| Ref: | **NR/L2/SIG/30014/F120** |
|---|---|
| Issue: | 01 |
| Date: | 06/09/2014 |
| Compliance date: | 07/09/2015 |

# Level 2

# The Verification and Validation of Western Region E10,000 Interlockings

## Endorsement and Authorisation

For endorsement, authorisation and issue record of this document, please refer to NR/L2/SIG/30014

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## Issue record

| Issue | Date | Comments |
|---|---|---|
| 01 | September 2014 | Initial Issue. Detail extracted from WR technical instruction B35. |

## Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 7 March 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

| | |
|---|---|
| NR/L2/SIG/11201 | Signalling Design Handbook |
| NR/L2/SIG/30014 | Signalling Works Testing Handbook |
| NR/L2/SIG/30014/A100 | Selection of Standards for Signalling Testing |
| NR/L2/SIG/30014/A110 | Signalling Works Testing |
| NR/L2/SIG/30014/B410 | Signalling Works Testing Staff Competence Assessment |
| NR/L2/SIG/30014/C120/TP01 | Test Plan form |
| NR/L2/SIG/30014/C310 | Test Certificates and Check Marking and Recording on Test Copies |
| NR/L2/SIG/30014/E110 | Signalling Works Testing Glossary |

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## 1 Purpose

This document is part of the suite of documents contained within the Signalling Works Testing Handbook, NR/L2/SIG/30014, which together detail the requirements for signalling works testing activities.

The document NR/L2/SIG/30014/D120/TS11-01 "Test Specification for Control Tables and Principles Testing" references this document specifically for Western Region E10K style Interlockings.

This Level 2 document sets out the requirements for the Verification and Validation of Western Region E10K style Interlockings to be used during signalling works testing. It has been produced as a "best practice" relating specifically to the legacy Western Region E10K Interlocking. Testing requirements for other generations of this type of Interlocking may vary.

The original WR Technical Instruction No B35 only addressed Control Table testing and therefore reference shall be made to NR/L2/SIG/30014/F110 for guidance on Principles Testing requirements for type of interlocking.

## 2 Scope

This Level 2 standard applies to work that meets the selection criteria for NR/L2/SIG/30014/A110 or NR/L2/SIG/30014/A210 as defined in NR/L2/SIG/30014/A100.

## 3 Flowchart

None

## 4 Procedure

This testing standard is based on the former WR Technical Instruction No. B35.

Throughout this standard reference is made to various Tables. These are suggested "aids" for recording the progress of testing. Examples of these tables are detailed in Appendix A.

### 4.1 Pre-Functional Tests

As part of the general preparation:

(a) Circuit tests to be completed.

(b) Loops to be proved intact, independent, and free of earth connection, before any relays are plugged in.

> *Important: On the installation of subsequent stages, a further test to be made immediately on the connection of any additional loop.*

(c) On completion of tests (b), all relays to be plugged in and labelled, and time relays correctly adjusted.

(d) In the case of remote interlockings, repeat relays for both control and indication to be proved to follow the correct primary relay.

(e) Test panel wiring to be completed.

> *Important: Extra care must be taken when connecting the test panel if any relays in the interlocking are already in traffic service on stage work. Such relays must be very distinctively marked.*



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### 4.1.1 Point Calling and Detection correspondence

(a) Observe Normal indication with WZR and KR Normal.

(b) Observe flashing in lieu of Normal indication with WZR Normal and KR de-energised and Reverse. Revert to condition (a).

(c) Observe Reverse indication with WZR and KR Reverse

(d) Observe flashing in lieu of Reverse indication with WZR Reverse and KR de-energised and Normal. Revert to condition (c).

> *Note: The operation of NWCR, RWCR and all associated repeat or parallel relays must be observed under each test.*

Recording:

- Tick in **column 1** in Table 1.

### 4.1.2 Point Indications N and R

Operate the individual point switch and confirm:

(a) (i) Normal indication in correspondence with switch position.

(ii) Point layout indication in correspondence when master switch operated. (WNKPR)

(iii) Lock light exhibited when points called Normal.

(b) Similarly for Reverse position.

Recording:

- Tick in **column 2** in Table 1.

### 4.1.3 Lock Indications (Points and Ground Frames)

Separately release each LR (not LPR), and observe the lock light when LR de-energised.

Recording:

- Tick in **column 3** in Table 1.

### 4.1.4 Slot Controls

(a) Received: Confirm panel indication in correspondence with YR.

(b) Sent: Confirm operation of panel switch at outgoing cable terminal at the interlocking.

Confirm panel indication (Off: YKR de-energised; On: YKR energised).

Recording:

- Tick in **column 4** in Table 2.

### 4.1.5 Signal Indications

(a) Check Red and 'Off' by false feeding HR, and (S)GR where provided.

(b) Check that both indications require lamp alight in main aspect, by releasing GECR or GECPR or by removing temporary strap, as appropriate.

Recording:



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- Tick in **column 5** in Table 3.

### 4.1.6 Track Circuit Indications

De-energise the first TPR from the test panel and observe that all apertures of the panel indication are illuminated. Check the operation of all TPPR's and TPZR's.

Recording:

- Tick in **column 6** in Table 4.

### 4.1.7 Route and Track Lights (See also Push-button panels, section 4.3)

(a) Route Set: Set up each route and check route lights.

Recording:

- Tick in **red** the route number in **column 1** of the **control table**.

(b) Overlap Indications

(i) Facing points – Indication to agree with point setting N or R.

(ii) Trailing points, where delayed yellow aspect applies – Indication to agree with point setting, but only when the points are set to foul the overlap.

Recording:

- Tick in **columns 7(b)(i) or (ii)** of Table 5 as appropriate.

(c) Route Occupied: De-energise each TPR in the route separately in the direction of running, and observe the route lights change from White to Red, and back to White when TPR re-energised. (Entrance switch remaining in Reverse position). Track circuit indications must be limited to the actual route set, and not all apertures as required under test 4.1.6.

Recording:

- Cross tick in **red** the record of test 4.1.7(a).

(d) Stick Replacement Indication

(i) For each multiple aspect signal, observe flashing of first section white light after "stick" TPR is released and re-energised, until entrance switch restored to normal.

(ii) Repeat with "Auto" switch operated and verify that flashing does not occur.

Recording:

- Tick in **columns 7(d)** in Table 3.

### 4.1.8 Ground Frame and Hand crank Release Indications

Verify "Release Given" (flashing white), "Release Taken" (steady red) and Normal (steady white in the case of hand crank releases and ground frames in auto sections).

Recording:

- Tick in **green** in appropriate column in Table 6.



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Where a ground frame release is also given by route setting:

(a) Observe flashing of point apertures in track layout when release given, until YR operated.

(b) Restore release switch and observe flashing until YR released and WCR energised.

Recording:

- Cross tick in **column 5** in Table 6.

Where a separate KR is provided, prove control of the WCR by de-energising and reversing the KR.

Recording:

- Tick in **column 3** in Table 6.

### 4.1.9 Interlocking of Route Calling Relays

Maintain a feed on each UR under test (irrespective of the exit button) and pick up in turn all UR's applicable to conflicting routes.

Observe the release of the UR under test each time.

Recording:

- Tick in **red** in **column 19** of the control table.

### 4.1.10 Anti-pre-selection of Points

(a) Points to be in correct position or free to operate before UR can be energised.
Set up the route correctly, then restore the entrance switch and attempt to reset the route under the following conditions, a separate group of tests being made for each set of points in each route.

(i) With the points set and locked in the wrong position, prove that the UR will not energise.

(ii) With the points set and locked in the correct position, prove that the UR will energise.

(iii) With the points set but unlocked in the wrong position, prove that the UR will energise and the points will operate.

Recording:

- Tick in **red** the route numbers in **columns 2 and 3** of the Points control table.

(b) Points not to operate unless free at the time the switch is operated.

(i) Prove, by setting and locking any interlocked or lead points as necessary, that the points can be operated by the individual switch. Then restore the points to Normal and the switch to the centre position.

(ii) Lock the points Normal by suitable track circuit, place the switch to reverse and prove that the points will not operate.

(iii) Clear the track circuit and observe that the points remain locked and do not respond to the switch.



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(iv) Restore the switch to the Centre position and observe that the points have become free.

(v) Prove that the points can now be set and locked Reverse. Repeat the series of tests with the points in the Reverse position.

Recording:

- Tick in appropriate columns in Table 1.

(c) Ground Frame Points to be in correct position before a route can be set through the points in the Normal position.

(i) Prove that the route can be operated, then restore the entrance switch.

(ii) With WCR down and ZWR down, prove that the UR will not energise.

(iii) With WCR up and ZWR up, prove that the UR will not energise.

Recording:

- Tick in **red** the route number in **column 2** of the Releases control table.

(d) Ground Frame to be free or in use before aq UR can be energised for a route through the points in the Reverse position.

(i) With LR up and WCR up, prove that the UR will energise.

(ii) With LR down and WCR up, prove that the UR will not energise.

(iii) With LR down and WCR down, prove that the UR will energise.

Recording:

- Tick in **red** the route number in **column 3** of the Releases control table.

(e) Ground Frame Release to be ineffective unless free at the time the switch is operated.

(i) Prove, by setting and locking any interlocked or lead points as necessary, that the release can be given. Then restore the switch to the Normal position.

(ii) Lock the release by suitable track circuit, place the switch to the Reverse position and check that the release is not given.

(iii) Clear the track circuit and again check that the release is not given.

(iv) Restore the switch to Normal and again place in the Reverse position. Check that a release has now been obtained.

Recording:

- Tick in **column 4** in Table 6.

### 4.1.11 Control of Route Locking

To prove the route locked and the release of the first ULSR (where provided) when the UR is energised but the signal remains at Red.

(i) Check that all points and ground frames in the route are free.

(ii) Clear the route but prevent the signal from clearing, and observe that all the points and ground frames in the route are locked and that the first ULSR (where provided), is de-energised.



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