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NR/SMTH/Part/03

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Test B19	Defined Test: FREDDY Test
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Test B25	Defined Test: Mechanical Locking Function Test

END

1. Introduction

1.1 Maintenance Test Plans use the checks and tests which are defined in this Handbook.

2. Defined Checks

2.1 The following topics are covered:

a) **Correct Type -** Checking replacement equipment is of the correct type.

b) **Damage -** Checking replacement equipment is not damaged.

c) **Safe Insulation-** Checking that wiring insulation is safe.

d) **Correct Installation -** Checking replacement equipment is correctly installed.

e) **Correct Isolation -** Checking equipment is electrically isolated during work.

f) **Correct Labelling -** Checking for correct labelling.

g) **Correlation Check -** Correlation checking to verify that the equipment/wiring agrees with the site drawings.

3. Defined Tests

3.1 The following topics are covered:

a) **Wire Count -** To visually check that the correct number of wires or conductors are connected to each terminating point as shown on the wiring diagrams and any analysis.

b) **Continuity Test -** To check that the integrity of continuity and correspondence of individual wires or cable cores.

c) **Insulation Test -** To check that a cable, wire, spare core or other equipment meets the required insulation criteria.

d) **Cable Function Test -** To check that each circuit in a cable functions correctly after work on that cable.

e) **Earth Tests (DC and AC) -** To check that equipment and power supplies (non-earthed) are earth free.

f) **Aspect Test -** To check that only the correct signal aspect is displayed.

g) **Point Detection and Correspondence Test –**

I. To check that all the detection contacts are effective.

II. To check that the required correspondence is achieved between the point end, their controls and indications.

h) **Block Tests (various) -** To check that correct operation of specified block equipment.

i) **Mechanical Locking Function Test -** To check that that each mechanical lever is locked in its correct position.

j) **FREDDY Test –** To check the FREDDY functions correctly after work on the equipment.

k) **SSI Trackside Functional Module Test –** This test is to check that the TFM outputs operate correctly after a reset following the loss of the output interface.

l) **Mechanical Locking Function Test -** This test checks the operating lever conform the mechanical locking table**.**

END

1. Purpose

1.1 Confirms new or replacement equipment is inspected to check that the type is correct.

NOTE 1: *The content of checks is not exhaustive and other equipment specific installation checks might be required as specified in the Test Plans.*

2. Checks

2.1 Check the replacement item of equipment which has been selected for installation is a “like for like” replacement for the item.

2.2 Check that any configurable wiring or straps internal to the replacement item are correct.

2.3 Check the voltage, frequency, current, power ratings are correct.

2.4 Check the British Rail, Railway Group Standard, Network Rail or other specification number should be the same as the original item or directly compatible with it.

2.5 Check modification states for compatibility.

2.6 Check the size of the replacement item will fit in the available space. If any rewiring or repositioning of the equipment is necessary, the work shall be treated as a temporary diversion of circuits.

3. Relays

3.1 The contact arrangement, pin code and coil resistance of the replacement shall be checked against the item being replaced.

3.2 Check the relay prior to use for damage which might render the relay unusable. Any relay that has been dropped shall be returned for full servicing, it shall under no circumstances be placed into service

3.3 Check replacement relay has been functionally tested if the service date is in excess of three years.

NOTE 1: *Relays can be stored for up to 3 years before action is required prior to inserting them into operational use. Where relays have been stored for over 3 years and up to 10 years, a functional test shall be performed. Relays stored for 10 years or more require a full test to specification or to be sent for servicing.*

NOTE 2: *Plug-in relays can be checked using a relay test set before being made available for use. The test set should prove that contacts open and close correctly and prove polarity characteristics at working voltage. It should be noted that relay*

coil resistances can vary between different manufacturers' designs for the same type of relay, particularly for BR930 series relays.

3.4 Check "shelf type relays with detachable tops (Remax) Verification of correct type is extremely important when replacing.

3.5 The labelling of the replacement item shall be checked including any dates. Certain terminals or contacts might be labelled differently to the original item.

3.6 Check labelling is clear, not misleading and not conflicting with the diagram, it should be considered operationally equivalent.

3.7 If there is any risk of confusion or the diagram conflicts with the equipment, then the work shall be treated in the same way as a temporary diversion of circuits.

END

1. Purpose

1.1 When a replacement item of equipment is installed it is to be examined for physical damage before installation.

2. Checks

2.1 Check for obvious mechanical damage, dents, scrapes, cracks or misalignments.

2.2 Check moving mechanical parts do not bind and move freely.

2.3 Check for signs of excessive contamination by rust, grease, verdigris, or moisture, infestation by insects or rodents, or any signs of metallic contamination.

2.4 Check for any damage to external protective coatings.

2.5 Check for signs of water ingress or damage.

2.6 Check for any signs of metallic contamination.

3. Relays

3.1 Relays shall be examined, and any found with the following conditions shall not be put into service but either returned for servicing or scrapped:

a) Flaking plating on relay internal framework and components.

b) Prototype relays or relays of suspect origin.

c) Ill-fitting or warped/yellowing, damaged/cracked or loose covers.

d) Damaged or broken adjustment cards.

e) Presence of foreign bodies inside relay.

f) Presence of Silver Sulphide contamination.

g) Defective or missing seals.

h) Severe contamination, water, heat damage, physical damage (other than cosmetic).

i) Misalignment or mechanical damage which might have occurred in transit.

j) For BR 930 style relays manufactured by GEC, AEI-GS, AEI-GRS, GRS, or SGE, check that lifting card retainers are fitted.

END

1. Introduction

1.1 This check is to confirm the condition of wiring associated with new or replaced equipment.

2. Checks

2.1 Check wiring to be disconnected from an item of equipment or link, for damage and the condition of the insulation, particularly around crimps.

2.2 Check new wiring for damage and the condition of the insulation, particularly the area around crimps.

2.3 Check adjacent wiring, likely to be disturbed by the work, for damage and the condition of the insulation, particularly the area around the crimps.

If the insulation is found to be defective your SM(S) shall be advised.

END

1. Purpose

1.1 When a replacement item of equipment is installed it shall be examined to check that it is correctly positioned and orientated.

2. Checks

2.1 Check the equipment is fixed securely as designed using any screws, bolts, pins, clips etc provided. The base, mounting or route shall also be secure.

2.2 Check the equipment meets the requirements of the standard structure gauge as per NR/L3/SIG/10064 – General Instructions for Staff Working on S&T Equipment - C001 (Clearances for S&T Equipment).

2.3 Check that the correct crimp and crimp tool have been used.

2.4 Check the wire end and insulation are secure in the crimp and with no conductor strands visible.

2.5 Check any terminal protection such as terminal shrouds, are correctly fitted.

2.6 Check that any equipment connections are properly terminated, and that no stray electrical connection or mechanical snagging is possible.

2.7 Check wires and cables are secured to minimise disturbance and prevent damage or trapping during routine access to the equipment room, apparatus case or route.

END

1. Purpose

1.1 To confirm that equipment is isolated correctly and safely.

2. Methods of Isolation

2.1 When an existing item of equipment is required to be electrically isolated from working circuitry, there are three acceptable methods. Where the item to be replaced is a cable or wire, both ends shall be isolated. If there is any doubt, more than one method of isolation shall be carried out. The three methods of isolation are:

a) Disconnection at a plugboard.

b) Removal of a cable core/wire.

c) Slipping links/removing fuses/MCB's.

3. Disconnection at a Plugboard

3.1 All necessary checks and tests are contained within the Test Plan.

4. Removal and Refitting of a Cable Core / Wire

4.1 Where removing and refitting a cable core/wire is part of the process of replacing an item of equipment, all necessary checks and tests are contained within the Test Plan.

4.2 Where the removal and refitting of a cable core/wire for isolation purposes is carried out at a point in the circuit remote from the item of equipment to be replaced, Maintenance Test Plan NR/SMTH/Part04/CA01 (Remove and Refit an Existing Cable Core or Wire) shall be used and recorded on a log sheet.

4.3 In either case the Maintenance Tester shall check that any disconnected wires are temporarily insulated, see NR/GI/E052 (Insulation of Unterminated Wire). The method of temporary insulation used shall be robust and not be compromised by the work to change the item of equipment.

For example:

a) Pulling wires through small cable entries.

b) The danger of inadvertent operation of equipment during replacement/testing.

c) The risk of sparking causing explosion.

5. Slipping Links / Removing Fuses / MCB's

5.1 Procedures for links slipped during the work or testing are described in NR/GI/B002. (Disconnections). Fuses / MCB's removed for isolation purposes shall be dealt with in the same way as links slipped during the work.

END

1. Purpose

1.1 To confirm that equipment is correctly labelled.

1.2 The labelling can relate to any of the following:

- The labelling of equipment to determine its function, e.g., relay label on a rack: “34 HR”.
- The labelling of wires and cables terminated, or for termination on, fitted or replacement equipment or links.
- The provision of additional labels.
- The stamping of locking components for fitment or replacement into the correct position in a mechanical locking frame.

2. All Labelling

2.1 Replace or make arrangements for, the replacement of any missing labels. Provide temporary if possible.

2.2 Check the labelling arrangements and style are consistent between existing and new labels, as far as practicable.

2.3 Check the equipment naming nomenclature and convention is consistent between existing, new and replacement equipment.

2.4 Check equipment labelling is such that each item of equipment can be readily identified.

2.5 Check all labels provide clear and unambiguous information.

2.6 Check all labels are clearly visible and secure.

2.7 Check label fixings are such that, as far as practicable, the label shall remain in situ if the equipment is removed, i.e., it is not held in place with the equipment fixing bolt, screw, etc.

3. Equipment Labelling

3.1 Certain terminals or contacts might be labelled differently to the original item.

3.2 Where no label exists, arrangements shall be made to fit one at the earliest opportunity.

4. Cable and Wire Labelling

4.1 Check wires and cable cores are correctly marked at each termination point in accordance with the diagrams.

4.2 Check cable core numbers are clearly visible.

4.3 Temporary labels shall not damage either wires or equipment. They shall be removed on completion of the work or on rectification of a temporary diversion to avoid confusion. The essential feature is that everyone likely to be involved in the work or testing shall understand the labelling system adopted.

4.4 A process for the temporary labelling of diverted cable cores is given in NR/SMTH/Part01/Module/12 (The Diversion of a Circuit/Relay Contact or Emergency Equipment Relocation).

END

1. Purpose

1.1 Correlation is the comparison of an existing signalling system with the current design records to check that the two are in agreement.

1.2 There are two types of correlation. Where major and complex projects are to be undertaken, which will eventually be Works Tested, a comprehensive correlation will be required. SMTH testers might undertake this correlation but will need to work to a defined correlation copy of the wiring diagrams. This type of correlation will be specifically called up in the Method Statement for the work. For work which will be Maintenance Tested, the process will be abbreviated.

1.3 The process of correlation goes beyond that of WIRE COUNT because it requires:

a) A set of drawings stamped 'CORRELATION COPY'.

b) Physical tracing or electrical proving of circuitry/cables to confirm that they run to where the diagrams state.

c) Verification of equipment profiles, types and labelling.

d) Tick marks to record the scope of each check.

1.4 The equipment shall be checked to the diagrams to avoid any chance of differences to the diagram being missed.

1.5 Correlation requires two members of staff, one of whom shall check the equipment and the second shall mark the diagrams.

1.6 Avoid disturbing fragile or degraded wiring.

BEFORE STARTING WORK

2. Full Correlation

2.1 Check that wiring diagrams are stamped ‘Correlation Copy’, and the correct circuitry is identified for correlation.

2.2 Check that the Correlation Copy and Maintenance Copy are the same issue.

2.3 Carry out an EARTH TEST (DC) or EARTH TEST (AC) as required.

3. SMTH Correlation

3.1 Check that the correct circuit is identified for correlation.

3.2 Check that a diagram is available to correlate the circuit against.

NOTE: *A simple correlation can be made against the maintenance copy of the drawings. If the work is more complicated, a photocopy of the relevant drawing can be used. The photocopy should be kept with the NR/SMTH test record on completion of testing.*

3.3 Check the photocopy and the maintenance copy are the same issue number.

3.4 When working in location case or equipment rooms carry out an EARTH TEST (DC) or EARTH TEST (AC) is required. For other equipment it is optional but recommended.

4. Correlation Checks

4.1 Carry out the procedure listed below, in relation to the equipment that requires correlation, marking the diagrams in accordance with NR/L2/SIG/30014/C310.

Further details are given in NR/L2/SIG/11201/Mod A2-20.

5. Equipment Rooms, Signal Boxes and Location Cases

5.1 Check of relay and equipment racks (where applicable) to include:

a) Profile check front and rear (including spaces).

b) Equipment check (including ratings, mod states and, where applicable, adjustment, e.g. for timers and capacitors).

c) Check for correct labelling.

5.2 WIRE COUNT the installation to wiring diagrams.

5.3 WIRE COUNT the installation to contact analysis (where available).

6. Point Machines, Signal Heads & Trackside Equipment

6.1 Equipment check to include:

a) Type of equipment.

b) Position of equipment/type of mounting.

c) Check for correct labelling.

6.2 Prove tail cables. Tail cables shall be physically traced. If this is not possible, they shall be electrically proved.

6.3 WIRE COUNT the installation to wiring diagrams.

7. Lineside Cables

7.1 Check at both ends of the cable, to include:

a) Correct cable identification.

b) Cores correctly terminated on links / binding posts.

7.2 WIRE COUNT Installation to wiring diagrams.

8. Track Circuit Bonding

8.1 Check the whole track circuit, to include:

a) Position and type of TC bonds.

b) Disconnection boxes (where applicable).

c) Check for correct labelling (where applicable).

8.2 Prove tail cables. Tail cables shall be physically traced. If this is not possible, they shall be electrically proved.

8.3 Carry out a WIRE COUNT to the bonding diagrams.

8.4 Check position of insulated rail joints to the bonding diagrams.

8.5 Check that IRJ clearances conform to any shown on the Bonding Plan and to NR/SMS/PartZ/Z03 (Train Detection – Reference Values).

9. Lever Locks, Circuit Controllers and Associated Equipment

9.1 Equipment checks to include:

a) Equipment type.

b) Lock type and position.

c) Lever band configuration.

d) Check for correct labelling.

9.2 WIRE COUNT the installation to wiring diagrams.

9.3 WIRE COUNT the installation to contact analysis (where available).

10. Mechanical Locking

This check of component position and connections to the Mechanical Locking Chart is required before and after disarrangement of interlocking for the purpose of replacement or cleaning, when components designed to hold the locking in place are to be removed. The application of this check is, itself, likely to cause a disarrangement of interlocking.

10.1 Check every component, type, side of cut and shape are in agreement with the Locking Chart, following each connection to other components. The check shall always be performed by inspecting the equipment and checking it to the diagrams to confirm no equipment or connection is missed.

It is necessary to record the correlation of each component and connection. The diagram shall be marked to show agreement BEFORE installation work and in a different style to indicate agreement AFTER installation work.

It is not be essential to have an unmarked diagram before starting a correlation check but there shall be room for additional marks which shall be made in a different colour to previous marks.

NOTE: *The Mechanical Locking Chart can also be known as a Dog Chart, Locking Diagram, or Tappet Diagram.*

DISCREPANCIES

11. Full Correlation

11.1 If any discrepancies are found between the wiring diagrams and equipment, the wires shall be traced through and the circuit drawn out in the prescribed manner.

11.2 Arrangements shall be made for an independent person to review any discrepancies for any safety implications (e.g., any conceptual design changes).

11.3 Any amendments to diagrams that are required shall be recorded on correlation log sheets (see NR/L2/SIG/11201/Mod A2-20.) and notified to the SM(S) by the reviewer.

12. SMTH Correlation

12.1 If any discrepancies are found between the wiring diagrams and equipment, the wires shall be traced through. Record any discrepancies. Do not proceed with the post correlation work without authority from the SM(S). Full details of the discrepancies shall be sent to the SM(S).

ON COMPLETION

13. Full Correlation

13.1 EARTH TEST (DC) or EARTH TEST (AC) as required.

13.2 Check all tick marks have been completed and all discrepancies have been marked up.

13.3 Sign and date each correlation diagram and return them to the SM(S).

14. SMTH Correlation

14.1 EARTH TEST (DC) or EARTH TEST (AC) .

END

Includes:	Single wires, Terminated Multicore cables and Plug-in type cables (including Fibre Optic cables)
Excludes:	Any other cable connection

1. Purpose

This is a visual examination to check that the correct number of wires, or conductors are connected to each terminating point as shown on the wiring diagrams and any analysis.

2. Methodology

The wire count shall be carried out with all wires terminated. This include any vertical links and bus bars.

If the conductors are cable cores, the cable core numbers shall also be checked for agreement with the diagram.

It is not necessary to wire count moulded cables only the wires on equipment terminals.

NOTE: *Particular attention should be paid to the labelling and reconnection of moulded cables.*

3. Test

a) All wire counts shall be recorded using a wire count grid sheet.

b) Check every termination point on the affected equipment has the correct number of wires, conductors or cables connected to it as shown on the wiring diagrams and any analysis.

A wire count shall always be carried out by inspecting the equipment and checking it to the diagram. Check that no wires or cables on the equipment are missing.

c) Whilst making a wire count check that spades/terminals are not loosened, wires are not broken and that there are no loose nuts, washers, off-cuts of wire or other superfluous metal objects in the vicinity of working circuits.

d) If, during the 'Before' section of a Maintenance Test Plan, the wire count reveals an error, then STOP and advise your SM(S).

e) If, during the 'After' section of a Maintenance Test Plan, the wire count reveals an error, then the work shall be corrected and independently retested.

f) The ticking of the maintenance wiring diagrams for auditing purposes is not necessary. If a job is pre planned a copy of the diagrams can be provide for ticking purposes by the SM(S).

(The wire count grid sheet is suitable for this purpose. An example of a completed grid sheet is shown in Figure1.

A suitable blank wire count grid sheet is provided in NR/SMTH/Part/02 for copying as required).

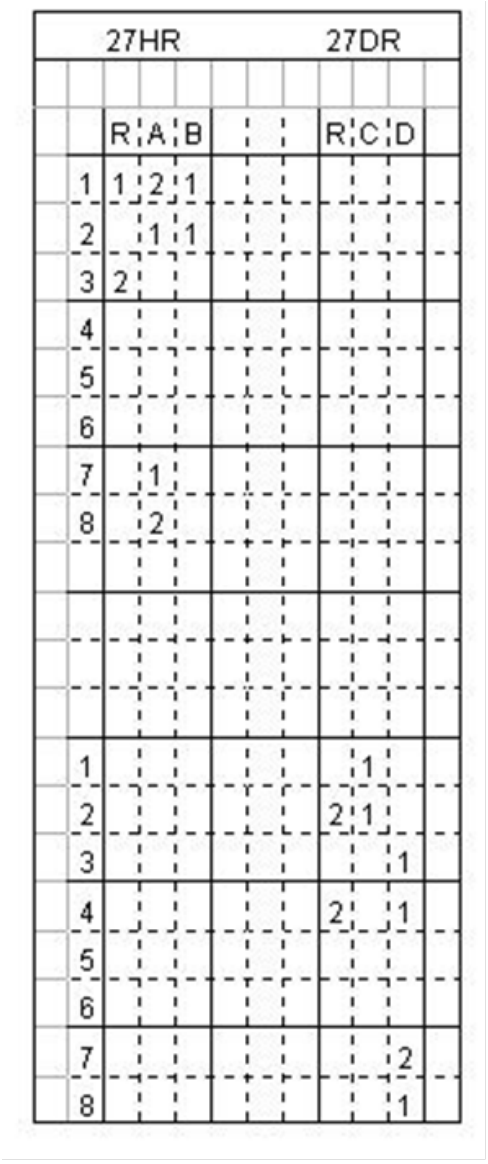


Figure 1 - Example of a Filled in Wire Count Grid Sheet

END

1. Purpose

This test is to check the continuity and correspondence of each individual wire/cable core. Where practicable the test shall be carried out with all wires terminated and all relay connectors locked in their bases, but with all relays, fuses and links removed.

2. Test

a. Test for correct polarity/correspondence of a two core cable using a DC source (e.g. battery) connected to one end of the cable and a voltmeter applied to the other. **(TWO CORE CABLES ONLY)**

b. Test for continuity by connecting a bell/buzzer test set or a multimeter set to ohms/continuity position in turn to both ends of the wire/cable core being tested. Spare cable cores may be used where the ends of the wire/cable core being tested are remote from each other.

c. Repeat for the next wire/cable core.

End

1. Purpose

To check that a cable, wire, spare core or other equipment meets the required insulation criteria. Cables carrying signalling circuits are subject to insulation tests. In certain cases, such as telecoms cables, special control measures might apply.

2. Wiring / Cable Insulation Test

Carry out CONTINUITY TEST first, to check that the whole cable is continuous.

The acceptable safe values of insulation resistance are shown in NR/SMS/Part/Z05 (Cable - Reference Values). This document specifies what to do when the insulation resistance measured has degraded and requires authorisation for circuits to remain in service.

Cables and wires shall be tested at 250V or 1000V with an approved insulation tester depending on the insulation grade see NR/SMS/PartB/Test/054 (Cable Insulation Test)

Carry out the following steps:

a) Test earth by insulation testing between the earth terminal to be used and a separate test earth.

b) CONTINUITY TEST the testing straps to be used.

c) Isolate all conductors of the cable from all circuits.

d) Test insulation between each core and all other cores in the cable connected together using the testing straps.

e) Test insulation between all cores connected together and earth using the testing straps.

3. Equipment Insulation Test

Refer to NR/SMS/PartZ/Z05 Clause 3.1 for details.

END

1. Purpose

This test is to check that each circuit functions correctly after jointing, adding a length of cable or the renewal of a cable or line wire. It also checks for voltages on the circuit capable of falsely energising the circuit function. A particular risk is that the cable being replaced has had one or more crosses between cores at joints (the replacement cable would be substituted omitting the crosses), or the internal wires attached to either end of the cable could have been replaced onto the wrong terminations. Either of these conditions could lead to incorrect functions being operated.

AC equipment with separate local and control coils shall be fed from the same supply. Where this is not the case **STOP** and inform your Section Manager (Signals). **(AC RELAY AREAS ONLY)**

'**FIRST** function' is the first item of equipment after the affected length of cable to be directly operated by the circuit under test, e.g. a relay, motor, indicator, etc.

'**FINAL** function' is the indication at the signalling panel or the equipment on site fed by the circuit(s) under test.

Each circuit in the affected cable shall be tested in the following way (refer to Figure 1)

2. Test

a. Select and Test **EACH** circuit in the affected cable by following the steps below and referring to Figure 1.

b. Insert the links, or connect the internal wires, at each end of the affected length for the circuit to be tested.

c. Arrange for the circuit to be energised.

d. Check correct operation of all AC phase sensitive equipment where local or control coils are fed from a supply via the cable under test.
(AC RELAY AREAS ONLY)

e. Test the circuit at the FIRST function for correct polarity.
(DC CIRCUITS ONLY)

f. Test the circuit at the FIRST function for correct voltage level.

g. Test that no stray voltage is present at the **FIRST** function whilst disconnecting the feed to each leg of the circuit at the first fuse, link or terminal unique to the operation of the **FIRST** function, first separately then at the same time. (A Suitable electronic meter with a 150k ohm shunt attached shall be used.) Reconnect the feed to each leg.
(CABLES CONTAINING ANY SAFETY CRITICAL CIRCUIT)

OR

Test that no stray voltage is present at the **FIRST** function when the circuit is de-energised. (A suitable electronic with a 150k ohm shunt attached shall be used)
(CABLES CONTAINING ONLY NON SAFETY CRITICAL OR REMOTE CONTROL CIRCUITS)

h. Observe that the **FIRST** function corresponds correctly to the operation of one of its controlling contacts/devices (refer to Figure 1).

i. Where the **FINAL** function is different to the **FIRST** function, Observe that the **FINAL** function corresponds correctly to the operation of one of the controlling contacts/devices (refer to Figure 1).
(CASCADED RELAY CIRCUITS ONLY)

j. Repeat all above tests for each remaining circuit.

k. Test that no voltage can be measured between the supplies fed from different ends of the cable.
(MICROCORE CABLES ONLY WITH SEPARATE COMMON RETURN CONDUCTORS)

l. Check that all unused links are removed.

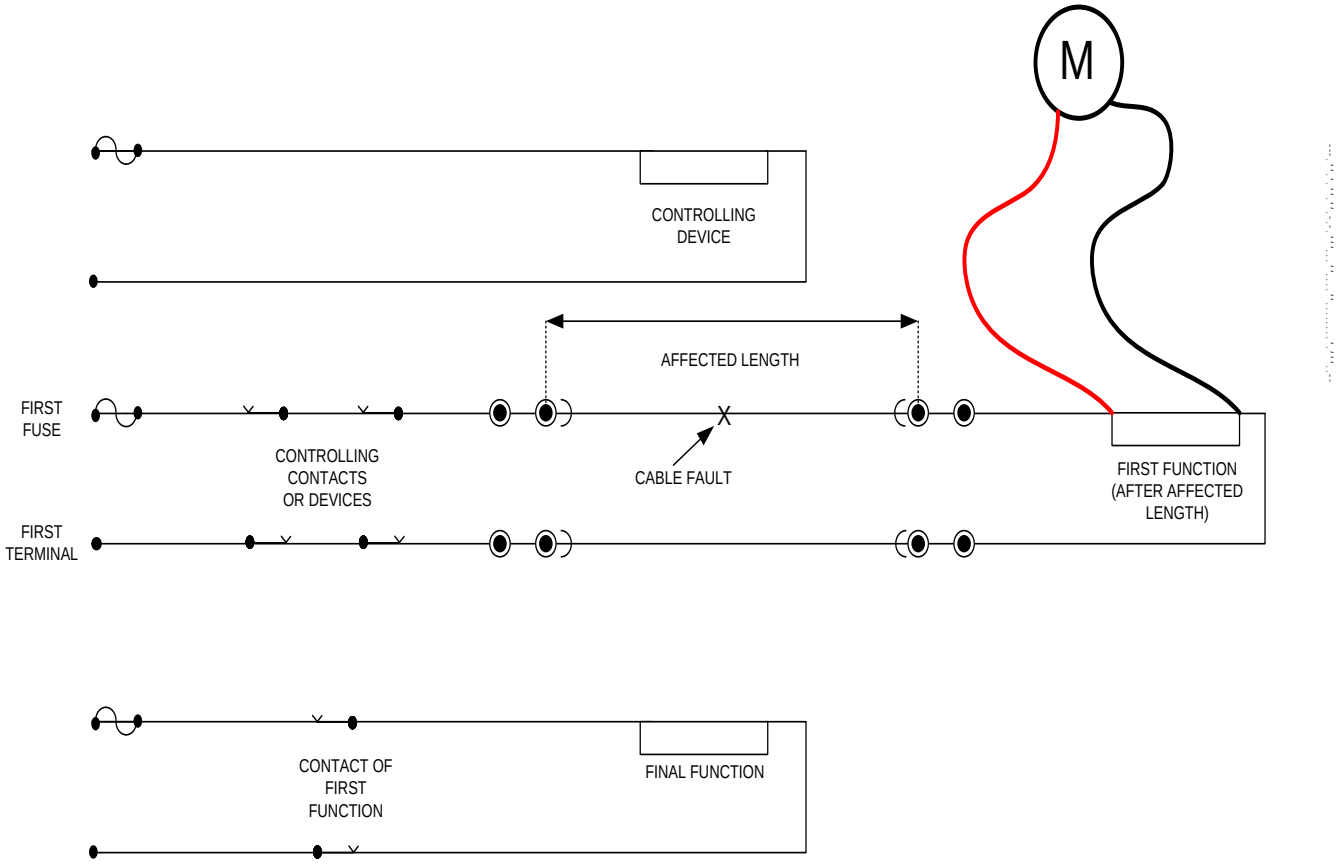


Figure 1: Cable Function Test Schematic

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 03/Test B05		
Defined Test: Earth Test (DC up to a nominal 120V)		
Issue No. 06	Issue Date: 03/03/18	Compliance Date: 31/05/18

1. Purpose

This test is to check that equipment and power supplies (when designed to be) are earth free. It makes sure that circuits cannot be falsely operated from spurious feeds. Any earth present may originate from bus bars or from equipment.

Where an earth fault detector monitors the equipment the test is not required, but the detector shall be checked for correct operation before and after any work.

For point machines, this test shall be undertaken whilst each machine is operating normal and reverse. For level crossings, this test shall be undertaken throughout the operation cycle.

An appropriately calibrated electronic meter with input impedance of at least 1M ohm fitted with a 150k ohm shunt shall be used.

All test measurements shall be recorded on DC Busbar & Earth Test record card (NR/SMS/T051/RC/02), together with the reason for the test.

2. Test

a. Measure the DC voltage between the positive and negative busbars supplying the equipment to be tested. Record the voltage indicated (V).

b. With one meter lead connected to earth and the other to the positive busbar, Record the DC voltage indicated (V1). The polarity of the indication can be ignored.

c. With one meter lead connected to earth and the other to the negative busbar, Record the DC. voltage indicated (V2). The polarity of the indication can be ignored.

d. Disconnect the meter and refer to the reportable, acceptable and safety values listed in NR/SMS/Part/Z07 applicable to the actual busbar voltage (V). If the required busbar voltage is not listed select the nearest busbar voltage shown that is less than the measured voltage.

3. Results

3.1 Less than the Reportable Range

The recorded values of V1, V2 and V1+V2 are less than the reportable range no further action is required. If any earth fault is found with the voltage below the reportable voltage range NR/SMS/Part/Z07, and the trend is worsening significantly from previous results, report to your SM(S) within 24 hours.

3.2 In the Reportable or Maximum Acceptable Range

If the recorded values of V1, V2 and V1+V2 are in the reportable or maximum acceptable range NR/SMS/Part/Z07, the SM(S) shall be advised within 24 hours.
The SM(S) will decide if any further action is required.

3.3 More than the Maximum Acceptable Value

If any of the recorded values of V1, V2 and V1+V2 are greater than the maximum acceptable voltage values NR/SMS/Part/Z07 then the SM(S) shall be advised within 24 hours. The SM(S) will decide if any further action is required.

3.4 More than the Maximum Safety Value

If any of the recorded values of V1, V2 and V1+V2 are more than the maximum safety voltage values immediate action shall be taken. If the fault cannot be cleared the SM (Signals) shall be advised immediately and decide the action to be taken.

4. Rectification of Earth Faults

All earth fault conditions are potentially serious and may be located by methodical disconnections.

When an earth fault outside acceptable limits is found, Rectify the fault as corrective maintenance.

Report to your Section Manager (Signals) the problem and any difficulties rectifying it. Failure to rectify shall be reported to your Section Manager (Signals) for necessary remedial action – the report shall be made preferably immediately and certainly within 24 hours.

Check that any earth faults in the “Reportable Region”, or any worsening trends in earth readings, are rectified or reported in accordance with NR/SMS/EL21 and NR/SMS/EL31.

5. RACI

RACI DETAILS	KEY CONTROL ACTIVITY	Maintenance Tester	Section Manager (Signals)	
Process Task				
3.1		I	I	
3.2		R	AR	
3.3		R	AR	
3.4		R	AR	
end RACI				

RACI is a means of linking process steps to roles as follows:

R **Responsible:** the individual(s) who perform an activity – responsible for action/implementation – although usually only one, R's can be shared.

A **Accountable:** the individual who is ultimately accountable including yes/no decision and power of veto – only one 'A' can be assigned

C **Consulted:** the individual(s) to be consulted prior to a final decision being made or action taken – two-way communication

I **Informed:** the individual(s) who need to be informed after a decision is made or action is taken – one-way communication

End

1. Purpose

This test is to check that equipment and power supplies (when designed to be) are earth free. It makes sure that circuits cannot be falsely operated from spurious feeds. Any earth present may originate from bus bars or from equipment. Where an earth fault detector monitors the equipment these tests are not required, but the detector shall be checked for correct operation before and after any work.

For point machines, this test shall be undertaken whilst each machine is operating normal and reverse.

An appropriately calibrated electronic meter with input impedance of at least 1M ohm shall be used.

Caution: The 150k ohm shunt shall NOT BE USED with the meter when carrying out AC earth tests using the AC busbar earth test adaptor.

All test measurements shall be recorded on AC Busbar & Earth Test record card (NR/SMS/T051/RC/01), together with the reason for the test.

2. Test

a. Connect the meter set to volts DC to the red and one of the black terminals of the AC busbar earth test adaptor (see Figure 1).

b. Connect the green and other black terminal of the AC busbar earth test adaptor together and Measure the battery voltage (VB). Check VB is no less than positive 8V, which shows that the earth test adaptor is working and that the meter is connected the right way round. If VB is less than 8V, the battery shall be changed.

c. Remove the connection between the green and black terminals. Connect the green terminal of the adaptor to earth and the black terminal to either the BX or NX busbar. Record the DC voltage indicated (V1).

d. Reverse the leads to the selected busbar and earth so that the black terminal of the adaptor is connected to earth and the busbar is connected to the green terminal of the adaptor. Record the DC voltage indicated (V2).

e. Disconnect the test circuit and refer to the reportable, acceptable and safety values listed in NR/SMS/Part/Z07 applicable to the actual adaptor battery voltage VB. If the required adaptor battery voltage is not listed select the nearest battery voltage shown that is less than the measured voltage.

3. Results

Calculate V1+V2 and V1–V2 (*)

3.1 Less than the Reportable Range

The recorded values of V1+ V2 and V1-V2 are below the reportable range no further action is required.

3.2 In the Reportable or Maximum Acceptable Range

If the recorded values of V1+V2 and V1-V2 are in the reportable or maximum acceptable range, the Section Manager (Signals) shall be advised preferably immediately and certainly within 24 hours. The Section Manager (signals) shall decide if any further action is required.

3.3 More than the Maximum Acceptable Value

If any of the recorded values of V1+ V2 and V1-V2 are more than the maximum acceptable voltage values then the Section Manager (Signals) shall be advised preferably immediately and immediately within 24 hours. The Section Manager (signals) shall decide if any further action is required.

3.4 More than the Maximum Safety Value

If any of the recorded values of V1+ V2 and V1-V2 are more than the maximum safety voltage values immediate action shall be taken. If the fault cannot be cleared the Section Manager (Signals) shall be advised immediately and decide the action to be taken.

4. Rectification of Earth Faults

All earth fault conditions are potentially serious and may be located by methodical disconnections. When an earth fault outside acceptable limits is found, Rectify the fault as corrective maintenance. Report to your Section Manager (Signals) the problem and any difficulties rectifying it. Failure to rectify shall be reported to your Section Manager (Signals) for necessary remedial action – the report shall be made preferably immediately and certainly within 24 hours. Check that any earth faults in the “Reportable Region”, or any worsening trends in earth readings, are rectified or reported in accordance with NR/SMS/EL21 and NR/SMS/EL31

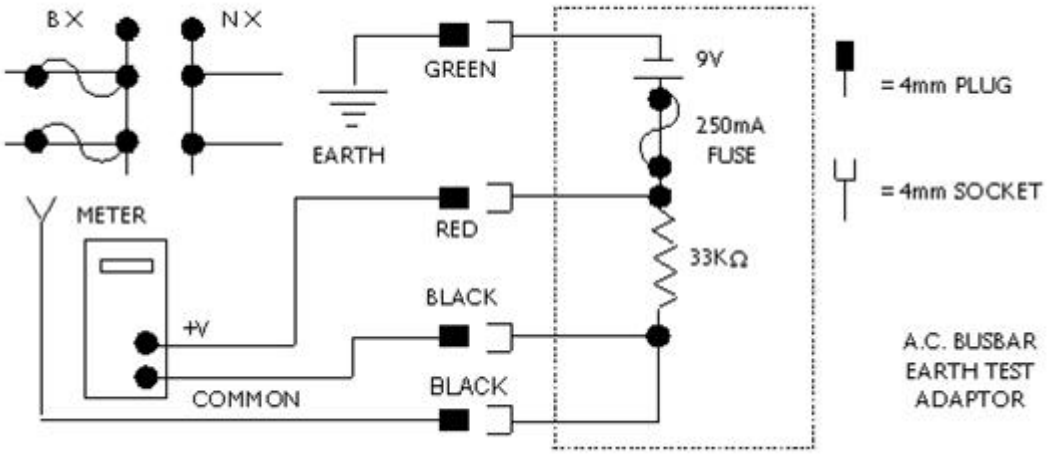


Figure 1: AC Earth Test Circuit

5. RACI

RACI DETAILS	**KEY CONTROL ACTIVITY**	Maintenance Tester	Section Manager (Signals)	
Process Task				
3.1		I	I	
3.2		R	AR	
3.3		R	AR	
3.4		R	AR	
end RACI				

RACI is a means of linking process steps to roles as follows:

R **Responsible:** the individual(s) who perform an activity – responsible for action/implementation – although usually only one, R's can be shared.

A **Accountable:** the individual who is ultimately accountable including yes/no decision and power of veto – only one 'A' can be assigned

C **Consulted:** the individual(s) to be consulted prior to a final decision being made or action taken – two-way communication

I **Informed:** the individual(s) who need to be informed after a decision is made or action is taken – one-way communication

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 03/Test B07		
Defined Test: Aspect Test		
Issue No. 06	Issue Date: 03/03/18	Compliance Date: 31/05/18

1. Purpose

This test is to check that the correct aspect (including any appropriate indication of route) is displayed.

Check that no other aspects, lamps, or signal lamp module are falsely illuminated during this test.

2. Test

a. Check the correspondence of each aspect control relay (or test correspondence of each SSI telegram) to its associated aspect. Additionally, for an electro-mechanical searchlight signal Test for correct polarity and operation of mechanism.

b. Check the correspondence of each aspect (or test correspondence of each SSI telegram) to its associated signal box indication or aspect repeat relay.

c. Check that all fitted lamp proving circuit(s) operate correctly.

d. Check (if provided) that any fitted filament changeover and first filament failure indication(s) operate correctly.

e. Check (if provided) that the signal post replacement switch returns the signal back to danger from a proceed aspect.

f. Check that adequate sighting is achieved for all aspects and route indications NR/SMS/Test/302.

g. Check that there is no ambiguity or conflict with any other signals.

h. Check that there is no ambiguity or conflict with any extraneous lighting.

End

1. Point Detection and Correspondence Test

This consists of a check followed by three tests. This check and tests need to be carried out in the order they are listed in Table 1:

Order	Check or Test	Definition
01	Point Position Check	This is to make sure of a correct understanding of the lie of the points in their normal and reverse positions
02	Correspondence Test	This is to make sure that the signal box controlling device, e.g. lever, controls and indications correspond with the lie of the points for both normal and reverse positions.
03	Detection Test	This is to make sure that all contacts are in the circuit and effective
04	Out of Correspondence Test	This is to make sure that detection cannot be obtained if one or more ends are not in the correct position.

Table 1 – Test Sequence

2. Carrying Out the Tests

To assess which point ends need to be tested the term ‘affected end’ has been defined:

a) If point equipment has been changed on any point end that point end is the ‘affected end’.

b) If a point detection cable is changed between any point ends those point ends are the ‘affected ends’.

All three tests shall be carried out to all point ends with a common detection circuit which includes the ‘affected end(s)’.

The point permutation chart (contained in NR/SMTH/Part/02) shall be used.

3. Point Position Check

a) Check that the point number of point end to be tested, as shown on the signalling plan, corresponds with the number on the point identification plate.

b) Check that the actual layout of the points relative to adjacent track/points/signals corresponds with that shown on the signalling plan.

c) Check that you have a correct understanding of the lie of the points in their normal and reverse positions, as follows:

d) Check that the normal position of the points (as shown on the signalling plan) agrees with the normal position as indicated by the identification plates on the points.

e) Check that you and the Signaller have a common understanding of the destination route/line for trains travelling over the points in the normal and reverse positions.

4. Correspondence Test

Operate the points normal and reverse in turn and perform the following tests for both positions:

a) Check that the control and detection relays (or voltages, or, in the case of SSI, the control and detection telegrams) correspond with the lie of the points.

b) Check that the position of the Signallers control device for the points and the Signallers' indications correspond with the lie of the points.

5. Detection Test

For ALL ends of the set of points, and ALL supplementary detectors where fitted, break each detection contact three times in succession and check that the correct local detection relay de-energises each time for both normal and reverse positions or test that the correct SSI telegram is given for both normal and reverse positions.

For systems with micro switches operate the micro switches which are not compressed.

For HW point machines, the detection contact springs are arranged in pairs of phosphor bronze contacts.

To undertake the detection breaks, break each spring of the pair once, and one of them for a second time, to achieve the three detection breaks required by this test.

Where the detection contacts are not accessible in the detector, e.g. as in the case with the Hy-Drive System, the 'Detection Test' shall be undertaken by breaking detection once for each supplementary detector position at the outgoing detection links in the associated Location Case.

The point detection test for the HPSS shall be carried out as detailed in NR/SMS/PartB/Test/008 (HPSS Tests) - Supplementary Sensor Integrity and Detection Test.

6. Out of Correspondence Test

Out of correspondence condition means that neither the normal or reverse detection relay is made or that the SSI telegram is indicating "out of correspondence".

During the out of correspondence test, the detection relays or SSI telegrams shall be continuously monitored to check that detection is only made at the correct phase of the tests.

To facilitate the monitoring of the detection relays or telegram, the points shall be operated manually (as required by SMTH) at such a rate that any false operation of relays or telegrams can be observed.

Out of Correspondence shall not be tested between the point operating mechanism and any supplementary detectors fitted to the same end.

Point detection (Steps b) & f) below) shall be checked at the relay or detector concerned (rather than at the signal box indication) or by testing for the correct SSI telegram. In certain cases, it may be tested on the KR circuit.

At certain installations the circuitry can be designed to cut the feed path to the detection circuit when detection is lost for five seconds.

To facilitate testing it can be necessary to maintain the feed to the circuit (WCR, WJR or equivalent) to make sure continued operation for the duration of the test. This is the case, for example, where the points are fitted with a separate controller. Any such requirement should be confirmed by reference to the diagrams, recorded as part of the record of test and restored on completion of the Out of Correspondence test.

The Out of Correspondence test shall be recorded to assist the Maintenance Tester in performing the test. The permutation chart grid sheets are provided for this purpose, see NR/SMTH/Part/02.

a) Normalise all ends. Refer to the first step of the permutation chart.

b) Isolate (only) the ends indicated by a zero (0) on the permutation chart.

c) Ask the Signaller to operate the points to reverse. Check they indicate out of correspondence.

d) Manually operate the isolated end(s) to reverse. Check that reverse detection is only given at full reverse position.

e) Leave the isolated ends isolated. Ask the Signaller to operate the points to normal. Check they indicate out of correspondence.

f) Manually operate the isolated end(s) to normal. Check that normal detection is only given at full normal position.

g) Repeat Steps b) to f) following the next step on the permutation chart until all permutations are complete.

h) Reconnect the isolated point drive(s).

7. Point Permutation Chart Examples

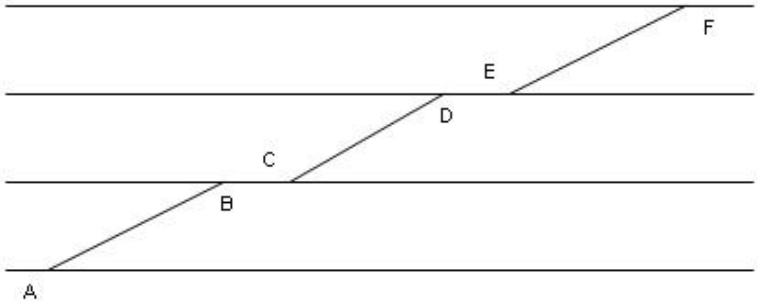


Figure 1 – Shows three separate detection circuits

A & B ends share same detection circuit (common KR or SSI input).

C & D ends share same detection circuit (common KR or SSI input).

E & F ends share same detection circuit (common KR or SSI input).

If A is the affected end, test A to B using the permutation chart for 2 ends.

A completed permutation chart grid sheet for this example would look like this:

No.	End 01	End 02	Tick
	A	B	
01	0	0	✓
02	0	1	✓
03	1	0	✓

Table 2 – Shows a completed grid sheet for one detection circuit

A, B, C, D, E & F share same detection circuit (common KR). If A is the affected end, test A to B to C to D to E to F using the point permutation chart for 6 ends.

END

1. Block Controls Nomenclature

Normal (Line Blocked)

Refers to commutator / indications in the central / vertical position.

Compulsory Train on Line Block (CTOLB)

When the controlling track circuit(s) is occupied, the block will automatically register TRAIN ON LINE regardless of the position of the commutator. To restore the block to either LINE CLEAR or NORMAL (LINE BLOCKED) the controlling track circuit(s) must be clear and the commutator placed at TRAIN ON LINE and then at LINE CLEAR or NORMAL (LINE BLOCKED) as required.

One Acceptance Block (OAB) (also known as Welwyn Block and One Train Block)

The same as CTOLB with the additional requirement that once a LINE CLEAR has been given it is not possible to give a further LINE CLEAR until the controlling track circuit(s) of the home signal has been occupied and cleared and the signal restored, or the signaller has operated a time release. There are currently two types of ONE ACCEPTANCE BLOCK (OAB):

Type 1 Where the TRAIN ON LINE indication remains when the controlling track circuit is cleared.

Type 2 Where the TRAIN ON LINE indication returns to NORMAL (LINE BLOCKED) when the controlling track circuit is cleared.

2. Test

This test is to check for the correct operation of all absolute block equipment in three stages:

Stage 1: Tests the system to prove that no LINE CLEAR can be given with any normal contact broken.

Stage 2: Tests to prove that the controlling track circuit occupied restores the block to TRAIN ON LINE (separate tests for type 1 & type 2 OAB).

Stage 3: Tests to prove that a LINE CLEAR is required to release the starting signal (LINE CLEAR releases ONLY).

The starting point for each stage is with the block restored, if necessary by using the ABSOLUTE BLOCK RECOVERY TEST.

2.1 Stage 1: No LINE CLEAR with any normal contact broken

1. Place the commutator to LINE CLEAR. Check that the block indicator shows LINE CLEAR.
2. Place the commutator to NORMAL then to LINE CLEAR. Check that the block indicator shows NORMAL (LINE BLOCKED) (OAB ONLY).
3. Use the ABSOLUTE BLOCK RECOVERY TEST to restore the block (‘OAB’ ONLY).

4. Check that LINE CLEAR cannot be given with the first contact in the normal proving circuit broken (see wiring diagrams).
5. Restore the first contact in the normal proving circuit. Check that LINE CLEAR can be given.
6. Repeat steps 03 to 05 for any additional contact in the normal proving circuit.

2.2 Stage 2: Prove controlling track circuit occupied restores the block to TRAIN ON LINE. (CTOLB and OAB type 1 ONLY)

7. Place the commutator to LINE CLEAR. Check the block indicator shows LINE CLEAR.
8. Check the block indicator shows TRAIN ON LINE for the 1st controlling track circuit occupied and cleared (see wiring diagrams).
9. Place the commutator to NORMAL (LINE BLOCKED). Check the block indicator continues to show TRAIN ON LINE.
10. Place the commutator to LINE CLEAR. Check the block indicator continues to show TRAIN ON LINE.
11. Place the commutator to NORMAL (LINE BLOCKED). Check the block indicator continues to show TRAIN ON LINE.
12. Place the commutator to TRAIN ON LINE. Check the block indicator continues to show TRAIN ON LINE.
13. Place the commutator to NORMAL (LINE BLOCKED). Check the block indicator shows NORMAL (LINE BLOCKED).
14. Repeat steps 07 to 13 for any additional controlling track circuit restoring the block first where necessary.
15. Check the block indicator shows TRAIN ON LINE for the 1st controlling track circuit occupied and cleared (see wiring diagrams).
16. Place the commutator to TRAIN ON LINE. Check the block indicator continues to show TRAIN ON LINE.
17. Place the commutator to NORMAL (LINE BLOCKED). Check the block indicator shows NORMAL (LINE BLOCKED).

2.3 Stage 2: Prove controlling track occupied restores the block to TRAIN ON LINE. (OAB TYPE 2 ONLY)

Place the commutator to LINE CLEAR. Check the block indicator shows LINE CLEAR.

18. Check the block indicator shows TRAIN ON LINE for the 1st controlling track circuit occupied and cleared (see wiring diagrams).

19. Place the commutator to NORMAL (LINE BLOCKED). Check the block indicator shows NORMAL (LINE BLOCKED).
20. Check the block indicator shows TRAIN ON LINE for the 1st controlling track circuit occupied (see wiring diagrams).
21. Check the block indicator shows NORMAL (LINE BLOCKED) for the 1st controlling track circuit cleared (see wiring diagrams).
22. Place the commutator to TRAIN ON LINE. Check the block indicator shows TRAIN ON LINE.
23. Check the block indicator shows TRAIN ON LINE for the 1st controlling track circuit occupied.
24. Place the commutator to NORMAL (LINE BLOCKED). Check the block indicator continues to show TRAIN ON LINE.
25. Check the block indicator shows NORMAL (LINE BLOCKED) for the 1st controlling track circuit cleared.
26. Repeat steps 18 to 26 for any additional controlling track circuit restoring the block first where necessary.

2.4 Stage 3: Prove that LINE CLEAR is required to release starting signal (LINE CLEAR RELEASE ONLY)

27. Check that the starting signal can be released while the block indicator is at LINE CLEAR.

Where 'one train' control applies, the track circuit ahead of the starting signal must be occupied and cleared to remove the LINE CLEAR release.

28. Check that the starting signal cannot be released again with the same LINE CLEAR.
29. Check that the starting signal cannot be released while the block indicator is at TRAIN ON LINE and at NORMAL (LINE BLOCKED).
30. Check that the starting signal at the adjacent signal box can be released while the commutator is at LINE CLEAR.
31. Check that the starting signal at the adjacent signal box cannot be released while the commutator is at TRAIN ON LINE and at NORMAL (LINE BLOCKED).
32. Use the ABSOLUTE BLOCK RECOVERY TEST to restore the block.

End

General

When the controlling track circuit(s) or treadle(s) is occupied, the block will automatically register TRAIN IN SECTION regardless of the position of the acceptance switch.

To restore the block the controlling track circuit(s) or treadle(s) of the home signal must have been occupied and cleared and, at the receiving signal box, the acceptance switch placed to NORMAL and the TRAIN ARRIVED plunger operated.

Tokenless Block Controls Test

This test is to check for the correct operation of all BRB tokenless block equipment:

1. Check the block indicator shows NORMAL at both signal boxes.
2. Place the acceptance switch to ACCEPT.
3. Check the block indicator shows NORMAL at both signal boxes.
4. Check that the starting signal cannot be released at both signal boxes.
5. Check the block indicator shows NORMAL at both signal boxes with the first contact in the normal proving circuit broken and the OFFER button operated at the adjacent signal box (see wiring diagrams).
6. Restore the first contact in the normal proving circuit while the OFFER button continues to be operated at the adjacent signal box.
7. Check the block indicator shows TRAIN ACCEPTED at both signal boxes.
8. Check that the starting signal cannot be released.
9. Check that the starting signal can be released at the adjacent signal box.
10. Check the block indicator shows TRAIN IN SECTION at both signal boxes for the first controlling track circuit or treadle occupied and cleared (see wiring diagrams).
11. Recreate the effect of a passing train in the approaching direction.
12. Check the block indicator shows TRAIN IN SECTION at both signal boxes.
13. Operate the TRAIN ARRIVED button. Check the block indicator shows NORMAL at both signal boxes.
14. Repeat steps 2 to 13 for any additional contact in the normal proving circuit and for any additional controlling track circuit or treadle.

15. Place the acceptance switch to NORMAL.

16. Check the block indicator shows NORMAL at both signal boxes.

17. Place the acceptance switch to ACCEPT at the adjacent signal box.

18. Check the block indicator shows NORMAL at both signal boxes.

19. Check that the starting signal cannot be released at both signal boxes.

20. Operate the OFFER button. Check the block indicator shows TRAIN ACCEPTED at both signal boxes.

21. Check that the starting signal cannot be released at the adjacent signal box.

22. Check that the starting signal can be released.

23. Check the block indicator shows TRAIN IN SECTION at both signal boxes for any controlling track circuit or treadle occupied and cleared.

24. Recreate the effect of a passing train to the adjacent signal box.

25. Check the block indicator shows TRAIN IN SECTION at both signal boxes.

26. Operate the TRAIN ARRIVED button at the adjacent signal box. Check the block indicator shows NORMAL at both signal boxes.

Prove block release winder operates correctly (MODIFIED SYSTEMS WITH BLOCK RELEASE WINDER ONLY)

27. Turn the winder until the N disappears. Check that the winder cannot be turned anticlockwise.

28. Check the block indicator shows TRAIN IN SECTION at both signal boxes.

29. Continue to turn winder. Check the block indicators at both signal boxes show TRAIN IN SECTION until the N fully reappears.

NOTE: *This should take a minimum of 30 seconds, if it does not, inform your SM(S).*

30. Check the block indicator shows NORMAL at both signal boxes.

END

1. General

When the controlling track circuits(s) or treadle(s) is occupied, the block will automatically register TRAIN GOING TO regardless of the position of the acceptance switch. To restore the block the controlling track circuit(s) or treadle(s) of the home signal must have been occupied and cleared and, at the receiving signal box, the acceptance switch placed to NORMAL and the ringing key operated.

2. Test

This test is to check for the correct operation of all Open/Sealed cancel type tokenless block equipment.

1. Check the block indicator shows NORMAL at both signal boxes.
2. Place the acceptance switch to REVERSE. Check the block indicator shows NORMAL at both signal boxes.
3. Check that the starting signal cannot be released at both signal boxes.
4. Check the block indicator shows NORMAL at both signal boxes with the first contact in the normal proving circuit broken and the ringing key operated at the adjacent signal box (see wiring diagrams).
5. Restore the first contact in the normal proving circuit while the ringing key continues to be operated at the adjacent signal box.
6. Check the block indicator shows TRAIN COMING FROM.
7. Operate the ringing key. Check the block indicator shows TRAIN GOING TO at the adjacent signal box.
8. Check that the starting signal cannot be released.
9. Check that the starting signal can be released at the adjacent signal box.
10. Operate the ringing key and the OPEN CANCEL button at the adjacent signal box.
11. Check the block indicator shows TRAIN COMING FROM.
12. Place the acceptance switch to NORMAL. Check that the TRAIN COMING FROM indication is extinguished.
13. Operate the ringing key. Check the block indicator shows NORMAL at the adjacent signal box.
14. Operate the ringing key at the adjacent signal box. Check the block indicator shows NORMAL.
15. Occupy and then clear the first controlling track circuit or treadle (see wiring diagrams).
16. Check the block indicator shows TRAIN GOING TO.
17. Check the block indicator shows TRAIN COMING FROM at the adjacent signal box.
18. Operate the ringing key at the adjacent signal box. Check the block indicator shows NORMAL.

19. Repeat steps 02 to 18 for any additional contact in the normal proving circuit and for any additional controlling track circuit or treadle.
20. Place the acceptance switch to REVERSE at the adjacent signal box. Check the block indicator shows NORMAL at both signal boxes.
21. Operate the ringing key. Check the block indicator shows TRAIN COMING FROM at the adjacent signal box.
22. Operate the ringing key at the adjacent signal box. Check the block indicator shows TRAIN GOING TO.
23. Check that the starting signal cannot be released at the adjacent signal box.
24. Check that the starting signal can be released.
25. Operate the ringing key and the OPEN CANCEL button.
26. Check the block indicator shows TRAIN COMING FROM at the adjacent signal box.
27. Place the acceptance switch to NORMAL at the adjacent signal box.
28. Check that the TRAIN COMING FROM indication is extinguished at the adjacent signal box.
29. Operate the ringing key at the adjacent signal box. Check the block indicator shows NORMAL.
30. Operate the ringing key. Check the block indicator shows NORMAL at the adjacent signal box.
31. Place the acceptance switch to REVERSE at the adjacent signal box. Check the block indicator shows NORMAL at both signal boxes.
32. Operate the ringing key. Check the block indicator shows TRAIN COMING FROM at the adjacent signal box.
33. Operate the ringing key at the adjacent signal box. Check the block indicator shows TRAIN GOING TO.
34. Place the acceptance switch to NORMAL at the adjacent signal box.
35. Operate the ringing key and OPEN CANCEL button with the first contact in the normal proving circuit broken (see wiring diagrams).
36. Check the block indicator shows TRAIN COMING FROM at the adjacent signal box.
37. Restore the first contact in the normal proving circuit.
38. Operate the ringing key, whilst operating the SEALED CANCEL button at the adjacent signal box.
39. Check the block indicator shows NORMAL at the adjacent signal box.
40. Operate the ringing key at the adjacent signal box. Check the block indicator shows NORMAL.
41. Repeat steps 34 to 40 for any additional contact in the normal proving circuit (see wiring diagrams).

--`,,`,`,,`,`,,,,,,,,,`,,`,,,,`,,`,,,`,`-`-`,,`,,`,`,,`---

42. Place the acceptance switch to REVERSE.
43. Operate the ringing key at the adjacent signal box. Check the block indicator shows TRAIN COMING FROM.
44. Operate the ringing key. Check the block indicator shows TRAIN GOING TO at the adjacent signal box.
45. Occupy and then clear the first controlling track circuit or treadle at the adjacent signal box.
46. Operate the SEALED CANCEL button. Check the block indicator shows TRAIN COMING FROM.
47. Continue to operate the SEALED CANCEL button whilst holding in the ringing key at the adjacent signal box.
48. Check the block indicator continues to show TRAIN COMING FROM.
49. Place the acceptance switch to NORMAL.
50. Operate the SEALED CANCEL button, whilst holding in the ringing key at the adjacent signal box. Check the block indicator shows NORMAL.
51. Operate the ringing key. Check the block indicator shows NORMAL at the adjacent signal box.
52. Repeat steps 42 to 51 for any additional controlling track circuit or treadle.
53. Occupy and clear the first controlling track circuit and incoming arm of treadle.
54. Place the acceptance switch to NORMAL
55. Operate the ringing key. Check the block indicator shows NORMAL at the adjacent signal box.
56. Operate the ringing key at the adjacent signal box. Check the block indicator shows NORMAL.
57. Check SEALED CANCEL glasses are replaced at both signal boxes.

End

1. General

The block indicator uses white lights for indications. NORMAL is no light showing.

2. Test

This test is to check for the correct operation of all direction lever tokenless block equipment.

1. Use the TOKENLESS CO-OPERATIVE CANCEL TEST to restore the block.
2. Check that the starting signal cannot be released at both signal boxes.
3. Operate the acceptance lever to REVERSE at both signal boxes at the same time. Check that there are no indications at both signal boxes.
4. Replace the acceptance lever to NORMAL at both signal boxes. Check the block indicator shows NORMAL at both signal boxes.
5. Operate the acceptance lever to REVERSE at the adjacent signal box.
6. Check the block indicator shows TRAIN ACCEPTED.
7. Check the acceptance lever cannot be operated to REVERSE.
8. Use the TOKENLESS CO-OPERATIVE CANCEL TEST to restore the acceptance lever at the adjacent signal box.
9. Check the block indicator shows NORMAL at both signal boxes.
10. Check the acceptance lever cannot be operated REVERSE with the first contact in the normal proving circuit broken (see wiring diagrams).
11. Restore the first contact in the normal proving circuit.
12. Operate the acceptance lever to REVERSE.
13. Check the block indicator shows TRAIN ACCEPTED.
14. Check the acceptance lever at the adjacent signal box cannot be operated to REVERSE.
15. Use the TOKENLESS CO-OPERATIVE CANCEL TEST to restore the acceptance lever.

16. Check the block indicator shows NORMAL.

17. Repeat steps 10 to 16 for any additional contact in the normal proving circuit.

END

1. General

The check sequence in the token testing table is designed for either two or three token instruments.

2. Test

This test is to check that only ONE token can be released from the system at any one time.

a. Check all tokens are electrically locked in the instruments.

If a token is missing from the system (Pilotman, damage) one token may be removed from the system for testing purposes, and the situation recorded as part of the record of test.

If there are insufficient tokens in the system, then spare tokens may be added to the system for testing purposes, and the situation recorded as part of the record of test.

b. Carry out token tests as shown in the following token testing table. (For two instruments carry out tests 01 to 11, for three instruments carry out tests 01 to 28).

A token can only be withdrawn electrically when there is an even number of tokens in the system.

Token Block Controls Test Table

Test	Instrument 01	Instrument 02	Instrument 03
01	WE	G	-
02	0	G	-
03	G	0	-
04	R	-	-
05	G	WE	-
06	G	0	-
07	0	G	-
08	-	R	-
09	WM	WM	-
10	**REPEAT TESTS 1 TO 8**		
11	R	R	-
12	G	G	WE
13	G	G	0

Test	Instrument 01	Instrument 02	Instrument 03
14	0	G	0
15	G	0	0
16	-	-	R
17	G	WE	0
18	G	G	0
19	-	R	-
20	WE	G	0
21	G	G	0
22	R		0
23	WM	-	WM
24	**REPEAT TESTS 12 TO 22**		
25	R	-	R
26	-	WM	WM
27	**REPEAT TESTS 12 TO 22**		
28	-	R	R

Abbreviation	Meaning
0	Unable to withdraw token
R	Replace token
WE	Withdraw token electrically
WM	Withdraw token manually
G	Give release

End

General

1. Test

This test is to check that only ONE tablet can be released from the system at any one time.

a) Check all tablets are electrically locked in the instruments.

b) Carry out tablet tests as shown in the following tablet testing table.

Test	Instrument 01	Instrument 02
01	WE	G
02	0	G
03	G	0
04	R	-
05	G	WE
06	G	0
07	0	G
08	-	R

Table 1 - Tablet Block Controls Test Table

Abbreviation	Meaning
0	Unable to withdraw token
R	Replace token
WE	Withdraw token electrically
G	Give release

Table 2 – Token Test Abbreviations

END

1. General

The check sequence in the token testing table is designed for either two or three token instruments. Note that step b. applies to all installations apart from the Whitby branch and step c. applies to the Whitby branch only (the Battersby-Glaisdale, & Glaisdale – Whitby sections where there is no signaller at any end. It takes account of the local wiring to allow the systems to be tested as groups of two machines).

2. Test

This test is to check that only ONE token can be released from the system at any one time.

a. Check all tokens are electrically locked in the instruments.

If a token is missing from the system (Pilotman, damage) one token may be removed from the system for testing purposes, and the situation recorded as part of the record of test.

If there are insufficient tokens in the system, then spare tokens may be added to the system for testing purposes, and the situation recorded as part of the record of test.

b. ALL INSTALATIONS EXCEPT WHITBY BRANCH:
Carry out token tests as shown in the token testing table 01. (For two instruments carry out tests 01 to 11, for three instruments carry out tests 01 to 28).

c. WHITBY BRANCH ONLY:
These systems shall be tested as a sequence of separate two instrument tests where the systems are numbered from one end of the system in sequence. 1, 2, 3, (4), with 2, (3) as intermediates.

- Three Instrument System: - Test 02&01, 02&03.
- Four Instrument System: - Test 02&01, 02&04, 03&01, 03&04. (1 and 4 are the ends of the system)

Carry out token tests as shown in the token testing table 02.

A token can only be withdrawn electrically when there is an even number of tokens in the system.

Token Block Controls Test Table 01

Test	Instrument 01	Instrument 02	Instrument 03
01	GO, WE *	-	-
02	GO, 0	-	-
03	GO	0	-
04	R	-	-
05	G	WE *	-
06	G, 0	0	-
07	0	-	-
08	-	R	-
09	WM	WM	-
10	REPEAT TESTS 1 TO 8		
11	R	R	-
12	G	-	WE *
13	G	-	0
14	0	0	-
15	GO, 0	-	-
16	-	-	R
17	G	WE	-
18	G	-	0
19	-	R	-
20	GO, WE	-	-
21	G	-	0
22	R	-	-
23	WM	-	WM
24	REPEAT TESTS 12 TO 22		
25	R	-	R
26	-	WM	WM
27	REPEAT TESTS 12 TO 22		
28	-	R	R

Token Block Controls Test Table 02

Test	Base Instrument	Second Instrument
01	GO, WE *	-
02	GO, 0	-
03	-	GO,0
04	R	-
05	-	GO, WE *
06	-	GO,0
07	GO,0	-
08	-	R
09	WM	WM
10	REPEAT TESTS 1 TO 8	
11	R	R
12	REPEAT TESTS FOR NEXT PAIR OF MACHINES	

*: Immediately after withdrawing a token, an attempt shall quickly be made to withdraw a second token during the same galvanometer deflection or indication

Abbreviation	Meaning
0	Unable to withdraw token
R	Replace token
WE	Withdraw token electrically
WM	Withdraw token manually
G	Give release
GO	Give own release

End

1. General

The check sequence in the token testing table is suitable for two, three, or four token instruments.

2. Test

This test is to check that that only ONE token can be released from the system at any one time

a. Check all tokens are electrically locked in the instruments.

If a token is missing from the system (Pilotman, damage) one token may be removed from the system for testing purposes, and the situation recorded as part of the record of test.

If there are insufficient tokens in the system, then spare tokens may be added to the system for testing purposes, and the situation recorded as part of the record of test.

b. Carry out the token tests as shown in the following token testing table, using the columns appropriate to the number of instruments in the system.

- For two instruments carry out tests 1 to 19
- For three instruments carry out tests 1 to 25
- For four instruments carry out tests 1 to 34

A token can only be withdrawn electrically when there is an even number of tokens in the system.

Test	Instrument 01	Instrument 02	Instrument 03	Instrument 04
01	G, WE *	-	-	-
02	G, 0	-	-	-
03	G	0	0	0
04	R	-	-	-
05	-	G, WE *	-	-
06	-	G, 0	-	-
07	0	G	0	0
08	-	R	-	-
09	-	-	G, WE *	-

Test	Instrument 01	Instrument 02	Instrument 03	Instrument 04
10	-	-	G, 0	-
11	0	0	G	0
12	-	-	R	-
13	-	-	-	G, WE *
14	-	-	-	G, 0
15	0	0	0	G
16	-	-	-	R
17	WM	WM	-	-
18	**REPEAT TEST 1 TO 16**			
19	R	R	-	-
20	WM	-	WM	-
21	**REPEAT TEST 1 TO 16**			
22	R	-	R	-
23	-	WM	WM	-
24	**REPEAT TEST 1 TO 16**			
25	-	R	R	-
26	WM	-	-	WM
27	**REPEAT TEST 1 TO 16**			
28	R	-	-	R
29	-	WM	-	WM
30	**REPEAT TEST 1 TO 16**			
31	-	R	-	R
32	-	-	WM	WM
33	**REPEAT TEST 1 TO 16**			
34	-	-	R	R

* : Immediately after withdrawing a token, an attempt shall quickly be made to withdraw a second token during the same galvanometer deflection or indication

Abbreviation	Meaning
0	Unable to withdraw token
R	Replace token
WE	Withdraw token electrically
G	Give release on local instrument (NSTR) or Give release from signal box (NST)

End

BLOCK CONTROLS NOMENCLATURE

Normal (Line Blocked)

Refers to commutator / indication in the central / vertical position.

Compulsory Train on Line Block (CTOLB)

When the controlling track circuit(s) is occupied, the block automatically registers TRAIN ON LINE regardless of the position of the commutator.

To restore the block to either LINE CLEAR or NORMAL (LINE BLOCKED) the controlling track circuit(s) should be clear and the commutator placed at TRAIN ON LINE and then at LINE CLEAR or NORMAL (LINE BLOCKED) as required.

One Acceptance Block (OAB) (also known as Welwyn Block and One Train Block)

The same as 'CTOLB' with the additional requirement that once a LINE CLEAR has been given it is not possible to give a further LINE CLEAR until the controlling track circuit(s) of the home signal has been occupied and cleared and the signal restored, or the Signaller has operated a time release.

There are currently two types of ONE ACCEPTANCE BLOCK ('OAB'):

a) **Type 1** - Where the TRAIN ON LINE indication remains when the controlling track circuit is cleared.

b) **Type 2** - Where the TRAIN ON LINE indication returns to NORMAL (LINE BLOCKED) when the controlling track circuit is cleared.

BLOCK RECOVERY TEST

This test is to verify that the block restoration circuitry is effective (where fitted with 'OAB'). It can be used to restore the block during the NR/SMTH/Part03/Test/B09 (Defined Test: Absolute Block Controls Test) or following the replacement of a block instrument, block switch, block release winder or timer.

The indication given by the block indicator at the end of step 4 shows either TRAIN ON LINE or NORMAL (LINE BLOCKED). This is due to differences in the signalling circuitry of the former regions.

If required, the block can be restored during the test by carrying out steps 9 or 13 (as applicable) where a block release winder is provided or at step 16 where a block release timer is provided.

All Types

1. Place the commutator to LINE CLEAR. Check the block indicator shows LINE CLEAR.

2. Place the commutator to NORMAL (LINE BLOCKED). Check the block indicator shows NORMAL (LINE BLOCKED).

3. Place the commutator to LINE CLEAR. Check the block indicator shows NORMAL (LINE BLOCKED).

Where a Block Release Winder is Provided

4. Turn the winder until the N disappears. Check the winder cannot be turned anticlockwise.

   Observe the block indicator, if it shows TRAIN ON LINE carry out steps 5 to 10.

   If the block indicator shows NORMAL (LINE BLOCKED) carry out steps 11 to 14.

5. Check the block indicator shows TRAIN ON LINE.

6. Continue to turn winder until the N fully reappears. Check the block indicator shows only TRAIN ON LINE.

   NOTE: *This should take a minimum of 30 seconds, if it does not, inform your SM(S).*

7. Place the commutator to NORMAL (LINE BLOCKED). Check the block indicator shows NORMAL (LINE BLOCKED).

   If block does not restore to NORMAL (LINE BLOCKED), check wiring diagrams and place the commutator to TRAIN ON LINE then NORMAL (LINE BLOCKED) if required.

8. Place the commutator to LINE CLEAR. Check the block indicator shows LINE CLEAR.

9. Place the commutator to TRAIN ON LINE. Turn the winder until the N disappears and fully reappears. Check the block indicator shows only TRAIN ON LINE.

10. Turn the commutator to NORMAL (LINE BLOCKED). Check the block indicators at both signal boxes show NORMAL (LINE BLOCKED).

11. Check that the block indicator shows NORMAL (LINE BLOCKED).

12. Continue to turn the winder. Check that the block indicator only shows LINE CLEAR when the N fully reappears.

NOTE: *This should take a minimum of 30 seconds, if it does not, inform your SM(S).*

13. Place the commutator to TRAIN ON LINE. Turn the winder until the N disappears and fully reappears. Check the block indicator shows only TRAIN ON LINE.

14. Turn the commutator to NORMAL (LINE BLOCKED).

    Check the block indicators at both signal boxes show NORMAL (LINE BLOCKED).

Where a Block Release Timer is Provided

15. Start the timer running. Check the block indicator can only show LINE CLEAR when the timing sequence is complete.

16. Place the commutator to TRAIN ON LINE. Start the timer running.

17. When timing is complete, turn the commuter to NORMAL (LINE BLOCKED). Check the block indicators at both signal boxes show NORMAL (LINE BLOCKED).

END

1. Test

This test is to check that that the block restoration circuitry is effective. It can be used to restore the block during the TOKENLESS BLOCK CONTROLS TEST (DIRECTION LEVER) or following the replacement of any associated equipment.

During a TOKENLESS BLOCK CONTROLS TEST (DIRECTION LEVER), start at step 4 to restore the block.

15. Operate the acceptance lever to REVERSE.
16. Check the block indicator shows TRAIN ACCEPTED.
17. Check the acceptance lever at the adjacent signal box cannot be operated to REVERSE.
18. Check the acceptance lever can only be restored NORMAL when operating the CANCEL button at both signal boxes simultaneously.
19. Check the block indicator shows NORMAL at both signal boxes.

End

Includes:	Single Line Control and TOPS Presence Detectors

The presence of any metallic object (tools, rings, watches, steel toe caps in boots etc) above and close to the sensor will be detected, and connected control systems will be activated.
Where the sensor and control unit are powered from a battery-backed supply, the battery shall not be disconnected without first disconnecting the AC feed.

FREDDY treadles are not approved for use on Network Rail Infrastructure and will be removed in due course. This Test is provided only for testing existing FREDDY treadles, pending their removal. Observe the block indicator, if it shows TRAIN ON LINE carry out steps 5 to 10. If the block indicator shows NORMAL (LINE BLOCKED) carry out steps 11 to 14.

1. General

A possession of the equipment is required with the necessary disconnections to ensure that routes cannot be set.

For 'One Train Working' sections, ensure that the section indicator in the controlling signal box shows 'Occupied' or 'Train in Section'.

For TOPS reporting presence detectors, check that no local wagon movements will take place whilst testing is being carried out.

2. FREDDY Set-up Details

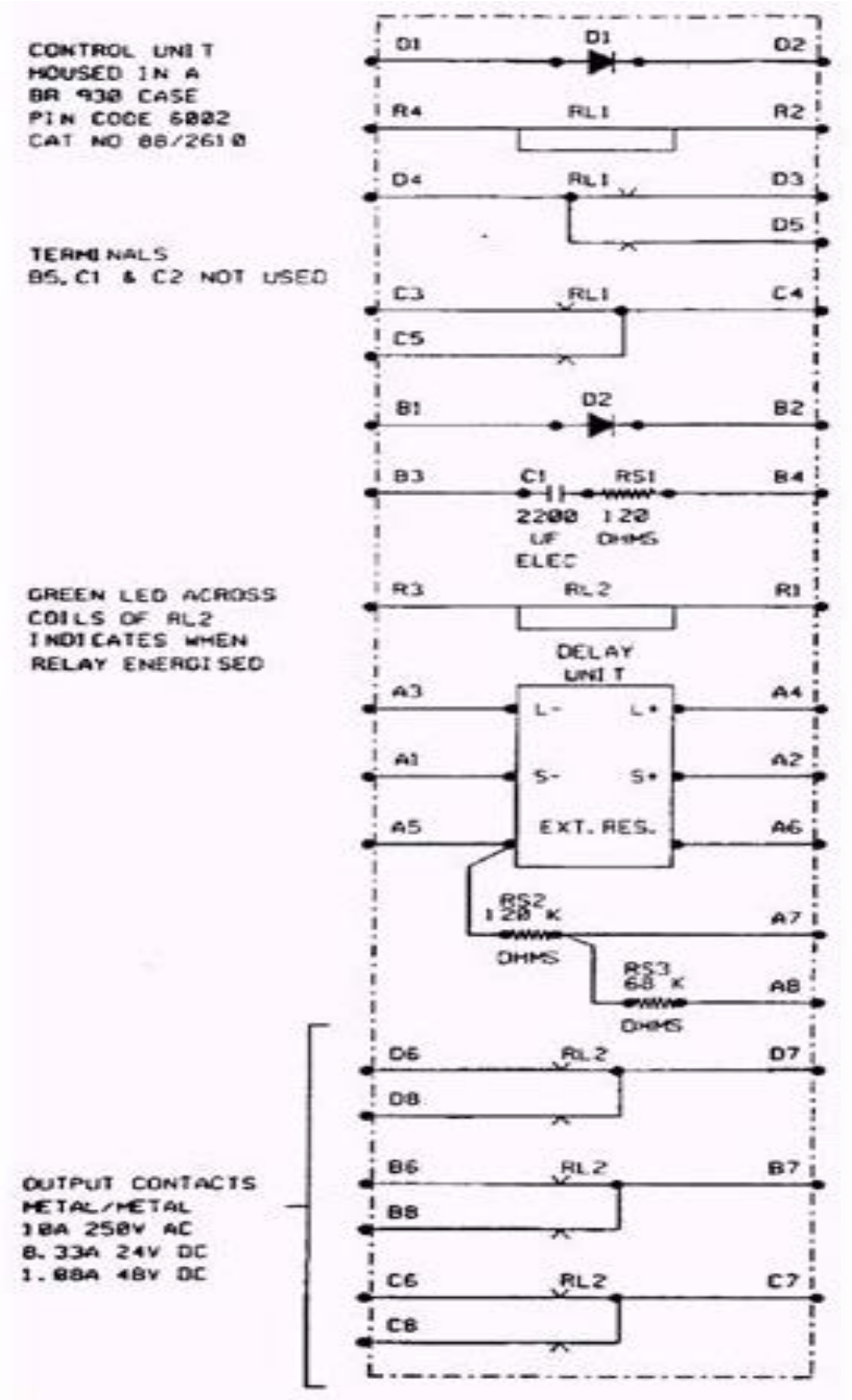
Nominal delay (Seconds)	Straps
0.25	A5 – A6
2.00	A5 – A8, A6 – A7
4.00	A5 – A7, A6 – A8
6.00	A6 – A7
8.00	A6 – A8
Infinite	None

Delayed release for normally de-energised configuration

Capacitor/resistor (C1 / RS1) gives a built in delay of 6 seconds. Other combinations may be added externally to give other times.

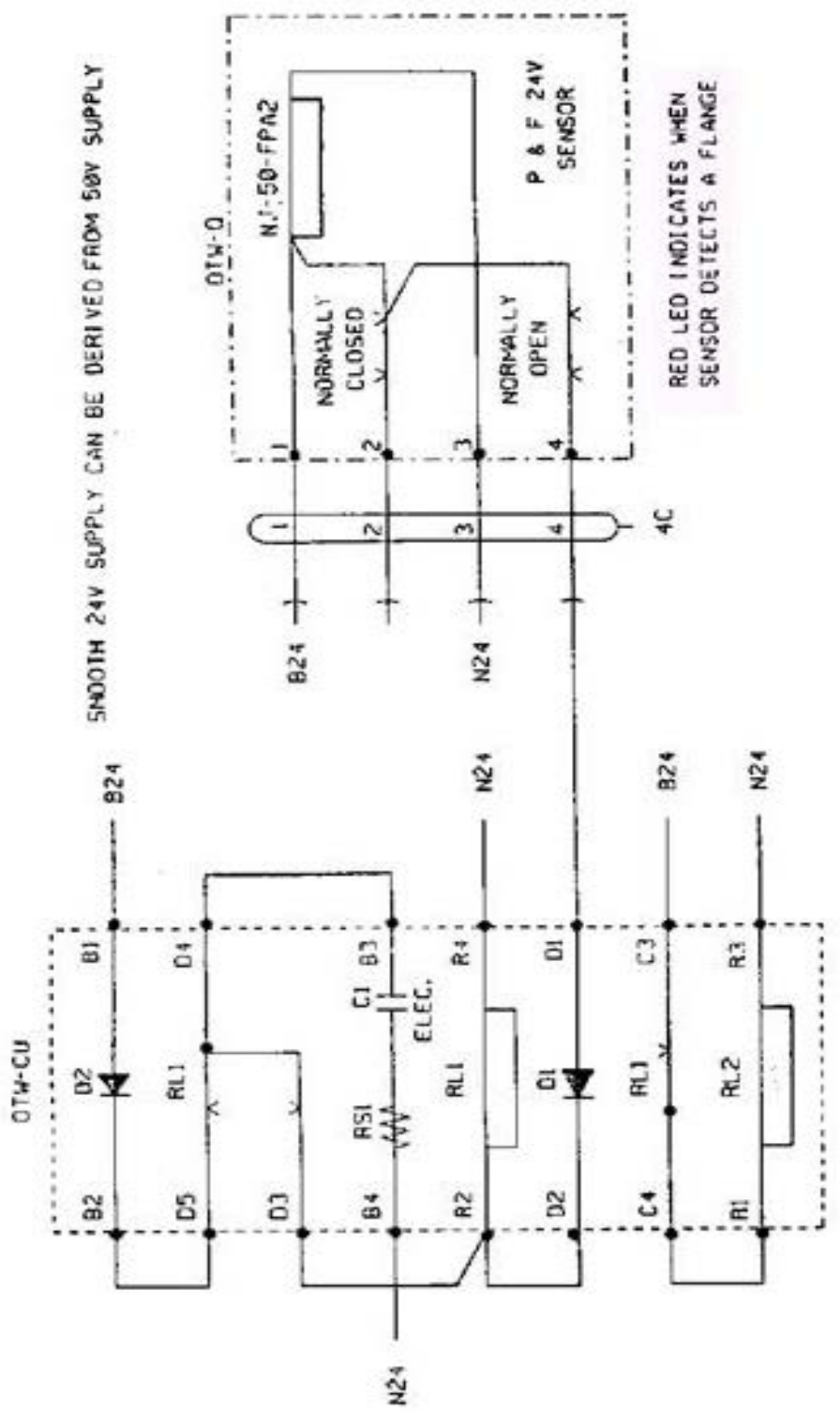
3. Circuit Details

3.1 Freddy Internal Wiring



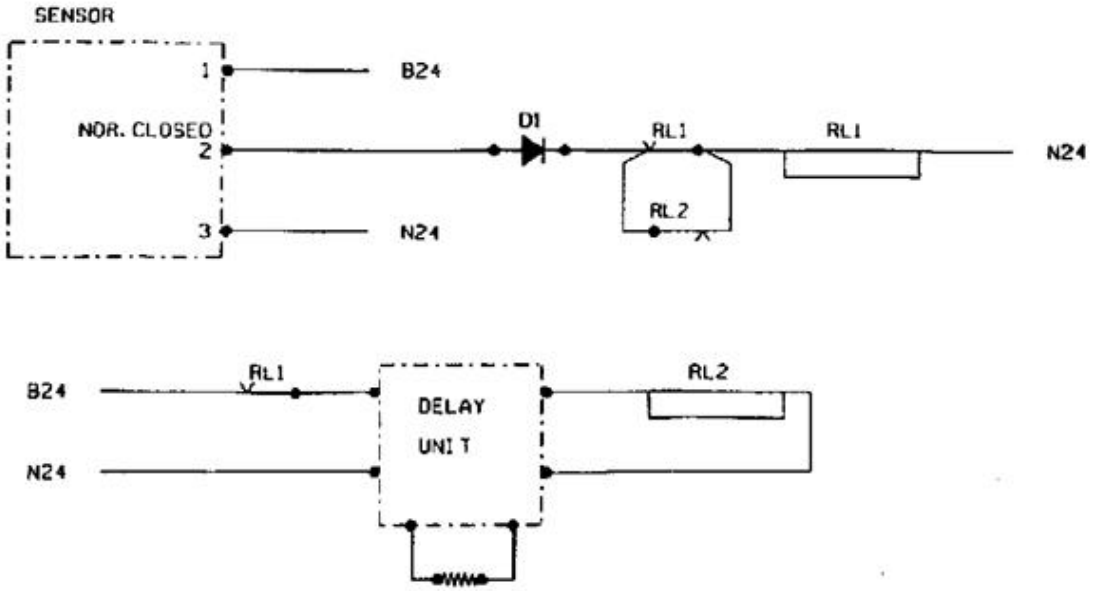
3.2 One Train Working Application

see BRS-SW67-52 for associated relay circuits
(with Control Unit RL2 contacts substituted for QRR contacts)

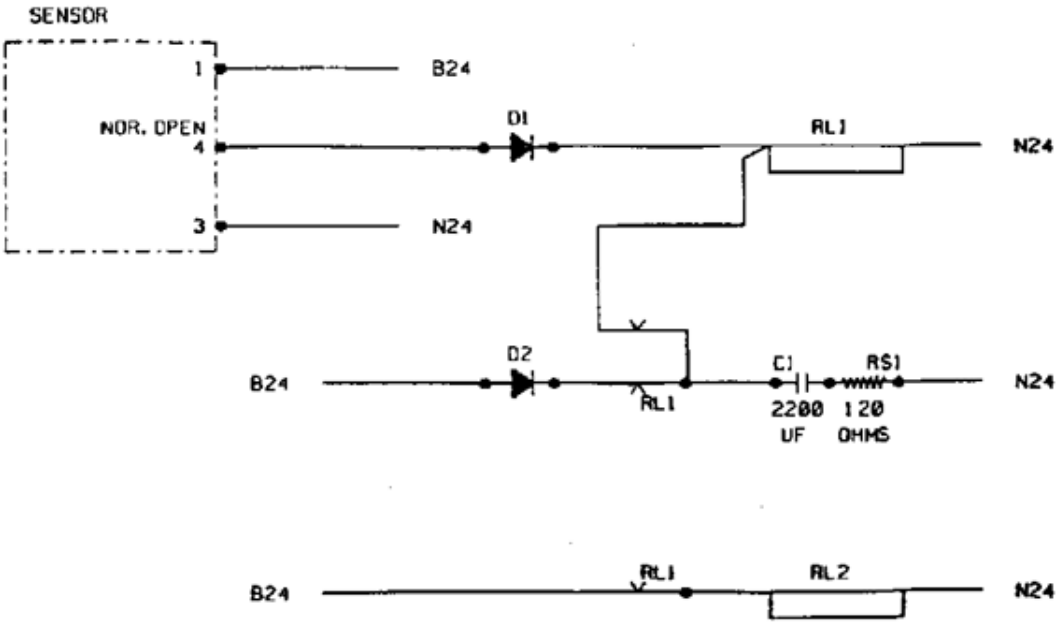


3.3 Equivalent Operating Diagrams

(1) Normally Energised Configuration



(2) Normally De-energised Configuration



4. Tests

4.1 One Train Working Circuits

The relay nomenclature used is typical and may not be found at all installations.

1. Monitor local train control relays for correct operation. Check that the orange or yellow fault LED is out and the green LED is illuminated.
2. Run a dummy wheel slowly across the sensor head in the 'onto single line' direction. Record the head detecting (relay) LED relay voltage.
3. When the presence of the dummy wheel is detected, Check that the relay mechanical indicator flag operates and Check that the green LED goes out.
4. Check either by 'closed loop supervision' of spare relay contacts RL2 or by observation of the relay operation that both RL1 and RL2 relays have operated.

RL2 is a repeat for RL1

5. When RL2 has operated, Check that either the (OTW)SR relay or the QNR and the (OTW)SR relays drop together and the QRR picks. (OFF1)TCSR and (OFF2)TCSR should remain down. Check that the green LED remains out for 6-8 seconds and Record the RL1 fixed time delay.
6. Check that both RL1 and RL2 relays drop smartly following the delay period.
7. Drop the leaving or exit track circuit(s) from the single line.
8. Repeat steps 02 and 03 and Check that the controls have operated and the green LED is out. After RL2 has operated, Check that either the QRR relay has operated or the back contacts of RL2 have energised (OFF1)TCSR.
9. After (OFF1)TCSR has operated, Check that the sequencing relay (OFF2)TCSR has operated.
10. Clear the leaving or exit track circuit(s). With both (OFF1)TCSR and (OFF2)TCSR up, Check that the (OTW)SR has picked and stuck.

    The sequence to achieve this is:

    a) RL2 operated and held by RL1 delay network (or combination QRR/RL2),

    b) RL2 operated and held by RL1 delay network,

    c) Exit track circuits occupied,

    d) Operation (sequentially) of (OFF)TCSRs,

    e) Repick of (OTW)SR,

    f) Time out of RL1/RL2,

    g) Exit track circuits clear, (OFF)TCSRs down with TPR or TZR up,

h) QNR (or FREDDY/RL2) 'Normal' to allow stick up of (OTW)SR,

i) Single line section clear, following full 'OFF' sequential control.

11. Check with the signaller that upon restoration of indication and route controls that the single line section shows 'Clear'.

12. Ask the signaller to set a signalled route onto the single line section.

13. Check that the 'onto single line' signal is showing a proceed aspect.

14. Repeat as above for 'train onto single line'.

15. Check with the signaller that the single line indication shows occupied after:

a) 'Onto single line' signal has been cleared and berth/approach track circuits occupied,

b) FREDDY operating sequence,

c) 1st wheel replacement of 'onto single line' signal following occupation of track circuits,

d) FREDDY sequence complete and track circuits clear,

e) 'Train on Branch' indicated at the signal box,

f) Either sectional route release or TORR occurs to clear USR locking and route control normalised,

g) Check that another functioned route to the single line will be locked out with the branch occupied.

16. Ask the signaller to clear the 'exit from single line' signal (in certain cases this may be approached released by the exit track circuits)

17. Drop the exit track circuits and Check the 'exit from single line' signal clears to a proceed aspect.

18. Operate FREDDY.

19. Simulate a train off the single line by occupying and clearing track circuits,. Check that 1st wheel replacement replaces the exit signal to red.

20. With FREDDY normal, Check the state of the single line indication with the signaller following final clearance of the exit track circuits (ahead of the FREDDY in direction of travel).

These are the 'onto single line' track circuits. steps 11 to 14.

21. Check that single line indication shows clear.

22. Check that sectional route release has started. (It may not be possible for the technician to fully function to next controlled signal to restore.) Either clear out by above or TORR or wait independent route JRs to operate to clear to allow points to be called again to the 'Main' or normal positions.

23. Record the installation dates of the sensor and RL1/RL2 relays (maximum 10 years between re-servicing).

4.2 TOPS Presence Detectors Used in Connection with Wagon Transponder Pads

1. Monitor RL2 relay for each FREDDY using spare contacts with the meter set to DC Volts.
2. Run a dummy wheel across the sensor in the direction of the arrow on the sensor.
3. Check that the green LED lights and the yellow or orange LED remains extinguished.
4. Record the sensor relay voltage from the display.
5. Check that the mechanical indicator flag of the sensor relay operates to indicate a change of state and the presence of a flange has been recorded.
6. Check the operation of RL1 relay and from the meter. Check that the front contacts of RL2 are made (typical value 24V DC).
7. Check and Record the servicing dates of RL1, RL2 and the presence relay in the sensor. (Maximum 10 years between re-servicing)
8. Check and Record the time delay factor of RL1 relay is between 6 and 8 seconds before the green LED extinguishes.
9. Repeat for all FREDDYs for each direction.[i.e. 2+2 or 1+1 if detected directionally 1 rail only, then correspondence becomes 1+1, and 1+1].
(SEE LAYOUT PLAN TO ASCERTAIN CORRECT SEQUENCE)
10. Check with the Bunker operator for each FREDDY function that 'Presence' has been recorded. Ask the operator to cancel the wagon indication. (At some sites this may not be possible, in which case, wagon presence may be counted out again by operation of the opposing direction FREDDYs)
11. If the number of 'wagon axles' does not correspond to the Bunker operators' display there may be a transponder fault. This shall be reported to the infrastructure owners.
12. Close and secure all FREDDY units on completion.

4.3 Sequence Power Supplies to FREDDYS

4.3.1 For OTW Circuits or Barrier Exit Treadles

1. Check that the single line section is clear and all controls are restored to normal.
2. Remove or fail power supply to the FREDDY.
3. Check that the signaller's display shows 'Train on Branch' and the (OTW)SR has de-energised.
4. Check that both LEDs are extinguished.

5. Restore power supplies. Check that the green LED is illuminated and the orange or yellow LED is extinguished.
6. Record the time from power failure to power restored by observation of the single line indication. Check this is as specified.
7. During this time period, Check that all signal routes on and off the single line are barred.
8. Following completion of the timing out period Record the JR time.
9. Check that the single line indicator shows clear and that all applicable route controls have timed out or have been restored.
10. Check that the (OTW)SR has re-picked either as part of the JR circuit or upon FREDDY reconnection, and that the (OFF1)TCSR and (OFF2)TCSR are down with all track circuits applicable to controls clear.

4.3.2 For All Control Types

1. Measure the ripple voltage of the FREDDY PSU output with a suitable meter. Check that this figure is less by 10% of the overall voltage figure.
2. Measure and Record the PSU voltage. This must be between 22V DC and 30V DC
3. Measure and Record with a current clamp the passive current of the FREDDY from the PSU. The limits are 15 to 115mA when operated.
4. For power derived set for FREDDY, Check and Record both B and N legs for earth fault currents, using the values given in the appropriate EARTH TEST (DC) or EARTH TEST (AC).
5. Where secondary cells back the PSU, disconnect the charger and Record the On and Off voltages over a 5 minute period.

It is not recommended that a current or voltage limit shunt is applied to the cells to prove the 'Fail' LED ranges. If the cells are poor and the overall voltage falls to below 22V then the orange or yellow LED will illuminate and the operational system will fail as designed to protect.

6. Check with a suitable meter the FREDDY bus bars for earth fault currents using the values given in the appropriate EARTH TEST (DC) or EARTH TEST (AC).
7. Check and Record the charging rate of the cells using a current clamp.
8. Check that the charger cuts in to maintain cells if not a CV type.

End

1. General

This test is to check that TFM outputs operate correctly after a reset following the loss of output interface.

2. Test

After a reset has taken place:

a. Check correct operation by observing the indications on the TFM.

b. Check that all outputs fed from a Signal TFM operate correctly (e.g. aspect feeds, inductor feeds, relay feeds and ATP feeds);

Or

Check any Points fed by a Point TFM, by calling them Normal and Reverse.

End

1. Test

a. Check by operating levers that locking conforms to the mechanical locking table.

Spare and out of use levers with locking still attached shall be included in this test.

b. Check that locking is not slack and there are no irregular releases.

c. During the Mechanical Locking Function Test each successful test shall be recorded on the locking table. It is not essential to have an unmarked locking table before starting a Mechanical Locking Function Test, but there should be room for additional marks which must be made in a different colour from previous marks. Any locking table extract produced for testing purposes shall require independent checking by a competent person.

End