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Module

TISP and TORR

Endorsement and Authorisation

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 contains colour-coding according to the following Red–Amber–Green classification.

Red requirements – *No variations, could stop the railway*

- **Red requirements shall** always be complied with and achieved.
- Red requirements shall be presented in a red box **with the word “shall” or expressed as a direct instruction**.
- Accountability for the efficacy of red requirements lies with the Professional Head/Standard Owner.
- Red requirements are monitored for compliance.
- Corrective actions shall be enforced if deviations are discovered through functional checks (e.g. engineering verification visits, audit or Operations Self-Assurance).

Amber requirements – *Controlled variations, approved risk analysis and mitigation*

- **Amber requirements shall** be complied with unless variation has been approved in advance.
- Amber requirements shall be presented with an amber sidebar **and with the word “shall” or expressed as a direct instruction**.
- Accountability for the efficacy of these requirements lies with the Professional Head/Standard Owner, or their nominated Delegated Authority.
- Amber requirements are monitored for compliance.
- Variations **may** be permitted. Variations are approved by the Standard Owner or through existing Delegated Authority arrangements.
- Corrective actions shall be enforced if **non-approved** variations are discovered through functional checks (e.g. engineering verification visits, audit or Operations Self-Assurance).

Green – *Guidance*

Guidance is based on good practice. Guidance represents supporting information to help achieve **Red** and **Amber** requirements.

Guidance shall be presented with a dotted green sidebar **and with the word “should” (usually in notes) or as a direct instruction**.

Guidance is **not mandatory** and is not monitored for compliance.

Alternative solutions may be used. Alternative solutions do not need to be formally approved.

Decisions made by a competent person to use alternative solutions should be backed up by appropriate evidence or documentation.

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Issue record

Issue	Date	Comments
4	April 2008	4 th Issue
5	Sept 2015	Conditional statement for monitoring irregularities in the standard TISP sequence amended in Clause 3.2.8

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 06/12/2015.

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.

Reference documentation

[GK/RT0063](#) - "Approach Locking and Train Operated Route Release", Issue 1, October 1988

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1 Introduction

In [SSI8003-10G](#) the action of the program when operating on the TISP and RR sections of the Output Telegram Special for Signal is explained. Also, the data required for the most commonly used form of TISP ("Train-In-Section-Proving") and TORR ("Train-Operated-Route Release") has been introduced. This document further examines the data for these and other forms of TISP and TORR, and covers the difficulties caused by short track sections, delayed signal replacement, sequence irregularities, etc.

The principles contained within this document are based on Signalling Principle Standard [GK/RT0063](#). Only sufficient information is given for data preparation; the actual Standard shall be used for other purposes such as Control Table preparation.

A single reference to a sequence of train detection being called "TISP" when applied to TORR is made in [GK/RT0063](#) clause 5.3 - it should be noted that in this document [SSI8003-61](#), the term TISP is only used in the context of releasing approach locking.

2 TISP

2.1 Principles

TISP proves that a train has entered a route, and once the associated signal has been restored to danger, is used to release approach locking for that route.

[GK/RT0063](#) Section A2 allows a number of ways in which TISP may be done. The most commonly used method is:

- (i) "First and second track sections in the route occupied followed by the first track section clear with the second track section occupied."

Where application of this sequence causes operational difficulties, alternative sequences/conditions are to be considered (and, if necessary, be subject to risk assessment). They are to be agreed with Network Rail, usually via control table approval.

Typical alternatives shown in [GK/RT0063](#) are:

- (ii) "All track sections in the route occupied with final track section of route occupied for a time." This is used (in conjunction with (i) for non-stopping or shorter trains) if, as a normal feature of operations, a long train can occupy the first track section whilst waiting at the exit signal and it is necessary to release the overlap ahead of the exit signal [or release opposing locking].
- (iii) "Berth and first section occupied, followed by berth track section clear with first track section occupied." This is used instead of (i) if no second track section is provided or the train has not cleared the first track section when the approach locking is required to be released [but see also (ii)]. Note this form of release will not function if the berth track remains occupied after the train has departed, e.g. the signal is a starting signal at a station platform at which a train may be divided or two trains may stand.

Another alternative, not shown in [GK/RT0063](#), and also requiring Network Rail approval (as above) is:

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- (iv) The first track section cleared after having been occupied for a time. This is normally used if no second track section is provided and the lack of, or the remaining occupation of, the berth track section prevents the use of (iii). The time used is based on the shortest fastest train occupying this track section, with a two second reduction for equipment operation time.

[GK/RT0063](#) Section 4.2.1 requires that TISP sequences shall be “protected against irregular releases due to power, transmission or other failure”. This is taken as requiring the inclusion of checks, where practical, to confirm that irregular conditions have not occurred between successive steps. Such checks are not expected to be defined in the control tables.

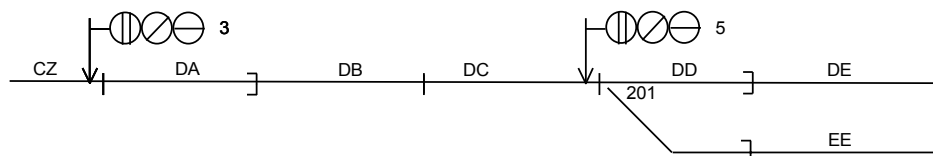
For (i) above, a sequence irregularity is deemed to have occurred if, after the first step of both track sections being occupied, the second track section is then cleared, i.e. before the second step of the first track section clearing with the second occupied has been achieved. Similarly this applies to (iii), but not to (ii) [there is only one step] or to (iv) [not practical with just one track section]. If an irregularity is detected then the sequence is reset thus preventing TISP freeing the approach locking, which in turn inhibits TORR.

The control tables are expected to have catered for where the second track section in a sequence, as used in (i) or (iii) above, is short (see the [SSI8500D](#) Section on Control Tables). This track section has to be long enough to confirm that the TISP data will be processed at least once in the interval between the first and second track sections in the sequence clearing. If this is not so then (i) above is changed to “first and second track sections in the route occupied followed by the first track section clear with the second or third occupied.” A similar change can be made to (iii), but (ii) & (iv) are not affected. This change affects in turn the sequence irregularity monitoring mentioned above, and this is detailed in the next Section.

2.2 Data

[SSI8003-10G](#) Section 1.2.1 has already described the action of the program when operating on the TISP section of the Output Telegram Special for Signal. The data used in the TISP section, together with associated data for sequence irregularity monitoring, is now illustrated for the various conditions described in the previous section. Note that for a multi-routed signal, the data in the TISP section may not be the same for each route.

2.2.1 Sequence of Track Sections



Section 2.1 (i) and (iii) are covered by this Section. Considering (i) first, the control tables for the route from signal 3 will require “DA clear, DB occupied after DA, DB occupied”

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In the two track reference form the TISP section data is:

```
#TDA      #TDB                                     . / TISP
```

[SSI8003-63](#) may require the TISP section data to be done in three test form so that a test for a TISP code of 2 can be made to aid overlap releasing, in which case the data is:

```
if TDA o , TDB o \                               / Tests for TISP 0 to 1
if TDA c , TDB o \                               / Tests for TISP 1 to 2
if \                                              / Null test for TISP 2 to 3
                                              . / TISP
```

A single conditional statement per signal is also required to monitor sequence irregularities. This includes a test on the second track section in the sequence being occupied and resets the TISP code to zero if this track section becomes other than occupied in mid-sequence. It is located immediately before the Output Telegram Special for Signal (for the signal concerned) rather than in the RSU section because it is changing the signal's memory.

```
if TDB o then else S3 set tisp0 \
```

If the second track section is not the same for all routes then conditioning by the controlled point position will be required. Signal 5 in the diagram above is an instance of this.

```
if ( P201 cn , TDE o or P201 cr , TEE o ) then else S5 set tisp0 \
```

Returning to signal 3, if the second track section (DB) is too short for reliable operation (see Section 2.1) then the control tables will require “DA clear, DB or DC occupied after DA, DB occupied” The three test list form of TISP data has to be used:

```
if TDA o , TDB o \
if TDA c ( TDB o or TDC o ) \
if \                                     . / TISP
```

This data will allow the second set of tests to be achieved even if DB is so short that it appears to clear at the same time as DA. The conditional statement shown above also has to be changed to allow for DB legitimately being clear at the time of the second and third code transitions.

```
if ( TDB o or TDC o ) then else S3 set tisp0 \
```

This form of the conditional statement is also to be used in the marginal situation where the second track section is within one second of being too short and the three test list form of TISP data is being used. This caters for the extra major cycle it takes for the TISP code to reach three.

If (iii) in Section 2.1 applies, the control tables for the route from signal 3 will require “CZ clear, DA occupied after CZ, DA occupied” The track sections used in TISP data and the conditional statement are changed accordingly:

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#TCZ #TDA

. / TISP

```
if TDA o then else S3 set tisp0 \
```

Note that changing the TISP data to the three test list form, merely to allow TISP at 2 testing for overlap releasing (as described in [SSI8003-63](#)), cannot apply when these two track sections are being used for TISP, as the TISP code reaches the required value of 2 at the wrong time for overlap release.

If the second track section (DA) is too short for reliable operation (see Section 2.1) then the control tables will require “CZ clear, DA or DB occupied after CZ, DA occupied” Again, the three test list form of TISP data has to be used and the conditional statement changed:

```
if TCZ o , TDA o \
if TCZ c ( TDA o or TDB o ) \
if \
. / TISP

if ( TDA o or TDB o ) then else S3 set tisp0 \
```

If a signal has type (i) TISP for some routes and type (ii) for others then the conditional statement will have to be expanded in a similar fashion to that shown above for different second track sections. The conditioning can be done by point controls (as above) or routes set or a mixture of both, i.e. whatever is appropriate and minimises data processing time.

2.2.2 Long Train

Section 2.1 (ii) is covered by this Section. This form of TISP is used in conjunction with (i). The control tables for the route from signal 3 will require “(DA clear, DB occupied after DA, DB occupied) or (DA, DB occupied, DC occupied for time)”. The data as shown for (i) in Section 2.2.1 is used, modified as follows. The three test list form of data is used, with the second test list amended. Note that the long train automatically satisfies the first step of (i).

```
if TDA o , TDB o \
if TDB o ( TDA c or TDA o , TDC o> <time> ) \
if \
. / TISP
```

The conditional statement, as used for (i) in Section 2.2.1, is required, but unchanged as there are no additional sequence irregularities to monitor.

If the second track section (DB) is too short for reliable operation (see Section 2.1) then the control tables will require “(DA clear, DB or DC occupied after DA, DB occupied) or (DA, DB occupied DC occupied for time)”.

```
if TDA o , TDB o \
if ( TDA c ( TDB o or TDC o )
or TDA o , TDB o , TDC o> <time>
)
\
if \
. / TISP
```

The conditional statement is also changed to suit, i.e. as for (i) in Section 2.2.1.

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2.2.3 Single Track Section

Section 2.1 (iv) is covered by this Section. The control tables for such a route will require "(DA clear after DA occupied for time)" where DA is the single track section past the signal. The three test list form of data is used.

```
if TDA o> <time> \
if TDA c \
if \
```

The conditional statement, as used for (i) in Section 2.2.1, is not required as there are no sequence irregularities to monitor.

3 TORR

3.1 Principles

TORR is a train-initiated method of releasing a route, once the train has entered the route. It is an alternative method to that of the Signaller pulling the route entrance button and thus extra conditions have to be satisfied to replace the human level of protection provided by the Signaller's observations.

3.1.1 Minimum Requirements

The minimum requirements for TORR, as specified in [GK/RT0063](#) Section 5.2, are:

- [a] "The signal is disengaged and thus prevented from reclearing after the train movement has taken place", i.e. the signal stick shall have been unset.
- [b] "The signal is not set to work automatically", i.e. the signal shall not be in auto mode.
- [c] "The Signaller has not initiated the release of the route", i.e. the entrance button shall not have been pulled.
- [d] "The approach locking for the route has been released". This in turn proves the signal is on. Because of [c], the approach locking shall have been released by TISP (see Section 2).
- [e] "The signal controls were OFF at the time the train passed the signal". The signal stick is also unset by this control, thus [e] will be satisfied by proving [a]. The signal stick unsetting additionally requiring the berth track section occupied is acceptable.

3.1.2 Additional Requirements

For most routes, i.e. those involving passenger movements or speeds in excess of 15 mph (as defined in [GK/RT0063](#) Section 5.3) there is an additional requirement for one additional condition or sequence of train detection devices to be satisfied. The additional condition or sequence shall be one of the following, usually one of the first two: