



Appendix A, *System architecture*

Network Rail specification

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1 Introduction

1.1 Background

The concept of Modular Signalling has been adopted and developed within Network Rail to introduce new products and changes in the implementation of signalling projects in order to bring about significant cost savings.

1.2 Purpose

This document details the system architectures that are acceptable on Modular Signalling Schemes.

The architectures contained within this document may be used for a conventional resignalling scheme where suited to the particular requirements of that scheme and location.

1.3 Scope

This document applies to all projects deemed to be Modular Signalling Schemes and being implemented on Network Rail infrastructure.

The document contains principles and derogations which may only be used in the context of a Modular Signalling Scheme and use in any other context or project type is not supported by this document.

1.4 Definitions

Common definitions are contained in the main section of the Modular Signalling Handbook.

2 Fundamental system requirements

2.1 General

A Modular Signalling Scheme will make savings in areas such as design, installation and testing when compared against a typical conventional signalling project.

Comparative terms used in the following list of requirements compare a Modular Signalling Scheme to a typical conventional signalling project.

2.2 Assumptions

It is assumed that in order to achieve the target SEU price, a Modular Signalling Scheme will offer appropriate functionality for the route/scheme being considered; this may result in reduced functionality compared to a typically conventionally signalled route/scheme.

2.3 List of System Architecture Requirements

The fundamental requirements of a Modular Signalling Scheme's system architecture are, in no order of importance, the following.

- The architecture of the system shall be based on the use of modern electronic equipment and the concept of "islands of signalling" so as to facilitate repeatable application design, standardised methods of control and standardised installation and testing techniques **[MSAC 1.0]**;
- The architecture shall not require the provision of continuous copper cabling along the route, either for provision of power or for data communications **[MSAC 2.0]**;
- The control system shall be capable of being located remotely from the interlockings it controls **[MSAC 3.0]**;
- The system shall provide 2 aspect colour light signalling, operated by Track Circuit Block and using axle counters as the method of train detection. Isolated 3 aspect signals may be necessary within a signalling island **[MSAC 4.0]**;
- System performance shall be determined using the method and component performance figures set out in Appendix D of the Modular Signalling Handbook **[MSAC 5.0]**;
- The system shall be capable of use on routes fitted with a.c. or d.c. electric traction systems **[MSAC 6.0]**;
- The system shall be capable of interfacing to an ERTMS Radio Block Centre by means of a serial interface **[MSAC 7.0]**;
- Data and voice transmission between Islands and to/from the Control Centre shall use the Network Rail Fixed Telecommunications Network **[MSAC 8.0]**;
- The control system shall be capable of controlling up to 250 SEUs **[MSAC 9.0]**.

Supplementary requirements on the architecture are as follows:

- The system shall have a planned life of 35 years for the longest lived component whereas those components that are redundant upon the introduction of ERTMS shall have a planned life of 15 years **[MSAC 5.1A]**;
- The system shall utilise low voltage a.c. or d.c. power within the signalling system with a minimum stand by duration of 4 hours **[MSAC 2.1A]**;
- Where incoming power is required, it shall take the form of a single phase intake from a Distribution Network Operator (DNO) **[MSAC 2.2A]**.

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3 High level system architecture

3.1 General

A Modular Signalling System consists of two major subsystems.

- Firstly, the systems and components used to control and operate the trackside signalling outputs (referred to as the “signalling functions”).
- Secondly, the systems and components used to provide power to the signalling functions.

The high level system architecture for the signalling functions can be seen in Figure 1. It depicts the relationship between the various subsystems.



Figure 1 – High level system architecture

3.2 Signalling islands

Modular Signalling schemes are generally only applicable to secondary lines.

Secondary lines are typically simple, two-track railways with few crossovers and junctions with repeating track layouts that are controlled by repeating blocks of signalling; these blocks of signalling are typically controlled by a mechanical signal box. These signal boxes are often located at junctions, level crossings and stations. Therefore a signal box which controls a level crossing may be similar to another signal box also controlling a level crossing in terms of its functionality and the layout it controls.

Modular Signalling uses standard and reusable configurations of system components along a line of route in arrangements called “signalling islands”. Typically, each signalling island controls the section of railway that was once controlled by a mechanical signal box.

In essence, signalling islands are replicable “blocks” of signalling functionality. Such is the repeating nature of the signalling along these types of route, that a signalling island designed, tested and built for one section of the route could be used at another location which has a similar layout with minimal redesign, if any at all. This results in a defined number of signalling islands that can be used at most sites along the route.