

FNMux

…………………..Plan

Failsafe Network Multiplexer (FNMux)

Document ID: TE/FNMux/

Version 1.0

Approval History

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|  | Prepared By | Reviewed By | Approved By |
| Name |  |  |  |
| Signature |  |  |  |
| Date |  |  |  |

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Revision History

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| Version (x.y) | Date of Revision | Description of Change | Reason for Change |
| 1.0 | 30th April 2024 | Baseline Document |  |
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1. preface

Fail-safe Network Multiplexer (FNMux) developed by Team Engineers (TE), is required to meet the Technical & Operational requirements of the RDSO specification “RDSO/SPN/11/2022” for transporting vital signalling information from interlocking to field using dual redundant OFC media in a fail-safe manner and driving the relays/end equipment in the field.

FNMux consists of the following functions

* Exchange of vital signalling digital I/O information from interlocking to field using the dual redundant OFC
* Driving the relays / end equipment in the field

For detailed explanation of each of the above functions and supporting functions refer RDSO Specification RDSO /SPN /211/2022, Effective Date: 24.11.2022 [Ref 1]

## Purpose

TO be fill

## Scope

TO be fill

## System Overview

Fail safe Network Multiplexer system will consist of a distributed multiplexer module, connected in a network, constituting a network of fail-safe multiplexer modules for exchange of vital signaling information among fail-safe multiplexer modules. The system architecture shall allow the formation of a scalable centralized unit of modules (FNMux Central Unit -CU) to concentrate I/O from the distributed field modules (FNMux Field Unit -FU). Furthermore, the network protocol and addressing technique adopted shall be such that any pair of vital modules, either in the central unit or in the field unit can be virtually connected from any point to any point. The FNMux Central unit shall also be able to communicate with Data Logger

The main purpose of FNMux is to transfer vital signaling information from FU to CU and from CU to CU meeting SIL4

The Figure 1 below gives the FNMUX top level block diagram.

A picture containing text, screenshot, diagram, colorfulness

Description automatically generatedFigure 1: System Overview

## Definitions

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| Terms | Definitions |
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Table 1: Definitions

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## Acronyms and Abbreviations

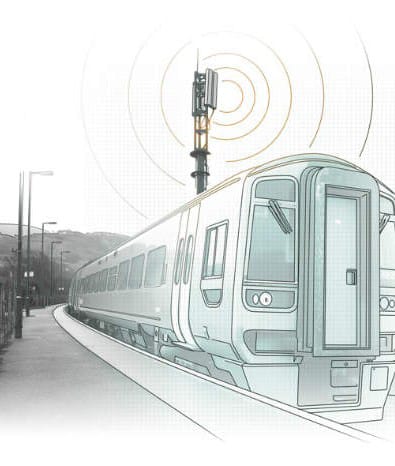
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| ABBREVIATIONS | DESCRIPTION |
| ADAD | Application Data Architecture and Design |
| ADAVR | Application Data/Algorithm Verification Report |
| ADPP | Application Data Preparation Plan |
| ADRS | Application Data Requirements Specification |
| ADTR | Application Data Test Report |
| ADTS | Application Data Test Specification |
| APVR | Application Preparation Verification Report |
| CENELEC | European Committee for Electrotechnical Standardization |
| CM | Commissioning Manual |
| CMP | Configuration Management Plan |
| CPS | Communication Protocol Specification |
| CS | Coding Standards and Guide lines |
| CU | Central Unit |
| DP | Document Plan |
| EL | Field Trial Records |
| EN | European Norm |
| ESS | Electronic Support System |
| ESSR | Electronic Support System Report |
| FAT | Factory Acceptance Test |
| FMECA | Failure Modes Effects and Criticality Analysis |
| FNMUX | Failsafe Network Multiplexer |
| FRACAS | Failure Reports and Corrective Actions |
| FTA | Fault Tree Analysis |
| FTP | Functional Test Procedure |
| FTR-SL | Functional Test Reports at System Level |
| FTR-CL | Functional Test Reports for Card Level |
| FTS | Fail Safety Test Specification and Report |
| FU | Field Unit |
| GASC | Generic Application Safety Test |
| HAS | Hardware Safety Analysis |
| HDD | Hardware Design Description |
| HRS | Hardware Requirements Specification |
| HVR | Hardware Validation Report |
| HZA | Hazard Analysis |
| HZL | Hazard Log |
| IM | Installation Manual |
| ISO | International Organization for Standardization |
| MFPR | Manufacturing Process Record |
| MIP | Manufacturing and Inspection Plan |
| MM | Maintenance Manual |
| OSTR | Overall Software Test Report |
| OSTS | Overall Software Test Specification |
| PCCL | Pre-Commissioning Check List |
| PHA | Preliminary Hazard Analysis |
| PMP | Project Management Plan |
| QMS | Quality Management System |
| QP | Quality Plan |
| RAM | Reliability Availability Maintainability |
| RAMA | RAM Analysis |
| RAMP | RAM Plan |
| RDSO | Research Design and Standards Organization |
| RNDV | Release Note and Deployment Plan |
| RNVP | Release Note and Validation Plan |
| SAD | System Architecture Description |
| SADVR | Software Architecture and Design Verification Report |
| SCAD | Source Code of Application Date |
| SCMP | Software Configuration Management Plan |
| SCR | Software Change Record |
| SCTR | Software Component Test Report |
| SDM | Software Deployment Manual |
| SDP | Supplies Development Plan |
| SDR | Software Deployment Records |
| SDVR | Software Deployment Verification Report |
| SHITR | Software/Hardware Integration Test Report |
| SHITS | Software/Hardware Integration Test Specification |
| SIL | Safety integrity level |
| SIS | Software Interface Specification |
| SITR | Software Integration Test Report |
| SITS | Software Integration Test Specification |
| SIVR | Software Integration Verification Report |
| SMP | Software Maintenance Plan |
| SMR | Software Maintenance Records |
| SMVR | Software Maintenance Verification Report |
| SPI | Serial Peripheral Interface |
| SPN | Specification Number |
| SQAP | Software Quality Assurance Plan |
| SQAPVR | Software Quality Assurance Plan Verification Report |
| SRS | System Requirement’s Specification |
| SRSVR | System Requirement’s verification Report |
| SSCD | Software Source Code and Supporting Documentation |
| SSCVR | Software Source Code Verification Report |
| SSP | System Safety Plan |
| SSVR | System Requirement’s Specification |
| STS | System Test Specification |
| STVR | Software Tools Validation Report |
| SVR | Software Validation Report |
| TTL | Traceability Table |
| UM | User Manual |
| VAP | Validation Plan |
| VP | Verification Plan |

Table 1: Acronyms and Abbreviations

## References

The following are the reference documents referred during the preparation of documentation plan for FNMux:

|  |  |  |
| --- | --- | --- |
| Reference No. | Document Title | Document Description |
|  | RDSO /SPN /211/2022,  Date Effective:24.11.2022 | Specification for Failsafe Network Multiplexer (FNMux). |
|  | EN 50126-1:2017  EN 50126-2:2017 | Railway Applications- Specifications and demonstration of Reliability, Availability, Maintainability & Safety. |
|  | 50128-2011+A1:2020 | Railway Applications-Communications, Signalling and processing systems-Software for Railway Control and Protection Systems. |
|  | EN 50129:2018 | Railway Applications-Communications, Signalling and processing systems- Safety Related Electronics Systems for Signalling. |
|  | EN50159:2010+A1:2020 | Railway Applications-Communications, Signalling and processing systems - Safety related communication in closed transmission systems. |
|  | RDSO/SPN/144/2012 | Safety and reliability requirement of electronic signalling equipment. |
|  | ISO 9001:2015 | Quality Management Systems – Requirements |

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