

Category 2 Standard

S2541

(Formerly E7159)

Maintenance of track circuits

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1 Purpose

- 1.1 This standard defines the minimum maintenance requirements for track circuits and associated equipment used on London Underground.

2 Scope

- 2.1 The standard covers 'traditional' track circuits used on London Underground, but does not address the maintenance of rail circuits such as 10kHz overlay rail circuits or de-energised rail circuits using blockjoints - these are the subject of engineering standard S2538, Rail circuits - maintenance standard. Basic functional tests for FS series Jointless Track Circuits are described, but installation documentation and Operation and Maintenance manuals must be consulted for detailed setting up and maintenance instructions for the particular JTC involved. Workshop overhaul is not covered by this standard.
- 2.2 It is not normally intended to define methods or tests, but where the standard does so it is for particular reasons and the Asset Steward shall adhere to those methods.
- 2.3 The primary user of this standard shall be the Asset Steward.
- 2.4 This issue replaces E7159 A3 and TLL-ENG-S7253- A1, which are withdrawn.

3 Requirements

3.1 Planning requirements

- 3.1.1 Asset Stewards shall devise maintenance regimes by which track circuits are maintained in a safe and effective state. The regime shall define the frequency or other criteria for maintenance and the tasks to be carried out.
- 3.1.2 The Asset Steward shall develop and utilise a method of verification to monitor the effectiveness of the maintenance regime at regular intervals.
- 3.1.3 Any changes required to the maintenance regime, whether identified by the verification process, or for any other reason, shall be managed in accordance with the requirements of S1538 Assurance.

3.2 Inspection requirements

- 3.2.1 Asset Stewards shall ensure that planned inspections of track circuits are undertaken covering the following key areas;
- a) mechanical integrity and fitness for purpose;
 - b) unobstructed accessibility;
 - c) interior and exterior cleanliness;
 - d) legibility of identification plates and labels.

3.3 Performance requirements

The Asset Steward shall ensure that the maintenance regime achieves the following condition requirements;

3.3.1 Condition of trackside equipment

- a) all track, pigtail, jumper, bond, and segment earth connections and any artificial ballast resistance, stabilizer or immunisation filter circuits are correctly installed in accordance with the appropriate design schemes, are secure and undamaged;

Note: Many connections have safety critical functions as well as reliability consequences if improperly maintained. For example:

- 1) Continuous rail jumpers, which ensure that sections of track are not electrically isolated from the track circuit;
- 2) Tunnel earth bonds, which provide safety earthing of the train chassis;
- 3) FS2500/2550 tunnel earth bonds, in metal lined tunnels, which ensure shunting performance is not degraded under various failure conditions;
- 4) Traction return bonds in 3rd rail areas, which minimise the risk of spurious track circuit energisation from traction supply harmonics with a train present.

- b) any debris accumulated around track circuit equipment is removed before it causes a hazard;
- c) trackside termination boxes such as TDBs are correctly labelled, free of internal debris, and electrical connections are secure;
- d) rail heads are free from rust or other contamination;
- e) block joints are sound, free from grease, iron particles, rail strippings and other detritus and (in 3rd rail traction areas) free from damage arising from traction return current;
- f) equipment cases are secure and fit for purpose;
- g) ballast drainage is effective.

3.3.2 Condition of relays and wiring

- a) equipment such as relay locations and equipment cases are correctly labelled;
- b) there is no evidence of verdigris, moisture, carbon deposits or other detritus within the relay; contacts, contact arms and supports shows no evidence of discolouration, deterioration or presence of foreign matter.

Note: Sustained fault currents of more than a few amps through contacts of Q style relays may cause the contact fingers to distort or to discolour or both, endangering the safe operation of the relay. Reactions between silver contacts and airborne sulphur compounds can lead to the build-up of conductive powdery deposits of silver sulphide on contacts;

- c) there are no signs of damage to the relay vane, or marks on the vane to suggest that it may be fouling other parts of the relay, and that the vane falls away freely when the relay is de energised.

Note: Badly worn vane relay pivots may result in a fine brown powdery deposit on the vane spindle near the end bearings;

- d) the relay impact detector (where fitted) is not dislodged;
- e) detachable relay tops are free from debris and moisture;
- f) the relay is correctly installed and that securing devices are effective;
- g) wiring to the relay is securely terminated, in good condition, and the insulation in the vicinity of the relay does not exhibit:
 - 1) shrinkage;
 - 2) liquefying or brittle degradation;
 - 3) conductive deposits (such as green copper chloride patches).
- h) any unterminated wiring at the relay or incoming fuse position is properly protected in accordance with engineering standard S2529, Signalling and Control Systems safety critical processes and, as appropriate LU standards and associated codes of practice;
- i) there is no damage to the relay case or glass panels;
- j) the relay is within its permitted service life, as specified in the maintenance regime.

3.3.3 Operation and adjustment

- a) the track circuit relay (or other output device) de-energises whilst the track is shunted by a train, or by a suitable shunting device;
- b) the relay vane (where applicable) falls away freely;
- c) the un-shunted track circuit energisation level is correct for the particular type of track circuit, as follows:
 - 1) AC capacitor fed (conventional LU type);

The vane indicator shall be 2/3 into the 'green band' in open sections of track and 1/3 into the 'green band' in tunnel sections.

Note: Where necessary, adjustments shall be in accordance with standard S2529.

- 2) FS2500 jointless track circuit;

The monitor point voltage (MPV) must be measured using a true RMS meter capable of measuring frequencies up to 10 kHz at the defined accuracy.