IECC Data Preparation

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Issue 4

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Simulator Tutorial

For approval and authorisation of this document, please refer to the IECC Applications Manual Contents, RT/E/S/10040.

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1 Introduction

The 68000-based simulator is an IECC subsystem which is intended to allow the IECC to be operated in an environment which is very similar to that of the real railway. It does so by functioning as a number of Solid State Interlockings (SSIs) which appear to be connected to a railway with trains operating in the usual manner. The simulator user is provided with a PC-based menu-driven interface, which provides facilities including the following:

(1) Modification of behaviour of trackside equipment.

(2) Creation of trains to timetable, including station stops and TRTS.

(3) Manual creation of trains; editing of parameters and stopping patterns of existing trains.

(4) Conversion of TTP timetables into simulator timetable data.

The simulator is intended for the following applications:

(1) Testing of IECC subsystems, particularly ARS, in a realistic manner prior to site commissioning.

(2) Familiarisation of operators with new track layout and working of new IECC before commissioning.

(3) Training to allow operators to react to unusual incidents and emergencies.

Like other IECC subsystems, the simulator program is not site-specific. Instead, the simulator is configured for a particular site application by the use of data.

The bulk of the data is taken from the Solid State Interlockings (or Relay Interlocking Interfaces) which will work with the new IECC. This data may simply be transferred to the simulator in object form, and its preparation is covered by reference 1.

Further data is required to describe to the simulated trains the path they must take across the track layout. This function is very similar to that provided by the SSI simulator. Hence, the IECC simulator has been made to use the SSI simulator data in object form. The preparation of this data is described in the reference 2.

Yet more data is necessary to control the functions which only the IECC simulator can provide - timetabled train operation and TTP timetable conversion. This data is documented in this Tutorial.

Data is also required to allow the user to control the operation of simulated trackside equipment and trains. It is largely converted automatically from SSI source data, but a certain amount of extra work is necessary and is described here.

This document is a tutorial. No attempt is made to define the syntax of the files themselves. Instead, a higher-level description is given of the type of information which is required, and this is illustrated by actual examples, most of which are based on fragments of data files for the Shenfield simulator.

1.1 CONVENTIONS USED IN THIS DOCUMENT

Bold is used within the text to indicate something which exists in the data files, or the names of the files themselves. ***Bold Italic*** means that other text must be substituted for this text in the data file. *Italic* text on its own is used for jargon words where they are defined, and for important warnings.

```
Examples look like this.  Each example is a small fragment of the data file,
and text in bold is entered or modified by the data preparer.  Text in normal
type is part of the standard prototype file, and may vary slightly depending
on the version of the file.
```


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2 Documents Referenced

2.1. SSI Data Preparation Guide - Interlocking
Railtrack, SSI8003-10.

2.2. SSI Data Preparation Guide - Simulator
Railtrack, SSI8003-40.

2.3. SSI Design Workstation User Guide
BR Research Limited, SSI8300.

2.4. Simulation Of Relay Interface Interlockings
BR Research Limited.

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3 Source Data

In this section are listed the items required to produce the data described in this document. Some of this information is used by automatic compilers and must therefore be provided in machine-readable form.

3.1 SSI DATA

As previously noted, the simulator makes use of the interlocking and train-movement data for all the SSI interlockings which will be used with the IECC in question. The SSI object file (**int.mot**) for each interlocking may be released directly to the simulator build process. Alternatively, it is possible to download the SSI data directly into the simulator from the SSI Design Workstation (this feature is documented in reference 3).

Identity numbers and physical extent of all interlockings must be known during simulator data preparation.

3.2 RII DATA

Where the area to be simulated is controlled wholly or in part by Route-Relay Interlockings, which are to be retained as part of the IECC and connected via the Relay Interlocking Interface (RII), the situation is somewhat more complicated than for SSIs. There are two approaches:

(1) Prepare SSI data based on the RRI control tables, but including the various extra features which will be provided by the RII (reminder devices etc). The area is then simulated as if it was SSI-controlled.

(2) Allocate two simulated interlockings for each RII signalling network connection. One interlocking contains the **int.mot** file generated by compiling the RII data. The other is known as the *auxiliary interlocking.* It contains new data which emulates the function of the RRI (excluding extra RII features), known as the *auxiliary data.* Special configuration data is written to allow output telegrams from one interlocking to be interpreted as input telegrams to the other, and the simulated RRI interlocking is controlled by this means.

The two methods involve similar amounts of data preparation. Method (1) has the advantage that only one simulated interlocking is needed, which could be significant where a simulation contains large numbers of interlockings (each simulator provides only 12 interlockings). Method (2) however allows the RII data prepared for the site application to be tested in simulation. It is also likely to result in more realistic delays in responding to IECC requests, although the difference is not great. Method (2) is therefore the preferred method.

These methods result in the generation of one or two **int.mot** files which are used for simulator build or download.

Method (1) involves only the preparation of standard SSI data and is therefore documented fully by reference 1. Method (2) is documented in reference 4.

3.3 SSI SIMULATOR DATA

The SSI Design Workstation system includes a simulator compiler, which produces object data from trackside database contents and optionally from a train-movement data file **SIM.dat**. For each SSI (and auxiliary RII) in the scheme, it is necessary to generate and compile the train-movement and trackside simulator data.

Reference 2 describes fully the preparation and compilation of this data. The resulting object file for each interlocking (**sim.mot**) may be released to IECC build or downloaded to the simulator, in the same way as SSI data.

It is useful to have access to a machine-readable version (or a printout) of the train-movement data in the preparation of the other data areas.

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3.4 SSI INPUT TELEGRAM FILES

The **IPT.dat** file is required (in machine-readable form) for each SSI and auxiliary interlocking within the simulation. This file provides source information for the MMI data compiler. During the development of the scheme the **IPT.dat** files change frequently. However, it is only necessary to recompile the MMI data (see section 7) when a change occurs which affects the allocation of SSI trackside module input bits to trackside equipment.

3.5 TRTS BUTTONS

TRTS buttons are by far the most common trackside operations and as their function is straightforward, all are considered simultaneously. For each button, the station, platform number, departure direction, interlocking number, telegram number, and bit number are required. This may, if necessary, be deduced from the **IPT.dat** files and scheme plans.

3.6 MISCELLANEOUS TRACKSIDE OPERATIONS

This heading covers a wide variety of possible functions, such as ground frames, lockouts, slots, alarms and level crossings. It excludes signal lamp-proving, point detections, TRTS and track circuits.

It is suggested that the number of user-operable functions is minimised, and that initial states are chosen to minimise the number of user actions to start the simulation. For each item, the interlocking, telegram and bit numbers are required, together with an initial state, and one or more of operating mode and trigger function.

Unless otherwise specified, the initial state will be determined from the SSI trackside database as detailed in reference 2. It is however possible to force an input to be set by the IECC simulator regardless of its “default” state, although it is not possible to force an input to be unset.

Operating modes are as follows:

(1) The input is never modified during the simulation. This is assumed unless otherwise specified. No trigger function is necessary.

(2) The input is set by a trigger function, and unset by a different trigger function. For the input to be “seen” by the simulated interlockings, at least 1s must elapse between triggers. It is suggested that both triggers be generated from the same source (movement of the same train, or user intervention).

(3) The input is inverted from its initial state by a trigger function, and restored a few seconds later (as for a TRTS button).

Possible trigger functions are as follows:

(1) User selection from MMI menu.

(2) Creation of a train at a given entry point.

(3) Departure becoming due of a stopping train from a specified platform at a specified station, in a specified direction.

(4) A specified TD step taking place.

It is likely that this information can only be obtained by consulation with technical and (possibly) operating staff.

3.7 ENTRY POINT LISTS

In order for trains to be generated at appropriate places in the simulation, lists of entry points and corresponding “real” track locations must be extracted from the train-movement data, and used in the preparation of other simulator data areas.

For each entry point representing a train entering the simulation from outside the controlled area or from sidings, it is necessary to determine exactly when the train is to be created (and the description interposed). This information

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