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Level 2

Intelligent Infrastructure Management – Data Logging Specification

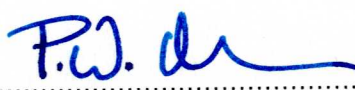
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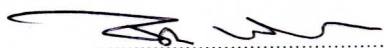
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Issue record

Issue	Date	Comments
1	June 2009	Combines and updates NR/SP/SIG/11304 and NR/SP/SIG/11305, which are withdrawn from the compliance date

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 05/12/2009.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 4 to continue to comply with the Issue of any relevant Network Rail Standards current when GRIP Stage 4 was reached and not to comply with requirements contained herein, unless the designated Standard Owner has stipulated otherwise in the accompanying Briefing Note.

Reference documentation

BS EN 50121-4 ,	“Railway Applications – Electromagnetic Compatibility Part 4 : Emission and Immunity of the Signalling and Telecommunications Apparatus”. 2006
BS EN 50125-3 :	“Railway Applications – Environmental Conditions for Equipment Part 3: Equipment for Signalling and Telecommunications”. 2003
BS EN 50126 ,	“Railway Applications – The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS)”. 1999
BS EN 50129 ,	“Railway Applications – Safety related electronic systems for signalling”. 2003.
NR/L3/SIG/11231	“Signalling Maintenance Testing Handbook”
NR/GN/SIG/11710	“Signalling Design Handbook”
NR/GN/SIG/11720	“Signalling Installation Handbook”
NR/GN/SIG/11730	“Signalling Works Testing”

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1 Purpose

The purpose of this specification is to define the requirements for Data Logging Systems used to monitor signalling installations, so that there is consistency throughout Network Rail infrastructure and compatibility with the NR Data Management System.

This specification also identifies safety related requirements involving signalling interfaces, these are documented within Section 7 [Safety Related Requirements].

2 Scope

This specification covers both permanent and temporary Data Logging Systems that are used for monitoring purposes, and are judged not to be safety critical. It includes planning, installation and commissioning issues.

This specification only covers Communications Network and DMS functionality that form part of the functionality of the Data Logging System.

3 Roles and responsibilities

The DMS shown in Figure 2 and its required message format are as specified by NRIM. Otherwise, system design is the responsibility of the supplier subject to compliance with all relevant clauses of this Standard.

4 Abbreviations

BST	British Summer Time
DMS	Data Management System
EMS Hub	Enterprise Messaging Service Hub
GMT	Greenwich Mean Time
Data Logger	Isolated Data Logging System
NR	Network Rail
NRIM	Network Rail Information Management
NTP	Network Termination Point
SIL	Safety Integrity Level
TZD	Time zone designator (in hours and minutes ahead or behind GMT)
UTC	Universal Time Constant (Zulu or GMT time)
XML	Extensible Mark-up Language

5 Definitions

5.1 Data Logging System (System)

For the purposes of this specification, a Data Logging System (the System) is defined as the hardware and software of a system designed to record digital events or discreet readings of analogue functions, providing access to the data both remotely and locally, and providing a facility for data analysis.

5.2 Isolated Data Logging System

The following diagram shows a typical Isolated Data Logging System. It incorporates data acquisition, local data recording, diagnostic and communications functionality. It does not include the DMS or other central data storage, the NTP (shown only for clarity) and communications network, or interrogation tools. The Isolated Data Logging System may operate independently, and provide the

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functionality of the System itself, or as part of a System that includes a DMS or other central storage.

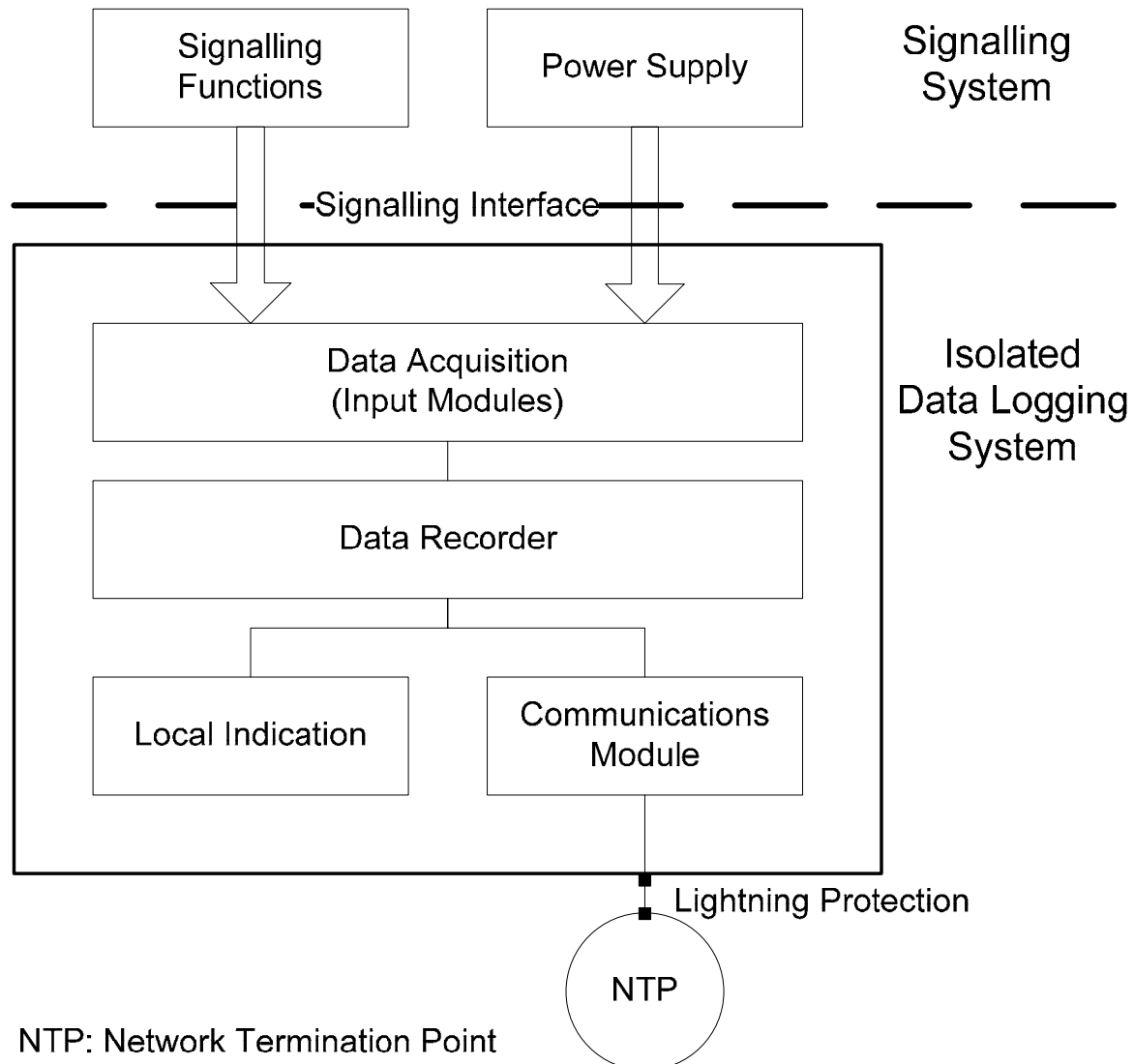


Figure 1 – Isolated Data Logging System

The Isolated Data Logging System has the following components:

5.2.1 Signalling Interface

The Signalling Interface forms the interconnection point of the Data Logging System to the operational signalling equipment.

5.2.2 Data Acquisition (Input Modules)

These gather logged data (digital change of state data or timed parameter readings), and provide data buffering prior to non-volatile storage.

5.2.3 Data Recorder

This is local non-volatile storage of logged data, referred to as Primary Storage Media where it forms the master record(s) of the logged data.

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5.2.4 Local Indication

This is diagnostic state of health information provided for maintenance purposes.

5.2.5 Communications Module

This provides industrial standard communications interfaces for the transmission of data to and from the DMS or other remote facilities.

5.3 Data Logging System Incorporating DMS

The following diagram shows a functional representation of the Data Logging System incorporating a Data Management System (DMS) interfaced via a communications network, and the functions provided by the DMS and centrally based analysis software.

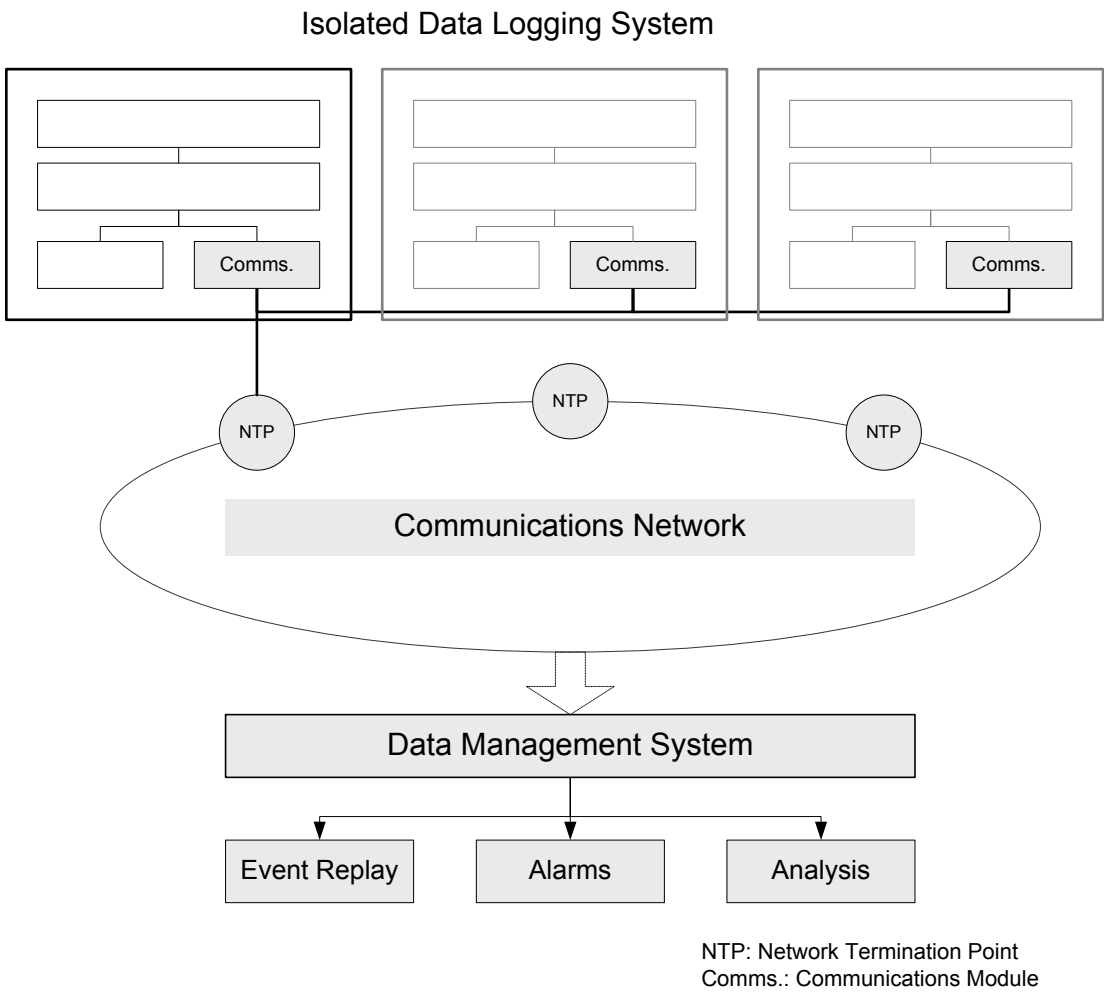


Figure 2 – Data Logging and Management Functional Schematic Diagram

5.4 Functional Module Descriptions

5.4.1 Isolated Data Logging System

In this configuration, the Isolated Data Logging System previously defined is shown sending the logged data to the NTP. Note that in some configurations an intermediate storage device, such as a proprietary server, may perform the function of forwarding logged data to a NTP.

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5.4.2 Network Termination Point (NTP)

The NTP is the gateway to the DMS and only its relevant interfaces are considered in this standard. At its interfaces, the logged data is converted to become compliant in format for the DMS.

5.4.3 Data Management System (DMS)

The DMS is the central database for all data logging systems where event data is stored for use in analysis. Only its relevant interfaces are considered in this standard.

5.4.4 Event Replay and Analysis

This is graphically based software for replay of digital events, or the comparison of analogue traces, in a meaningful manner to assist investigations and analysis. Event replay and analysis functionality is included in this standard.

5.4.5 Alarms

Predetermined alarms are generated based on selected events, or on a combination of events. Alarms are included in this standard.

6 Functional Requirements

6.1 System Configuration

The Data Logging System shall be configurable to meet the needs of a specific signalling installation including:-

The system shall provide a means for the user to define a name for the system which will identify the signalling site to which it is connected, and also its location in the Network Rail infrastructure.

The system shall provide a means for the user to define the names allocated to each input/output function to which it is connected. These will be managed at the central server using data supplied by the system designer.

The system shall incorporate a means of setting the date and time. If connected to a National Physical Laboratory time signal receiver, the date and time shall be automatically synchronised to that device.

6.2 Data Requirements

6.2.1 Digital Event Data Capture

The system shall capture a change of state for digital functions

Where:-

- Function present - 1
- Function not present - 0

A function shall be defined as a closed relay contact or as a voltage or signal of a pre-determined level being present. Where the function being monitored is held in a digitised form in an electronic system, the method for monitoring change of state will need to be adapted to suite.

For voltage free contact monitoring guidance, the voltage applied to non-fusible signalling relay contacts should not be less than 12V, and the current not less than 2mA. For non-fusible signalling relay contacts, an open contact shall be regarded as

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any resistance across the contact pair of over 3500Ω, and a closed contact shall be regarded as any resistance across a contact pair of 500Ω or less.

The data captured shall identify the state at the conclusion of the change of state for the function.

Digital functions shall capture any change of state of duration 10ms or greater, and shall ignore any change of state of duration 5ms or less (relay bounce).

6.2.2 Data Recording

Each change in digital state, or each timed analogue reading, shall be recorded, and a system timestamp added.

The minimum requirements for data recording of the Data Logging System, at the user interface and for data transfer, shall be:

- Timestamp to 10ms resolution (including date), contained within a field formatted compliant to International Standards ISO 8061 and the II RCM Interface Specification:

YYYY-MM-DDThh:mm:ss.s[s[s]] [TZD]

Date example: 2007-01-30 equates to 30th January 2007

T is provided to make the time date instant more readable

Time example: 08:55:33.01 = 08Hr 55Min 33Sec 01Hun)

Hundredths and thousandths of a second are dependant on the data item

TZD is only required if GMT is not used and shall be of the form +hh:mm or -hh:mm ahead or behind GMT respectively. GMT shall be used for local timestamping wherever possible.

- Function (e.g. relay name and contact open or closed)
This shall be contained within a field of up to 18 characters.
- Sequence number, 8 character Hexadecimal.
- Data should be held locally in text file format with the extension *.txt.
- Data fields should be column separated using the TAB character.
- Data rows should be terminated by a Carriage Return + Line Feed.
- Where columns of data values are written (analogue format) the line before the very first row should contain the channel names.

Examples of this file format are shown below:

2007-01-30T08:55:33.05[TAB] 144NWK2PR UP to DN[CR+LF]

2007-01-30T08:55:36.96[TAB] 144RWK2PR DN to UP[CR+LF]

Each record stored shall be in a field format 52 characters long.

Network Rail shall be able to interpret the data using standard software packages utilising *.txt or *.CSV extension files.