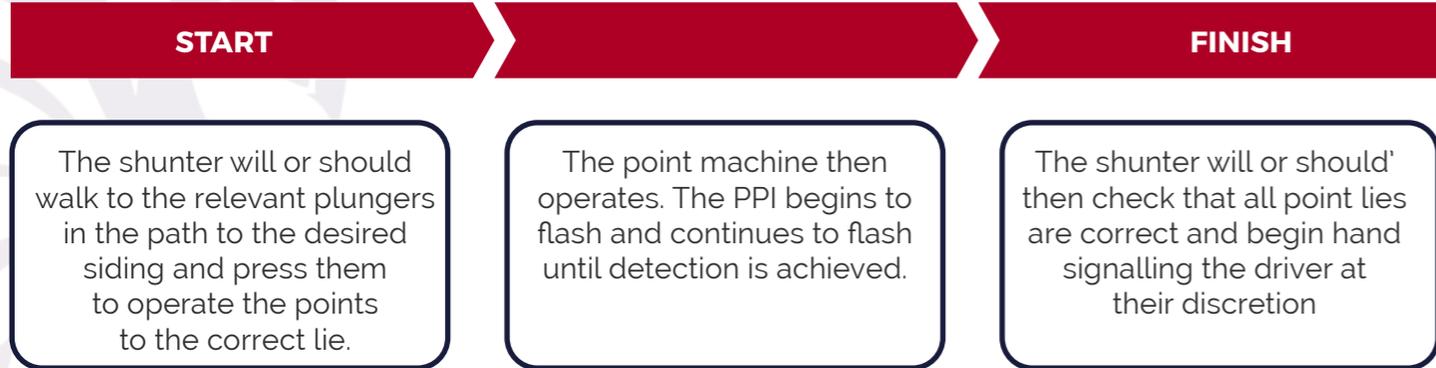
The main benefits of the Tie-FenLock 100 system are:

 <p>Known to be a reliable and cost-effective solution;</p>	 <p>Developed & compliant with EN standards; including safety integrity levels (SIL);</p>	 <p>Reduced capital cost vs mainline systems</p>
 <p>Over 1,000 systems worldwide since 1984;</p>	 <p>Operates in harsh environments including coal yards, harsh winters (e.g. in Finland & Poland)</p>	 <p>Minimal maintenance - low life cycle cost</p>
 <p>Lifetime 2nd line support - UK installations since 1989 are still fully supported for spares, technical support & O&M training;</p>	 <p>Reduced need for hand shunters – eliminates/reduces risk of staff slips, trips, falls, being struck by a train etc. as well as providing labour cost savings</p>	 <p>Systems have been installed in all types of electric traction areas & are fully compliant with EN50121-4 for immunity and emission</p>
 <p>Trailable, low-maintenance point machines;</p>		 <p>All system actions/events are recorded and saved for future access (remotely if required)</p>

3. Operational overview

3.1 Example of Operation

The Tie-FenLock 100 is a simple system intended to be operated by a single shunter (or other depot staff) in conjunction with standard depot hand signalling to partially automate depot operations.



The shunter will or should walk to the relevant plungers in the path to the desired siding and press them to operate the points to the correct lie.

The point machine then operates. The PPI begins to flash and continues to flash until detection is achieved.

The shunter will or should' then check that all point lies are correct and begin hand signalling the driver at their discretion

Alternatively, keyswitches can be installed on the side of the equipment or PPI housing to allow operation.



Figure 1 - Plunger mounted on top of PPI (optional) and keyswitch (labelled WHT)

4. System overview

4.1 System Characteristics

The main architecture of the LOPS comprises a point machine, a control unit, a PPI and a plunger for operation.

The system also boasts a modular design philosophy which is created from high grade industrial components, thus increasing the availability of spare parts and reducing maintenance costs. The system is constantly performing self-checks on the circuits and reporting faults, which means that malfunctioning units can be swapped very quickly and easily. The metal plates on the front (see figure 3) can be taken off, exposing the logic controller hardware board, known as a card, beneath. This card has a part number and pin-code, meaning only a card of that type can replace the original.

All systems are compatible with relevant EU EMC standards to all traction types. All outdoor equipment has a temperature operating window of at least -25°C to +45°C or harsher.



Figure 2 - Tie-FenLock 100 basic layout

4.2 System Architecture

4.2.1 Equipment Housing

The Tie-FenLock 100 system can either be installed in a post-mounted cabinet or in a location cabinet.

A small post mounted (see figure 3) single cabinet can accommodate enough cards to control a single ended set of points. A large post-mounted cabinet can accommodate enough cards to control a double ended set of points.

A location cabinet can be used to house the equipment for multiple point ends in areas where turnouts are densely populated. Unlike typical NR location cabinets, these are mounted on a swinging frame and therefore necessitate access from one side. The frame is made up of 2 columns of 8 19" racks (although typically only a maximum of 7 are used to allow cable bending and access in the base of the location), on which the cards to control and process wayside information are mounted.

The racks are also compatible with indoor application, where a glass fronted cabinet can be mounted within a designated building or within a relocatable equipment building (REB).



Figure 3 - Small cabinet with equipment for one point end

4.2.2 Point Machine

The Tie-FenLock 100 system uses low maintenance, trailable point machines which are robust and mounted in the four foot. The machine has been installed in approximately 80 minutes which is much faster than current mainline equipment. It is mounted on two crossmembers which clamp to the outside foot of the rail. The overall height of the machine is below the standard BS113 rail running height.



Figure 4 - Point machine installation

The detection and power is supplied by a single cable, with a minimum of 5 cores. The power supply is currently a three phase neutral 400Vac supply, although a 110Vac variant is in development. It is recommended that the tail cable to the point machine is armoured to prevent damage.

The points machine features an internal mechanism allowing the machine to be safely used in a trailing direction without damaging the components. The machine can be installed with a plate which allows the integration of a standard six-foot mounted back drive. In the event of a power failure, the machine can be operated manually by inserting a key to engage manual operation and then turning a crank handle.

The machine requires minimal maintenance at an interval of every 6 months, which is limited to the exterior of the machine. This is normally to account for vibration and for the wear in the turnout. It also includes adjustment of the detection rods and maintenance of the screw thread to prevent rusting, in addition to re-torquing the bolts.

4.2.3 Points Position Indicator (PPI)

The PPI is a two sided, three aperture LED indicator which is capable of showing two positive indications. The first is the straight ahead route, with points correctly set. This is shown as two vertical white lights. The second is for the diverging route, which is two horizontal lights. When the points are in the process of moving, the "new" position indication lamps flash in an out-of correspondence state until detection is achieved.

In the event of a failure, the PPI shall flash in this out-of-correspondance state until detection is achieved. This may occur if:

There is a blockage in the points blades and the machine motor times out;

Detection is lost after detection is made;

Loss of communication with the machine (power failure or cable break).



Figure 5 - Points Position Indicator

4.2.4 VDU/Control Panel

Not required for Tie-FenLock 100.

4.2.5 Signals

Not provided for Tie-FenLock 100.

4.2.6 Train detection

Not required for Tie-FenLock 100.

4.2.7 Movement Authority

The shunter will need to speak to the driver to tell the driver where and when to proceed.

4.2.8 Cable Routing

Separation between the cable for the plunger and other cables is required. This can be achieved by running the cables in separate troughs, providing 50mm separation between the cables within the trough, or providing a non-conductive barrier between the cables.

4.2.9 Power Supply

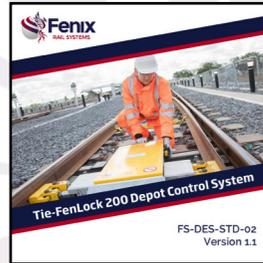
The Tie-FenLock 100 requires a three phase neutral 400Vac supply to the equipment housing, location or REB where it is transformed down and/or distributed as required. The electronic components predominantly run off 12Vdc and 24Vdc.

4.2.10 Points Heating

The Tie-FenLock 100 system is compatible with most points heating systems. However, should control of the points heating system be required by the depot operator, a more advanced version Tie-Fenlock 300 or 400 is required.

5. Further information and reading

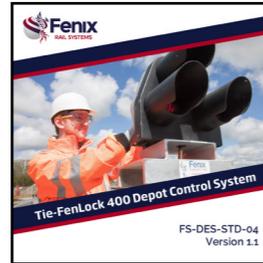
The Tie-FenLock 100 is the most basic and least expensive of the four Tie-FenLock DCS options and therefore may not be suitable for all depot applications. Further information can be found in the following documents:



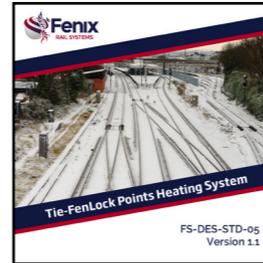
FS-DES-STD-002
– Tie-FenLock
200 Depot Control
System – System
Overview



FS-DES-STD-003
– Tie-FenLock
300 Depot Control
System – System
Overview



FS-DES-STD-004
– Tie-FenLock
400 Depot Control
System – System
Overview



FS-DES-STD-005
– Tie-FenLock
Points Heating
System – System
Overview



FS-DES-STD-006
– Tie-FenLock
Points Monitoring
System – System
Overview

Fenix Rail Systems provide signalling system consultancy and turnkey delivery (design, procurement, installation, testing, commissioning, handover and O&M) in the UK and worldwide for both greenfield projects and brownfield projects requiring complicated stageworks. Project delivery in the UK is aligned with Network Rail GRIP stages 2-8.

Our offices are open from 08.30 to 17.30 each day. Key management can be contacted via the office landline 03300 580180 and mobile numbers are provided for convenience outside office hours. Your main contact with Fenix Rail Systems are as follows:

Craig Purcell

craig.purcell@fenixrailssystems.com

18 Shottery Brook Office Park
Timothy's Bridge Road
Stratford upon Avon
CV37 9NR

www.fenixrailssystems.com

Tailored and innovative
signalling solutions





18 Shottery Brook Office Park, Timothy's Bridge Road, Stratford upon Avon, CV37 9NR,

Tel 01926 358428

Registered in England: 9478482