Infrastructure Projects
Signalling - Shared Learning

18/02: March 2018 – December 2018

Introduction

This Shared Learning document details key issues and incidents that have occurred on Signalling Projects between March 2018 and December 2018 and provides the key learning points associated with them.

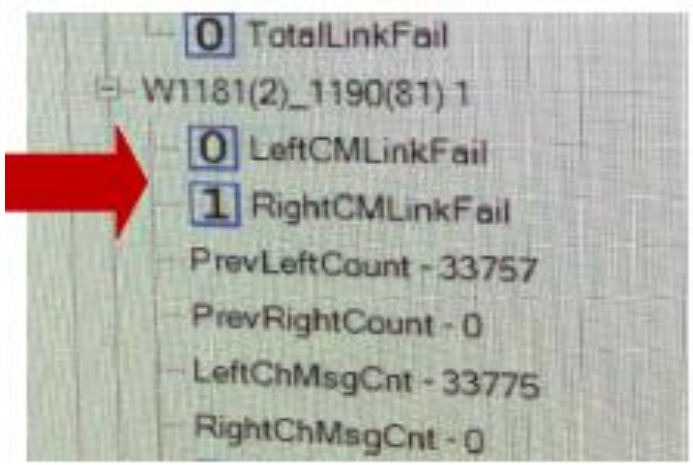
It is intended for distribution within the Network Rail Signalling community and the Supply Chain in order to raise awareness of the learning points within, and to enable best practice to be applied throughout all of our signalling activities.

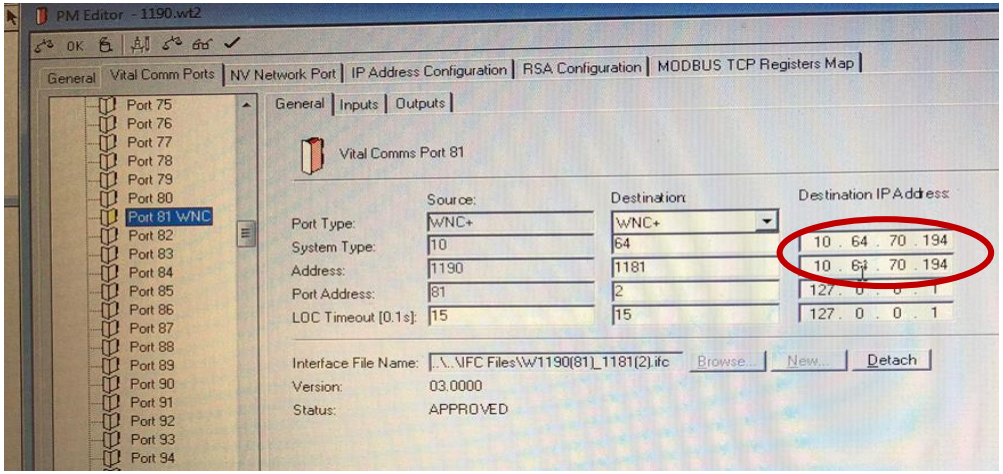
IP Addresses

Background

During post commissioning works it was discovered that the axle counter “B” link was not communicating due to a duplication of the IP address. Investigation showed that the IP address for the interlocking processor “A” and “B” network was duplicated in the Axle Counter Processor (ACP).

A latent defect in the system diagnostic software masked the error initially, showing both A and B systems as operating correctly.





Key Learning

All design, project engineering and testing staff should be aware of the criticality of correct IP addressing, understanding that duplication or error can result in a loss of duplicated systems.

Soak testing

Background

A Signal Module failed shortly after commissioning causing train delays. The module had generated a number of alarms during soak test. Constrained programme issues meant that installation works were continuing during the soak test period. The genuine alarms were not being distinguished from alarms caused by installation works and therefore not being fully investigated prior to commissioning.

Key Learning

During the soak test period project staff need to monitor ALL alarms and diagnostic information. This will in turn enable the team to react to alarms (identifying erroneous alarms caused by planned works) and rectify any issues prior to commissioning.

Computer Based Route Setting

Background

A number of issues have been experienced with computer based route setting systems, causing an increase in delay minutes attributable to the route setting functionality.

- Failed update of software, attempts caused whole system failure.
- Intermittent failures on A and B links, leading to a momentary loss of route setting sub-areas.
- Instances of timetable not downloading or unpacking correctly requiring reboot of the Timetable Server.

Key Learning

Issues are subject to investigation.

However, it is important to use test systems that have both the target hardware and firmware versions.

Permanent Speed Restriction AWS

Background

A train approaching a signal did not receive an AWS warning when passing over an associated Permanent Speed Restriction (PSR) magnet, for a diverging route.

The erroneous suppression of the PSR magnet only occurs during, or after, a diverging route including flashing aspect sequence is set after the main route has been taken and released, where the magnet is correctly suppressed.

The magnet suppression function would have been latched for the main, straight route, but the latch is not removed by manual button pull, but is by TORR (Train Operated Route Release).

A data error affected this signal and others in the same interlocking.

This scenario required a manual Operations intervention until the data was changed.

Key Learning

Designers need to consider carefully where the introduction of complex controls are absolutely necessary. Data designers and testers need to understand how latch controls are set and unset.

Operating Irregularity – Data Omission

Background

A train completing a reversing move on single line at a station received an AWS Code 7 (nothing received) on a suppressed magnet which should have given a warning.

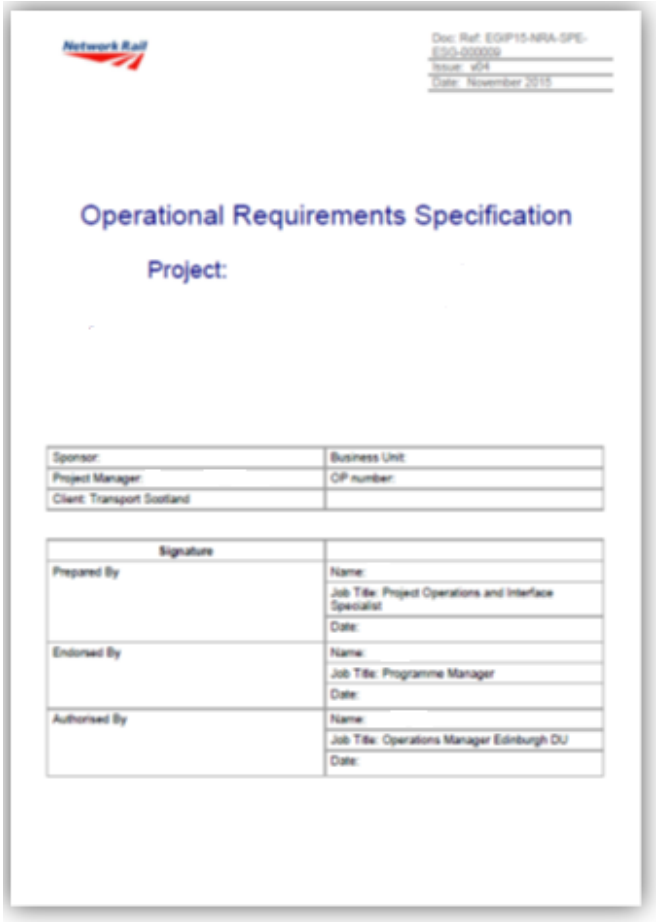
This is a legitimate non-signalled turnback move (no starting signal is provided at the station in question for the turn back move).

On investigation it was noted the requirement for this route had been included in the project Operational Requirements Specification (ORS). During the data development this requirement had been omitted from the interlocking data.

Key Learning

Projects need to understand all requirements listed in the ORS need to be included, these requirements are made through consultation with key stakeholders in Operations.

All requirements need to be effectively communicated through to data designers and testers.



Operational Requirements Specification

Project:

Sponsor:	Business Unit:
Project Manager:	OP number:
Client: Transport Scotland	

Signature	
Prepared By	Name: Job Title: Project Operations and Interface Specialist Date:
Endorsed By	Name: Job Title: Programme Manager Date:
Authorised By	Name: Job Title: Operations Manager Edinburgh DU Date:

IBJ Bonding

Background

After a successful resignalling commissioning, a proving train on a single line suffered traction problems (loss of line light) and could not complete its journey.

On investigation it was discovered a number of bonds which should have bonded around, a now redundant IBJ had not been fully installed.

The project had received a completion certificate for this work stating all planned works had been successfully commissioned. .

This omission could have caused a serious safety incident and did incur a significant amount of delay minutes.

Key Learning

Robust assurance checks are essential to ensure the integrity of the infrastructure prior to handback and completion of the required paperwork.

Traction bonding errors and omissions can have a serious safety impact.

Power Supply Source

Background

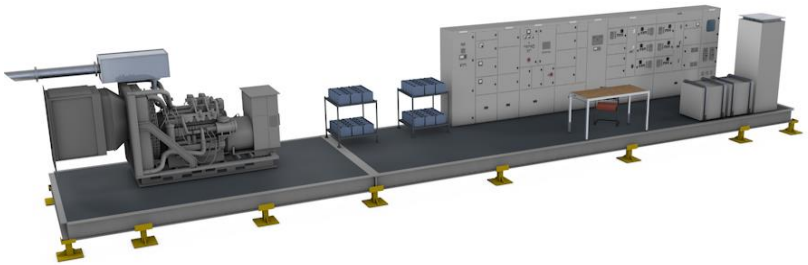
A recently re-locked area reported several changes of aspect. The Technician's Facility reported various Output Interface Disabled, Signalling Supply Frequency out of range and Voltage out of range alarms.

The signalling power was derived from a DC traction supply and the issues were resolved by transferring to a DNO (Distribution Network Operator) supply.

Electronic systems require a 'clean' power supply and incorporate checks on the quality of the power supply and isolate it when it is out of an acceptable range. This is more problematic on projects where the signalling power supply is not being renewed at the same time as the interlocking.

Key Learning

Consider where the signalling power supply is derived from and if it is suitable for the equipment being supplied.



Solid State Object Controller Output Cards

Background

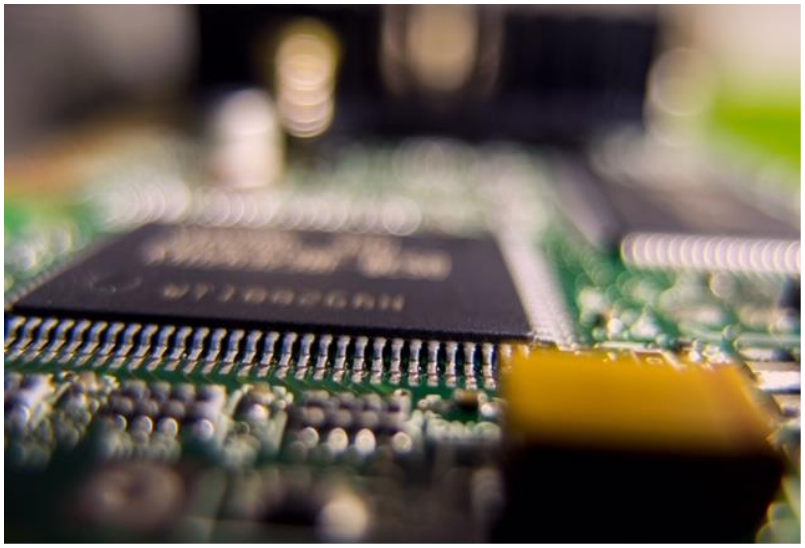
During a commissioning a significant number of relays were changed as a result of alarms being received stating that the card output drive current was over the 250mA threshold for the particular system.

Subsequently the same type alarm has occurred on other functions and further relays were changed.

The 250mA limit is around the current capacity for the output card, however the alarms being generated do not have any operational impact.

It is understood a modification is planned to reduce this particular alarm given the relays are within specification.

In an application of a different product, cards were hard failing due to the current drawn by trackside infrastructure. These were legitimate failures and have been foreseen in the development of the products



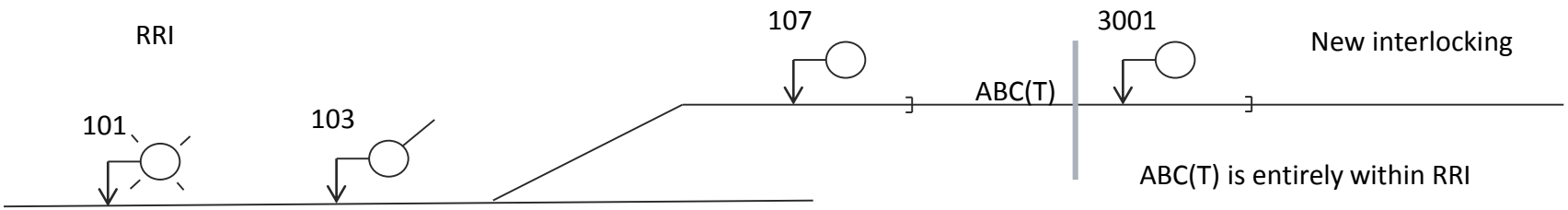
Key Learning

Applications of solid state cards should consider the objects to be driven and/or number of outputs used. This also needs to consider the threshold of the alarms so as to avoid excessive alarms.

Cross Boundary Data

Background

A standard data construct used in a new interlocking caused a signal in an adjacent RRI interlocking to act as a “double red”. Investigation revealed a track circuit occupied function combined with an aspect lit function that was not required. The project remit did include detail on the specific conditions to be used in this instance, but this was not implemented.



With the original functionality, junction signal 103 would step up to single yellow when a second train was routed via the divergence after the first train had cleared the overlap of 107. With the new functionality, junction signal 103 is prevented from stepping up to single yellow until the first train has cleared ABC track as well. This inhibits the flashing yellow sequence provided by 101 signal, until the first train has cleared ABC track causing a consequential delay if the following train is also routed via the divergence.

Key Learning

Designers and testers need to ensure consistency between data and wiring in fringe designs.

Signal Alignment

Background

Post commissioning reports of poor signal visibility or dim signals have been received on a number of projects, due to signal aspects not being aligned in accordance with the Signal Sighting Assessment Form (SSAF). The alignment is particularly critical on 3° narrow beam LED signals.

Key Learning

NB165 published in October 2018 gives clear guidance on the responsibilities of the Installer, Tester and Sighting Committee in the set up and assurance of alignment for signals and indicators.

It is considered best practice for the Signal Sighting Chair to complete the final sighting checks as part of the commissioning.

Information on this is available in:
NR/L2/SIG/10158 Appendix C; Signals – Configuration, Specification and Construction Guidance.

Signalling Works Test Specification - NR/L2/SIG/30014/D120/TS7-91 Inspection to SSF and Signal Sighting.

Level Crossing Fail to Raise

Background

A fault was reported that an MCB CCTV level crossing's barriers had failed to auto-raise, after the passage of a train..

A route was set in the Up direction followed by a Down direction route, which was then cancelled.

The train traversed in the Up direction, but the auto raise control was still waiting for the Down train and the barriers failed to raise.

The auto raise function had operated as designed, requiring either the Down train to run and cancel the route or the Signaller to manually raise the barriers.

The difference in operation was following a signalling renewal from a conventional relay system to a Computer Based Interlocking system.

This unusual sequence of events and how to manage it had not been communicated to the signallers.

Key Learning

Designers need to understand and communicate the implications of how the data has been written.
Differences in operation to be briefed to Signallers and contained within the signaller training material, as part of the project training.

Clarity of Responsibility

Background

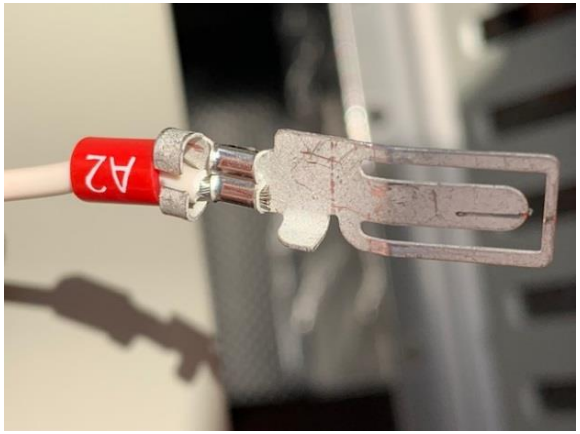
An operational incident required interrogation of a recently commissioned voice recorder (VR). However, the workstation had been commissioned without the voice recorder channels being configured.

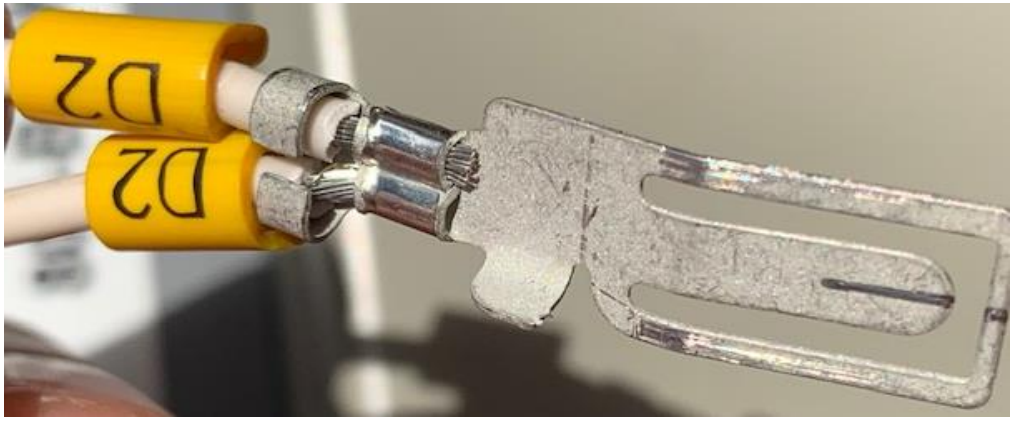
Investigation found that there was confusion regarding who was responsible for the VR configuration and test, and the Entry Into Service plan did not have sufficient detail on the VR.

Key Learning

Responsibility demarcations should be clearly documented and briefed to all project staff.
Where tests are being performed by a third party they shall be defined and included within testing documentation.

Crimp / Crimping Quality





Background

A project recently discovered numerous poorly made Q crimp connections. These have been supplied in location cases for several other projects.

Key Learning

Test crimps should be made available to testers, and quality checks undertaken.

All tools should be fully calibrated and have up to date certificates.

Further Information

For any further details or information please contact:

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