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Module

Relay Interfaced Signals

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

Issue	Date	Comments
1	August 2004	1 st Issue
2	03/03/2012	2 nd 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 Introduction

A requirement may arise for a relay interface to be added between an SSI-controlled signal and its controlling Signal Module. This may typically arise from:

- the repositioning of an existing SSI-controlled signal, or
- the position of the signal, typically in a tunnel or on a viaduct, causing difficulties, or
- the signal being in a fringe area.

However, relay-interfaced signals should be avoided where practical.

Note that this document does not cover the type of installation where a relay interlocking has been replaced by one or more SSIs and the external circuits from the relay interlocking to the trackside equipment have been retained. This subject is covered by [SSI8507](#).

2 Principles

2.1 Relay Interface

The signal circuits at the location serving the signal will be as though the signal was controlled by a relay interlocking, with any exceptions advised below. Therefore, if required, the following should be read in conjunction with the appropriate RRI (Route Relay Interlocking) standard circuits.

2.1.1 Outgoing Control Circuits

In order to control the signal, a Signal Module output controlling a BR966F7 output relay is provided for each main proceed aspect. This relay controls an outgoing line circuit, from the controlling Signal Module location to the location at the signal.

Thus for a four-aspect signal, Signal Module output relays HR, HHR & DR are provided that control outgoing line circuits HPR, HHPR and DPR respectively. For two or three aspect signals or for distant signals these will be reduced accordingly.

If the forward signal is RRI controlled, then direct aspect sequence lines can be used and there is no need for the Interlocking to output the HHR and DR functions.

If route or junction indicators are present then the appropriate number of Signal Module outputs, UHR output relays and UHPR line circuits are provided instead of the HR output relay and HPR line circuit. Polar circuits are used where appropriate. Any indicator lamp proving is done locally using a UECR and a HR at the signal location.

2.1.2 Incoming Proving Circuits

An ECR is provided at the signal location for lamp proving. An incoming ECPR line circuit, controlled by the ECR relay, is provided between the signal location and the Signal Module location, the ECPR then controlling a general purpose input.

An EKR relay is provided to monitor first filament failure at the signal location. An incoming EKPR line circuit, controlled by the EKR relay, is provided between the signal location and the Signal Module location, the EKPR then controlling a general purpose input. (Alternatively, where practical the EKR can be located at the Signal Module location.)

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It is a requirement that the Interlocking also has to have proof (or "detection") of the state of the final control relay, i.e. whether the signal is actually "on" or "off". The Interlocking then acts accordingly to any discrepancies between this and what the signal is being controlled to. To provide this detection, RGPR and H/DGPR incoming line circuits, controlled by the HPR (or HR relay) at the signal location, are provided from this location to the Signal Module location in order to control Signal Module inputs, thus detecting for the Interlocking the state of the signal. Polar circuits are normally used for these GPR circuits.

The Interlocking may need proof of whether the signal is at a less restrictive aspect than single yellow. Such a need will arise for aspect sequencing where the aspect of the signal in rear depends on this. Thus for a four aspect sequence, an incoming HH/DGPR line circuit, controlled by the HHPR relay and controlling a further Signal Module input is required (the above H/DGPR circuit is re-named HGPR).

If the signal in rear is RRI controlled then direct aspect sequence line circuits can be used, originating in the relay interfaced signal's location.

For non-panel schemes where the Signaller's signal indications distinguish between main proceed aspects, separate HHGPR and DGPR (instead of the HH/DGPR) line circuits, controlled by the HHR and DR relays and controlling a further two Signal Module inputs, may be required to give positive proof of aspects in such indications.

If the location with the Signal Module is close enough to that for the signal, then, SSI8500 permitting, the Signal Module input circuits can be fed out from the former location to the latter location, thus obviating the need for the repeat detection relays.

2.1.3 Automatic Signals

Of the above defined incoming line circuits and Signal Module inputs, the RGPR, HGPR (or H/DGPR), ECPR and EKPR will still be required. Other incoming line circuits may be required for aspect sequencing and Signaller's indications as illustrated above.

2.1.4 Distant Signals

Of the above defined incoming line circuits and Signal Module inputs, the ECPR and EKPR will be required. One or more of HGPR (if Y/G or Y/YY/G), HHGPR (if YY/G or Y/YY/G) and DGPR (if Y/G or YY/G) incoming line circuits and Signal Module inputs may be required for aspect sequencing and/or Signaller's indications.

2.1.5 Position Light Signals Associated with Main Aspect

If such a signal is present, a (PL)GPR outgoing line circuit, controlled by Signal Module output relay (PL)GR, is provided to control this aspect. A (PL)(OFF)GPR incoming line circuit is used to control a Signal Module input to provide detection for the Interlocking of this aspect's final control relay being up, and thus the aspect "off". Detection of this relay being down, and thus the aspect "on", is provided by including it in the RGPR line circuit. If selection of route indicators is required then the appropriate number of (PL)UPR outgoing line circuits are provided instead of the (PL)GPR outgoing line circuit with any indicator lamp proving done locally using UEGR and (PL)GR relays at the signal location.

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2.1.10 Tollerton Control for Signals Approaching SSI Areas

Where the first SSI controlled signal is relay interfaced, then the potential extra delays in reaction times of such a signal makes Tollerton Control measures even more imperative (see [SSI8003-51D](#) Section 2.1).

3 Aspect Detection Cross Proving

If the "on" and any of the "off" detection inputs from the relay interfaced signal are simultaneously made, then this is to be treated as having lost aspect detection. Although this may occur during Design Workstation based testing, it should not happen in normal service, but nevertheless it is to be protected against.

Where detection inputs for higher aspects double yellow or green are provided, the GP latches for these are held unset if the detection input for the single yellow is not made.

3.1 Control of the Aspects of the Relay Interfaced Signal

In clearing a relay interfaced three or four aspect stop signal, this signal is to be held at single yellow until the signal is detected "off". If this detection subsequently fails with the signal cleared, the signal is to be returned to single yellow. This will result in the signal being briefly held at single yellow when clearing to a higher aspect, and is considered as a suitable substitute for that applied by the use of the aspect sequence data command.

3.2 Aspect Sequencing

What aspect the signal in rear should display is based on either the controlled aspect or the detected aspect of the relay interfaced signal, whichever is the more restrictive. As the controlled aspect responds to aspect change more quickly than the detected aspect, this confirms that the aspect of the signal in rear:

- is changed to a more restrictive aspect faster, and
- is not changed to a less restrictive aspect until the relay interfaced signal has been detected as having actually changed to a less restrictive aspect.

If no aspect is detected, or if any of the one or more Signal Modules controlling the relay interfaced signal enter red-retaining, then the aspect on the signal in rear should be based on the relay interfaced signal being at its most restrictive aspect.

3.3 Approach Locking Application and Release

The approach locking of a signal is to be applied immediately the clearing of the signal is initiated. In addition to the usual conditions (signal controlled to red, plus time-out, look-back or TISP), the approach locking of a signal may only be released after the signal has been detected as "on" (i.e. final control relay de-energised).

A delay is required, if a signal has been replaced immediately after the signal clearing has been initiated, in order to confirm that any subsequent reaction in the signal detection has been reported to the Interlocking. Approach locking time-out may only proceed whilst the signal is detected as "on", and any loss of this detection during time-out is to cancel that part of the time measured so far.