Ref:	**NR/L3/SIG/11303/1D05**
Issue:	2
Date:	4 September 2010
Compliance date:	4 December 2010

Level 3 Module

Signalling Installation — Electrical Wiring: Installation Diagrams and Symbols

Endorsement and Authorisation

For endorsement and authorisation, please refer to NR/L3/SIG/11303.

This module is a reformatted version of the previous Signalling Installation Handbook with no change to the content other than correction of terminology.

It represents historic best practice which may no longer be relevant.

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Issue record

Issue	Date	Comments
2	September 2010	Reformatted version of previous document incorporating the text of the installation handbook.
1	August 2000	First issue.

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 4 December 2010.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 4 to continue to comply with the Issue of any relevant Network Rail Standards current when GRIP Stage 4 was reached and not to comply with requirements contained herein, unless the designated Standard Owner has stipulated otherwise in the accompanying Briefing Note.

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1 Introduction

As an Installer, the electrical installation diagrams you may use fall into the following categories:

- Plans and Schematics
- Circuit Diagrams and associated information
- Signal Sighting Forms
- Control Tables
- Other Engineering Details and Schedules

A complete list, telling you where to find more information about each type is given in Figure 1.

Diagrams supplied to you for installation work should be stamped INSTALLATION COPY and carry both drawn and checked initials and an issue date. The only exception to this rule is for diagrams which have been colour plotted from a Computer Aided Design system, in which case a single set of initials signify that the original has been checked and the colouring is correct. Any design details that are unchecked and issued for preliminary information, or material ordering, etc., will be stamped PRELIMINARY COPY or DRAFT COPY and will carry an issue date.

2 Plans

Plans are usually drawn to scale. They show an overall view of a particular site or area of work. For example:

Scheme Plan	Shows the general signalling arrangements for the completed scheme. It also shows the equipment to be removed.
Signalling Plan	Shows the current signalling features and identities.
Location Area Plan	Shows the position of lineside location cases and rooms. Gives their identities and areas of influence.
Cable Route Plan	Shows the position and details of the cable route. It is sometimes combined with the Location Area Plan.
Bonding Plan	Shows track circuit details such as insulated rail joints, connections, jumpers, traction bonds, cross bonds, structure bonds.
Cable Schematic	Shows the signalling cables required between cases and rooms.
Power Cable Schematic	Shows the power supply distribution.

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All plans carry a title block. The information that this contains is similar to that shown in Figure 3 except that for a Scheme Plan the Version reference is a single letter: the original being “A”, the next “B” etc.

The symbols used on plans are given in NR/GN/SIG/11004, Symbols for Plans and Sketches Used in Signalling Applications. A copy of this should be available for you to refer to when necessary. Any symbols shown dotted (but uncoloured) on a signalling plan means that the equipment has been physically removed, but the circuitry for it remains in the interlocking.

A typical Bonding Plan is shown in Figure 2.

Some bonding plans for electric traction areas are prepared jointly by the organisations responsible for designing the signalling system and the electric traction system. They include details of track circuit bonding, but also electrification requirements that will be installed by others. Generally, track circuit bonding is shown with thin lines and traction bonding with thick lines. However, for single rail track circuits, the insulated rail is depicted with a thick line and the common (or traction) rail with a thin line. See Module 2P15 for further details. Alternatively, the track circuit bonding and insulated rail may be coloured, using different colours to distinguish between adjacent track circuits.

Standards have changed over the years, so some symbols used on old plans may be different to those presently in use.

3 Circuit Diagrams – General

Circuit diagrams are detailed drawings showing the wiring connections between items of equipment. The layout of the equipment is also shown, together with various analysis sheets.

The diagrams are usually supplied in book form. They are divided into sections, each of which applies to a convenient area such as one apparatus case or equipment room.

Each diagram carries a title block as shown in Figure 3. The block includes the name and a number for identification and also gives a version reference in the Version box beneath the Sheet Number. The original diagram for the first job is called Version “AA1” and each subsequent change to this version will increase the last digit - to give “AA2”, “AA3” etc. The next alteration to that diagram (i.e. the next job) will have a different alteration letters, e.g. “AB”, giving a version reference “AB1”, with subsequent changes to that as “AB2”, etc. Referring to the example in Figure 3, the version reference indicates that that sheet applies to alteration “AD” and change “2”.

The Update Block, shown on the left of the title block, may give you to a clue as to what has happened previously. You should see the alteration letters of jobs that have been completed before yours, but note that jobs do not always happen in alphabetical order. The version of your current job will not appear here until the drawing is re-issued after the records have been updated. If you are confused by different versions of the same drawing you should consult your supervisor.

Diagrams for each area include the following:

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- Index
- Approvals & Issue Record (this shows the job description and version reference for all the alterations that have taken place in that area).
- Equipment layout for each room, rack and frame.
- Wiring to be installed (or recovered) between all the pieces of equipment.
- Tabulations showing the usage of various contacts, terminals, fuses and links. This is known as the “Analysis”.

4 Circuit Diagrams – Wiring Symbols

Signalling circuits use special symbols to represent the various pieces of equipment. The wiring is drawn in a standard way.

You need to be able to read and understand the diagrams in order to carry out your installation work. An outline of the basic principles is given here. If you need help in understanding any diagram, ask your supervisor for assistance.

The symbols used on circuit diagrams are given in NR/GN/SIG/11205, Symbols for Signalling Circuit Diagrams. A copy of this should be available for you to refer to when necessary. In general, the following rules apply:

- Wires are shown as full lines connecting one termination to another.
- Functional apparatus is represented by rectangular blocks, usually with broken lines.
- Broken lines are also used to show grouping or containment, for example, the boundary of an item of equipment or terminal block. Broken lines are also used to show wiring or equipment in outline as a reminder or their existence, with full details given elsewhere. However, if a broken line is coloured green, it means the item is to be removed (see the section CIRCUIT DIAGRAMS - COLOURING).
- Contacts (of relays, plungers etc.) are always shown as “made” (i.e. drawn on the line) even if that is not their normal position.
- If possible, the whole of a circuit is shown on one sheet. This means that the termination points or contacts for one item of equipment (e.g. a relay) may be spread over numerous sheets.

5 Circuit Diagrams – Wire And Cable Size And Type

Present design standards require the installation drawings to show the sizes of all wires and cables but older drawings may not do so: some drawings only included the details of non standard wire or cable size and type.

Therefore, if the wire or cable to be used is not specified on the drawing, you should install the standard type. The standard to be used in a particular situation is detailed in the appropriate module of this handbook (see 1D15, 2E05, 2F05, or 2G10, for example). A summary of the most commonly used standards for safety signalling circuits is:

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- Single wires internal to an equipment room, location case, or signal box (but not associated with signal lever, locking frame, or block shelf areas) - not in touch with metal surfaces and run within all plastic trunking or conduit, separate from any cables, and which cannot be damaged by sharp edges or corners:
  - 0.75mm^2 wires to NR/L2/SIG/00005 Type A1, black.
- Single wires internal to an equipment room, location case, or signal box - not conforming to the previous requirements:
  - 0.75mm^2 wires to NR/L2/SIG/00005 Type A2, black.
- Multicore cables internal to an equipment room, location case, or signal box:
  - Cables to NR/L2/SIG/00005 Type A3, black, with 0.75mm^2 cores.
- External single wires (for signal repeaters, ground frames, etc.) but not on track:
  - 2.5mm^2 wires to NR/L2/SIG/00005 Type B1, black.
- External multicore cables within cable route protection and not on track:
  - Cables to NR/L2/SIG/00005 Type B2, black, with 0.75mm^2 cores (1.5 or 2.5mm^2 cores are non preferred alternatives).
- External cables for on track use:
  - Flexible cables to NR/L2/SIG/00005 Type C1 (single core) or Type C2 (multicore), black, with 2.5mm^2(f) cores.

Exceptions to the above standards will have the conductor size or wire or cable type:

- written alongside the wire to which it applies (sometimes in the form of a symbol referring to a footnote), or
- given as a general note on a particular wiring sheet or reference sheet, or
- given as a cable size and type, where the wires are part of a cable (see below).

Wires shown on signalling installation diagrams are assumed to be single wires (not part of a twin or multicore cable) unless otherwise indicated. Exceptions will have the cable size and type indicated:

- by a special note adjacent or arrowed to the wires to which it applies, or
- by a balloon round the affected wires, with the cable description added (examples are shown in Figure 7), or
- by a description or note on the link, terminal, or cable analysis sheet.

Signalling power cable will normally be:

- Cable to NR/L2/SIG/00005 Type B1 (single core) or Type B2 (2 core) for copper conductors. The conductor size will be specified on the drawings.
- Cable to BS 6346:1997 Table 8 for two core aluminium conductors. The conductor size will be specified on the drawings.

SSI wiring will normally be:

- 24/0.20 mm^2 pvc white wire to DEF STAN 61-12 Part 6, Type 3.

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