

Data Recorders on Trains – Design Requirements

Synopsis

This document defines the design requirements for the provision and function of data recorders on trains.

signatures removed from electronic version

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Part A

A1 Issue record

Issue	Date	Comments
One	01 June 2002	Original Document

This document will be updated when necessary by distribution of a complete replacement.

A2 Implementation of this document

The publication date of this document is 01 June 2002.

This document comes into force on 03 August 2002.

The dates by which compliance with the requirements of this document is to be achieved are set out in Part B2. Where those dates are later than the date on which this document comes into force, this is to give Railway Group members additional time to plan and commence implementation so as to achieve full compliance by the dates set out in Part B2.

This document supersedes the following Railway Group Standard in part as indicated:

Railway Group Standard	Issue No.	Title	RGS sections superseded by this document	Date(s) as of which sections are superseded
GO/RT3272	2	Data Recorders on Trains	Mandatory sections 4, 5, 6 and 7 of GO/RT3272 Issue 2 relating to data recorder design requirements	03 August 2002 for sections 4, 5, 6 and 7. GO/RT3272 Issue 3 supersedes section 8 of GO/RT3272 Issue 2 and completes supersession

A3 Scope of Railway Group Standards

The overall scope of Railway Group Standards is set out in Appendix A of GA/RT6001. The specific scope of this document is set out in Part B2.

A4 Responsibilities

Railway Group Standards are mandatory on all members of the Railway Group* and apply to all relevant activities that fall into the scope of each individual's Railway Safety Case. If any of those activities are performed by a contractor, the contractor's obligation in respect of Railway Group Standards is determined by the terms of the contract between the respective parties. Where a contractor is a duty holder of a Railway Safety Case then Railway Group Standards apply directly to the activities described in the Safety Case.

* The Railway Group comprises Railtrack PLC, Railway Safety, and the train and station operators who hold railway safety cases for operation on or related to infrastructure controlled by Railtrack PLC.

Railtrack PLC is known as Railtrack.

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A5 Health and safety responsibilities

In issuing this document, Railway Safety makes no warranties, express or implied, that compliance with all or any documents published by Railway Safety is sufficient on its own to ensure safe systems of work or operation. Each user is reminded of its own responsibilities to ensure health and safety at work and its individual duties under health and safety legislation.

A6 Technical content

The technical content of this document has been approved by:

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A7 Supply

Controlled and uncontrolled copies of this document may be obtained from the Industry Safety Liaison Dept, Railway Safety, Evergreen House, 160 Euston Road, London NW1 2DX.

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Part B

B1 Purpose

The purpose of this document is to define the design requirements for the provision and function of data recorders on trains.

B2 Application of this document

B2.1 To whom the requirements apply

This document contains requirements that are applicable to the duty holders of the train operator category of Railway Safety Case.

B2.2 Compliance requirements

Specifically, the contents of this document apply to any train that is permitted to operate outside the limits of a possession on Railtrack controlled infrastructure other than those stated in B2.4.

All of the requirements of this document are within the scope of Vehicles Acceptance Body approval.

B2.2.1 Fitment to new trains

Data recorders shall be fitted to all new trains accepted for operation on Railtrack controlled infrastructure. For the purpose of this document, a new train is one that has its first certificate of conformance for vehicle design signed on or after 06 December 2003. From this date, new trains shall be fitted with data recorders that meet the requirements of all sections of this document, except those set out in B4.2.

Trains with a first certificate of conformity for vehicle design signed before 06 December 2003 shall meet the requirements set out in section B2.2.2

B2.2.2 Fitment to existing trains

Data recorders that meet the requirements set out in section B4.2 of this document shall be fitted to all existing trains by 31 December 2005 if the trains are to remain in operation on Railtrack controlled infrastructure beyond 31 December 2007.

Where existing trains are already fitted with a data recorder, the data recorder shall meet the requirements set out in section B4.2 of this document by 31 December 2005 if the trains in which they are fitted are to remain in operation on Railtrack controlled infrastructure beyond 31 December 2007.

After 31 December 2005 trains not fitted with compliant data recorders shall not be permitted to operate on Railtrack controlled infrastructure unless the withdrawal date for the train is on or before 31 December 2007. For the purpose of this document, existing trains shall include those trains accepted for operation on Railtrack controlled infrastructure before 06 December 2003.

Where reasonably practicable, the requirements set out in section B4.3, B4.4, B5 and B6 shall be applied to the fitment of data recorders on existing trains.

B2.2.3 Schedule of fitment for existing trains

The train operator shall ensure that the schedule for fitting existing trains, where required by clause B2.2.2, is documented.

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B2.3 General compliance requirements

Until the compliance dates, or the date by which compliance is achieved (if earlier), the applicable requirements of the predecessor documents shall continue to be met (see Part A for details).

After the compliance dates, or after the date by which compliance is achieved (if earlier), Railway Group members shall not deviate from the requirements set out in this document.

Where it is considered not reasonably practicable to comply with the requirements set out in this document, authorisation not to comply shall be sought in accordance with GA/RT6001, GA/RT6004 or GA/RT6006.

B2.4 Exclusions from the application of this document

The contents of this document do not apply to road-rail recovery vehicles, rail mounted maintenance machines that only operate within possessions and locomotives exclusively used for shunting purposes where limited operation occurs on Railtrack controlled infrastructure.

B2.5 Related requirements in other documents

GO/RT3272 contains related requirements in respect of the operating procedures of data recorders.

B3 Definitions

Driving cab

Location or position within a train from where a driver may exercise full control over the movement of that train.

Data recorder

For the purpose of this document, equipment provided on a train to record data about the operation of its controls and performance in response to those controls and other train control systems.

A data recorder is also referred to elsewhere as a data logger, event recorder, on-train monitoring and recording (OTMR) equipment and juridical recorder.

Train

Two or more items of rolling stock coupled together, at least one of which is a traction unit, or a single vehicle traction unit not coupled to any other rolling stock, or a single vehicle fitted with a driving cab.

Traction unit

Any railway vehicle which has the capacity for self-propulsion (whether or not the power by which it operates is derived from a source external to the vehicle).

B4 Information to be recorded

B4.1 New trains

Data recorders fitted to new trains accepted for operation on Railtrack controlled infrastructure shall, as a minimum, permit the following information to be recorded:

- a) Train brake demand including operation of brake controls and other activation of the brakes.
- b) Operation of traction power controls.
- c) Train speed including:
 - i) wheel rotational speed or speed derived from another speed measurement system, and
 - ii) the signal capable of reproducing the speedometer indication given to the driver.

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- d) Operation of and driver response to warning and protection systems such as TPWS, automatic warning system (AWS), automatic train protection (ATP), in-cab signalling system, tripcocks and train control system (TCS).
- e) Activation of the driver's reminder appliance (DRA).
- f) Activation of the driver's safety device (DSD) and driver's vigilance device (DVD).
- g) Operation and driver override of passenger emergency system (PES).
- h) Isolation/override of warning and protection systems including, but not limited to, TPWS, AWS, ATP, in-cab signalling system, DSD, DVD, DRA, PES and pantograph automatic dropping device (ADD) where such systems are installed.
- i) Operation of the train warning horn.
- j) Operation of centralised passenger door controls.
- k) Status of interlock between doors and traction.
- l) Operation of systems that control wheel slide.
- m) Operation of tilt control system and tilt enable and supervision system.
- n) Operation of speed supervision and control systems.

Consideration shall also be given to the provision of capability for recording additional information on a data recorder, including:

- o) status and operation of cab radio systems
- p) data available from a train management system (TMS)
- q) information defined within ERTMS specifications.

Train operators shall review the requirements for other train borne safety systems mandated elsewhere to identify if there are any additional recording requirements.

B4.2 Existing trains

Data recorders to be fitted to existing trains shall, as a minimum, permit the following information to be recorded:

- a) Train brake demand: notch position, or brake pipe pressure, or leading bogie brake cylinder pressure.
- b) Emergency brake demand: yes/no.
- c) Traction power demand: preferably notch position, otherwise yes/no.
- d) Train speed; either wheel rotational speed, speed derived from another speed measurement system or a signal capable of reproducing the speedometer indication given to the driver.
- e) Operation of and driver response to warning and protection systems, such as TPWS, AWS, ATP, in-cab signalling system, TCS.
- f) DRA.
- g) Isolation/override of warning and protection systems, including but not limited to TPWS, AWS, ATP, in-cab signalling system, DSD, DVD, DRA, PES, where such systems are installed.
- h) Operation of centralised passenger door controls, where the train door control signals are available on the vehicle fitted with the data recorder.
- i) Status of interlock between doors and traction.

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B4.3 Suitability of recorded data

When a train is being driven on Railtrack controlled infrastructure, sufficient data shall be recorded to provide accurate and timely data on:

- a) Train driving performance in normal operation to permit frequent and systematic safety monitoring as a means of preventing incidents and accidents.
- b) Driver and train performance in the period leading up to and (if appropriate) immediately after an incident or accident, to enable the identification of causes related to train driving or train systems, and support the need for new or changed measures to prevent recurrence.

During continuous non-fault condition operation, the recorder shall be capable of storing data for, as a minimum, the last 8 hours of operation.

B4.4 Processes to match data

Train operators shall have processes in place to match recorded data to:

- a) date and time of the recording of each event
- b) train identity (reporting number)
- c) driver identity
- d) traction unit identity
- e) the driving cab being used to drive the unit.

It is permissible to achieve these requirements by use of facilities within the data recorder or by other means.

B5 Equipment requirements

B5.1 Design, location and labelling

Data recorders for all trains shall be designed, located and labelled to:

- a) Permit rapid extraction and analysis of data for driver or vehicle system monitoring purposes.
- b) Assist retrieval after an incident or accident.
- c) Mitigate the effects on recorded data of foreseeable collision impact or derailment.

B5.2 Crash protection

Data recorders for all trains shall be designed and constructed to withstand a number of tests performed to demonstrate the integrity of the recorded data and the ability to extract data following an incident. After each of the types of tests described in this section, a functional test shall be performed to confirm that extraction of the recorded data is possible and integrity of the recorded data is maintained. It is permissible to remove the data recording medium from the data recorder housing to demonstrate achievement of these requirements.

B5.2.1 Shock Test

The data recorder shall be subjected to three shocks in each direction of the three mutually perpendicular axes (total of 18 shocks). Each shock shall be a 100 g acceleration, 10 ms duration, half sine using the method set out in EN60068 – 2 – 27.

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B5.2.2 Crush test

A data recorder in an undamaged state shall be separately subjected to 9 crushing tests, each with the force acting through the centre point of the recorder. In three tests, forces shall be applied at the centres of each of the opposite faces and in six tests, forces shall be applied at the midpoints of each of the diagonally opposite edges. In all cases the crushing force shall be 20 kN applied via a hard face of 25 mm diameter and sustained for a minimum period of 1 minute. Where the data recorder is not cuboid in shape tests equivalent to the above shall be applied.

B5.2.3 Fire protection

The data recorder shall be subjected to a fire test such that it shall withstand a minimum temperature of 700°C for 5 minutes. The data recorder, at ambient temperature, shall be placed within the heat source and the air temperature monitored at a position 5 mm +/- 1 mm above the centre of the top face of the data recorder. The time duration shall be from when the heat source temperature has returned to the nominal heat source temperature of 700°C +/- 20°C.

B5.2.4 Post incident hazard testing – chemical immersion test

The recorded data medium contained within the data recorder shall be subjected to a full immersion test in the following substances for a period of not less than 60 minutes at normal ambient temperatures:

- a-a) Domestic tap water.
- b-b) Anti Fire Fighting Foam (AFFF).
- c-c) Refrigerant, type R134A.

B5.2.5 Post incident hazard testing – magnetic field test

The recorded data medium contained within the data recorder shall be subjected to a magnetic field produced by a current flow from 0 to 64 kA at a rate rise of 10⁷ A/s at a distance of 1 metre, measured from the centre of the data recorder. The tests shall be repeated a total of six times, with the conductor parallel to each of the three mutually perpendicular axes and with the field in both directions in each axis.

B5.3 Visible indication

There shall be a means of visible indication in the driving cab that the data recorder is operative whilst the train is in service.

B5.4 Reliability

Plausible failure modes of the data recorder shall not degrade a vehicle's circuits or systems. The loss of an input to a recording channel shall be treated individually and shall not cause the recorder to cease recording any other channel.

B6 Equipment and data management

B6.1 Maintenance, testing and repair

Train operators shall have documented systems in place for the maintenance, testing, repair and replacement of data recording equipment. Such systems shall ensure that:

- a) As far as is reasonably practicable, a data recorder relating to the cab from which a train is being driven is functioning correctly.
- b) Faults occurring in data recorders during train operation are identified, repaired or rectified as soon as possible.

Arrangements for defective data recorders on trains entering or in service are contained in GO/RT3000 and GO/RT3437.

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B6.2 Data retrieval

All forms of data download shall be read only and the data shall be protected against unauthorised corruption or deletion. The data recorder, if capable of downloading whilst the train is moving, shall be capable of continuous recording during the download. The recorder shall record each occurrence of a download as an event.

A means shall be provided to download data from a data recorder that has been removed from a vehicle, such that the integrity of the data is not put at risk.

Train operators shall ensure that stored data is retrievable for a period as set out in GO/RT3272 Data Recorders on Trains – Operating Requirements.

Railway Group Standard

GM/RT2472

Issue One

Date June 2002

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References

Railway Group Standards and other Railway Group Documents

- | | |
|------------------|---|
| GA/RT6001 | Railway Group Standards Change Procedures |
| GA/RT6004 | Temporary Non-Compliance with Railway Group Standards |
| GA/RT6006 | Derogations from Railway Group Standards |
| GO/RT3000 | Master Rule Book |
| GO/RT3272 | Data Recorders on Trains – Operating Requirements |
| GO/RT3437 | Defective On-Train Equipment |

Other references

- | | |
|-------------------------|--|
| EN60068 – 2 – 27 | Environmental testing procedures. Tests. Test Ea and Guidance. Shock |
|-------------------------|--|

The Catalogue of Railway Group Standards and the Railway Group Standards CD-ROM give the current issue number and status of documents published by Railway Safety.