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NR/L3/SIG/11231

NR/SMTH/Part/08

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NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part/08		
Index – Wrong Side Failure Test Guides		
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NR/SMTH/Part08/T001		
Use of the Signalling Failure and Incident Testing Guides		
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1. Scope

- 1.1 These T series Fault Finding Guides have been introduced in the form of check lists to detail the suggested checks and tests which shall be carried out when investigating wrong side signalling failures and incidents.
- 1.2 Intermittent and obscure failures shall be investigated using the Test Guide(s) in the U series [NR/SMTH/Part09](#) (Intermittent or Obscure Failure Guides).
- 1.3 Further faulting guidance can be found within the documents listed in [NR/SMTH/Part10](#) (Faulting Guides) and in relevant Manufacturer's Documentation.

2. Records

- 2.1 Complete [NR/SMTH/Part02/Form/13](#) (Wrong Side Failure or Incident Check Sheets).

Any measurement results or test records shall be included or attached as required.
- 2.2 If any item is replaced under NR/SMTH the SMTH Log Sheet shall also be included.
- 2.3 If you are investigating a SPAD, you shall also write down the results of each test that you complete and send it to your SM(S). Remember to identify any root cause as well as the actual cause of the failure.
- 2.4 If operating staff decline access to equipment for test/check purposes, this fact shall be recorded on the SMTH logbook sheet and advised to your SM(S).

END

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Wrong Side Failure Test Guide: Track Circuits		
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GENERAL

Where rail head contamination is confirmed, and you have been authorised by the SFI Level 2 or above, one of the following test plans shall be used instead:

- a) [NR/SMTH/Part08/T025](#) (Wrong Side Failure Test Guide: Track Circuit Rail Head Contamination – Remote Condition Monitoring (Not Fitted)) or
- b) [NR/SMTH/Part08/T026](#) (Wrong Side Failure Test Guide: Track Circuit Rail Head Contamination – Remote Condition Monitoring (Fitted)).

All test measurements shall be recorded on the Record Card together with the reason for the test.

NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note any relevant signal box indications.
- N.2 Check the condition of lamps / other indicators.
- N.3 Note the state of relevant train describer displays.
- N.4 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc.).
- N.5 Note the nature of any work being done or persons working in the area.
- N.6 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent.
- N.7 Note whether the train approach was particularly slow.
- N.8 Note whether any Track Circuit Actuator (TCA) was fitted to the affected train and if it was working correctly.
- N.9 Note the time and type of operation last made, prior to the report, which used the affected equipment.
- N.10 Note any other train movements in the affected area.
- N.11 Note any significant weather conditions in the area.
- N.12 Download available condition monitoring and data logger evidence (e.g. Centrix, Asset View, SSI) and confirm that the data supports the allegation.

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Running Rails

N.13 Check the rails for contamination and record the type of contamination and extent (Complete or sporadic).

Where rail head contamination is now confirmed, and you have been authorised by the SFI Level 2 or above, one of the following test plans shall now be used starting from step N13:

- a) [NR/SMTH/Part08/T025](#) (Wrong Side Failure Test Guide: Track Circuit Rail Head Contamination – Remote Condition Monitoring (Not Fitted)) or
- b) [NR/SMTH/Part08/T026](#) (Wrong Side Failure Test Guide: Track Circuit Rail Head Contamination – Remote Condition Monitoring (Fitted)).

Lineside Locations and Equipment Room

N.14 Check that the cupboard or room is correctly locked or padlocked.

N.15 Check for damage.

N.16 Review any relevant system terminal printout and remove any recording media for checking.

NOTE: Evidence might have been recovered remotely as part of step N12.

N.17 Check for signs of recent disturbances (wiring alterations or renewals activity).

N.18 Check for security or tightness of equipment.

N.19 Check and record the position and correspondence of relevant relays (energised, de- energised). Consider TR, TPR, TKR, etc.

N.20 Check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).

N.21 Check that relays correspond to the wiring diagram (type and specification, pin code, voltage, contact arrangement).

N.22 Record the last service date on the WSF form and forward to your Section Manager (Signals).

N.23 Check that equipment and settings correspond to the wiring diagram (specification, power, voltage rating, track capacitor, etc.).

N.24 Check the rear of relay bases for silver migration.

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- N.25 Check the equipment for short circuits (nuts, washers, solder, wire off-cuts, conducting dust, etc.).
- N.26 Check the equipment for any unusual amounts of moisture.
- N.27 Test bus bar and circuit voltages and record the results.
- N.28 Carry out [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) on all circuits and bus bar power supplies.

Track Equipment

- N.29 Check for damage.
- N.30 Check for signs of recent disturbances (track maintenance or renewals activity, no unused rails in any tuned zones).
- N.31 Check the condition of any stainless-steel strip.
- N.32 Check that the track circuit bonding corresponds to the bonding diagram.
- N.33 Check any insulated rail joint condition.
- N.34 Check that the rail connections are properly insulated.
- N.35 Check under the rails for short circuits.
- N.36 Note the details of any H.T. electrical equipment nearby, associated with the track circuit (BR Point switch heaters, BR shore electrical supplies, etc.).
- N.37 Test insulated rail joints.
- N.38 Check any impedance bond phasing and connections.
- N.39 Note the type of sleepers in use (timber, concrete, steel) with reference to high residual voltages and TCAID malfunction.
- N.40 If a laptop is available, download the error log. (DIGITAL EBI TRACK 200 & 400 RX ONLY)

NOTE: *This can be done whilst the system is operational by connecting to the 9-way D type port on the front of the Digital Rx, using a laptop and the required software.*

DO NOT turn or remove the frequency key during this process.

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Cables and Bonds

- N.41 Check the insulation of cables and wires at terminations. Check that adjacent terminations are properly insulated from each other.
- N.42 Remove covers from trunking and check for safe insulation (chafing, scorched, rodent damage).
- N.43 Note any signs of obvious damage (fires, squashed cables, etc.).
- N.44 Check for broken jumpers and broken or missing bonding.
- N.45 Check that cables and jumpers comply with diagram.

Miscellaneous

- N.46 Note any extraneous conditions or circumstances that could have an effect on the failure.

DESTRUCTIVE TESTS

Track Equipment

- D.1 Carry out a Track Circuit Maintenance Test and compare readings with previous tests on the track circuit record card.
- D.2 Connect the minimum permissible drop shunt to all extremities of the Track Circuit and confirm the track relay de-energises when the shunt is applied.
- D.3 Carry out Residual Voltage Test / Interference Test and Record results.
- D.4 Measure the track circuit voltage at the Relay or Receiver whilst a train passes over the length of the track circuit.

NOTE: *This step is to ascertain that the train wheels are making good contact with the track throughout the length of the track circuit and to verify that the contamination observed would allow the track circuit to fail wrong side.*

- D.5 Test for the polarity or phase (stagger) of adjoining track circuits.
- D.6 Check and test the track circuits either side of the affected track circuit.
- D.7 Record where TCAIDs are fitted and carry out [NR/SMS/PartB/Test/043](#) (Track circuit Aid (TCAID) Test).
- D.8 Record where Force Down Treadles are fitted and confirm that they are working / timing correctly.

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Lineside Locations or Equipment Rooms

- D.9 WIRE COUNT the relevant equipment or circuits to the wiring diagram.
- D.10 Test drop away and pick-up voltages at the relay.
- D.11 Connect the minimum permissible drop shunt at intervals throughout the length of the track circuit whilst observing the track relay de energises.
 - NOTE: The normal interval is 15 Metres, longer intervals are possible for plain line and long track circuits. The interval shall be agreed with the SFI Level 2 (or above).
- D.12 Check relay base front for silver migration, damage, spades pushed too far forward or broken contact insulators.
- D.13 Test any capacitor slug circuit that can prevent a relay from dropping for intermittent high resistance faults, unless relay stick contacts are wired in series with the capacitor.
- D.14 Test common return, looping or spur circuits for intermittent high resistance faults.
- D.15 Remove relays and check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).

Cables

- D.16 Carry out [NR/SMTH/Part03/Test/B04](#) (Cable Function Test) on the Line Circuits.
- D.17 Carry out [NR/SMTH/Part03/Test/B03](#) (Insulation Test) on all cables (tail, lineside, rack to rack).
 - NOTE: Tail cables connected to rails shall not normally be insulation tested.

OTHER CONSIDERATIONS

- O.1 Consider possible remote-control system failure.
- O.2 Possible cathodic protection problems.
- O.3 Consider possible invalid track circuit combination.
- O.4 Consider possible design error.
- O.5 Consider possible problem with train.
- O.6 Consider if track circuit might be shorter than the minimum length required.

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- O.7 Consider and relevant Special Inspection notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction.

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NR/SMTH/Part08/T003		
Wrong Side Failure Guide : Depression Bar		
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1. NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note relevant signal box indications.
- N.2 Note the state of relevant train describer displays.
- N.3 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- N.4 Note the nature of any work being done, or persons working in the area.
- N.5 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent.
- N.6 Note the time and type of operation last made, prior to the report, which used the affected equipment.
- N.7 Note any other train movements in the affected area.

Lineside Locations or Equipment Rooms

- N.8 Check that the cupboard or room is correctly locked or padlocked.
- N.9 Note any significant weather conditions in the area (cloud cover, position and strength of sun and wind conditions).
- N.10 Check for damage.
- N.11 Check any relevant system terminal printout and remove any recording media for checking.
- N.12 Check for signs of recent disturbances (wiring alterations, track maintenance or renewal activity).
- N.13 Check for security or tightness of equipment.
- N.14 Check the position of relevant relays (energised, de-energised).
- N.15 Check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- N.16 Check that relays correspond to the wiring diagram (type and specification, pin code, voltage, contact arrangement).

Record the last service date on the WSF form and forward to your Section Manager (Signals).

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- N.17 Check that equipment and settings correspond to the wiring diagram (specification, power, voltage rating, etc).
- N.18 Check rear of relay bases for silver migration.
- N.19 Check the equipment for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc).
- N.20 Check that cables and wires at terminations are properly isolated from each other.
- N.21 Remove covers from trunking and check for safe insulation (chafing, scorched, rodent damage).
- N.22 Test voltages, recording the results.
- N.23 [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits and supplies.
- N.24 Test voltage across relay coil or track circuit feed equipment with depression bar in normal position and with bar depressed by train.

Track Equipment

- N.25 Check for damage.
- N.26 Check for signs of recent disturbances (wiring alterations, track maintenance or renewal activity).
- N.27 Test height of depression bar from rail surface.
- N.28 Check for security or tightness of equipment.
- N.29 Check contact box interior for moisture, security and terminal insulation.
- N.30 Check the contact box for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc.).
- N.31 Check for damage (fires, squashed cables, etc.).

Miscellaneous

- N.32 Check SPECIAL INSPECTION NOTICES (SINs) and TECHNICAL INSTRUCTIONS (TIs) for any other relevant Non-Destructive tests.

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Wrong Side Failure Guide : Depression Bar		
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DESTRUCTIVE TESTS

Lineside Locations or Equipment Rooms

- D.1 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.
- D.2 Remove relays and check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- D.3 Check relay base front for silver migration, damage, spaded pushed too far forward or broken contact insulators.
- D.4 Test current to relay coils or track circuit feed equipment with depression bar in normal position and with bar depressed by train.

Track Equipment

- D.5 [WIRE COUNT](#) contact box to the wiring diagram.

Cables

- D.6 [CABLE FUNCTION TEST](#) the line circuits.
- D.7 [INSULATION TEST](#) all cables (tail, lineside, rack to rack).

Miscellaneous

- D.8 Check SPECIAL INSPECTION NOTICES (SINs) and TECHNICAL INSTRUCTIONS (TIs) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

- 1. Possible WSF of track circuit.
- 2. Possible design error.
- 3. Possible problem with train e.g. wheel profile.

END

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Wrong Side Failure Test Guide: Thales Axle Counters		
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Includes:	Thales AzL systems
Excludes:	Any other axle counter system

GENERAL

The permission of the Signaller shall be obtained before any actions are taken that affect the normal working of an axle counter section.

The system shall not be restored to normal operation without permission of the Signaller.

On all systems, the Signaller is responsible for ensuring an axle counter section is clear before a system restore can take place.

A system re-set (if provided) can take place to assist with fault finding, providing the system is isolated from the signalling equipment it feeds (Disconnect TPR link or data output from the evaluator).

All test measurements shall be recorded on the NR/SMS record card together with the reason for the test.

For Further Information see [NR/SMS/Appendix/15](#) – General Information on the Thales Axle Counter Systems

NON-DESTRUCTIVE TESTS

Signal Box

N.1 Note the relevant signal box indications for the relevant section(s).

Later series of systems with '2 out of 3' evaluators can have multiple detection points; the failure of one of these evaluators may affect more than one section.

N.2 Note the state of any relevant train describer displays.

N.3 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).

N.4 Note if any persons were working/ patrolling/ examining in the area and, if working, the nature of the work.

Any metallic object that is brought near to a rail contact will affect it.
Mobile phones used near any EAK or evaluator may affect them.

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N.5 Note the time of the failure of the equipment and, if it occurred after the passage of a train, the type of train (passenger, freight, light engine etc).

• An object hanging from a train can strike and damage rail contacts.

N.6 If a failure occurred after a passage of a train, note if there was anything unusual about it (slow moving train, long time in the section, emergency non-signalled movement).

N.7 Note any other train movements in the affected area.

Lineside Locations or Equipment Rooms

N.8 Check that the room or case is securely locked.

N.9 If the evaluator equipment is located in a cubicle, check this is securely locked.

N.10 On systems provided with a re-set button, check that the button cover is securely locked.

N.11 Check any site record cards or log books for relevant information.

N.12 Check for any signs of equipment damage.

N.13 Check the LED and other indications on the evaluator and associated cards and PSUs (LED indications ([NR/SMS/Appendix/15](#))).

N.14 If provided, check any system logging or recording media for relevant information (PC based logger, Instead event recorder, Trackwatch, etc.).

N.15 On systems provided with a diagnostic interface, check using a laptop PC the stored historical data. (This includes the AzLM series).

N.16 Check for signs of any recent activity (new works, temporary wiring, diversion of circuits, track maintenance activity).

N.17 Check the equipment for security.

N.18 Visually check any cables or connecting leads for security.

N.19 Record the evaluator indications. [NR/SMS/Appendix/15](#) gives details of evaluator indications.

N.20 Check the position and correspondence of relevant relays (energised, de-energised). Relays include TSR, TZR, TPR, TKR, etc.

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- N.21 Check for damage or contamination on or inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, corroded terminals).
- N.22 Check that the relays correspond to the diagrams (type and specification, pin code, voltage, contact arrangement, single/double wound coils).
 - Record the last service date on the WSF form and forward to your Section Manager (Signals).
- N.23 Check that the equipment and settings correspond to the diagrams (specification, power, voltage rating, etc).
- N.24 Check for silver migration on the rear of relay bases.
- N.25 Check the equipment and cards for any possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc).
- N.26 Check the room/case heating/cooling systems for correct operation.
 - Extremes of heat or cold can affect the operation of electronic equipment.
- N.27 Check the equipment for any signs of moisture or water contamination (leaking roofs, damaged or missing seals, flooding).
- N.28 Check for possible radio interference (mobile phone masts, RETB aerials).
- N.29 Test and record relevant waveforms and line levels (line voltages [NR/SMS/AX11,AX12](#) or [AX15](#))
- N.30 [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits and supplies.

Lineside Junction Box (EAK)

- N.31 Check the EAK for damage.
- N.32 Check the EAK cover is correctly fitted and secured.
- N.33 Check that the earthing of the EAK is secure and effective.
- N.34 Check the interior for signs of moisture.
- N.35 Check the LED indications on the EAK cards (LED indications [NR/SMS/Appendix/15](#)).
- N.36 Check the equipment for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, moisture, etc).

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N.37 Check for possible radio interference (mobile phone masts, RETB aerials).

N.38 Where applicable check the ARD plug is installed correctly.

Rail Contacts

N.39 Check the rail contacts for damage.

N.40 Check that the rail contacts are secure ([NR/SMS/PartZ/Z03](#) Train Detection – Reference Values) - rail contact fittings.

N.41 Check for any debris or rubbish, around the rail contacts.

N.42 Check for signs of any recent activity (new works, track maintenance, etc.).

N.43 Check surrounding area for any other equipment / rail contacts that could cause an influence in some way.

Cables & Wires

N.44 Check cables for damage (cables squashed by rails in the cess, fire damage, rodent damage).

N.45 Check all cables and wires for safe insulation and check that all terminations are correctly insulated from each other.

Where cables or wires run in trunking or troughing, remove the covers to check.

Miscellaneous

N.46 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

N.47 Note any extraneous conditions or circumstances that could have an effect on the failure.

DESTRUCTIVE TESTS

Lineside Locations or Equipment Rooms

D.1 Wire Count the relevant equipment or circuits to the wiring diagram, including jumpers on cards and connecting leads/cables.

D.2 Remove relays and check for damage or contamination on or inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, corroded terminals).

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D.3 Check relay base fronts for correct pin code, silver migration, damage, spades pushed too far forward or broken contact insulators.

D.4 Check evaluator cards for damage (hair-line cracks, dry joints, damaged edge connectors).

D.5 Check evaluator card slots for damage (damaged connectors in the card slots).

D.6 [INSULATION TEST](#) relevant circuits to earth and to other suspect circuits.

Check electronic components are disconnected as the high voltages evolved in this test damages them.

D.7 Test for intermittent high resistance faults in any capacitor slug circuits unless relay stick contacts are wired in series with the capacitor.

D.8 Test for intermittent high resistance faults in common return, looping or spur circuits.

Cables

D.9 [CABLE FUNCTION TEST](#) line circuits.

D.10 [INSULATION TEST](#) all cables (tail, lineside, rack to rack).

Check cables are totally disconnected for this test as the high voltages involved damages electronic components.

Lineside Junction Boxes and Rail Contacts

D.11 Test the operation of the system by a dummy wheel test at the detection points for the relevant section [NR/SMS/PartB/Test/042](#) (Axle Counters Dummy Wheel Test - AzL 70, 70/30, 70/30S) or [NR/SMS/PartB/Test/045](#) (Thales Axle Counters Dummy Wheel Test (AxLM & AzLE). Observe the indications on the LEDs at both the relevant EAKs and evaluator during this test.

Miscellaneous

D.12 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

D.13 Undertake a Post Mortem analysis PMA for the ACE in question.

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OTHER CONSIDERATIONS

- | O.1 Possible remote-control system fault/failure.
- | O.2 Possible design error.
- | O.3 Check compact flash/program plug against ISSR record

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Wrong Side Failure Guide: Block		
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NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note relevant lever, switch or commutator positions.
- N.2 Note relevant signal box indications.
- N.3 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- N.4 Note the nature of any work being done, or persons working in the area.
- N.5 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent.
- N.6 Note the time and type of operation last made, prior to the report, which used the affected equipment.
- N.7 Note any other train movements in the affected area.
- N.8 Note whether the instrument is padlocked or not.
- N.9 Check for dust or particles inside the instrument.
- N.10 Check for wear or freedom of movement on commutator block, where fitted.

Lineside Locations or Equipment Rooms

- N.11 Check cupboard or room is correctly locked.
- N.12 Check for any signs of equipment damage.
- N.13 Check for signs of recent disturbances (wiring alterations, P Way activity).
- N.14 Check for security or tightness of equipment (lever locks, circuit controllers, arm repeaters, etc).
- N.15 Check for broken/loose contacts, or excessive wear in moving parts.
- N.16 Check the position of relevant relays (energised, de-energised).
- N.17 Check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).

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NR/SMTH/Part08/T005		
Wrong Side Failure Guide: Block		
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- N.18 Check that relays correspond to the wiring diagram (type and specification, pin code, voltage, contact arrangement).
 - Record the last service date on the WSF form and forward to your SM(S).
- N.19 Check that equipment and settings correspond to the wiring diagram (specification, power, voltage rating, etc).
- N.20 Check rear of relay bases for silver migration.
- N.21 Check the equipment for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc).
- N.22 Check that cables and wires at terminations are properly isolated from each other.
- N.23 Test voltages, recording the results.
- N.24 [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits and supplies.

Cables and Wires

- N.25 Check for damage (fires, squashed cables etc).
- N.26 Check the insulation of cables and wires at terminations. Confirm that adjacent terminations are properly isolated from each other.
- N.27 Remove covers from trunking and check for safe insulation (chafing, scorched, rodent damage).

Miscellaneous

- N.28 Check SPECIAL INSPECTION NOTICES (SINs) and TECHNICAL INSTRUCTIONS (TIs) for any other relevant Non-Destructive tests.

DESTRUCTIVE TESTS

Signal Box

- D.1 [BLOCK CONTROLS TEST](#) equipment.
- D.2 [BLOCK RECOVERY TEST](#) equipment.
- D.3 Test block operation by creating the effect of a passing train.

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Lineside Locations or Equipment Rooms

- D.4 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.
- D.5 Remove relays and check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- D.6 Check the relay base front for silver migration, damage, spades pushed too far forward or broken contact insulators.
- D.7 Check any contact adjustment (lever bands, etc).
- D.8 [INSULATION TEST](#) relevant circuit to earth.
- D.9 [INSULATION TEST](#) relevant circuit to other suspect circuits.
- D.10 [INSULATION TEST](#) any lightning arrestors.
- D.11 Test for intermittent high resistance faults that might prevent a relay from dropping in any capacitor slug circuit, unless relay stick contacts are wired in series with capacitor.
- D.12 Test for intermittent high resistance faults in common return, looping or spur circuits.

Cables

- D.13 [CABLE FUNCTION TEST](#) the line circuits.
- D.14 [INSULATION TEST](#) all cables (tail, lineside, rack to rack)

Miscellaneous

- D.15 Check SPECIAL INSPECTION NOTICES (SINs) and TECHNICAL INSTRUCTIONS (TIs) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

- O.1 Possible WSF with treadle circuit.
- O.2 Possible WSF of track circuit (Berth track).
- O.3 Possible WSF of mechanical signal wire.
- O.4 Possible design error in block circuits.

END

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NR/SMTH/Part08/T007		
Wrong Side Failure Test Guide: Filament Lamp – No Light (Any Type)		
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***** ESCALATION EXEMPT *****

GENERAL

- A lamp out in a signal, barrier boom or crossing road light is a wrong side failure.
- The equipment's design cannot be fail-safe because lamps will always fail.

The escalation exempt shall **not** apply in the following circumstances:

- a) The rectification is not a straightforward equipment change or
- b) There is any doubt as to the cause of failures or
- c) The equipment has not functioned as expected or
- d) The failure appears to be caused by defects not able to be identified by the checks and tests in this guide.

The Escalation Exemption shall only apply where the rectification is a straightforward equipment replacement, and a single, obvious cause has been identified. Steps shall be taken to rectify the problem immediately.

- If non-destructive or destructive testing is required, it can be carried out by a Maintenance Tester attending the failure without further authority.

All test measurements shall be recorded on the NR/SMS record card together with the reason for the test. The failure shall be logged as soon as convenient.

NON-DESTRUCTIVE TESTS

- N.1 Check for obscured lamp.
- N.2 Check for damage.
- N.3 Check which lamp is not working.
- N.4 Test for defective lamp.
- N.5 Test for correct voltage.
- N.6 Check that the EKR is working, where applicable.
- N.7 Test for blown fuses.
- N.8 Test for defective lamp holder.
- N.9 Test for disconnection in the lamp circuit.

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- N.10 [ASPECT TEST](#) the signal.
- N.11 Note any extraneous conditions or circumstances that could have an effect on the failure.

DESTRUCTIVE TESTS

- D.1 [CABLE FUNCTION TEST](#) line circuits.
- D.2 [INSULATION TEST](#) all cables (tail, lineside, rack to rack).

END

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NR/SMTH/Part08/T008		
Wrong Side Failure Test Guide: Colour Light Signal		
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NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note any other train movements in the affected area.
- N.2 Note relevant signal box indications.
- N.3 Note relevant lever or switch positions.
- N.4 Note the state of any relevant train describer displays.
- N.5 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- N.6 Check whether the signal was replaced in front of the train.
- N.7 Note the nature of any work being done, or persons working in the area.
- N.8 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent.
- N.9 Note the time and type of operation last made, prior to the report, which used the affected equipment.
- N.10 Check that lever locks are correctly padlocked.
- N.11 Check that the signal can display the aspect reported, using any aspect sequence chart, control table or diagram.

NOTE: Establishing that a signal could not have displayed the reported aspect does not mean that a wrong side failure did not occur.

Lineside Locations or Equipment Rooms

- N.12 Check that the cupboard or room is correctly locked or padlocked.
- N.13 Note the position of relevant relays (energised, de-energised).
- N.14 Check for damage to equipment.
- N.15 Check any relevant system terminal printout and remove any recording media for checking.

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N.16 Where an SSI Trackside Functional Module (TFM) operates an external function via an interface relay, check the diagrams to confirm that the system actually proves the correct operation of the external function concerned.

The diagrams should show an input to a TFM which proves the external function has responded correctly. It is not sufficient to prove simply that the interface relay has operated.

N.17 Check the insulation of cables and wires at terminations. Check that adjacent terminations are properly isolated from each other.

N.18 Check for signs of recent disturbances (wiring alterations, track maintenance or renewal activity).

N.19 Check for equipment security or tightness.

N.20 Check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).

N.21 Check that relays correspond to the wiring diagram (type and specification, pin code, voltage, contact arrangement).

Record the last service date on the WSF form and forward to your SM(S).

N.22 Check that equipment and settings correspond to the wiring diagram (specification, power, voltage rating, etc).

N.23 Check rear of relay bases for silver migration.

N.24 Check equipment for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc).

N.25 Check equipment for any unusual amounts of moisture.

N.26 Test voltages and record the results.

N.27 [EARTH TEST \(DC\)](#) and/or [EARTH TEST \(AC\)](#) circuits and supplies.

Signal Equipment

N.28 Note any significant weather conditions in the area (cloud cover, position and strength of sun).

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- N.29 Note aspects displayed.
 - A camera can be used to record the signal aspects, but it should be noted that because of the shutter speed it is possible to record the aspect flickering (LED Only). This flickering cannot be seen by the human eye.
- N.30 Check that equipment is correctly locked or padlocked.
- N.31 Check background and any relevant street lighting.
- N.32 Check for damage. Check interior of signal head for dirt, deterioration, or moisture ingress.
- N.33 Check for safe insulation of cables and wires at terminations. Check that adjacent terminations are properly isolated from each other.
- N.34 Check for signs of any recent disturbances (wiring alterations, track maintenance or renewal activity).
- N.35 Check for correct beam and hot strip alignment [NR/SMS/PartC/SG00](#) (Signals: General).
- N.36 Check condition of interior and exterior lenses (colour, type, clean, not damaged, contaminated or discoloured, etc.). Pay attention to the red aspect. If the lenses are polycarbonate, check lens is not beyond renewal date and not opaque with excessive scratching.
- N.37 Check condition of any hoods (length, type, etc).
- N.38 Check position of signals in sequence for possible reading through of aspects.
- N.39 Note voltage of all aspects in the signal head whether lit or not.
- N.40 Visually check from the sighting distance of the signal that all aspects and indications are clear and visible. [NR/SMS/PartZ/Z01](#) (contains sighting distance details).

Cables

- N.41 Check for damage to tail cables (fires, squashed cables, etc).
 - This includes fibre optic harnesses.
- N.42 Remove covers from trunking and check for safe insulation (chafing, scorched, rodent damage).

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Miscellaneous

- N.43 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.
- N.44 Note any extraneous conditions or circumstances that could have an effect on the failure.

DESTRUCTIVE TESTS

Signal Box

- D.1 Check switch, button or circuit controller condition and security and look for signs of metallic dust which could have caused a short circuit.
- D.2 Check that any polarised needle type indicators operate in correspondence with any polarised relays wired in series with the indicator.

Lineside Locations or Equipment Rooms

- D.3 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.
- D.4 Check that latched relays do not unlatch when lightly tapped.
- D.5 Test effectiveness of approach locking by recreating the effect of a train.
- D.6 After clearing the suspect signal, Test for voltage at the final control relay, or equivalent, whilst recreating the passage of a train on the section ahead from the entrance signal up to the end of the overlap of the exit signal.
 - When reproducing the effect of a passing train, the tests shall be carried out twice; once for a 'light engine' and once for the longest likely train.
- D.7 After clearing the suspect signal, Test for voltage at the final control relay, or equivalent, whilst alternative overlaps are selected and occupied.
- D.8 Test for voltage at the final control relay, or equivalent, with no route set forward from the suspect signal while each point in the route ahead of the signal is operated (one at a time) to both reverse and normal.
- D.9 Remove relays and check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- D.10 Remove mechanical searchlight mechanism and check for damage inside (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).

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- D.11 Check relay base for silver migration, damage, spades pushed too far forward or broken contact insulators.
- D.12 Check the contact adjustment or pressure of any relevant contacts (lever bands, circuit controllers, etc).
- D.13 Check for loose connections or crimps in any circuit affecting the reported signal.
- D.14 [CABLE FUNCTION TEST](#) line circuits.
- D.15 [INSULATION TEST](#) suspect circuit to earth.
- D.16 [INSULATION TEST](#) suspect circuit to other relevant circuits.
- D.17 [INSULATION TEST](#) all cables (tail, lineside, rack to rack).
- D.18 Test the lamp circuit current, with lamp lit and with the lamp removed.
- D.19 Check that the TFM current proving function is in use, by carrying out [NR/SMS/PartB/Test/022](#) (Signal Lamp and Light Module Proving Tests) for each current-proved output, (ALSTOM Mk3, MOD STATE 4, SSI SIGNAL MODULE ONLY).

It is not necessary to carry out the first filament failure test, but only to confirm with the Signaller that the lamp-out condition has been detected.

If the module fails to detect lamp out, current proving links in the 75-way plug coupler shall be verified by visually checking for correct position of the pins and measurement of electrical continuity. If the links and plug coupler are in place, the module itself shall be sent for investigation.

- D.20 Test the position light junction indicator transformer current with the indicator lamps removed (where relays are used for lamp proving position light junction indicators fitted with transformers).
- D.21 Test for intermittent high resistance faults in common return, looping or spur circuits.

Signal Equipment

- D.22 Check signal post replacement switch condition.
- D.23 Check that the lamp is securely held in the lamp holder.
- D.24 Test and note time of approach locking and check that any indication of signal being approach locked is effective to the Signaller.
- D.25 Test and note time of any approach control.

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D.26 [ASPECT TEST](#) the signal for the affected route while maintaining alternative exit signals at their least restrictive aspect.

It is not necessary to clear alternative exit shunt signals unless the suspect signal pre-sets the shunt signal.

D.27 Check filament change-over relays for correct operation.
Miscellaneous

D.28 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

O.1 Possible right side failure of signal in advance (masked by report of WSF to signal in rear).

O.2 Possible WSF of signal in advance.

O.3 Possible remote-control system failure.

O.4 Possible failure of track circuit.

O.5 Possible design error in signal circuits.

O.6 Possible WSF of AWS misleading driver into expecting a less restrictive aspect.

O.7 Possible WSF of interlocking.

O.8 Possible WSF of lever lock.

O.9 Possible WSF of block circuits.

O.10 Possible timing mismatch between SSI interlockings and conventional relay circuits.

END

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NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note relevant lever or switch positions.
- N.2 Note relevant signal box indications.
- N.3 Note the state of any relevant train describer displays.
- N.4 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- N.5 Note the nature of any work being done, or persons working in the area.
- N.6 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent.
- N.7 Note the time and type of operation last made, prior to the report, which used the affected equipment.
- N.8 Note any other train movements in the affected area.
- N.9 Note any significant weather conditions in the area (cloud cover, position and strength of sun).

Lineside Locations or Equipment Rooms

- N.10 Check cupboard or room is correctly locked or padlocked.
- N.11 Check for damage.
- N.12 Check for signs of recent disturbances (wiring alterations, P Way activity).
- N.13 Check for security or tightness of equipment (lever locks, circuit controllers, arm repeaters, etc).
- N.14 Check the position of relevant relays (energised, de-energised).
- N.15 Check for damage (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).

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- N.16 Check that any relays correspond to the wiring diagram (type and specification, pin code, voltage, contact arrangement).
 - Record the last service date on the WSF form and forward to your SM(S).
- N.17 Check that equipment and settings correspond to the wiring diagram (specification, power, voltage rating, etc).
- N.18 Check rear of relay bases for silver migration.
- N.19 Check equipment for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc).
- N.20 Check equipment for any unusual amounts of moisture.
- N.21 Test voltages, recording the results.
- N.22 [EARTH TEST](#) (DC) or [EARTH TEST](#) (AC) circuits and supplies.

Signal Equipment and Wire Run

- N.23 Check for any signs of equipment damage.
- N.24 Check for signs of any recent disturbances (wiring alterations, track maintenance or renewals activity).
- N.25 Check the signal's position.
- N.26 Check background and any relevant street lighting.
- N.27 Check that the spindle is not seized or frozen.
- N.28 Check that the return weights are not missing.
- N.29 Check for any excessive vegetation holding signal arm off.
- N.30 Check for any mechanical detection holding signal arm off.
- N.31 Check for excessive wear in moving parts.
- N.32 Check the counterweights and pulley wheels are not binding on adjacent weights and crank arms.
- N.33 Check the wire run for fouling objects.
- N.34 Check for wire caught in other wires or rods.
- N.35 Check that the wire is not frozen to the ballast, troughing or pipes.

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N.36 Check for correct regulation of the signal wire.

N.37 Check cleanliness and state of lubrication.

Cables and Wires

N.38 Check for damage (fires, squashed cables, etc).

N.39 Check the insulation of cables and wires at terminations. Check that adjacent terminations are properly isolated from each other.

N.40 Remove covers from trunking and check for safe insulation (chafing, scorched, rodent damage).

Miscellaneous

N.41 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

DESTRUCTIVE TESTS

Signal Box

D.1 [MECHANICAL LOCKING FUNCTION TEST](#) affected levers.

D.2 Check that any polarised needle type indicators operate in correspondence with any polarised relays wired in series with the indicator.

D.3 Test operation of signal by slowly returning the lever to the normal position in the frame whilst observing the movement of the signal arm or disk.

Lineside Locations or Equipment Rooms

D.4 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.

D.5 Remove relays and check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).

D.6 Check relay base front for silver migration, damage, spades pushed too far forward or broken contact insulators.

D.7 Check contact adjustment and pressure of any relevant contacts (lever bands, circuit controllers, etc).

D.8 [INSULATION TEST](#) relevant circuit to earth.

D.9 [INSULATION TEST](#) relevant circuit to other suspect circuits.

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- D.10 Test for intermittent high resistance faults in any capacitor slug circuit, unless relay stick contacts are wired in series with capacitor.
- D.11 Test for intermittent high resistance faults in common return, looping or spur circuits.

Signal Equipment

- D.12 Check contact adjustment and pressure of any relevant contacts (arm repeaters, point detection, etc).
- D.13 Carry out [NR/SMS/PartB/Test/012](#) (Detection Test (Mechanical)) and record the test measurements on the NR/SMS record card, together with the reason.
- D.14 Carry out the electrical detection test as required, from the following list and record the test measurements on the NR/SMS record card, together with the reason for the test.
 - a) [NR/SMS/PartB/Test/010](#) (998 Detector Electrical Tests).
 - b) [NR/SMS/PartB/Test/011](#) (Electrical Detection Test (Machine)).
 - c) [NR/SMS/PartB/Test/013](#) (Detection Test (Clamp Lock)).
- D.15 Test the minimum 'hold off' voltage of a motor operated signal.
- D.16 Check signal machine brake releases when de-energised (Motor operated signals).

Cables and Wires

- D.17 [CABLE FUNCTION TEST](#) line circuits.
- D.18 [INSULATION TEST](#) all cables (tail, lineside, rack to rack).

Miscellaneous

- D.19 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

- O.1 Possible WSF of treadle circuits.
- O.2 Possible WSF of block circuits.
- O.3 Possible WSF of track circuit.

END

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NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note relevant lever or switch positions.
- N.2 Note relevant signal box indications.
- N.3 Note the state of any relevant train describer displays.
- N.4 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- N.5 Note the nature of any work being done, or persons working in the area.
- N.6 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent.
- N.7 Note the time and type of operation last made, prior to the report, which used the affected equipment.
- N.8 Note any other train movements in the affected area.
- N.9 Note the condition of sealed releases.

Lineside Locations or Equipment Rooms

- N.10 Check that the cupboard or room is correctly locked or padlocked.
- N.11 Check for damage.
- N.12 Check any relevant system terminal printout and remove any recording media for checking.
- N.13 Where an SSI Trackside Functional Module (TFM) operates an external function via an interface relay, check the diagrams for the system to prove the correct operation of the external function concerned. The diagrams show an input to a TFM which proves the external function has responded correctly. It is not enough to prove simply that the interface relay has operated.
- N.14 Check for signs of recent disturbances (wiring alterations, track maintenance or renewals activity).
- N.15 Check for security or tightness of equipment.
- N.16 Check the position of relevant relays (energised, de-energised).

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- N.17 Check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- N.18 Check that relays correspond to the wiring diagram (type and specification, pin code, voltage, contact arrangement).
- N.19 Record the last service date on the WSF form and forward to your SM(S).
- N.20 Check that equipment and settings correspond to the wiring diagram (specification, power, voltage rating, etc).
- N.21 Check rear of relay bases for silver migration.
- N.22 Check equipment for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc).
- N.23 Check equipment for any unusual amounts of moisture.
- N.24 Test voltages, recording the results.
- N.25 [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits and supplies.

On-Track Equipment

- N.26 Check that the equipment is correctly locked or padlocked.
- N.27 Check for damage.
- N.28 Check for signs of any recent disturbances (wiring alterations, track maintenance or renewals activity).
- N.29 Check ECU is correct type, (HPSS ONLY).
- N.30 Check for excessive wear in moving parts.
- N.31 Check that the points have not been run through.
- N.32 Check that the machine casting is not broken or cracked.
- N.33 Check for correct movement in mechanical detectors, rodding runs and compensators.
- N.34 Check security of fastenings and sole plate.
- N.35 Check the reservoir oil level and for any leaks in the hydraulic system (clamp locks).
- N.36 Check rail openings and record any track defects.

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- N.37 Check for cracks in Mk1 clamp lock bodies, FPL castings and detector castings.
- N.38 Check hollow steel bearers for cracks or damage.
- N.39 Check torsion supplementary drive for cracks or damage.
- N.40 Check the break-out devices have not been operated, (Hy-Drive System ONLY).
- N.41 Check the by-pass valve has not been operated or damaged such as would cause a loss of hydraulic pressure, (Hy-Drive System ONLY).
- N.42 Check the plug/socket connectors are not damaged and that the connector plug has been properly connected and locked in place. Do not disconnect at this stage.

Cables

- N.43 Check for damage (fires, squashed cables, etc).
- N.44 Check for safe insulation of cables and wires at terminations. Check that adjacent terminations are properly isolated from each other.
- N.45 Remove covers from trunking and check for safe insulation (chafing, scorched, rodent damage).

Miscellaneous

- N.46 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

DESTRUCTIVE TESTS

Signal Box

- D.1 Test that swinging overlaps can only be swung when alternative overlaps are free.
- D.2 Test that points respond to their being called and that any FPL lever operation is effective.
- D.3 Check the independent point switch to confirm it is secure and that there are no short circuits (e.g. metallic dust, wire strands) across the contacts.

Lineside Locations or Equipment Rooms

- D.4 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.
- D.5 Check that latched point relays do not unlatch when lightly tapped.

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- D.6 Test that the route locking holds after the protecting signal is replaced to danger by recreating the effect of a passing train and cancelling the route.
- D.7 Test that occupying the berth track circuit of the protecting signal(s) correctly locks the points for the designed time (where required by the control tables).
- D.8 Remove relays and check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- D.9 Check relay base front for silver migration, damage, spades pushed too far forward or broken contact insulators.
- D.10 Check contact adjustment or pressure of any relevant contacts (lever bands, etc).
- D.11 [INSULATION TEST](#) relevant circuit to earth.
- D.12 [INSULATION TEST](#) relevant circuit to other suspect circuits.
- D.13 [INSULATION TEST](#) motor in both normal and reverse positions.
- D.14 Test for intermittent high resistance faults in any capacitor slug circuit, unless relay stick contacts are wired in series with capacitor.
- D.15 Test for intermittent high resistance faults in common return, looping or spur circuits.

On-Track Equipment

- D.16 [WIRE COUNT](#) on-track point operating equipment to the wiring diagram.
- D.17 Test effectiveness of power/manual selector switch interlock (clamp lock).
- D.18 Check for any excessive point operation time.
- D.19 Test and note hydraulic pressure and that any pressure detection is effective, e.g. train operated points.
- D.20 Test that air has been excluded from the hydraulic system before continuing check system for air, [NR/SMS/PartB/Test/015](#) (Clamp Lock: Test for air in the system), (CLAMP LOCKS ONLY).
- D.21 Check plug coupler condition and security and look for signs of metallic dust which could have caused a short circuit.
- D.22 Check contact adjustment or pressure of any relevant contacts (drive, detection, etc).

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- D.23 Check the clutch.
- D.24 Test the time of motor cut-out when point movement is obstructed.
- D.25 Carry out [POINT DETECTION AND CORRESPONDENCE TEST](#).
- D.26 Test Facing point lock [NR/SMS/PartB/Test/001-005](#) and record the test measurements on the NR/SMS record card, together with the reason for the test.
- D.27 Test for electrical leakage, [NR/SMS/PartB/Test/010](#) (BR998 Detector Electrical Tests), (APPLICABLE BR998 DETECTORS ONLY).
- D.28 Connect the HPSA Handset to the ECU. From the “Main Menu” select the “Get Log Dump” function. Once the data has been transferred to the Handset (approx 2 minutes), select the “Get Status” function. Note the readings and report any discrepancies between the handset readings, the physical lie of the points and the number of LVDTs (Linear Variable Differential Transducer) installed, (HPSS ONLY).

The Handset shall be sealed (e.g. by bagging) and advice sought on the facilities to interpret the data. Do not use the handset on another ECU as this causes data to be over written. The same handset may be used to reset the HPSS datum on the ECU concerned.
- D.29 Check the brake torque (holding capability) is correct, testing each brake separately [NR/SMS/PartC/PC51](#) (High Performance Switch System (HPSS)), (HPSS ONLY).
- D.30 Manually release both brakes and attempt to bar the points to the opposite position by applying force to the open switch rail. Repeat for the opposite lie of the points (this is to check the integrity of the Acme leadscrew, located in the gearbox, which performs the function of the FPL), (HPSS ONLY).
- D.31 Check each LVDT is working correctly by conducting the detection test [NR/SMS/PartB/Test/011](#) (Electrical Detection Test (Machine)), (HPSS ONLY).
- D.32 Where air is suspected in the system it shall be bled by:
 - a) Opening the by-pass valve.
 - b) Manually operating the points in only one direction for at least 90 seconds.
 - c) And closing and locking the by-pass valve (Hy-Drive System ONLY).
- D.33 Check each SO Unit is working correctly by conducting the detection test [NR/SMS/PartB/Test/009](#) (Detection Test (SO Hydraulic Supplementary Point Drive System)), (Hy-Drive System ONLY).

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Cables

- | D.34 [CABLE FUNCTION TEST](#) line circuits.
- | D.35 [INSULATION TEST](#) all cables (tail, lineside, rack to rack).

Miscellaneous

- | D.36 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

- | O.1 Possible remote-control system failure.
- | O.2 Possible WSF of track circuit.
- | O.3 Possible WSF of protecting signal.
- | O.4 Possible design error in point circuits.
- | O.5 Possible WSF of lever lock.
- | O.6 Possible timing mismatch between SSI interlockings and conventional relay circuits.

END

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Wrong Side Failure Test Guide: Automatic Warning System (AWS)		
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Includes:	Standard Automatic Warning System
Excludes:	Temporary Magnets (see NR/SMTH/Part08/T042)

GENERAL

All test measurements shall be recorded on the record card together with the reason for the test.

For Temporary Magnets instead refer to [NR/SMTH/Part08/T042](#) (Wrong Side Failure Test Guide: Temporary Automatic Warning System (AWS) associated with Speed Restrictions).

NON-DESTRUCTIVE TESTS

Signal Box

N.1 Note any unusual operating methods in place (hand-signalling, possessions, single line working, speed restrictions (ESR/TSR), etc).

N.2 Note the nature of any work being done, or persons working in the area.

N.3 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent and whether the train approach was particularly slow.

Class 319 electric multiple units automatically sense the traction system, so will display to the driver if the traction is DC. The AWS setting defaults to standard strength and will remain so until the driver selects the extra-strength setting (for DC traction areas). If the driver does not correctly set the AWS system to the right sensitivity, the AWS might indicate a Code 5 WSF.

On routes operating class 377/2, 377/5, and 376/6 electric multiple units, confirm that the AWS receiver on the rail vehicle is operating in the correct mode of operation (AC or DC).

This is particularly applicable to failures on services that are operating on a route that has traversed an AC & DC electrified boundary.

N.4 Note the time and type of operation last made, prior to the report, which used the affected equipment.

N.5 Note any other train movements in the affected area.

N.6 If practicable, arrange to have the OTMR (On-Train Monitor and Recorder) download and analysed from the train involved in the failure.

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Lineside Locations or Equipment Rooms

- N.7 Check that the location case, apparatus case or room is correctly locked.
- N.8 Check for damage.
- N.9 Check any relevant system terminal printout and remove any recording media for checking.
- N.10 Check for signs of recent disturbances (wiring alterations, track maintenance or renewals activity).
- N.11 Check for security or tightness of equipment.
- N.12 Check the position of relevant relays (energised, de-energised).
- N.13 Check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- N.14 Check that relays correspond to the wiring diagram (type and specification, pin code, voltage, contact arrangement).
 - Record the last service date on the WSF form and forward to your SM(S)
- N.15 Check that equipment and settings correspond to the wiring diagram (specification, power, voltage rating, etc.).
- N.16 Check rear of relay bases for silver migration.
- N.17 Check equipment for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc).
- N.18 Check equipment for any unusual amounts of moisture.
- N.19 Test voltages, recording the results.
- N.20 [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits and supplies.

On-Track Equipment

- N.21 Check position of magnets (height, centre of track).
- N.22 Check equipment is correct type (Standard - yellow or Extra-Strength - green).
- N.23 Check for other potential sources of magnetic field nearby (e.g. impedance bonds, DC traction cables).

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- N.24 Take several digital photographs of the magnet with at least one showing the complete installation.
- N.25 Check for any other magnets within 250m (274 yards) in either direction on the same line as the AWS under investigation. If one is found, measure and record the distance between the two magnets.
- N.26 Check for damage.
- N.27 Check for signs of any recent disturbances (wiring alterations, track maintenance or renewals activity).
- N.28 Check for track defects in the area of the inductors.
- N.29 Check security of internal and external connections, in the inductor disconnection box.
- N.30 Check security of cable gland or plug coupler, where fitted.

Cables

- N.31 Check for damage (fires, squashed cables, etc).
- N.32 Check the insulation of cables and wires at terminations if provided. Check that adjacent terminations are properly isolated from each other.
- N.33 Remove covers from trunking, and check for safe insulation (chafing, scorched, rodent damage).

Miscellaneous

- N.34 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

DESTRUCTIVE TESTS

Lineside Locations or Equipment Rooms

- D.1 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.
- D.2 Remove relays and check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- D.3 Check relay base front for silver migration, damage, spades pushed too far forward or broken contact insulators.
- D.4 Test current to inductor with signal at all possible aspects.

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D.5 Test AWS diode if present carry out [NR/SMS/PartB/Test/024](#) (AWS Tests) and record the test measurements on the record card.

NOTE: *The Vortok AWS magnets are designed with spark quench diodes as part of their internal circuitry and there is no requirement to perform this test.*

D.6 Test that lamp proving relays function correctly when the lamps are disconnected.

D.7 [INSULATION TEST](#) relevant circuit to earth.

D.8 [INSULATION TEST](#) relevant circuit to other suspect circuits.

D.9 Test for intermittent high resistance faults in common return, looping or spur circuits.

On-Track Equipment

When testing a plug coupled unit you shall use a "Breakout box". Do not use test equipment directly on the plug coupler pins and/or sockets.

D.10 If provided, disconnect plug coupler and check for damage (cracked casing, internal moisture, foreign matter, contact arcing, metal flakes, bent or broken or corroded contacts) to either male or female contacts.

D.11 Test resistance or impedance of inductor and compare with voltage and current readings.

D.12 Test (for each aspect) the signal's permanent and electro-magnets for correct strength and polarity (using S&P meter).

D.13 Test voltage and polarity at the electro-magnet, recording the results.

D.14 Test (for each aspect) the signal's electro-magnets for incorrect operation by any adjacent signal (using S&P meter).

D.15 Test voltage and polarity at the electro-magnet for incorrect operation by any adjacent signal at each of its aspects.

Cables

D.16 [CABLE FUNCTION TEST](#) line circuits.

D.17 [INSULATION TEST](#) all cables (tail, lineside, rack to rack).

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Miscellaneous

D.18 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

- O.1 Consider possible right side failure of signal in advance of AWS.
- O.2 Consider possible failure of train borne equipment.
- O.3 Where suppression is switched by occupation of track circuit, consider if joints could be too close to suppressed inductor. They shall not be less than 40 metres.
- O.4 Consider possible WSF of track circuit where occupation of track circuit switches off suppression or ISR circuit is involved.
- O.5 Consider possible design error in AWS circuits.

END

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NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note relevant lever or switch positions, stopping or non-stopping selection.
 - At some sites the selection is controlled by the train describer and this should be noted.
- N.2 Note relevant signal box indications.
- N.3 Note the state of any relevant train describer displays.
- N.4 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- N.5 Note the nature of any work being done, or persons working in the area.
- N.6 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent and whether the train approach was particularly slow.
- N.7 Note the time and type of operation last made, prior to the report, which used the affected equipment.
- N.8 Note any other train movements in the affected area.
- N.9 Note any significant weather conditions in the area (cloud cover, position and strength of sun and wind conditions).

Lineside Locations or Equipment Rooms

- N.10 Check that the cupboard or room is correctly locked or padlocked.
- N.11 Check for damage.
- N.12 Check any relevant system terminal printout and remove any recording media for checking.
- N.13 Where a SSI Trackside Functional Module (TFM) operates an external function via an interface relay, check the diagrams to confirm that the system actually proves the correct operation of the external function concerned.

NOTE: The diagrams should show an input to a TFM which proves the external function has responded correctly. It is not enough to prove simply that the interface relay has operated.

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- N.14 Check for signs of recent disturbances (wiring alterations, track maintenance or renewal activity).
- N.15 Check for security or tightness of equipment.
- N.16 Check the position of relevant relays (energised, de-energised).
- N.17 Check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- N.18 Check that relays correspond to the wiring diagram (type and specification, pin code, voltage, contact arrangement).
 - Record the last service date on the WSF form and forward to your SM(S).
- N.19 Check that equipment and settings correspond to the wiring diagram (specification, power, voltage rating, etc).
- N.20 Check rear of relay bases for silver migration.
- N.21 Check the equipment for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc).
- N.22 Check the equipment for any unusual amounts of moisture.
- N.23 Check the time clock setting.
- N.24 Check with diagrams, that vital relay contacts are not by-passed by non-vital contacts.
- N.25 Check that a power off relay contact is in the driver's white light (DWL) circuit.
- N.26 Test voltages, recording the results.
- N.27 Test voltages on Agastat relay coils.
- N.28 [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) the circuits and supplies.

Crossing Equipment

- N.29 Check that the equipment is correctly locked or padlocked.
- N.30 Check for damage.
- N.31 Check for clearance around the counterweight when the boom has risen.

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- N.32 Check for signs of any recent disturbances (wiring alterations, track maintenance or renewals activity).
- N.33 Check aspects displayed, if showing.
 - If this step is carried out during the hours of darkness, it shall be repeated during daylight.
- N.34 Check for correct road lamp beam alignment.
- N.35 Check red road light flashing rates are correct.
- N.36 Observe road lights from road approaches and check the background, any relevant side lighting and any obstructions such as fencing or vegetation.
- N.37 Measure sighting distance of road lights and signs.
- N.38 Measure sighting distance of any driver's red and/or white light.
- N.39 Check any driver's crossing indicator (DCI) signals for correct beam alignment.
- N.40 Test voltages, recording the results.
- N.41 Check condition of any hoods (length, type, etc).
- N.42 Check that all lenses are correctly installed and in good condition (colour, type, correct way up, etc).
- N.43 Check the condition and colour of boom lights.
- N.44 Check the Local Control Switch position and connections.
- N.45 Check the oil level in the hydraulic system's reservoir.
- N.46 Check security and tightness of circuit controllers.
- N.47 Check treadle interior for moisture, security and insulation of terminals.
- N.48 Test and record the arm clearances on the treadle, [NR/SMS/PartB/Test/177](#) (Treadle - Gauge Test), together with the reason for the test.

Cables

- N.49 Check for damage (fires, squashed cables, etc).
- N.50 Check the insulation of cables and wires at terminations. Check that adjacent terminations are properly isolated from each other.
- N.51 Remove covers from trunking and check for safe insulation (chafing, scorched, rodent damage).

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- N.52 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

DESTRUCTIVE TESTS

When reproducing the effect of a passing train the tests shall be carried out twice; once for a 'light engine' and once for the longest likely train.

Lineside Locations or Equipment Rooms

- D.1 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.
- D.2 Check that latched relays do not unlatch when lightly tapped.
- D.3 Test the effectiveness of the red road lamp proving.
- D.4 Test the effectiveness of comprehensive approach locking by recreating the effect of a train, to prove the locking.
- D.5 Test the time of approach locking of protecting signals.
- D.6 Test the time of approach control circuits.
- D.7 Remove relays and check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- D.8 Check relay base front for silver migration, damage, spades pushed too far forward or broken contact insulators.
- D.9 Check adjustment and any contamination of any relevant contacts (lever bands, etc). Check contactors for arc damage or evidence of welding.
- D.10 [INSULATION TEST](#) relevant circuit to earth.
- D.11 [INSULATION TEST](#) relevant circuit to other suspect circuits.
- D.12 Test current in relevant lamp feed circuits with and without lamp(s) lit (road lamps, boom lamps, driver indication lamps as required).
- D.13 Test for intermittent high resistance faults in any capacitor slug circuit, unless relay stick contacts are wired in series with capacitor.
- D.14 Test for intermittent high resistance faults in common return, looping or spur circuits.

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Crossing Equipment

D.15 Check aspects if not showing.

If this step is carried out during the hours of darkness, it shall be repeated during daylight.

D.16 Test time of warning light operation by recreating the effect of a passing train.

D.17 Test audible warning operates correctly by recreating the effect of a passing train.

D.18 Check that any driver's white light operates correctly by recreating the effect of a passing train.

D.19 Check that any floodlights operate, by recreating the effect of a passing train.

D.20 Recreate the effect of a passing train over-running any protecting signals and check the warning sequence is initiated.

D.21 Recreate the effect of an approaching train after the STOP and NON-STOP switch is turned to the NON-STOP position and check that the earlier warning was given.

D.22 Check that turning STOP or NON-STOP switch back to STOP position does not reduce the warning time after the effect of a train strike in.

D.23 Test by simulating the effect of the final approach track circuit clearing before the exit track circuit and any clearance treadle has been reached.

D.24 Test and record the timings on the treadle, [NR/SMS/PartB/Test/044](#) (Mechanical Treadle Timing and Adjustment Test), together with the reason for the test.

D.25 Test drop shunt and pick-up shunt of track circuits and test that repeat relays correspond with TRs.

D.26 Check adjustment of any contacts.

D.27 Operate Local Control Switch and check that AUTO position breaks all other contacts.

Cables

D.28 [CABLE FUNCTION TEST](#) line circuits.

D.29 [INSULATION TEST](#) all cables (tail, lineside, rack to rack).

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Miscellaneous

D.30 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

O.1 Possible WSF of track circuit.

O.2 Possible WSF of protecting signal reducing warning time.

O.3 Possible design error in crossing circuits.

O.4 Strike in point (treadle or track circuit) might not be far enough out for speed of route.

O.5 Possible timing mismatch between SSI interlockings and conventional relay circuits.

END

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NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note relevant lever or switch positions.
- N.2 Note relevant signal box indications.
- N.3 Note the state of any relevant train describer displays.
- N.4 Check picture quality on CCTV crossings. Look for any obstruction to view of crossing, such as fencing or vegetation.
- N.5 Check effectiveness of any floodlighting.
- N.6 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- N.7 Note the nature of any work being done, or persons working in the area.
- N.8 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent and whether the train approach was particularly slow.
- N.9 Note the time and type of operation last made, prior to the report, which used the affected equipment.
- N.10 Note any other train movements in the affected area.
- N.11 Note any significant weather conditions in the area (cloud cover, position and strength of sun and wind conditions).

Lineside Locations or Equipment Rooms

- N.12 Check that the cupboard or room is correctly locked or padlocked.
- N.13 Check for damage.
- N.14 Check any relevant system terminal printout and remove any recording media for checking.
- N.15 Where a SSI Trackside Functional Module (TFM) operates an external function via an interface relay, check the diagrams to confirm that the system actually proves the correct operation of the external function concerned.

NOTE: *The diagrams should show an input to a TFM which proves the external function has responded correctly. It is not enough to prove simply that the interface relay has operated.*

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- N.16 Check for signs of recent disturbances (wiring alterations, track maintenance or renewals activity).
- N.17 Check for security or tightness of equipment.
- N.18 Check the position of relevant relays (energised, de-energised).
- N.19 Check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- N.20 Check that relays correspond to the wiring diagram (type and specification, pin code, voltage, contact arrangement).
 - Record the last service date on the WSF form and forward to your Section Manager (Signals).
- N.21 Check that equipment and settings correspond to the wiring diagram (specification, power, voltage rating, etc).
- N.22 Check rear of relay bases for silver migration.
- N.23 Check equipment for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc).
- N.24 Check equipment for any unusual amounts of moisture.
- N.25 Check time clock setting.
- N.26 Check with diagrams that vital relay contacts are not by-passed by non-vital contacts.
- N.27 Test voltages, recording the results.
- N.28 Test voltages on Agastat relay coils.
- N.29 Carry out [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) on circuits and supplies.

Crossing Equipment

- N.30 Check that the equipment is correctly locked.
- N.31 Check for damage.
- N.32 Check for signs of any recent disturbances (wiring alterations, track maintenance or renewals activity).

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- N.33 Check aspects displayed if showing.
 - If this step is carried out during the hours of darkness, it shall be repeated during daylight.
- N.34 Check for correct road lamp beam alignment.
- N.35 Check red road light flashing rates are correct.
- N.36 Observe road lights from road approaches and check the background, any relevant side lighting and any obstructions such as fencing or vegetation.
- N.37 Measure sighting distance of road lights and signs.
- N.38 Test voltages, recording the results.
- N.39 Check the condition of any hoods (length, type, etc).
- N.40 Check that all lenses are correctly installed and in good condition (colour, type, right way up, etc.).
- N.41 Check condition and colour of boom lights.
- N.42 Check completeness and effectiveness of boom skirts.
- N.43 Check Local Control Switch position and connections.
- N.44 Check the oil level in the hydraulic system's reservoir.
- N.45 Check security and tightness of circuit controllers.
- N.46 Measure barrier side arm clearance to the pedestal (between 95mm and 105mm).
- N.47 Check any treadle interior for moisture, security and insulation of terminals.
- N.48 Test and record the arm clearances on the treadle, [NR/SMS/PartB/Test/177](#) (Treadle - Gauge Test), together with the reason for the test.

Cables

- N.49 Check for damage (fires, squashed cables, etc).
- N.50 Check the insulation of cables and wires at terminations. Check that adjacent terminations are properly isolated from each other.
- N.51 Remove covers from trunking and check for safe insulation (chafing, scorched, rodent damage).

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Miscellaneous

- N.52 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

DESTRUCTIVE TESTS

When reproducing the effect of a passing train the tests shall be carried out twice; once for a 'light engine' and once for the longest likely train.

Lineside Locations or Equipment Rooms

- D.1 Carry out [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.
- D.2 Check that latched route calling relays does not unlatch when lightly tapped.
- D.3 Test effectiveness of comprehensive approach locking of protecting signals by reproducing the effect of track circuit occupation in rear of the signal, one at a time.
- D.4 Test that the route locking holds the protecting signal at danger by reproducing the effect of a passing train.
- D.5 Test that the route locking holds after the protecting signal is replaced to danger by the recreated effect of a passing train and route cancelled.
- D.6 Test time of approach locking on protecting signals.
- D.7 Test time of approach control circuits.
- D.8 Check that local crossing controls cannot irregularly by-pass normal controls.
- D.9 Remove relays and check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- D.10 Check relay base front for silver migration, damage, spades pushed too far forward or broken contact insulators.
- D.11 Check contact adjustment of any relevant contacts (lever bands, etc). Check contactors for arc damage or evidence of welding.
- D.12 Carry out [INSULATION TEST](#) relevant circuit to earth.
- D.13 Carry out [INSULATION TEST](#) relevant circuit to other suspect circuits.
- D.14 Test current in circuit with and without lamp lit.

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- D.15 Test for intermittent high resistance faults in any capacitor slug circuit, unless relay stick contacts are wired in series with capacitor.
- D.16 Test for intermittent high resistance faults in common return, looping or spur circuits.

Crossing Equipment

- D.17 Measure gaps between booms and height off road when lowered.
- D.18 Check aspects if not showing.
 - If this step is carried out during the hours of darkness, it shall be repeated during daylight.
- D.19 Test the warning light operation time during the lowering sequence.
- D.20 Test that the audible warning operates correctly during lowering sequence.
- D.21 Check that booms can be halted part way through the rising or lowering operation.
- D.22 Check that the barriers do not rise prematurely whilst in AUTO RAISE mode by recreating the effect of a passing train.
- D.23 Recreate the passage of a train over-running any protecting signals, and check that the warning sequence is initiated.
- D.24 Test and record the timings on the treadle, [NR/SMS/PartB/Test/044](#) (Mechanical Treadle Timing and Adjustment Test), together with the reason for the test.
- D.25 Test drop shunt and pick-up shunt of track circuits and that repeat relays correspond with TRs.
- D.26 Check any contact or limit switch adjustments.
- D.27 Operate Local Control Switch and check that AUTO position breaks all other contacts.

Cables

- D.28 Carry out [CABLE FUNCTION TEST](#) line circuits.
- D.29 Carry out [INSULATION TEST](#) all cables (tail, lineside, rack to rack).

Miscellaneous

- D.30 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

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OTHER CONSIDERATIONS

- | O.1 Possible WSF of track circuit(s).
- | O.2 Possible WSF of protecting signals.
- | O.3 Possible design error in crossing circuits.
- | O.4 Possible WSF with treadle circuits.
- | O.5 Possible remote-control system failure.
- | O.6 Possible timing mismatch between SSI interlockings and conventional relay circuits.

END

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Wrong Side Failure Test Guide: Staff Warning Systems		
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Includes:	Train operated warning systems, Fixed warning systems, barrow crossing lights, staff warning lights
Excludes:	ILWS (Inductive Loop Warning System)

NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note the relevant lever or switch positions, stopping or non-stopping selection.
 - At some sites the selection is controlled by the train describer and shall be noted.
- N.2 Note the relevant signal box indications.
- N.3 Note the state of any relevant train describer displays.
- N.4 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- N.5 Note the nature of any work being done, or persons working in the area.
- N.6 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent and whether the train approach was particularly slow.
- N.7 Note the time and type of operation last made, prior to the report, which used the affected equipment.
- N.8 Note any other train movements in the affected area.

Lineside Locations or Equipment Rooms

- N.9 Note any significant weather conditions in the area.
- N.10 Check that the equipment is correctly locked.
- N.11 Check for damage.
- N.12 Check any relevant system terminal printout and remove any recording media for checking.
- N.13 Check for signs of any recent disturbance (wiring alterations, track maintenance or renewals activity).
- N.14 Check for security or tightness of equipment.
- N.15 Check the position of relevant relays (energised, de-energised).

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- N.16 Check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- N.17 Check that relays correspond to the wiring diagram (type and specification, pin code, voltage, contact arrangement).
 - Record the last service date on the WSF form and forward to your SM(S).
- N.18 Check that equipment and settings correspond to the wiring diagram (type and specification, power, voltage rating, etc.).
- N.19 Check the rear of relay bases for silver migration.
- N.20 Check the equipment for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc.).
- N.21 Check for any unusual amounts of moisture.
- N.22 Check the time clock setting.
- N.23 Check, with diagrams, that vital relay contacts are not by-passed by non-vital contacts.
- N.24 Test voltages, recording the results.
- N.25 Carry out [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) on circuit and supplies.

Switch Boxes and Audible Alarms.

- N.26 Check for damage.
- N.27 Check for recent disturbance (wiring alteration, track maintenance or renewals activity).
- N.28 Check for security and tightness of equipment.
- N.29 Check for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc.).
- N.30 Check for any unusual amounts of moisture.

Cables and Wires

- N.31 Check for damage (fires, squashed cables, etc.).
- N.32 Check for safe insulation at terminals.

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N.33 Remove covers from trunking, and check for safe insulation (chafing, scorching, rodent damage).

Miscellaneous

N.34 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

DESTRUCTIVE TESTS

Audible Alarm

D.1 Check that the audible warning operates correctly by recreating the effect of a train.

D.2 Test that controlled signals does not clear to a proceed aspect until a warning has sounded for the required time.

D.3 Recreate the effect of a train over-running any protecting signals, and check that the warning sequence is initiated.

Visual Alarm

D.4 Check that warning lights function correctly with all protecting signals at red and free of approach locking.

D.5 Check that the warning lights function correctly by recreating the effect of a train approaching with clear signals.

D.6 Check that controlled signals does not clear to a proceed aspect until the warning light has correctly responded for the required time.

D.7 Check that the warning sequence is initiated if a protecting signal is overrun by recreating the effect of a train passing the signal.

Lineside Locations or Equipment Rooms

D.8 Carry out [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.

D.9 Check that latched relays does not unlatch when lightly tapped.

D.10 Test and record the time of approach locking for all associated protecting signals.

D.11 Remove relays and check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).

D.12 Check relay base front for silver migration, damage, spades pushed too far forward or broken contact insulators.

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- D.13 Carry out [INSULATION TEST](#) relevant circuit to earth.
- D.14 Carry out [INSULATION TEST](#) relevant circuit to other suspect circuits.
- D.15 Test for intermittent high resistance faults in any capacitor slug circuit unless relay stick contacts are wired in series capacitor.
- D.16 Test for intermittent high resistance faults in common return, looping or spur circuits.
- D.17 Test drop shunt and pick-up shunt of track circuits and that repeat relays correspond with TRs.
- D.18 Check all lamp proving circuits associated with the staff warning system operate correctly.
- D.19 Check any staff warning system lamp filament changeover relays for correct operation.

Switch Boxes and Audible Alarms

- D.20 Carry out [WIRE COUNT](#) the equipment to the wiring diagrams.

Cables

- D.21 Carry out [CABLE FUNCTION TEST](#) on the line circuits.
- D.22 Carry out [INSULATION TEST](#) on all related cables (tail, lineside, rack to rack).

Miscellaneous

- D.23 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

- O.1 Possible RSF of track circuit at exit of warning system area.
- O.2 Possible WSF of track circuit within warning system area.
- O.3 Possible WSF of treadles within warning system area.
- O.4 Strike in point for warning system might not be far enough out for line speed.
- O.5 Second train could have struck in before first train had cleared TOWS or FWS area.
- O.6 Possible design error with warning system circuits.

END

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NR/SMTH/Part08/T015		
Wrong Side Failure Test Guide: Electro-Hydraulic Trainstop		
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GENERAL

- All test measurements shall be recorded on Trainstop (Electro-Hydraulic)
- Calibration Test NR/SMS record card together with the reason for the test.

NON-DESTRUCTIVE TESTS

Lineside Locations or Equipment Rooms

- N.1 Check that the cupboard or room is correctly locked.
- N.2 Check for damage.
- N.3 Check any relevant system terminal printout and remove any recording media for checking.
- N.4 Check for signs of recent disturbance (wiring alterations, track maintenance or renewals activity).
- N.5 Check for equipment security or tightness.
- N.6 Note the position of relevant relays (energised, de-energised).
- N.7 Check for damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- N.8 Check that relays correspond to the wiring diagram (type and specification, pin code, voltage, contact arrangement).
 - Record the last service date on the WSF form and forward to your Section Manager (Signals).
- N.9 Check that equipment and settings correspond to the wiring diagram (specification, power, voltage rating, etc.).
- N.10 Check the rear of relay bases for silver migration.
- N.11 Check for possible short circuits (nuts, washers, solder, off-cuts of wire, metallic dust, etc.).
- N.12 Check the equipment for any unusual amounts of moisture.
- N.13 Test voltages recording the results.
- N.14 Test voltage across coil of trainstop valve while signal at all possible aspects.
- N.15 [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuit and supplies.

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Wrong Side Failure Test Guide: Electro-Hydraulic Trainstop		
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On-Track Equipment

- N.16 Note the signal aspect displayed.
- N.17 Note whether the trainstop arm is up or down.
- N.18 Check the trainstop position (height, distance from rail).
- N.19 Check that the equipment is correctly locked or padlocked.
- N.20 Check that the arm is not obstructed.
- N.21 Check for damage (return spring).
- N.22 Check for unusual amounts of moisture.
- N.23 Check security and tightness of equipment.

Cables and Wires

- N.24 Check for damage (fires, squashed cables, etc.).
- N.25 Check that the insulation of cables and wires at terminations are properly isolated from each other.
- N.26 Remove covers from trunking and check for safe insulation (chafing, scorched, rodent damage).

Miscellaneous

- N.27 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

DESTRUCTIVE TESTS

Trackside Cupboard or Equipment Rooms

- D.1 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.
- D.2 Remove relays and check for damage inside (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- D.3 Check relay base front for silver migration, damage, spades pushed too far forward or broken contact insulators.
- D.4 Test current to trainstop valve while signal at all possible aspects.

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- | D.5 Test air pressure (where applicable).
- | D.6 Carry out an [INSULATION TEST](#) of the suspected circuit to earth.
- | D.7 Carry out an [INSULATION TEST](#) of the suspected circuit to other relevant circuits.
- | D.8 Carry out an [INSULATION TEST](#) all cables (tail, lineside, rack to rack).
- | D.9 Check that the arm is not obstructed externally or within trainstop.

On-Track Equipment

- | D.10 Check the position of trainstop ram and arm for each aspect of the signal.

Miscellaneous

- | D.11 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

- ⋮ 01 Possible WSF of signal.
- ⋮ 02 Possible WSF of track circuit if trainstop valve energised by track circuit occupied.
- ⋮ 03 Possible failure of trainborne equipment.
- ⋮ 04 Possible design error in trainstop valve circuit.

END

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NR/SMTH/Part08/T018		
Wrong Side Failure Test Guide: Balise (TASS)		
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NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- N.2 Note the nature of any work being done, or persons working in the area.
- N.3 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent and whether the train approach was particularly slow.
- N.4 Note the time and type of train or operation last made, prior to the report, which used the affected equipment.
- N.5 Note any other train movements in the affected area.
- N.6 Note any significant weather conditions in the area.

Balise

- N.7 Check for any signs of damage or missing equipment.
- N.8 Check for security or tightness of equipment.
- N.9 Check for signs of any recent disturbances (track maintenance or renewals activity, replacement mountings, equipment re-located).
- N.10 Check location of equipment in conjunction with Balise Positioning Form or other form of local record.
- N.11 Check that equipment is correctly installed and centrally mounted.
- N.12 Check the 14-character identifier is identical on both the balise and the mounting bracket assembly.
- N.13 Test the Balise telegram data through the air gap using a balise reading tool.

Miscellaneous

- N.14 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

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OTHER CONSIDERATIONS

- | O.1 Possible design error in telegram data.
- | O.2 Possible design error in specifying balise position.
- | O.3 Possible failure of train borne equipment.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
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Wrong Side Failure Test Guide: Train Protection Warning System (TPWS)		
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GENERAL

- All test measurements should be recorded on the appropriate record card together with the reason for the test.
- TPWS is not a 'fail safe' piece of equipment, because it requires energisation to stop trains.
- The failure to transmit when required is protected by the TPWS fault circuit (VCR), usually by replacing the signal in rear and indicating a lamp failure at the signal with the failed TPWS in the signal box.
- The signalling interface is designed such that any 'right side' failure will cause TPWS to transmit.
- This failure mode is generally not indicated by the TPWS fault circuit and will instead be identified by TPWS fitted trains having an unwarranted emergency brake application.
- Where a TPWS failure is identified by either the stopping of a train, or the extinguishing of a lamp out indication or other means of TPWS failure reporting, any testing required may be carried out by a certified Maintenance Tester attending the failure without further authority.
- Where there is any doubt as to the cause of the failure, or where failure of TPWS to transmit is not reported correctly, or the speed of a train is not correctly reduced, the normal escalation procedures shall be followed.
- Fault finding flowcharts are provided in [NR/SMTH/Part10/FF13](#) (Faulting Guide: Train Protection Warning System (TPWS) Flow Charts).

NON-DESTRUCTIVE TESTS

General

- N.1 Note the mechanism by which it was discovered that TPWS was not operating correctly (maintenance testing, TPWS fitted train not stopped, lineside observation of loops active, SSI out of correspondence report, etc.).

Signal Box

- N.2 Note the signal box indication for the relevant signal, the display of the relevant TPWS failure indication.
- N.3 Note the aspects displayed by signals approaching the failure and at the TPWS fitted signal.

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- N.4 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc.).
- N.5 Note the nature of any work being done, or persons working in the area.
- N.6 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent and, where possible, the likely speed of the train on the approach to the signal, PSR or buffer stops.
- N.7 Note if the train was being propelled or not driven from the leading cab.
- N.8 If practicable arrange to have the train OTMR (On-Train Monitor and Recorder) downloaded and/or to interview the train crew.
- N.9 Note if the train had been fitted with TPWS, and if the train has a record of TPWS equipment failure or isolation.
- N.10 Note the distance past the signal the train came to a stand if the train passed the signal at danger.
- N.11 Note the time and type of any train movements made over the failed equipment immediately prior to the failure.
- N.12 Note any other train movements in the affected area at the time of the failure.
- N.13 Note any specific control table requirements for the control or reporting of TPWS failures at this installation.

Lineside Locations or Equipment Rooms

- N.14 Check that the cupboard or room is correctly locked.
- N.15 Note the date of the latest routine maintenance visit and any measurements taken.
- N.16 Check for damage.
- N.17 Check any relevant system terminal printout and remove any recording media for checking.
- N.18 Check for signs of recent disturbances (wiring alterations etc.).
- N.19 Check for security or tightness of equipment.
- N.20 Check the position of relevant relays (energised, de-energised) and the status of LED indications on TPWS modules (lit, un-lit).

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- N.21 Check for visible damage inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- N.22 Check that relays and TPWS modules correspond to the wiring diagram (type and specification, part numbers, serial numbers, mod state, pin code, voltage, contact arrangement).
- N.23 Record the last service date on the WSF form and forward to your SM(S)
- N.24 Check that any other equipment and settings correspond to the wiring diagram (specification, power, voltage rating, etc.).
- N.25 Check rear of relay and module bases, where accessible, for silver migration.
- N.26 Check equipment for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc.).
- N.27 Check equipment for any unusual amounts of moisture or dirt.
- N.28 Check status of any ELDs or surge arrestor cartridges.
- N.29 Test voltages, recording the results (in particular test power supply voltage, main and suppression input voltages, voltage and frequency of the transmitter loop circuit at the TSS/OSS module output links).
- N.30 [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits and supplies.

On-Track Equipment

- N.31 Note the weather conditions at the time of investigation and those when the reported failure occurred.
- N.32 Check position of loops (centre line, height and distances between arming and trigger loops). Check that the TPWS OSS/OSS+ positioned at correct distance from signal.
- N.33 Check for correct operation of any TPWS loops on the same track and in close proximity to the TPWS installation under investigation (note the separation distance, function and frequency of any other TPWS transmitter loops that are within 75 metres and on the same route as the loops under test.)
- N.34 Check for damage to on-track equipment (loops, plug couplers, disconnection boxes etc.).
- N.35 Check for any other signs of recent disturbances (track maintenance or renewals activity, etc.).

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- N.36 Check security of internal and external connections in the disconnection boxes.
- N.37 Note and record the presence of any significant metal objects lying on or near the TPWS transmitter loops (i.e. within 3 metres).
- N.38 Note the characteristics of the track associated with the loops e.g. tight horizontal and vertical curves of the line, loops positioned within points or crossings, check rails, concrete slab track, steel bridges, wet track beds or poor track condition.
- N.39 Note the type of track circuits that the loops are installed on.

Cables

- N.40 Check for damage (fires, squashed cables, etc.).
- N.41 Check the insulation of cables and wires at terminations. Check that adjacent terminations are properly isolated from each other.
- N.42 Remove covers from trunking and check for safe insulation (chafing, scorched, rodent damage etc.).

Miscellaneous

- N.43 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

DESTRUCTIVE TESTS

Signal Box

- D.1 Test the signal box failure indication of each relevant TPWS function by arranging for each TPWS installation to be separately isolated using the 250mA fuse on the Baseplate or Trackside Enclosure with the signal at danger.

Lineside Locations or Equipment Rooms

- D.2 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.
- D.3 Before disturbing the modules, individually Test that each module proving contact functions correctly. This can be done by slipping the OSM/TSM links to the outgoing transmitter loop circuit, hence creating a fault.

As the OSS and TSS SIM proving contacts are connected in series, removing the fuse powering an OSS and a TSS will not identify which module has failed.

A potential cause of TPWS failing to transmit without initiating a failure indication might be a welding of the proving relay contact within the SIM.

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As the OSS and TSS SIM proving contacts are connected in series, a single contact welding might not immediately be apparent.

Furthermore, in these fault conditions the status of the proving contact might not necessarily correspond to the status of the Loops Active LED on the same SIM.

- D.4 Check that unused suppression circuits are linked out correctly.
- D.5 Check that the wetting current resistors are connected in place across main and suppression circuits.
- D.6 Place digital multi-meter onto wetting current resistor leads where provided or Module input terminals (IP BX/IP NX) and measure voltage. Disconnect TPWS inputs (at baseplate, plugboard or trackside enclosure links) and Check that voltage remains the same.
- D.7 Remove modules and relays. Check for damage on relays and modules (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, silver sulphide, metal flakes, bent or broken contact springs, or corroded terminals).
- D.8 Check relay and module bases for signs of silver migration, damage to spades, spades pushed too far forward or broken contact insulators.
- D.9 [INSULATION TEST](#) relevant circuits to earth.
- D.10 [INSULATION TEST](#) relevant circuits to other suspect circuits.
- D.11 Test for intermittent high resistance faults in common return, looping or spur circuits.
- D.12 Test the voltage of the outgoing links to the transmitter loop circuit of TSS / OSS modules, with a 75ohm shunt resistor. (See Voltage Testing and Dummy Load Testing in [NR/SMTH/Part10/FF12](#) (Faulting Guide: Train Protection Warning System (TPWS)).
- D.13 Test that any relevant wetting current resistors are still within specification.
- D.14 Check all VCR and other TPWS specific relays are able to drop by removing connection to coil.
- D.15 Check any suppression stick / timer circuits for relays failing to drop.

On-Track Equipment

- D.16 Check the security of the plug coupler. Test the loop voltage whilst moving the loop plug coupler back and forth, look for fluctuations in voltage. Do not subject the plug coupler to any excessive twisting stress, as this causes damage.

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- D.17 Disconnect plug coupler. Check terminals for moisture, foreign matter, arcing, corroded contacts, broken or bent springs.
- D.18 Test DC resistance of loops (between 0.5 and 1.5 ohms across the two smaller pins of the transmitter loop plug coupler). See Transmitter Loop Related Failures in [NR/SMTH/Part10/FF12](#) (Faulting Guide: Train Protection Warning System (TPWS)).
- D.19 Test (for each signal aspect) the TPWS loop outputs for correct voltage and frequency at 310mm above rail level (using the TPWS commissioning test jig), Record the results. In complex areas, Test the TPWS loop output voltages for each permutation of signal aspect and points position; according to control table entries (see [NR/SMS/Part/Z03](#), for correct values).
- D.20 Test (for each signal aspect) the TPWS loop output voltages for incorrect operation by any adjacent signal. In complex areas, test the TPWS loop output voltages for each permutation of signal aspect and points position, for incorrect operation by adjacent signals.

Cables

- D.21 [CABLE FUNCTION TEST](#) signalling interface line circuits.
- D.22 [INSULATION TEST](#) all relevant cables (tail, lineside, rack to rack).
- D.23 Do not perform an insulation test of either the TPWS loop feeder cable or the SPOSS treadle cable, with the transmitter loop connected, as this damages the loops.

Miscellaneous

- D.24 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

- O.1 Possible WSF of the signal aspect lighting circuits.
- O.2 Possible failure of train borne equipment.
- O.3 Possible train exceeding design speed.
- O.4 Possible WSF of track circuit or points operation / indication, where occupation of track circuits or the position of points affects TPWS suppression.
- O.5 Possible design error in TPWS circuits or loop position.
- O.6 Possible signalling power supply problems.

END

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NR/SMTH/Part08/T020		
Wrong Side Failure Test Guide: EBI Gate 200 Level Crossing System		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

NON-DESTRUCTIVE TESTS

Before opening EBI Gate Post

- N.1 Note the weather conditions.
- N.2 Check that the posts are correctly closed and padlocked.
- N.3 Check for visible signs of damage.
- N.4 Check for signs of recent disturbances (track maintenance/cable damage).
- N.5 Check for correct LED beam alignment of the Post LED's.
- N.6 Observe LED illumination (Red/Green) from road and or foot approaches and Check the background, any relevant side lighting and any obstructions such as fencing or vegetation (consider viewing positions for all type of crossing users – i.e crossing user in a high farm style vehicle or pedestrian).
- N.7 Check the “On Demand” buttons (if fitted) are lit.

After opening EBI Gate Post

- N.8 Check the equipment for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc).
- N.9 Check the equipment for any unusual amounts of moisture.
- N.10 Check that the Green and Red LEDs are correctly installed and in good condition (colour, type, correct alignment, etc).
- N.11 Check and record the DC power light (Green)/overload indication (Red) on the PULS Power supply unit.
- N.12 Check status LEDS on the UPS Controller, OK/BAT, BAT.>85%, Alarm and BAT.FAULT. (Red, Yellow or Green).
- N.13 Check that no trains are traversing the EBI block sections and Record the indications on the ACB cards.
- N.14 Check that no trains are traversing the EBI block sections and Record the LED status indications on the IMC card.

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Wrong Side Failure Test Guide: EBI Gate 200 Level Crossing System		
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Wheel sensors (Only if the ACB card indicates a problem at the wheel sensor)

- N.15 Check the condition of the cables and troughing route to the wheel sensor (fire damage, squashed cables, etc).
- N.16 Check GAK box for damage.
- N.17 Check for the safe insulation of cables and wires at terminations.
- N.18 Check that adjacent terminations are properly isolated from each other.
- N.19 Check sensor head for damage.
- N.20 Check the sensor head is correctly mounted on the running line, as shown in [NR/SMS/PartC/AX41](#) (Frauscher: RSR123 Wheel Sensors).

Miscellaneous

- N.21 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

DESTRUCTIVE TESTS

EBI Gate Post

- D.1 Press the “On Demand button” (if fitted) and observe the passage of a train take note of indications and audio alarm.
- D.2 Record the time at which the button was pressed so this information can be compared to the data recorded the system log later.
- D.3 Check for the safe insulation of cables and wires at terminations.
- D.4 Check that adjacent terminations are properly isolated from each other.
- D.5 Power down the post.
- D.6 Remove and secure the SD cards as per [NR/SMS/PartB/Test/079](#) (Interrogation of the EBI Gate 200 SD Card).
- D.7 Following the removal of the SD Cards both DayLogs for the day concerned shall be downloaded and the operation observed in step D1 has been recorded correctly. For additional information related to interpreting the result refer to [NR/SMS/PartB/Test/079](#) (Interrogation of the EBI Gate 200 SD Card).

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Crossing Equipment

- | D.8 [INSULATION TEST](#) cables between Master and Slave Posts as well as tail cables to sensors via the GAK.

Miscellaneous

- | D.9 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

- | O.1 Possible design error in crossing circuits.
- | O.2 Strike in point might not be far enough out for speed of route.
- | O.3 Train travelling over the speed limit.
- | O.4 P way issues.

END

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Wrong Side Failure Test Guide: Vamos Crossing System		
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NON-DESTRUCTIVE TESTS

Before opening any equipment

- N.1 Note the weather conditions.
- N.2 Check that the Vamos equipment case and indication posts are correctly closed and padlocked.
- N.3 Check for visible signs of damage.
- N.4 Check for signs of recent disturbances (track maintenance/cable damage), on ALL detector heads.
- N.5 Check for correct LED beam alignment of the Indication Post LED's.
- N.6 Observe LED illumination (Red/Green) from road and or foot approaches and Check the background, any relevant side lighting and any obstructions such as fencing or vegetation.
- N.7 Check the "On Demand" buttons (if fitted) and record if they are :
 - a) Illuminated - If the system is in "Standby Mode" the button is yellow, and it turns blue when its operated.
 - b) Extinguised - If the indicator posts are displaying and red or green LEDs.

After opening Vamos Equipment Case

- N.8 Check the equipment for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc).
- N.9 Check the equipment for any unusual amounts of moisture.
- N.10 Check and record all of the LED indications on each item of equipment.
- N.11 Check that no trains are traversing the crossing area and record the LED status indications on the IMC card.
- N.12 Record info on Telemetry Module display shown only.

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Indication Posts

- N.13 Check that the Green and Red LEDs are correctly installed and in good condition (colour, type, correct alignment, etc).
 - a) Check for any chafing, rodent damage or cables being trapped when the hinged door is open or closed.

Wheel sensors

- N.14 Check the condition of the cables and troughing route to the wheel sensor (fire damage, squashed cables, etc).
- N.15 Check GAK box for damage.
- N.16 Check the insulation of cables and wires at terminations. Check that adjacent terminations are properly isolated from each other.
- N.17 Check for safe insulation (chafing, scorched, rodent damage).
- N.18 Check sensor head appears secure and is undamaged.

Miscellaneous

- N.19 Check Special Inspection Notices (NR/SIN), or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

DESTRUCTIVE TESTS

Vamos Equipment Case

- D.1 Press the "On Demand button" (if fitted) as a train approaches and observe the passage of a train take note of indications and audio alarms.
- D.2 Record the time "actual" at which the button was pressed so this information can be compared to the data recorded the system log later.
- D.3 Check the insulation of cables and wires at terminations. Check that adjacent terminations are properly isolated from each other.
- D.4 Check for safe insulation (chafing, scorched, rodent damage).
- D.5 Check all data in the Telemetry module buffer is downloaded to the card. As described in [NR/SMS/PartB/Test/158](#) (Interrogation of the Vamos Crossing System SD Card).
- D.6 Remove and replace the SD card, and secure the removed SD card.

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- D.7 Interrogate the SD card as driscribed in [NR/SMS/PartB/Test/158](#) (Interrogation of the Vamos Crossing System SD Card). This test contains additional information related to interpreting of the results.
- D.8 Power down the System.

Crossing Equipment

- D.9 [INSULATION TEST](#) cables between Indication Posts and the Vamos equipment case as well as tail cables to sensors via the GAK.

Miscellaneous

- D.10 Check Special Inspection Notices (NR/SIN), or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

- O.1 Possible design error in crossing circuits.
- O.2 Strike in point might not be far enough out for speed of route.
- O.3 Train travelling over the speed limit.
- O.4 Pway issues.
- O.5 Malice has occurred.

END

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Wrong Side Failure Test Guide: Harmon Crossing Predictor HXP-3		
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1. NON-DESTRUCTIVE TESTS

Signal Box Tests

- N.1 Note any relevant Signal Box indications.
- N.2 Note any relevant switch or push button states, stopping or non-stopping selection.
 - At some sites the selection is controlled by the train describer and this should be noted.
- N.3 Note the state of any relevant train describer displays.
- N.4 Note any unusual operating methods in place (possessions, single line working, etc.).
- N.5 Note the nature of any work being done, or persons working in the area.
- N.6 Note the time and type of train or operation that first caused the reported failure to become apparent and whether the fault developed without train interference.
- N.7 Note the time and type of train or operation last made prior to the report, which made use of the affected equipment.
- N.8 Note any other train movements in the affected area.
- N.9 Note any significant weather conditions in the area.
- N.10 Check that any signals or points that have been reported to be part of or connected to any incident can display the aspect reported/move in the direction reported (i.e. not clipped and plugged).
- N.11 Download available condition monitoring and data logger evidence (e.g. Centrix, Asset View, SSI) and confirm that the data supports the allegation.

On Track Equipment/Running Rails

- N.12 Check the rails for contamination and record the type of contamination and extent (Complete or sporadic).
- N.13 Test and record the arm clearances on the treadle, [NR/SMS/PartB/Test/177](#) (Treadle - Gauge Test), together with the reason for the test.

Trackside Cupboards Or Equipment Rooms

- N.14 Check that the cupboard or room is correctly locked or padlocked.

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- N.15 Check for any signs of damage and/or disturbance.
- N.16 Check for any signs of recent work (wiring alterations, stage work, etc.).
- N.17 Check for security or tightness of equipment (modules, racking cable connectors, etc.).
- N.18 Check the position of any relevant relays (energised or de-energised).
- N.19 Check for any visual signs of damage.
- N.20 Test voltages and record results.

HXP-3 Specific Tasks

- N.21 Download event data from the site recorder (Recorder Memory Module(RMM)), this data is time critical and therefore priority.
- N.22 Select SD on the IDK and analyse any self-diagnostic codes that have been stored by the HXP-3, as described in [NR/SMS/PartC/IS30](#) (Harmon LX Predictor (HXP-3) - Appendix E . All codes are preceded by the date and time they were logged with the most recent entry being shown first.
- N.23 Check the configuration settings correspond to the site record, with particular note of the loss of shunt setting. Site records showing configuration settings of N/A are treated as a records deficiency and shall be escalated to supervisor.
- N.24 Check if configurations have changed using the IDK, option 94. Note, loss of site configuration information is associated with an expired BIOS battery.
- N.25 Contact Manufacturer second line support, liaise with manufacturer to review event data for indicator of cause of failure. If unsure how to conduct this step, contact the SFI Level 2.
- N.26 Check and record the RX value for each track using the IDK.
- N.27 Check and record the Track Circuit Phase angle (PHASE) value for each track using the IDK.
- N.28 Where a failure is identified on an island track section, perform the island check out test [NR/SMS/PartB/Test/151](#) (Harmon Crossing Processor (HXP-3) Tests - Section 3.
- N.29 Check that the Power LED on each module is on. If all Power LEDs are off, check the Master On/Off Switch is on and that the fuse is intact.

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- N.30 Check that the MDR LED is on, as this indicates the presence of MDR Drive voltage and hence that the problem is elsewhere in the equipment.
- N.31 Check that the CWE1 LED is on for single track lines and that CWE1 and CWE2 LEDs are on for double track lines. If these LEDs are not lit, this indicates that the associated track is in Motion Detect mode - this causes warning times to be longer than expected.
- N.32 Check each TRM to see if the High Signal LED is on. This could be caused by an open track circuit.
- N.33 Check for intermittent bond wire terminations or a defective insulated joint coupler.
- N.34 Check outgoing track cables are of correct type (twisted pair) and are correctly terminated.
- N.35 Check for open termination shunts.
- N.36 Check for open or defective insulated joint couplers.
- N.37 Check for improper application of the track frequency when overlapping with another HXP-3.
- N.38 Check for defective sleepers, tie bars and point insulations.

DESTRUCTIVE TESTS

Common Destructive Tests

- D.1 [WIRE COUNT](#) relevant equipment or circuits and controls to the wiring diagrams.
- D.2 Test and record the timings on the treadle, [NR/SMS/PartB/Test/044](#) (Mechanical Treadle Timing and Adjustment Test), together with the reason for the test.

HXP-3 Power Loss

- D.3 If some or all of the Power LEDs are not on, apply pressure to each module to make sure that the DIN connectors are properly seated.
- D.4 If the HXP-3 lost power while the Master On/Off switch was On and the fuse was intact, check to see if the AAR terminals N12 and B12 have 12 volts applied to them. If not, the problem can be related to the battery, battery buss, battery charger or Motion Detector Surge Arrester (MDSA).

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LED Indications

- D.5 If any of the CWE1, CWE2, AUX, ISL1, ISL2, MDR, AX1, AX2 or AX3 LEDs are not illuminated as expected, check for a 12 Vdc current across the AAR terminals directly above the LED.
- D.6 Check that the ISL1 and ISL2 LEDs are illuminated. These correspond to the RSI modules for tracks 1 and 2 respectively. If the RSI Modules are present and the equivalent ISL1 or ISL2 LEDs are not illuminated, check that the RSI Module is correctly adjusted and operating.
- D.7 Check that the Stall Timer LED (located on the CPU module) is not illuminated.
- D.8 If the ISL LED is not illuminated, check the RSI module to see if the (green) HIGH LED is on constantly. When the RSI Module detects a malfunction the (green) HIGH LEDs, (yellow) CALIBRATE LEDs and (red) LOW LEDs flash on and off in a distinct pattern. The pattern varies with the type of fault detected.
- D.9 If a pattern is noticed check that the B12 voltage is between 10 and 14 Vdc.
- D.10 If the B12 voltage is correct, check the LOS jumpers. One mini shunt shall be installed on LOS 0, LOS 1, and LOS 2.
- D.11 If the LOS jumpers are correct, check the fault jumpers. One mini shunt shall be installed on FAULT 0 or FAULT 1.
- D.12 If, after these checks, no correctable faults are detected and the fault remains, replace the RSI module.

High Signal (High Impedance or Open Track Circuit)

- D.13 Check the Ballast Compensation parameter (BC) using the IDK .
- D.14 Place a hard wire shunt, approximately 50% of the distance of the approach away from the crossing. If the value of RX decreases to approximately "50", there is an open circuit in the last 50% of the approach that was shunted. To locate the open circuit, move the hard wire shunt to positions of 60%, 70%, 80%, 90%. If the value of RX does not decrease to approximately "50" and the possibility of an incorrect Ballast Compensation setting has been eliminated, the open circuit is located between the hard wire shunt and the opposite approach termination. To locate the open circuit, move the hard wire shunt to positions of 10%, 20%, 30%, 40%.

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- D.15 Check if the open circuit has been caused by a defective termination shunt. The three types of termination shunt are hard wire, wideband, and narrow band (NBS). To test an approach termination, connect a hard wire shunt where the approach termination is connected. Note the RX change on the HXP-3.
- a) When the approach termination is of the hard wire type, no change is visible.
 - b) When the approach termination is of the wideband type, RX decreases by no more than 2.
 - c) When the approach termination is of the narrow band (NBS) type RX can decrease by as much as 25. If RX increases when the hard wire shunt is connected at the termination, the NBS is defective.
- D.16 Test for defective joint couplers using the following procedure.
- a) Place a hard wire test shunt on the crossing side of the joint coupler.
 - b) Observe and record the drop in RX.
 - c) Remove the test shunt.
 - d) Place the hard wire test shunt on the termination side of the joint coupler.
 - e) Observe and record the drop in RX.
 - f) Remove the test shunt.

Low Phase (Phase angle <math><32^\circ</math>)

- D.17 Check that the frequency is correct for the approach length using the table found in [NR/SMS/PartZ/Z04](#) (Level Crossing - Reference Values) - Predictor HXP-3.
- D.18 If track conditions are extremely wet, especially in the island circuit, carry out a Phase Compensation adjustment, as described in [NR/SMS/PartC/IS30](#) (Harmon LX Predictor (HXP-3)) - Appendix B.

Open Track Tail Cables

- D.19 An open track tail cable does not always cause a high signal condition, but can indicate a broken or high impedance track tail cable condition, such as resistive track wires, track connections, or defective bonds in the island circuit. A broken transmitter tail cable can cause a high signal condition and code C527 for track 1 or c547 for track 2 to be displayed. A broken receiver tail cable can cause condition code C620 for track 1 or C630 for track 2 to be displayed.

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D.20 When an MDSA is used and an open condition has been narrowed to the track tail cable, the MDSA is a possible cause for the open circuit. The MDSA has a fusible link in series with each track tail cable: T1, T2, R1, and R2. Finding defects with these fuseable links is done by bypassing or jumpering around each of them. For example, to jumper around the T2 fuse link, connect a clip jumper from the T1 TRACK terminal to the T1 equipment terminal on the MDSA.

D.21 To make sure that no more than one track tail cable fuse link is causing the open, jumper around all four at one time. This determines whether the open is caused by the MDSA or some other portion of the track tail cable.

Rising RX on an Inbound Train

D.22 Check for rising RX for inbound trains. A slight rise in RX can be seen with a shunt or train near the termination. For this RX increase to occur the termination is usually a NBS and some HXP-3 signal is leaking past the termination creating this phenomenon. Poor ballast conditions or a defective NBS can also cause this.

Tail Ringing

Tail ringing is a term used in US applications to describe the re-activation of the crossing signals after the train has cleared the island. This could happen with the HXP-3 if RX decreased as the train was travelling outbound or in association with a diagnostic code.

D.23 Analyse diagnostic codes as described in [NR/SMS/PartC/IS30](#) (Harmon LX Predictor (HXP-3)) - Appendix E.

D.24 If tail ringing was caused by RX decreasing as the train was travelling outbound; this is usually an indication of a defective TJC.

OTHER CONSIDERATIONS

O.1 Possible WSF of protecting signal reducing warning time.

O.2 Strike in point (treadle or track circuit) might not be far enough out for speed of route.

O.3 Possible mis-match of interlocking functionality with HXP-3.

END

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Wrong Side Failure Test Guide: VHCL systems		
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1. NON-DESTRUCTIVE TESTS

Signal box tests

- N.1 Note any relevant Signal Box indications.
- N.2 Note any relevant switch or push button states.
- N.3 Note the state of any relevant train describer displays.
- N.4 Note any unusual operating methods in place (possessions, single line working, etc.)
- N.5 Note the nature of any work being done, or persons working in the area.
- N.6 Note the time and type of train or operation that first caused the reported failure to become apparent and whether the fault developed without train interference.
- N.7 Note the time and type of train or operation last made prior to the report, which made use of the affected equipment.
- N.8 Note any other train movements in the affected area.
- N.9 Note any significant weather conditions in the area.
- N.10 Check that any signals or points that have been reported to be part of or connected to any incident can display the aspect reported/move in the direction reported (i.e. not clipped and plugged).

Trackside cupboards or equipment rooms

- N.11 Check that the cupboard or room is correctly locked or padlocked.
- N.12 Check for any signs of damage and or disturbance.
- N.13 Check for any signs of recent work (wiring alterations, stage work, etc.).
- N.14 Check for security or tightness of equipment (modules, racking cable connectors, etc.).
- N.15 Check the position of any relevant relays (energised or de-energised).

VHLC specific tasks

- N.16 Check for any visual signs of damage.

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N.17 Carry out Power Supply Testing, see [NR/SMTH/Part10/FF18](#) (Faulting Guide: VHLC).

N.18 Carry out General Fault diagnosis (see [NR/SMTH/Part10/FF18](#) (Faulting Guide: VHLC).

DESTRUCTIVE TESTS

Common destructive tests

D.1 Carry out a [WIRE COUNT](#) on relevant equipment or circuits and controls to the wiring diagrams.

D.2 Remove any relays associated with the VHLC interlocking (interface relays) and check for damage inside, such as cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, silver sulphide, metal flakes and bent or broken springs.

D.3 Check relay bases for any damage, silver migration, spades pushed in too far or broken contact insulators.

D.4 Carry out Auxiliary Communications Processor (ACP) checks, see [NR/SMTH/Part10/FF18](#) (Faulting Guide: VHLC).

D.5 Carry out Vital Signal Driver AC (VSDAC) checks, see [NR/SMTH/Part10/FF18](#) (Faulting Guide: VHLC).

D.6 [INSULATION TEST](#) any affected cable cores associated with the final function and the VSDAC.

D.7 As required, carry out a [CABLE FUNCTION TEST](#) on the final function to the VSDAC using the LCP.

D.8 Carry out VGPIO and Input/Output faults checks, see [NR/SMTH/Part10/FF18](#) (Faulting Guide: VHLC).

D.9 [INSULATION TEST](#) any affected cable cores associated with the final function and the VSDAC.

D.10 As required, carry out a [CABLE FUNCTION TEST](#) on the final function to the VSDAC using the LCP.

D.11 Carry out Vital Logic Processor (VLP) checks, see [NR/SMTH/Part10/FF18](#) (Faulting Guide: VHLC).

D.12 Replacing a battery or 5VDC power supply, see [NR/SMTH/Part10/FF18](#) (Faulting Guide: VHLC).

END

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NR/SMTH/Part08/T024		
Wrong Side Failure Test Guide: Flex Crossing System		
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NON-DESTRUCTIVE TESTS

Before opening any equipment

- N.1 Note the weather conditions.
- N.2 Check that the Flex equipment case and indication posts are correctly closed and padlocked.
- N.3 Check for visible signs of damage.
- N.4 Check for signs of recent disturbances (track maintenance / cable damage).
- N.5 Check for correct LED beam alignment of the Indication Post LED's.
- N.6 Observe LED illumination (Red/Green) from road and or foot approaches and check the background, any relevant side lighting and any obstructions such as fencing or vegetation.
- N.7 Check GAK housing and Frauscher head for any damage and that cables are not damaged.

After opening Flex Equipment Case

- N.8 Take a photo and video to show all LED's.
- N.9 Check the equipment for possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc).
- N.10 Check the equipment for any unusual amounts of moisture, check heater function.
- N.11 Check and record all of the LED indications on each item of equipment by photographing each item.
- N.12 Check that no trains are traversing the crossing area and record the LED status indications on the IMC card.
- N.13 Check the Flex Life display for any alarms.

Indication Posts

- N.14 Check that the Green and Red LEDs are correctly installed and in good condition (colour, type, correct alignment, etc).
- N.15 Open housing to check for wiring / cable from any chafing, rodent damage or being trapped with opening of door.

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NR/SMTH/Part08/T024		
Wrong Side Failure Test Guide: Flex Crossing System		
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Wheel sensors

- N.16 Check the condition of the cables and troughing route to the wheel sensor (fire damage, squashed cables, etc).
- N.17 Check GAK box for damage.
- N.18 Check the insulation of cables and wires at terminations. Check that adjacent terminations are properly isolated from each other.
- N.19 Check for safe insulation (chafing, scorched, rodent damage).
- N.20 Check sensor head appears secure and is undamaged.

Miscellaneous

- N.21 Check Special Inspection Notices (NR/SIN), or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

DESTRUCTIVE TESTS

Flex Equipment Case

- D.1 Observe the passage of a train and take note of indications and audio alarms.
- D.2 Record the time "actual", at which the button was pressed, so this information can be compared later, to the data recorded on the system log.
- D.3 Check for safe insulation (chafing, scorched, rodent damage).
- D.4 Check all data in the Flex Life module buffer is downloaded onto a USB, which is inserted into one of the ports on the bottom of the Flex life case, by using the Logfiles Screen.
- D.5 Remove USB Device.
- D.6 Interrogate the Flex life data by inserting the USB in a Laptop. The logs are shown in Microsoft notes format and can be transferred to excel for easier interpretation.

Crossing Equipment

- D.7 [INSULATION TEST](#) cables between Indication Posts and the Flex equipment case as well as tail cables to sensors via the GAK.

Miscellaneous

- D.8 Check Special Inspection Notices (NR/SIN), or Letters of Instruction (NR/BS/LI/) for any other relevant destructive tests.

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OTHER CONSIDERATIONS

- | O.1 Possible design error in crossing circuits.
- | O.2 Strike in point might not be far enough out for speed of route.
- | O.3 Train travelling over the speed limit.
- | O.4 Pway issues.
- | O.5 Malice has occurred.

END

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NR/SMTH/Part08/T025		
Wrong Side Failure Test Guide: Track Circuit Rail Head Contamination – Remote Condition Monitoring (Not Fitted)		
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GENERAL

These test guides are for use where rail head contamination is suspected and shall only be used with the authorisation of the SFI level 2 (or above).

Where the results of this test plan are inconclusive OR where evidence of rail head contamination cannot be found at step N13, Test Plan [NR/SMTH/Part08/T002](#) (Wrong Side Failure Test Guide: Track Circuits) shall be used instead.

Where a train fails to operate a series of track circuits on the same line of route, it is permissible to test only the first, middle and last track circuit in addition to any track circuit containing S&C.

NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note any relevant signal box indications.
- N.2 Check the condition of lamps / other indicators.
- N.3 Note the state of relevant train describer displays.
- N.4 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc.).
- N.5 Note the nature of any work being done or persons working in the area.
- N.6 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent.
- N.7 Note whether the train approach was particularly slow.
- N.8 Note whether any Track Circuit Actuator (TCA) was fitted to the affected train and if it was working correctly.
- N.9 Note the time and type of operation last made, prior to the report, which used the affected equipment.
- N.10 Note any other train movements in the affected area.
- N.11 Note any significant weather conditions in the area.
- N.12 Download available condition monitoring and data logger evidence (e.g. Centrix, Asset View, SSI) and confirm that the data supports the allegation.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T025		
Wrong Side Failure Test Guide: Track Circuit Rail Head Contamination – Remote Condition Monitoring (Not Fitted)		
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Running Rails

N.13 Check the rails for contamination and record the type of contamination and extent (complete or sporadic).

Where rail head contamination is unconfirmed, the SFI Level 2 or above shall be consulted for further guidance.

Lineside Locations and Equipment Room

N.14 Check and record the position and correspondence of relevant relays (energised, de-energised). Consider TR, TPR, TKR, etc.

Track Equipment

N.15 Check for signs of recent disturbances (track maintenance or renewals activity, no unused rails in any tuned zones).

N.16 If a laptop is available, download the error log. (DIGITAL EBI TRACK 200 & 400 RX ONLY).

NOTE: This can be done whilst the system is operational by connecting to the 9-way D type port on the front of the Digital Rx, using a laptop and the required software.

DO NOT turn or remove the frequency key during this process.

DESTRUCTIVE TESTS

Track Equipment

D.1 Carry out a Track Circuit Maintenance Test and compare readings with previous tests on the track circuit record card.

D.2 Connect the minimum permissible drop shunt to all extremities of the Track Circuit and confirm the track relay de-energises when the shunt is applied.

D.3 Connect the minimum permissible drop shunt at intervals throughout the length of the track circuit whilst observing the track relay de-energises.

NOTE: The normal interval is 15 Metres, longer intervals are possible for plain line and long track circuits. The interval shall be agreed with the SFI Level 2 (or above).

D.4 Carry out Residual Voltage Test / Interference Test and record results.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T025		
Wrong Side Failure Test Guide: Track Circuit Rail Head Contamination – Remote Condition Monitoring (Not Fitted)		
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D.5 Measure the track circuit voltage at the Relay or Receiver whilst a train passes over the length of the track circuit.

NOTE: *This step is to ascertain that the train wheels are making good contact with the track throughout the length of the track circuit and to verify that the contamination observed would allow the track circuit to fail wrong side.*

D.6 Record where TCAIDs are fitted and carry out [NR/SMS/PartB/Test/043](#) (Track Circuit Aid Test).

D.7 Record where Force Down Treadles are fitted and confirm that they are working / timing correctly.

OTHER CONSIDERATIONS

O.1 Consider possible remote-control system failure.

O.2 Consider possible invalid track circuit combination.

O.3 Consider possible design error.

O.4 Consider possible problem with train.

O.5 Consider if track circuit might be shorter than the minimum length required.

O.6 Consider and relevant Special Inspection notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T026		
Wrong Side Failure Test Guide: Track Circuit Rail Head Contamination – Remote Condition Monitoring (Fitted)		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

GENERAL

These test guides are for use where rail head contamination is suspected and shall only be used with the authorisation of the SFI level 2 (or above).

Where the results of this test plan are inconclusive OR where evidence of rail head contamination cannot be found at step N13, Test Plan [NR/SMTH/Part08/T002](#) (Wrong Side Failure Test Guide: Track Circuits) shall be used.

Where a train fails to operate a series of track circuits on the same line of route, it is permissible to test only the first, middle and last track circuit in addition to any track circuit containing S&C.

NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note any relevant signal box indications.
- N.2 Check the condition of lamps / other indicators.
- N.3 Note the state of relevant train describer displays.
- N.4 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc.).
- N.5 Note the nature of any work being done or persons working in the area.
- N.6 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent.
- N.7 Note whether the train approach was particularly slow.
- N.8 Note whether any Track Circuit Actuator (TCA) was fitted to the affected train and if it was working correctly.
- N.9 Note the time and type of operation last made, prior to the report, which used the affected equipment.
- N.10 Note any other train movements in the affected area.
- N.11 Note any significant weather conditions in the area.
- N.12 Download available condition monitoring and data logger evidence (e.g. Centrix, Asset View, SSI) and confirm that the data supports the allegation.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T026		
Wrong Side Failure Test Guide: Track Circuit Rail Head Contamination – Remote Condition Monitoring (Fitted)		
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Running Rails

N.13 Check the rails for contamination and record the type of contamination and extent (complete or sporadic).

Where rail head contamination is unconfirmed, the SFI Level 2 or above shall be consulted for further guidance.

Track Equipment

N.14 Check for signs of recent disturbances (track maintenance or renewals activity, no unused rails in any tuned zones).

N.15 Correspond the Remote Condition Monitoring system to the Track Circuit under investigation.

NOTE: This test is to confirm that the RCM equipment is connected to the correct track and is functioning correctly.

DESTRUCTIVE TESTS

Track Equipment

D.1 Carry out a Track Circuit Maintenance Test and compare readings with previous tests on the track circuit record card.

D.2 Connect the minimum permissible drop shunt to all extremities of the Track Circuit and confirm the track relay de-energises when the shunt is applied.

D.3 Carry out Residual Voltage Test / Interference Test and record results.

D.4 Record where TCAIDs are fitted and carry out [NR/SMS/PartB/Test/043](#) (Track Circuit Aid (TCAID) Test).

D.5 Record where Force Down Treadles are fitted and confirm that they are working / timing correctly.

OTHER CONSIDERATIONS

O.1 Consider the impact rail head treatment has had by reviewing the RCM traces post treatment. If treatment is ineffective consideration shall be given to applying T002 in full.

O.2 Consider if track circuit might be shorter than the minimum length required.

O.3 Consider possible problem with train.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T026		
Wrong Side Failure Test Guide: Track Circuit Rail Head Contamination – Remote Condition Monitoring (Fitted)		
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- O.4 Consider any relevant Special Inspection Notices (NR/SIN), Technical Instructions.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T027		
Wrong Side Failure Test Guide: Automatic Train Protection (ATP) (GWML)		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Great Western Main Line ATP
Excludes:	Chiltern Line ATP

GENERAL

All test measurements shall be recorded on ATP (GWML) Test NR/SMS record card together with the reason for the test.

NON-DESTRUCTIVE TESTS

General

- N.1 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- N.2 Note the nature of any work being done, or persons working in the area.
- N.3 Note the time and the type of train or operation which first caused the reported failure to become apparent.
- N.4 Note the time and type of operation last made, prior to the report which used the affected equipment.

Lineside Locations or Equipment Rooms

- N.5 Check ATP enclosure and signal location or room is correctly locked or padlocked.
- N.6 Check and record encoder indications.
- N.7 Check for equipment security and tightness.
- N.8 Check that equipment and settings correspond to the wiring diagram (specification, power, voltage rating, etc).
- N.9 Check the insulation of cables and wires at terminations. Check that adjacent terminations are properly isolated from each other.
- N.10 Check equipment for possible short circuits (nuts, washers, solder, off-cuts of wire, metallic dust, etc.).
- N.11 Check for any unusual amounts of moisture.

Track Equipment

- N.12 Check beacon is not damaged and is correctly positioned.
- N.13 Check that all ATP beacons in the area on the same line are correctly offset from the centre of the track.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T027		
Wrong Side Failure Test Guide: Automatic Train Protection (ATP) (GWML)		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- N.14 Check ATP loop is not damaged and correctly positioned.
- N.15 Check for any signs of recent disturbances (wiring alterations, track maintenance or renewals activity).
- N.16 Check for equipment security and tightness.
- N.17 Check that equipment and settings correspond to the wiring diagram (specification, power, voltage rating, etc).
- N.18 Check the insulation of cables and wires at terminations. Check that adjacent terminations are properly isolated from each other.
- N.19 Check equipment for possible short circuits (nuts, washers, solder, off-cuts of wire, metallic dust, etc.).
- N.20 Check for any unusual amounts of moisture.

Cables

- N.21 Check ATP cables are not damaged (fires, squashed cables, etc).
- N.22 Remove covers from trunking and check for safe insulation (chaffing, scorched, rodent damage).
- N.23 Simulate reported condition, then:

Track Equipment

- N.24 Test and record beacon(s) telegram/message.
- N.25 Test and record beacon(s) signal strength.
- N.26 Test and record loop telegram/message.
- N.27 Test and record loop signal strength.
- N.28 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.

Lineside Locations or Equipment Rooms

- N.29 Test ATP and UT output voltage, at input terminals of ATP enclosure.
- N.30 Test ATP volts, level, etc.
- N.31 [EARTH TEST](#) 110V AC bus bar.
- N.32 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T027		
Wrong Side Failure Test Guide: Automatic Train Protection (ATP) (GWML)		
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Miscellaneous

- | N.33 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

DESTRUCTIVE TESTS

Track Equipment

- | D.1 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.
- | D.2 Test resistance of loop.

Lineside Locations or Equipment Rooms

- | D.3 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.
- | D.4 Simulate reported condition, Test back-up BITE memory and Record results.
- | D.5 Test ATP LIT and UT primary current.

Cables

- | D.6 [INSULATION TEST](#) all ATP cables.
- | D.7 [INSULATION TEST](#) signal head tail cable(s).
 - | After reconnecting cables, check encoder indications.

Miscellaneous

- | D.8 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

- | O.1 Possible right-side failure not noticed by train crew.
- | O.2 Possible wrong side failure of signal not noticed by train crew.
- | O.3 Possible that signal to signal distance is different from ATP design details.
- | O.4 Possible that PSRs/TSRs have changed without ATP modification.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T028		
Wrong Side Failure Test Guide: ATP (GWML) Reported WSF of signal, no allegation against ATP equipment		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Great Western Main Line ATP
Excludes:	Chiltern Line ATP

GENERAL

All test measurements shall be recorded on ATP (GWML) Test NR/SMS record card together with the reason for the test.

Follow normal WSF investigation procedures listed in [NR/SMTH/Part08/T007](#) (Wrong Side Failure Test Guide: Lamp – No Light (Any Type)) or [NR/SMTH/Part08/T008](#) (Wrong Side Failure Test Guide: Colour Light Signal), with the addition of the following steps:

NON-DESTRUCTIVE TESTS

- N.1 Before any disconnections are made check and record ATP encoder indications. If they are working correctly, this can be taken as proof that there are no internal encoder faults which could affect signal head circuit.
- N.2 If encoder indications are not correct there might be an internal fault and after all relevant conditions have been simulated, encoder shall be renewed and original sent for investigation.

DESTRUCTIVE TESTS

- D.1 Carry out an [INSULATION TEST](#) on signal tail cable. This can be carried out in the normal way. ATP equipment shall be disconnected from signal head circuit by disconnecting ATP LITS.
- D.2 Carry out an [INSULATION TEST](#) on the ATP cable from signal location to encoder. This can be carried out in the normal way after disconnecting ATP LITS in signal location and unplugging encoder.
- D.3 After above tests, plug-in encoder and re-connect signal and ATP LITS. Check encoder indications and check they are working correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T029		
Wrong Side Failure Test Guide: Thameslink ERTMS Irregular Movement Authority		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Siemens Class 700 rolling stock within the Thameslink ETCS Area
Excludes:	All other rolling stock and ETCS Areas and implementations

NOTE:

Tasks requiring the use of the WESTCAD Technician's Terminal (TT), WESTLOCK Technician's Facility (TF), Radio Block Centre Technician's Facility (RBC TF) and GSM-R Qualitative Analysis & Troubleshooting System (QATS) can be undertaken from locally or remotely (from another site) as listed in the table below.

System	Site	
	TBROC	LBER / Arch 886
WESTCAD Technician's Terminal (TT)	✓	
WESTLOCK Technician's Facility (TF)	✓	✓
GSM-R Qualitative Analysis & Troubleshooting System (QATS)	✓	✓
Radio Block Centre Technician's Facility (RBC TF)		✓

NON-DESTRUCTIVE TESTS

Three Bridges Rail Operating Centre

- N.1 Note any other train movements in the affected area.
- N.2 Note which Signaller is controlling the affected section of line.
- N.3 Note the relevant indications.
- N.4 Note the state of any relevant train describer displays.
- N.5 Note the time and type of train (including vehicle class and number), event or operation that first caused the reported failure to become apparent.
- N.6 Note the operating level & mode of the train (Level 2 / Level NTC, Full Supervision (FS) mode etc.) as shown on the WESTCAD-E (Service Control Workstation) General Information Display's Train List.
- N.7 Note whether the train is at a signal or ETCS block marker and the relevant designation number.
- N.8 Check and note if the movement authority was issued and then withdrawn.
- N.9 Check and note if there are ESR/TSR's in place.
- N.10 Note any unusual operating methods in place (hand-signalling, possessions, Single line working etc.)

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T029		
Wrong Side Failure Test Guide: Thameslink ERTMS Irregular Movement Authority		
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- N.11 Note the nature of any work being carried out on the suspect or associated equipment and any persons working in the area of the allegation.
- N.12 Note the time and type of operation made prior to the report using the affected equipment.
- N.13 Note any error reports occurring at the time of the allegation on the WestCad-E TT.
- N.14 Note any failure alarms displayed on the WestCad-E TT that were present at the time of the allegation.
- N.15 Using the WESTCAD Technician's Terminal, interrogate the WESTCAD-E (Service Control Workstation) Event Log to establish if a route request was made by the signaller or ARS (or equivalent of ARS where provided) and what that route was.
 - NOTE:** *It is also possible to interrogate the WESTLOCK TF log to confirm if a route request was made by the signaller or ARS (or equivalent of ARS where provided) and what that route was.*
- N.16 If a temporary speed restriction was active at the time and is suspected to be incorrect, download the SCS Event Log for retention and review it to determine what was entered by the user.
 - NOTE:** *The RBC Event Log and QATS shows the temporary speed restriction in the movement authority issued to the train.*
- N.17 Download electronic copies of the WESTCAD-E (Service Control Workstation) Status and Event Logs from the TT for retention, the copies shall where possible start when the route against which the allegation is made was last used.
- N.18 Download electronic copies of the WESTCAD-E Trace Logs from the TT for retention and send copies to Siemens for analysis. The file shall, where possible, start when the route against which the allegation is made was last used.
- N.19 Review any voice recordings relating to the allegation.
- N.20 Obtain a statement if practicable from the Signaller which records the events that he / she recalls of the allegation.
- N.21 Contact the Route Control Manager and request a statement from the driver which records the events that he / she recalls of the allegation.
- N.22 Obtain a statement if practicable from any other person which records the events that he / she recalls of the allegation.

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Wrong Side Failure Test Guide: Thameslink ERTMS Irregular Movement Authority		
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London Bridge Equipment Room / Arch 886

- N.23 Note any error reports occurring at the time of the allegation on the WestLock and RBC TF(R).
- N.24 Note any failure alarms displayed on the WestLock and RBC TF(R) that were present at the time of the allegation.
- N.25 Interrogate WestLock and RBC TF(L) History File to establish if and the content of a movement authority sent by the RBC to the train. Print a copy of relevant information.
- N.26 Download an electronic copy of the WESTLOCK log pertaining to the allegation via the TF for retention, the copy shall where possible start when the route against which the allegation is made was last used.
- N.27 Download an electronic copy of the following logs for retention; RBC Event Log, Interlocking Log, Signalling Model Log, Alarms and Access Control Logs from the TF pertaining to the allegation by running a Test Log, the copies shall where possible start when the route against which the allegation is made was last used.
- N.28 Interrogate the RBC Event Log to establish the content of the movement authority sent by the RBC to the train (including any temporary speed restriction if relevant).
- N.29 Contact the Route Control Manager and request an annotated download of the on-board Juridical Recording Unit (JRU) data from the train pertaining to the allegation, the annotations shall start at the route prior to the one against which the allegation is made. For comparison, request the same for the last train to have used the route before the incident.
- N.30 Interrogate the log of the GSM-R QATS (Qualitative Analysis & Troubleshooting System) to identify any irregularities or errors in the GSM-R system.
- N.31 Interrogate the log of the GSM-R QATS (Qualitative Analysis & Troubleshooting System) to identify any irregularities or errors in the messages exchanged between the infrastructure and train.
- N.32 Download an electronic copy of the GSM-R QATS data pertaining to the allegation for retention, the copy shall where possible start when the route against which the allegation is made was last used. For comparison, download the same for the last train to have used the route before the incident.

DESTRUCTIVE TESTS

- D.1 Download an electronic copy of the WestCad-E data from the TT pertaining to the allegation, the copy shall where possible start when the route against which the allegation is made was last used.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T029		
Wrong Side Failure Test Guide: Thameslink ERTMS Irregular Movement Authority		
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OTHER CONSIDERATIONS

1. Possible error in Balise position. |
2. Possible failure of train-borne equipment. |

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T030		
Wrong Side Failure Test Guide: Cambrian ERTMS Irregular Movement Authority		
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NON-DESTRUCTIVE TESTS

Route Control Centre

- N.1 Note any other train movements in the affected area.
- N.2 Note which Signaller is controlling the affected section of line.
- N.3 Note the relevant indications.
- N.4 Note the state of any relevant train describer displays.
- N.5 Note any unusual operating methods in place (hand-signalling, possessions, single line working etc.)
- N.6 Check if the movement authority was issued and then withdrawn.
- N.7 Note the nature of any work being carried out on the suspect or associated equipment and any persons working in the area of the allegation.
- N.8 Note the time and type of train (including vehicle class and number), event or operation that first caused the reported failure to become apparent.
- N.9 Note the time and type of operation made prior to the report using the affected equipment.
- N.10 Note any error reports occurring at the time of the allegation on the TT or SICAM.
- N.11 Note any failure alarms displayed on the TT or SICAM that were present at the time of the allegation.
- N.12 Interrogate the TT History File to establish if a route request was made by the Signaller and what that route was. Print a copy of relevant information.
- N.13 Interrogate SICAM History File to establish if and the content of a movement authority sent by the RBC to the train. Print a copy of relevant information.
- N.14 Review any voice recordings relating to the allegation.
- N.15 Obtain on board data from the train pertaining to the allegation.
- N.16 Obtain a statement if practicable from the Signaller which records the events that he/she recalls of the allegation.
- N.17 Obtain a statement if practicable from the driver which records the events that he/she recalls of the allegation.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T030		
Wrong Side Failure Test Guide: Cambrian ERTMS Irregular Movement Authority		
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- N.18 Obtain a statement if practicable from any other person which records the events that he/she recalls of the allegation.

DESTRUCTIVE TESTS

- D.1 Download an electronic copy of the TT and SICAM data pertaining to the allegation, the copy shall where possible start when the route against which the allegation is made was last used.
- D.2 Recreate the situation that prevailed at the time of the allegation and record the results.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T031		
Wrong Side Failure Test Guide: Cambrian ERTMS Incorrect Information is received from a Balise by a train		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

NON-DESTRUCTIVE TESTS

Route Control Centre

- N.1 Note the nature of any work being carried out on the suspect or associated equipment and any persons working in the area of the allegation.
- N.2 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent.
- N.3 Note any error reports occurring at the time of the allegation on the SICAM.
- N.4 Note any failure alarms displayed on the SICAM that were present at the time of the allegation.
- N.5 Interrogate SICAM History File to establish what position information was received by the RBC from the train at the suspect Balise Group and the two previous Balise Groups. Print a copy of relevant information.
- N.6 Download an electronic copy of the SICAM data pertaining to the allegation, the copy shall where possible start when the route against which the allegation is made was last used.
- N.7 Obtain on board data from the train pertaining to the allegation in particular Balise positioning information.
- N.8 Obtain a statement if practicable from the Signaller which records the events that he/she recalls of the allegation.
- N.9 Obtain a statement if practicable from the driver which records the events that he / she recalls of the allegation.
- N.10 Obtain a statement if practicable from any other person which records the events that he / she recalls of the allegation.

On Site

- N.11 Check the longitudinal position of the Balise Group.
- N.12 Check the height and position between the rails of the individual Balise that make up the group.
- N.13 Check the security of the Balise and brackets, including the condition of the sleepers and other track components to which the brackets are secured.
- N.14 Check the messages programmed into the Balise Group involved in the allegation as well as the preceding two groups.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T031		
Wrong Side Failure Test Guide: Cambrian ERTMS Incorrect Information is received from a Balise by a train		
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DESTRUCTIVE TESTS

- D.1 Recreate the situation that prevailed at the time of the allegation and record the results.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T032		
Wrong Side Failure Guide: Siemens ACM 100		
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GENERAL

- | The permission of the Signaller shall be obtained before any actions are taken that affect the normal working of an axle counter section.
- | The system shall not be restored to normal operation without permission of the Signaller.
- | On all systems, the Signaller is responsible for checking an axle counter section is clear before a system restore can take place.
- | Keep switched on mobile phones away from the counting heads (3m) as they can cause false counts/readings.
- | Keep metallic objects away from the counting heads. The movement of metallic objects including tools and jewellery across the upper surface of the counting heads can cause occupation of the track sections.
- | All test measurements shall be recorded on the record card together with the reason for the test.
- ⋮ There are three different ways of resetting and restoring an axle counter. [NR/SMS/PartC/AX00](#) (Axle Counters General) details these different methods.
- ⋮ Certain forms might need to be completed before any restore procedure is enacted.

NON-DESTRUCTIVE TESTS

Signal Box

- | N.1 Note the relevant signal box indications for the relevant section(s).
 - ⋮ **NOTE:** *The ACM100 system can have multiple detection points; the failure of one ACM100 might affect more than one track section.*
- | N.2 Note the state of any relevant train describer displays.
- | N.3 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- | N.4 Note if any persons were working/ patrolling/ examining in the area and, if working, the nature of the work.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T032		
Wrong Side Failure Guide: Siemens ACM 100		
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N.5 Note the time of the failure of the equipment and, if it occurred after the passage of a train, the type of train (passenger, freight, light engine etc).

NOTE: *An object hanging from a train can strike and damage rail contacts*

N.6 If a failure occurred after a passage of a train, note if there was anything unusual about it (slow moving train, long time in the section, emergency non-signalled movement).

N.7 Note any other train movements in the affected area.

Lineside Locations or Equipment Rooms

N.8 Check that the room or enclosure containing the ACM100 system is securely locked.

N.9 Check any site record cards or logbooks for relevant information.

N.10 Check for any signs of equipment damage.

N.11 Check and record the LEDs on the ACM100 system components.

NOTE: *The relevant SMS for the ACM100 system give some details of the equipment indications ([NR/SMS/Appendix/13](#)).*

N.12 If provided, check any system logging or recording media for relevant information.

N.13 Check the diagnostic website of the ACM100 system and record any details.

N.14 Check for signs of any recent activity (new works, temporary wiring, diversion of circuits, track maintenance activity).

N.15 Check that all equipment covers are securely fitted with no sign of tampering or attempted access to internal parts.

N.16 Visually inspect all cables or connecting leads are correctly inserted and secure.

N.17 Check the position and status of the reset relays (energised, de-energised).

N.18 Check for damage or contamination on or inside relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, corroded terminals).

N.19 Check that the relays correspond to the diagrams (type and specification, pin code, voltage, contact arrangement, single/double wound coils).

Record the last service date on the WSF form and forward to your SM(S).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T032		
Wrong Side Failure Guide: Siemens ACM 100		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- N.20 Check that the equipment and settings correspond to the diagrams (specification, power, voltage rating, etc).
- N.21 Check for silver migration on the rear of relay bases.
- N.22 Check the equipment for any possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc).
- N.23 If provided, check the room/case heating/cooling systems for correct operation.
 - NOTE: Extremes of heat or cold can affect the operation of electronic equipment.
- N.24 Check the equipment for any signs of moisture or water contamination (leaking roofs, damaged or missing seals, flooding).
- N.25 Check for possible radio interference (mobile phone masts, RETB aerials).
- N.26 [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits and supplies.

Lineside Connection Box (DISBOX)

- N.27 Check the DISBOX for damage.
- N.28 Check the DISBOX cover is correctly fitted and secure.
- N.29 If in an electrified area, check that the earthing of the DISBOX is secure and effective.
- N.30 Check the interior for signs of moisture.
- N.31 Check for any possible short circuits (nuts, washers, solder, wire off-cuts, metallic dust, etc).
- N.32 Check for possible radio interference (mobile phone masts, RETB aerials).

Wheel Detectors

- N.33 Check the wheel detectors for damage.
- N.34 Check the wheel detectors are secure.
- N.35 Check for any debris or rubbish around the wheel detectors, particular check for any metal objects.
- N.36 Check for signs of any recent activity (new works, track maintenance, etc.).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T032		
Wrong Side Failure Guide: Siemens ACM 100		
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Cables & Wires

- N.37 Check the trackside cabling for signs of damage cables squashed by rails in the cess, fire damage, rodent damage).
- N.38 Check all cables and wires for safe insulation and check that all terminations are correctly insulated from each other.

Miscellaneous

- N.39 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI) for any other relevant Non-Destructive tests.
- N.40 Note any extraneous conditions or circumstances that could have an effect on the failure.

DESTRUCTIVE TESTS

Lineside Locations or Equipment Rooms

- D.1 [WIRE COUNT](#) the relevant equipment or circuits to the wiring diagram and connecting leads/cables.
- D.2 Remove the relays and check for damage or contamination on or inside the relays (cracked casing, internal moisture, insects, foreign matter, contact arcing, internal cloudiness, strong smell, silver sulphide, metal flakes, bent or broken contact springs, corroded terminals).
- D.3 Check relay plug board for correct pin code, silver migration, damage, spades pushed too far forward or broken contact insulators.

Cables

- D.4 [CABLE FUNCTION TEST](#) line circuits.
- D.5 [INSULATION TEST](#) all cables (tail, lineside, rack to rack).

Check cables are totally disconnected for this test as the high voltages involved will damage electronic components.

Lineside connection boxes and wheel detectors

- D.6 Test the operation of the system by carrying out a test of the wheel detector at the detection points for the relevant section [NR/SMS/PartB/Test/039](#) (Siemens ACM 100 – In Service Functional Test of Wheel Detector). Observe the indications on the LEDs at the relevant ACM100 during this test.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T032		
Wrong Side Failure Guide: Siemens ACM 100		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Miscellaneous

- D.7 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

- O.1 Possible remote-control system fault/failure.
- O.2 Possible design error.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T033		
Wrong Side Failure Test Guide: Balise		
Issue No. 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Siemens and Alstom Balises (including ETCS, SDO and ATO)
Excludes:	All other type of beacon or balise.

NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- N.2 Note the nature of any work being done, or persons working in the area.
- N.3 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent and whether the train approach was particularly slow.
- N.4 Note the time and type of train or operation last made, prior to the report, which used the affected equipment.
- N.5 Note any other train movements in the affected area.
- N.6 Note any significant weather conditions in the area.

NOTE: Do not use metal measuring tapes when checking the balise position.

- N.7 Check for any signs of damage or missing equipment.
- N.8 Check for security or tightness of equipment.
- N.9 Check for signs of any recent disturbances (track maintenance or renewals activity, replacement mountings, equipment re-located).
- N.10 Check the location of equipment, in conjunction with the Balise Sighting Form.
- N.11 Check that equipment is correctly installed and centrally mounted.
- N.12 Check the Identification (ID) label is identical on both the balise and the mounting bracket assembly.

Some Testing and Programming Tools generated strong electromagnet fields during their use. These can interfere with cardiac pacemakers and can have long-term detrimental effects on health.

- N.13 Test the Balise telegram data through the air gap using the Testing and Programming Tool.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T033		
Wrong Side Failure Test Guide: Balise		
Issue No. 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

N.14 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

OTHER CONSIDERATIONS

- ⋮ O.1 Possible design error in telegram data.
- ⋮ O.2 Possible design error in specifying balise position.
- ⋮ O.3 Possible failure of train-borne equipment.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T034		
Wrong Side Failure Test Guide: SDO Beacon		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Tracklink II & Tracklink III Beacons (SDO)
Excludes:	All other types of Beacon and Balise

NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- N.2 Note the nature of any work being done, or persons working in the area.
- N.3 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent and whether the train approach was particularly slow.
- N.4 Note the time and type of train or operation last made, prior to the report, which used the affected equipment.
- N.5 Note any other train movements in the affected area.
- N.6 Note any significant weather conditions in the area.

Beacon

- N.7 Check for any signs of damage or missing equipment.
- N.8 Check for security or tightness of equipment.
- N.9 Check for signs of any recent disturbances (track maintenance or renewals activity, replacement mountings, equipment re-located).
- N.10 Check location of equipment in conjunction with the signalling plan or other form of local record.
- N.11 Check that equipment is correctly installed and centrally mounted.
- N.12 Check the two Beacon labels are correct for beacon type, part number, station CRS code, platform number and approach direction.
- N.13 Test the Tag and Beacon.

Miscellaneous

- N.14 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T034		
Wrong Side Failure Test Guide: SDO Beacon		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

OTHER CONSIDERATIONS

- █ O.1 Possible design error in telegram data.
- █ O.2 Possible design error in specifying balise position.
- █ O.3 Possible failure of train-borne equipment.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T036		
Wrong Side Failure Test Guide: Colour Light Signal – Degraded by Sunlight		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

***** ESCALATION EXEMPT *****

GENERAL

- Failures resolved using this Test Guide only require Level 1 sign back.
- A separate Investigation Report is not be required unless additional tests or tests not defined in this Test Guide are required to resolve the failure.

NON-DESTRUCTIVE TESTS

Signalbox

- N.1 Note the time and type of train or operation that caused the failure to become apparent.
- N.2 Note relevant signal box indications.
- N.3 Note relevant lever or switch positions.
- N.4 Establish from Signaller that the equipment operated normally and responded in the manner expected. Note details.

Signal Equipment

- N.5 Note any significant weather conditions in the area (cloud cover, position and strength of sun).
- N.6 Note aspects displayed.
- N.7 Check background for any possible distractions. Check signal backboard is matt black and not discoloured or faded. Check other lighting factors with potential to contribute to confusion or degradation of aspect.
- N.8 Check door is initially closed. Check that the seals on the door(s) are effective and that the door(s) are secured with padlock(s).
- N.9 Check for damage. Check interior of signal head for dirt, deterioration, or moisture ingress.
- N.10 Check for correct type of signal i.e. ground mounted or elevated.
- N.11 Check for correct beam and hot strip alignment. See [NR/SMS/PartC/SG00](#) (Signals: General) - Beam alignment.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T036		
Wrong Side Failure Test Guide: Colour Light Signal – Degraded by Sunlight		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

N.12 Check condition of interior and exterior lenses (colour, type, clean, not damaged, contaminated or discoloured, etc.). Pay attention to the red aspect.

If the lenses are polycarbonate, check the lens is not beyond renewal date and not opaque with excessive scratching.

N.13 Check condition of any hoods (length, type, etc.).

Miscellaneous

N.14 Note any extraneous conditions or circumstances that could have an effect on the failure.

DESTRUCTIVE TESTS

Signal Equipment

D.1 Test voltages on all aspects and record results.

D.2 Visually check from the sighting distance of the signal that all aspects and indications are clear and visible. Carry out [NRSMS/PartB/Test/302](#) (Signal Visibility Check).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T037		
Wrong Side Failure Test Guide: Colour Light Signal – Obscured by Obstruction		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

GENERAL

- A separate Investigation Report is not required unless additional tests or tests not defined in this Test Guide are required to resolve the failure.

NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note the time and type of train or operation that caused the failure to become apparent.

Signal Equipment

- N.2 Using the Signal Sighting Record, or the process in [NR/SMS/PartB/Test/302](#) (Signal Visibility Check), identify the required reading distance (RRD). Walk towards the signal from the reading distance identified on approach to the signal, checking for obscurations to the driver's visibility of the signal.
- N.3 Record findings on [NR/SMTH/Part02/Form 21](#) (Obscuration Diagram).
- N.4 Check background for any possible distractions, including street lighting. Check signal backboard (where fitted) is matt black and not discoloured or faded.
- N.5 Signals that do not require folding down to access, check condition of lenses (colour, type, clean, not damaged, contaminated or discoloured, etc.). On multi-aperture signals pay particular attention to the red aspect.

If the lenses are polycarbonate, check they are not beyond renewal date and not opaque with excessive scratching.

Miscellaneous

- N.6 Note any extraneous conditions or circumstances that could have an effect on the failure.

DESTRUCTIVE TESTS

Signal Equipment

- D.1 Signals that require folding down to access, check condition of lenses (colour, type, clean, not damaged, contaminated or discoloured, etc.). On multi-aperture signals pay particular attention to the red aspect.
- D.2 Recheck signal visibility after the obstruction has been removed. Carry out [NR/SMS/PartB/Test/302](#) (Signal Visibility Test).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T038		
Wrong Side Failure Test Guide: Mechanical Signal – Obscured by Obstruction		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

GENERAL

A separate Investigation Report is not required unless additional tests or tests not defined in this Test Guide are required to resolve the failure.

NON-DESTRUCTIVE TESTS

Signal Box

N.1 Note the time and type of train or operation that caused the failure to become apparent.

Signal Equipment

N.2 Using the Signal Sighting Record, or the process in [NR/SMS/PartB/Test/302](#) (Signal Visibility Check), identify the required reading distance (RRD). Walk towards the signal from the reading distance identified on approach to the signal, checking for obscurations to the driver's visibility of the signal.

Record findings on [NR/SMTH/Part02/Form/21](#) (Obscuration Diagram).

N.3 Check background for any possible distractions, including street lighting.

N.4 Check any signal backboard is effective.

Miscellaneous

N.5 Note any extraneous conditions or circumstances that could have an effect on the failure.

DESTRUCTIVE TESTS

Signal Equipment

D.1 Test voltage on filament lamp or check condition of oil lamp.

D.2 Test by operation of the equipment.

D.3 Recheck signal visibility after the obstruction has been removed. Carry out [NR/SMS/PartB/Test/302](#) (Signal Visibility Test).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T039		
Wrong Side Failure Test Guide: Automatic Train Protection (ATP) (Chilterns)		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Chiltern ATP
Excludes:	Great Western Main Line ATP

GENERAL

All test measurements shall be recorded on ATP (Chilterns) Test NR/SMS record card together with the reason for the test.

NON-DESTRUCTIVE TESTS

- N.1 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- N.2 Note the nature of any work being done, or persons working in the area.
- N.3 Note the time and the type of train or operation which first caused the reported failure to become apparent.
- N.4 Note the weather conditions at time of fault or incident.
- N.5 Note the time and type of operation last made, prior to the report which used the affected equipment.

Lineside Locations or Equipment Rooms

- N.6 Check ATP equipment and signal location or room is correctly locked or padlocked.
- N.7 Check and record LEU indications.
- N.8 Check for equipment security and tightness.
- N.9 Check the insulation of cables and wires at terminations. Check that adjacent terminations are properly isolated from each other.
- N.10 Check equipment for possible short circuits (nuts, washers, solder, off-cuts of wire, metallic dust, etc.).
- N.11 Check for any unusual amounts of moisture.

Track Equipment

- N.12 Check ATP loop is not damaged and correctly positioned.
- N.13 Check for any signs of recent disturbances (wiring alterations, track maintenance or renewals activity).
- N.14 Check for equipment security and tightness.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T039		
Wrong Side Failure Test Guide: Automatic Train Protection (ATP) (Chilterns)		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

N.15 Check equipment for possible short circuits (nuts, washers, solder, off-cuts of wire, metallic dust, etc.).

N.16 Check for any unusual amounts of moisture.

Cables

N.17 Check ATP cables are not damaged (fires, squashed cables, etc).

N.18 Remove covers from trunking and check for safe insulation (chaffing, scorched, rodent damage).

Simulate reported condition, then:

Track Equipment

N.19 Test and record loop telegrams.

N.20 Test and record loop current.

Lineside Locations or Equipment Rooms

N.21 Test ATP power and signal interface voltages, at input terminals of ATP LEU.

N.22 [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) 110VAC bus bar.

N.23 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.

Miscellaneous

N.24 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Non-Destructive tests.

DESTRUCTIVE TESTS

Track Equipment

D.1 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.

D.2 Test resistance of loop.

Lineside Locations or Equipment Rooms

D.3 [WIRE COUNT](#) relevant equipment or circuits to the wiring diagram.

D.4 Simulate reported condition, test loop telegrams.

D.5 Remove TELGEN Card and check EPROM's (correct data and installation).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T039		
Wrong Side Failure Test Guide: Automatic Train Protection (ATP) (Chilterns)		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Cables

- | D.6 [INSULATION TEST](#) all ATP cables.
- | D.7 [INSULATION TEST](#) signal head tail cable(s).

Miscellaneous

- | D.8 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI/) for any other relevant Destructive tests.

OTHER CONSIDERATIONS

- | O.1 Possible right-side failure not noticed by train crew.
- | O.2 Possible wrong side failure of signal not noticed by train crew.
- | O.3 Possible that signal to signal distance is different from ATP design details.
- | O.4 Possible that PSRs/TSRs have changed without ATP modification.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T040		
Wrong Side Failure Test Guide: ATP (Chilterns) Reported WSF of Signal, No Allegation Against ATP Equipment		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Chiltern ATP
Excludes:	Great Western Main Line ATP

GENERAL

All test measurements shall be recorded on ATP (Chilterns) Test NR/SMS record card together with the reason for the test.

Follow normal WSF investigation procedures, those covered by [NR/SMTH/Part08/T007](#) (Wrong Side Failure Test Guide: Lamp – No Light (Any Type)) or [NR/SMTH/Part08/T008](#), (Wrong Side Failure Test Guide: Colour Light Signal) with the addition of the following steps:

NON-DESTRUCTIVE TESTS

- N.1 Before any disconnections are made check and record ATP LEU indications.
- N.2 If LEU indications are not correct there might be an internal fault and after all relevant conditions have been simulated, SIGANP Card shall be renewed and original sent for investigation.

DESTRUCTIVE TESTS

- D.1 Carry out an [INSULATION TEST](#) on the ATP cable from signal location to LEU. This can be carried out in the normal way after disconnecting signal interface switches in signal location and disconnecting the cable at the LEU.
- D.2 After above tests, reconnect the LEU and signal interface switches. Check that LEU indications are working correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T041		
Wrong Side Failure Test Guide: Automatic Warning System (AWS) Reduced Testing of Extra-Strength (Green) AWS Magnet following Code 5 failure		
Issue No: 01	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Extra-Strength (Green) AWS Magnet with a code 5 failure
Excludes:	Suppressor type AWS, Standard (Yellow) AWS, portable/temporary AWS and all other AWS fault codes

GENERAL

- Units fitted with Standard-Strength AWS Receivers are known to suffer with Code 5 Failures (Bell Vice Horn) when passing over Extra-Strength permanent magnets.

Prior to using this Reduced Test, the following shall be confirmed:

- a) The AWS magnet concerned is Extra-Strength type.
- b) The AWS magnet concerned is not a suppressed type.
- c) The AWS magnet concerned is not a portable type.
- d) The unit concerned is known to have a Standard-Strength Receiver fitted (see Table 1).
- e) A subsequent train has reported to have received correct AWS indication with the associated signal displaying a cautionary aspect.

If any of the above pre-checks cannot be confirmed, then authority to use this Test Plan shall be gained from the SFI Level 2.

Units known to have Standard-Strength Receivers		
On-Track-Plant (OTP)	Locomotives	Multiple Units
ALL	Class 66	Class 313
	Class 67	Class 165
	Class 73	Class 769
	Class 92	Class 319

Table 1 – Units with Standard Strength Receivers

NON-DESTRUCTIVE TESTS

- N.1 Note the AWS involved and its location.
- N.2 Note the details of the unit involved including Headcode, Unit Number, Unit Class, Unit type.

NOTE: On gaining authority from SFI Level 2 the AWS may be offered back for normal working and the remaining test plan steps N3 to N5 deferred for up to a maximum 91 days from the initial report. If authorised to defer the remaining tests, a WAIF should be raised in ellipse by the SM(S) responsible for the AWS and the record closed in FMS as 'WSF fault found as per NR/SMTH/Part08/T041'.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T041		
Wrong Side Failure Test Guide: Automatic Warning System (AWS)		
Reduced Testing of Extra-Strength (Green) AWS Magnet following Code 5 failure		
Issue No: 01	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

- N.3 Check and note any signs of recent works or disturbances at the AWS and for 50m in advance of / beyond the AWS.
- N.4 Check and record the position of the magnet(s) and associated ramps according to the relevant configuration detailed in Figure 1.

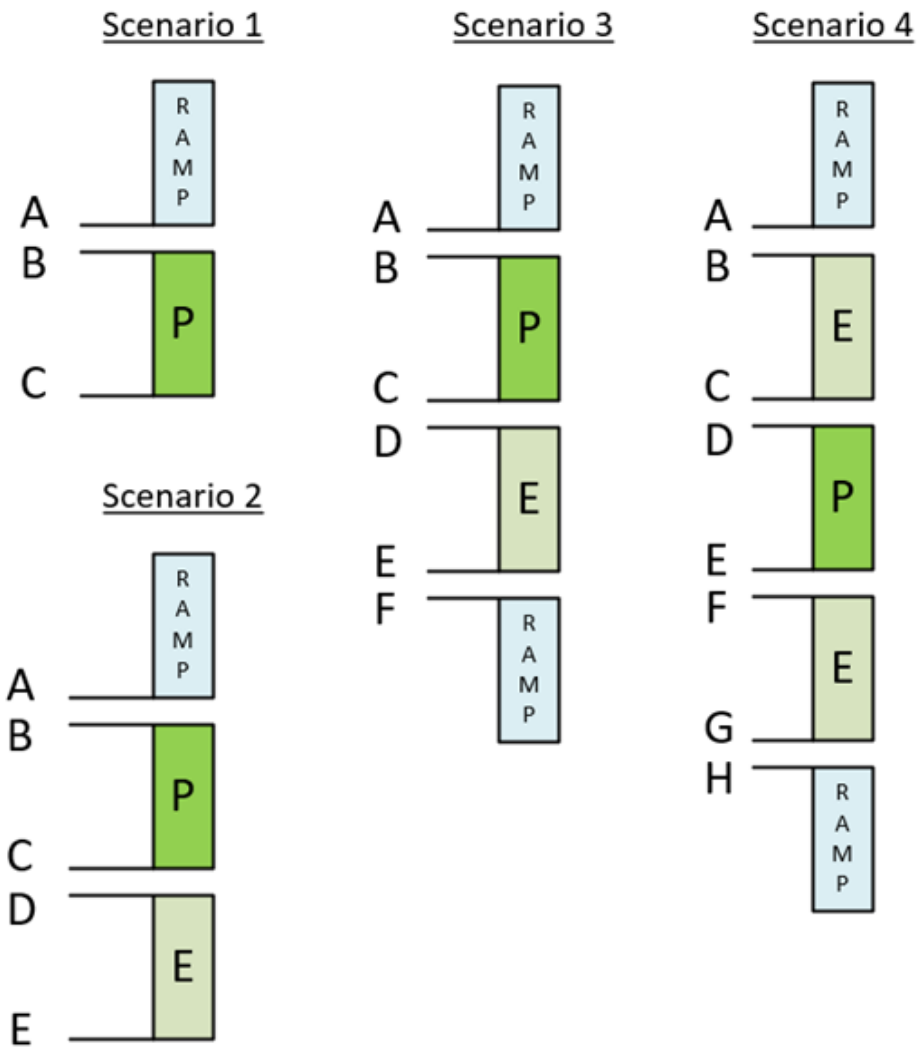


Figure 1 – AWS Configuration Scenarios

- N.5 Check that the magnet is centrally located in the 4-foot (+/-10mm from track centre line).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T041		
Wrong Side Failure Test Guide: Automatic Warning System (AWS)		
Reduced Testing of Extra-Strength (Green) AWS Magnet following Code 5 failure		
Issue No: 01	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

APPENDIX A - Reduced Test Plan form

T011-SR	FMS Report No.	Incident Date	Incident Time	Signal Box
Initial Report Detail				
Pre-Check	Confirmed	Detail / How confirmed		Initials
AWS is Extra-Strength and is not suppressed or portable type	Yes/No			
Unit concerned is known to have Standard Strength Receiver fitted	Yes/No			
Subsequent train has reported correct AWS indication with the associated signal displaying a cautionary aspect	Yes/No			
SFI Level 2 giving authority to use this Reduced Test (if a pre-check not confirmed)				
Name		Date	Time	
Reduced Test Plan Part A				
N1	Signal Identity		AWS Identity	Location
N2	Train ID (Headcode)	Unit Number	Class (if not OTP)	Unit Type (Loco / EMU / OTP)
SFI Level 2 giving authority to defer further testing and resume normal working				
Name		Date	Time	
SFI Level 1				
Name	Signature	Date	Time	

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T041		
Wrong Side Failure Test Guide: Automatic Warning System (AWS)		
Reduced Testing of Extra-Strength (Green) AWS Magnet following Code 5 failure		
Issue No: 01	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

If Part B deferred and AWS offered back for normal working			
SM(S)Responsible for AWS	Ellipse W/O number	W/O Created Date	Required Finish Date (max 91 days from initial report)

Reduced Test Plan Part B			
N3	Check and note any signs of recent works or disturbances at the AWS and for 50m in advance of / beyond the AWS.		
N4 (measurements in mm + is above rail level - is below rail level)	Arrangement Scenario No.		1 / 2 / 3 / 4
	A	B	C / D
	E	F	G / H
N5	Check AWS is centrally located (+/-10mm from Track Centre)		
	Yes / No		
SFI Level 1			
Name	Signature	Date	Time

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T042		
Wrong Side Failure Test Guide: Temporary Automatic Warning System (AWS) Associated with Speed Restrictions		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Temporary Magnets (e.g. Yardene)
Excludes:	Standard Automatic Warning System (see SMTH/Part08/T011)

GENERAL

- All test measurements shall be recorded.

NON-DESTRUCTIVE TESTS

Signal Box

- N.1 Note any unusual operating methods in place (hand-signalling, possessions, single line working, etc).
- N.2 Note the nature of any work being done, or persons working in the area.
- N.3 Note the time and type of train (including vehicle class or number), event or operation that first caused the reported failure to become apparent and whether the train approach was particularly slow.

Class 319 electric multiple units automatically sense the traction system, so will display to the driver if the traction is DC. The AWS setting defaults to standard strength and will remain so until the driver selects the extra-strength setting (for DC traction areas). If the driver does not correctly set the AWS system to the right sensitivity, the AWS might indicate a Code 5 WSF.

On routes operating class 377/2, 377/5, and 376/6 electric multiple units, confirm that the AWS receiver on the rail vehicle is operating in the correct mode of operation (AC or DC).

This is particularly applicable to failures on services that are operating on a route that has traversed an AC & DC electrified boundary.

- N.4 Note the time and type of operation last made, prior to the report, which used the affected equipment.
- N.5 Note any other train movements in the affected area.
- N.6 If practicable, arrange to have the OTMR (On-Train Monitor and Recorder) downloaded and analysed from the train involved in the failure.

On-Track Equipment

- N.7 Check the magnet is situated in the correct location (refer to ESR/TSR/PSR design).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T042		
Wrong Side Failure Test Guide: Temporary Automatic Warning System (AWS) Associated with Speed Restrictions		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

- N.8 Note the type of magnet fitted (e.g. Single-Rail Yardene Yellow or Green, Two-Rail Vortok, Two-Rail BR Yellow or Green, etc).
- N.9 Check if a calibration label is fitted and note the date.
- N.10 Check position of magnet (height in relation to the rail head, centre of track).
 - **NOTE:** Yardene Single-Rail types are not required to be height tested.
- N.11 Check equipment is correct type (Standard - yellow or Extra-Strength - green).
- N.12 Check for other potential sources of magnetic field nearby (e.g. impedance bonds, DC traction cables).
- N.13 Take several digital photographs of the magnet with at least one showing the complete installation.
- N.14 Check for any other magnets within 250m (274 yards) in either direction on the same line as the AWS under investigation. If one is found, measure and note the distance between the two magnets.
- N.15 Check for damage.
- N.16 Check for rail defects in the area of the magnet.

Miscellaneous

- N.17 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI) for any other relevant non-destructive tests.

DESTRUCTIVE TESTS

On-Track Equipment

- D.1 Check that the magnet is secured properly to the rail(s) so that it does not move when touched.
- D.2 Test for correct strength and polarity (using S&P meter) (**EXCLUDING YARDENE and VORTOK types**).

Miscellaneous

- D.3 Check Special Inspection Notices (NR/SIN), Technical Instructions (NR/TI) or Letters of Instruction (NR/BS/LI) for any other relevant destructive tests.

OTHER CONSIDERATIONS

- O.1 Possible failure of train borne equipment.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part08/T044		
Wrong Side Failure Test Guide: NCL ERTMS Irregular Movement Authority		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Siemens Class 717 rolling stock within the NCL ETCS Area
Excludes:	All other rolling stock and ETCS Areas and implementations

GENERAL

NOTE: Tasks requiring the use of the WESTCAD Technician's Terminal (TT), WESTLOCK Technician's Facility (TF), Radio Block Centre Technician's Facility (RBC TF) and GSM-R Qualitative Analysis & Troubleshooting System (QATS) can be undertaken from locally or remotely (from another site) as listed in Table 1.

TF System Available	YROC	Site
		KX Signal Box
WESTCAD Technician's Terminal (TT)	✓	
WESTLOCK Technician's Facility (TF-L)	✓	
GSM-R Qualitative Analysis & Troubleshooting System (QATS)	✓	✓
Radio Block Centre Technician's Facility (RBC TF-L)	✓	
Technician's Facility (TF-R+)		✓
Technician's Facility (TF-R) KX SB	✓	

Table 1

NON-DESTRUCTIVE TESTS

YROC

- N.1 Note any other train movements in the affected area.
- N.2 Note which Signaller is controlling the affected section of line.
- N.3 Note the relevant indications.
- N.4 Note the state of any relevant train describer displays.
- N.5 Note the time and type of train (including vehicle class and number), event or operation that first caused the reported failure to become apparent.
- N.6 Note the operating level and mode of the train (Level 2 / Level NTC, Full Supervision (FS) mode etc.) as shown on the WESTCAD-E(SS) (Service Control Workstation) General Information Display's Train List.
- N.7 Note whether the train is at a signal or ETCS block marker and the relevant designation number.
- N.8 Check and note if the movement authority was issued and then withdrawn.
- N.9 Check and note if there are ESR/TSR's in place

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- N.10 Note any unusual operating methods in place (hand-signalling, possessions, Single line working etc.)
- N.11 Note the nature of any work being carried out on the suspect or associated equipment and any persons working in the area of the allegation.
- N.12 Note the time and type of operation made prior to the report using the affected equipment.
- N.13 Note any error reports occurring at the time of the allegation on the Westcad-E(SS) TT.
- N.14 Note any failure alarms displayed on the Westcad-E(SS) TT that were present at the time of the allegation.
- N.15 Using the WESTCAD Technician's Terminal, interrogate the WESTCAD-E(SS) (Service Control Workstation) Event Log to establish if a route request was made by the Signaller or ARS (or equivalent of ARS where provided) and what that route was.
 - NOTE:** *It is also possible to interrogate the WESTLOCK TF log to confirm if a route request was made by the Signaller or ARS (or equivalent of ARS where provided) and what that route was.*
- N.16 If a temporary speed restriction was active at the time and is suspected to be incorrect, download the SCS Event Log for retention and review it to determine what was entered by the user.
 - NOTE:** *The RBC Event Log and QATS shows the temporary speed restriction in the movement authority issued to the train.*
- N.17 Download electronic copies of the WESTCAD-E(SS) (Service Control Workstation) Status and Event Logs from the TT for retention, the copies shall where possible start when the route against which the allegation is made was last used.
- N.18 Download electronic copies of the WESTCAD-E(SS) Trace Logs from the TT for retention and send copies to Siemens for analysis. The file shall, where possible, start when the route against which the allegation is made was last used.
- N.19 Review any voice recordings relating to the allegation.
- N.20 Obtain a statement if practicable from the Signaller which records the events that they recall of the allegation.
- N.21 Contact the Route Control Manager and request a statement from the driver which records the events that they recall of the allegation.

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- N.22 Obtain a statement if practicable from any other person which records the events that they recall of the allegation.

KX Signal Box

NOTE: YROC Also has TF equipment available for carrying out steps below.

- N.23 Note any error reports occurring at the time of the allegation on the TF(R).
- N.24 Note any failure alarms displayed on the TF(R) that were present at the time of the allegation.
- N.25 Interrogate RBC TF(R) History File to establish if and the content of a movement authority sent by the RBC to the train. Print a copy of relevant information.
- N.26 Download an electronic copy of the WESTLOCK log pertaining to the allegation via the TF for retention, the copy shall where possible start when the route against which the allegation is made was last used.
- N.27 Download an electronic copy of the following logs for retention; RBC Event Log, Interlocking Log, Signalling Model Log, Alarms and Access Control Logs from the TF pertaining to the allegation by running a Test Log, the copies shall where possible start when the route against which the allegation is made was last used.
- N.28 Interrogate the RBC Event Log to establish the content of the movement authority sent by the RBC to the train (including any temporary speed restriction if relevant).
- N.29 Contact the Route Control Manager and request an annotated download of the on-board Juridical Recording Unit (JRU) data from the train pertaining to the allegation, the annotations shall start at the route prior to the one against which the allegation is made. For comparison, request the same for the last train to have used the route before the incident.
- N.30 Interrogate the log of the GSM-R QATS (Qualitative Analysis & Troubleshooting System) to identify any irregularities or errors in the GSM-R system.
- N.31 Interrogate the log of the GSM-R QATS (Qualitative Analysis & Troubleshooting System) to identify any irregularities or errors in the messages exchanged between the infrastructure and train.
- N.32 Download an electronic copy of the GSM-R QATS data pertaining to the allegation for retention, the copy shall where possible start when the route against which the allegation is made was last used. For comparison, download the same for the last train to have used the route before the incident.

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DESTRUCTIVE TESTS

- D.1 Download an electronic copy of the Westcad-E SS data from the TT pertaining to the allegation, the copy shall where possible start when the route against which the allegation is made was last used.

OTHER CONSIDERATIONS

- ⋮ O.1 Possible error in Balise position.
- ⋮ O.2 Possible failure of train-borne equipment.

END