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Module

Chapter G: OPT File

For endorsement, authorisation and issue record of this document, please refer to the SSI Applications Manual Contents, NR/L2/SIG/17002.

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User information

This Network Rail standard may contain requirements that are colour-coded according to the following Red–Amber–Green classification.

Red – Mandatory requirements

- **Requirements** that **will** be complied with, and achieved under all circumstances.
- Accountability for the efficacy of these requirements lies with the Professional Head/Standard Owner.
- These requirements are monitored for compliance.
- Local non-compliances, discovered through engineering verification visits, will be reported and monitored through the quarterly Engineering Verification Report.
- Corrective actions will be enforced where local non-compliances remain open beyond the agreed mitigation plan dates.
- These are presented in a red box **and with the word “shall” or a direct instruction.**

Amber – Conditional requirements

- **Requirements** that **will** be complied with unless deviation has been approved.
- Accountability for the efficacy of these requirements lies with the Professional Head/ Standard Owner, or their nominated Delegated Authority.
- These requirements are monitored for compliance.
- Derogations **may** be permitted; which are to be approved by Standard Owner in advance.
- Derogations and Temporary Non-Compliances **may** be granted through the existing Delegated Authority arrangements.
- These are presented with an amber sidebar **and with the word “shall” or a direct instruction.**

Green – Guidance

- Guidance based on good practice; representing supporting information, based on good practice, to help achieve **RED** and **AMBER** requirements.
- This guidance is **not mandatory** and is not monitored for compliance.
- Alternative solutions may be used, which do not need to be formally approved.
- Decisions made by a competent person to use alternative solutions should be backed up by appropriate evidence/documentation.
- This is presented with a dotted green sidebar **and with the word “should” (usually in notes).**

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Issue record

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8	October 2005	8 th Issue
9	03/03/2012	9 th Issue

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 03/03/2012.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 3 (Option Selection) to continue to comply with the issue of any relevant Network Rail standards current when GRIP Stage 3 was completed and not to comply with requirements contained herein, unless stipulated otherwise in the scope of this standard.

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1 Output Telegram Data (OPT File)

The data for output telegrams is similar to that used for input telegrams in that there shall be a block of data for each output telegram to which a Trackside Functional Module has been allocated, or which is to be transmitted over the Internal Data Links to other Central Interlockings, except where an Internal Data Link telegram is used to send request codes (see [SSI8003-51C](#) Section 1.1). Each block shall start with a label which shall be of the form "*Onn", where "nn" is the decimal telegram number, in the range 1-63 (Trackside) or 64-78 (Internal), and shall end with an "end marker" data type. Two "output telegram special" data types may be used to shorten the data and speed the program. One of these is for points and one is for signals. The remaining data is built up from conditional statements. Blocks of data may be provided for unallocated telegrams in order to spread data processing (see [SSI8003-52](#)).

At the start of processing an output telegram all the data and status bits are set to '0', unless an output telegram command referring explicitly to this telegram number has already been processed to set some of the bits in the preceding major cycle. The output telegram data then overwrites this with information to set further bits to '1'.

Note that while five status bits are provided in each output telegram on the Trackside Data Links they have no function at present, and are ignored by Points and Signal Modules. Status bits are not included in Internal Data Link messages, and any data referring to them will be ignored. The data is processed in the order in which it is written and later data can overwrite the values of the telegram bits set up earlier. When the end marker "." (which indicates the end of the telegram) is reached, processing of data stops and the telegram is transmitted.

The "output telegram special" data types differ from the corresponding input telegram data types in that they are not self-contained. This means that not all the data required for the calculation is contained in the data type itself, but is placed after the data type in a predefined sequence. The end of the sequence of data is marked by an "end of special" data type. The constraints on the data sequences and the program actions induced by the data are discussed below for each of the two "output telegram special" data structures.

These structures are normally used in trackside output telegram data, but could also be used via the Internal Data Link to control points or signals attached to another Central Interlocking. In this case however, it is important to remember that in the event of an Internal Data Link failure, the other Central Interlocking will act as if the telegram was all-zero, and so the Internal Data Link should not be used to transmit a command to set a signal's most restrictive aspect. In practice this is unlikely to be an obstacle as the signal in this case will be treated as a "slot".

When a Central Interlocking is disabled, either by the Technician's control (Stop Interlocking) or after a Mode 1 or 2 start (see Chapter B Section 3.7), output telegrams are automatically set to their most restrictive state. Thus, other than those telegram bits indicated as red-retaining in "Output Telegram for Signal" specials, all other bits are set to '0', even if they have already been set to '1' by non-current telegram commands located in other data files.

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Additionally, conditional statements in the output telegram data are not executed. As these conditional statements can be used to amend memory areas as well as the output telegram, this feature allows selected operations on flag or timer memories to be suppressed while the Central Interlocking is disabled, by locating the relevant data in the OPT file instead of elsewhere.

1.1 Output Telegram for Points

This sequence of data comprises the "Output Telegram for Points" special (this defines the name of the points), followed by a telegram command which defines the two bits in the current telegram that control the drive to the points. By convention, the most significant bit relates to the normal drive, and the least significant bit to the reverse. For a Points Module, these will always be bits 7 & 6 or 5 & 4. The data construct is terminated with an end of special symbol "\$".

```
'P104    G s 54    $
```

See [SSI8003-66](#) for examples of data for points requiring automatic restoration. See [SSI8003-71](#) for examples of data for divided sets of points.

A conditional statement is also required for each set of points in a Panel controlled Central Interlocking. The reason for this is explained in Chapter E Section 3.2, but the data takes the form of:

```
if E222KC stopped then E222KC = 5 , L222KN xs , L222KR xs , L222KC s \
```

1.2 Output Telegram for Signal

This "special" has three main purposes. It shortens the data, speeds the program, and acts as a check list of the functions required. This last purpose is important because much of the Interlocking logic has been concentrated in this part of the program. Once the program has been informed that the "special" is in operation, it processes the "control data" which defines the required Interlocking functions.

The "control data" is organised as follows:

```
Train in section proving data
"End marker"
Signal stick unsetting data
"End marker"
Route step-up data
"End marker"
Aspect control data
"End marker"
Temporary approach control data
"End marker"
Route/junction indicator data
"End marker"
Aspect sequence data
"End marker"
AWS data
"End marker"
Approach locking release data
"End marker"
Route release data
"End marker"
```

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In the case of a signal which has no routes (i.e. automatic and semi-automatic signals, distant signals and signals controlled by single button), the "control data" can simply be preceded by the relevant "special" data type. This takes the form of the signal name preceded by an apostrophe, for example:

'S11

An "end of special" data type "\$" is written after the final "end marker" of the "control data" to indicate a return to normal data. Additional information on data for such signals is given in [SSI8003-62](#).

In the case of a signal from which there are two or more routes, this form of data would become somewhat complicated by the constant need to insert tests to determine which route is currently set. Under these circumstances, a different form of the special is available which allows the user to prepare data for each route separately. This includes features such as approach locking time-out values, which would have to be identical for all routes from the signal in a conventional Route Relay Interlocking. The form of the special in this case is as follows:

```
"special" data type
    route select data
    signal memory command
    telegram command
    "end marker"
"end of special" data type
```

There is also one or more sets of control data, pointed to by the route select data (see below).

In the case of a signal which has only one route, either form of data can be used. However, experience has shown that using the second form for all signals with routes results in more consistent data, and additionally results in speeding the program when no routes are set. Thus all examples in [SSI8003](#) of signals with one route are shown with this second (route select) form of data, and this is the recommended method.

The route select data consists of one or more pairs of data items. The first data item of each pair shall be a test for a route set and the second data item shall be a "carry out at ..." data type which points to the "control data" for that particular route. If none of the routes are set, the "signal memory command" and "telegram command" are used to tell the program how to set the most restrictive aspect for the signal, and the "signal stick" and "free of approach locking" bits in signal memory are unconditionally set to '1'.

The "signal memory command" need only be written if the most restrictive aspect available is not red, in which case the command is used to specify the aspect to be displayed. Similarly the telegram command specifies which bit or bits in the outgoing telegram shall be set in order to light the most restrictive aspect, and may be omitted if there are none. The "control data" is written exactly as it would have been in the other form of the special except that it is assumed throughout the calculation that the relevant route is set.

The "control data" can be situated anywhere in the OPT file, but it is usually most convenient to place all sets of control data immediately after the "." at the end of the

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data for the appropriate telegram. In this case the "control data" is to be preceded by a label corresponding to that used in the "carry out commands at ..." data item in the route select data, and is to be followed by a "terminator" so that the program can determine that it has reached the end of the data and return.

Because the data structure is fairly complex it is probably best to consider every part of it as applied to the following example (signal 11 in the Stopham West layout). There are two routes from this signal, so the second form of the special is used. The special would have the following data format:

```
'S11
  R11A s , @R11A          / Route select data
  R11B s , @R11B
  G s 7 .                / Set red aspect
$                          / End of special for S11
```

No "signal memory command" is included because the most restrictive aspect is red.

The "control data" for each of these routes would be of the form:

```
*R11A
  Train in section proving data
  "End marker"
  Signal stick unsetting data
  .....etc.....
  Route release data
  "End marker"
  "Terminator"
```

Note that when the Output Telegram Special for Signal is invoked, it takes a working copy of the current state of the Signal Memory, and works on that copy. This explains the restrictions on certain tests and commands within the data constructs described below.

The following sections describe each block of data within the control data, using signal 11 as an example.

1.2.1 Train in Section Proving Data

The first block of data is the train in section proving data which is used to update the train in section proving (TISP) code in signal memory. TISP is used for the release of approach locking. The data indicates to the program the conditions for changing the TISP code from 0 (no train) to 3 (train proved in section).

It should be noted that the program returns the code to zero when the approach locking is free. When the TISP code reaches three, the approach locking is freed when ALR data is subsequently processed (see Section 1.2.9), thus this returning the code to zero is delayed until at least the next major cycle after the TISP code has been set to three. With the use of the route select form of data (when TISP data is only processed whilst a route is set) the TISP code remains at its current value after a route is released (for whatever reason) until a route is next set from the signal when it is then immediately zeroed. Thus any data tests on the TISP code that are attempting to prove that a train has reached a particular stage in the TISP sequence shall be accompanied by a test for the "foal" bit not set.