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Level 3 Module

Electrical Wiring: Wiring Up and Termination

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 Wiring – Why Do We Need It

Most signalling circuits consist of a number of components which need to be connected up. The connections usually have to be made in a particular way to achieve, for example, the correct interlocking or controls. The system allows standard units (e.g. relays) to be used but with the end result tailored to suit exactly what is needed at each site. The wiring that you install therefore:

- connects up all the various components; and
- produces the correct controls.

Always remember that each wire you connect up is part of a whole electrical system whose purpose is the safe and efficient signalling of trains. What you do and how you do it have a direct effect on that system.

The wiring that you install needs therefore to be:

- Accurate : as the designer intended.
- Identified : logically routed and labelled.
- Robust : will not fail prematurely.
- Safe : no chance of accidental wrong connections.

In other words, give your wiring “AIRS”.

2 Being Accurate

It is vital to follow the wiring diagrams exactly. This means:

- using the specified type of wire.
- connecting it to the correct termination point.
- equipment is installed to the layout drawing.

If you are given insufficient information or you have doubts about what is required, then ask your supervisor to refer the problem back to the designers.

Keep a written record in your Installation Log Book of all the problems that have been referred back to the Design Office. Note when each reply is received. See Module 1X05 for more information about the Log Book.

For your own satisfaction and as an additional safeguard, check your own work for accuracy. This applies even though you know it will be checked by others later on.

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3 Identification

The installation containing your wiring will at some later time have to be checked, maintained, and perhaps even altered. Each wire needs to be identified in some way so that what it does and where it goes can be easily seen. There are several ways of doing this, for example:

- by fixing labels to it.
- by colour coding the wires.
- by using cables (suitably labelled) to group together wires running to and from certain places.
- by “tree-ing up” wires that go to a particular place or along a particular route.

4 Labelling

See Module 1M05.

5 Colour Codes

For permanent wires and cables a standard wire colour such as black is normally used.

To distinguish between cores in multicore cables, they are usually numbered or coloured. Core numbers are usually shown on wiring diagrams. Colour codes are commonly used in Telecomms type cable and will be referred to elsewhere when necessary.

Coloured wires or cores of cables were often used in power and mains voltage feeds. This is no longer an accepted practice for railway signalling and labelled cores or wires should be used instead - red/black is not to be used for new works. The usual colours which may be found ar

:

D.C. circuits	Positive	Red.
	Negative	Black.
A.C. circuits	Line	Brown.
(Domestic)	Neutral	Blue.
A.C. circuits	Line	Red.
(Non-domestic)	Neutral	Black.
Earth wiring		Green or Green/Yellow.

Where stage or temporary work is necessary, this is installed as coloured single wires on top of the permanent wiring.

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Stagework wiring may use any of the following colours for single wires:

- Violet
- Grey
- Orange
- Blue

Single core wiring coloured red is not used for stagework as this colour is used for temporary jumpers on lineside cables suffering from core faults.

6 Routing

The basic rules are:

- Plan the routing before you start running wires.
- If the design drawings call for special routing do not deviate from that.
- Protect where possible with non metallic ducting or sheathing.
- Produce a neat and tidy result.
- Do not cut corners - make the wires sufficiently long. Exceptionally, some designs (e.g. for Reed equipment) will call for direct point to point wiring.

Avoid:

- routes that will necessitate wires being dragged along ducting or against other wires.
- sharp edges or bumps. (If these are unavoidable then protect against chafing of the insulation.)
- the fixing screws on removable units.
- apertures required for adjustments or service.
- moving parts.
- heat sources, such as resistors, heaters and hot equipment.
- metallic clips. Also any sort of clip or cleat that will cut into the insulation.

Support long lengths of wiring or cableform not run inside ducting.

If wiring needs to pass over a hinged section, keep the wiring as close to the hinge axis as possible. Route the wires so that they twist rather than bend when the hinge operates.

7 Plug-In Relay Wiring

With all new wiring, wires to plug-in relays should be of uniform length and fed from above (see Figure 6). When making alterations at existing installations, previous

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