

|                                                                                   |  |                                                                                                                                        |
|-----------------------------------------------------------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>TECHNICAL INSTRUCTION</b>                                                      |  | <b>TI 149</b><br><b>Issue 2</b><br><b>09/06/2011</b><br><b>Page 1 of 13</b>                                                            |
|  |  | <b>NETWORK RAIL - SIGNAL ENGINEERING</b><br><b>Intelligent Infrastructure Data Logger –</b><br><b>Design, Install &amp; Commission</b> |
| Relevant Standards                                                                |  | NR/L3/SIG/11231, TI 087 & NR/L2/SIG/10064 (section U033)                                                                               |

### **Purpose**

This Technical Instruction details the requirements for Design, Installation and Commissioning for the National Rollout of Intelligent Infrastructure Compliant Data Loggers. Specific test plans for activities carried out under this process are published in further Technical Instructions.

### **Scope**

The installation of permanent data loggers that are part of the national rollout of Intelligent Infrastructure (II).

### **Changes in Issue 2**

The instruction has been updated to include information on the fitment of II loggers to track circuits and signalling power supply isometer systems. A section has been added confirming the requirement of II loggers systems to be designed and installed with adherence to instrumentation engineering principles. Additionally, some terminology has been changed with cognisance given to future changes to SMTH.

### **Key Roles & Competencies**

- Overlay Diagram Preparer
  - o Experience and ability to produce overlay drawings.
  - o Understanding of the project requirements.
  - o Understanding of the operation & functionality of the logger.
  - o Understanding of the requirements of wiring a datalogger into an existing installation.
- Instrumentation Engineer
  - o Understanding of the project requirements.
  - o Understanding of the operation & functionality of the logger.
  - o Competent Instrumentation Engineer.
  - o Responsible for the approval of overlay diagrams produced in accordance with NR/L2/SIG/10064-Section NR/GI/U033.

|                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------|
| Originator's Details:-<br>Adrian Gibbs<br>Network Rail<br><a href="mailto:adrian.gibbs@networkrail.co.uk">adrian.gibbs@networkrail.co.uk</a> |
| <b>PUBLISHED UNDER NR/L2/SIG/11120</b>                                                                                                       |

\*\*\*\*\*

- Installer
  - o Understanding of the project requirements.
  - o Experience, ability and understanding the requirements of correlation of the diagrams to the installation.
  - o Experience, ability and understanding of the installation of equipment into equipment housings.
  - o Experience and ability in installation work using diagrams.
  - o Experience, ability and understanding of marking diagrams during installation work.
  - o Experience and ability with the tools and techniques required to run and terminate wiring.
  - o Experience and ability in wire counting before and after installation work.
  - o Understanding of the need for independence in accordance with SMTH.
- Tester
  - o Understanding of the project requirements.
  - o Understanding of the operation & functionality of the logger.
  - o Competent to carry out the appropriate defined checks and tests.
  - o Experience and ability to function test the final installation.
  - o Experience and ability to identify when there are discrepancies and what action to take.
  - o Experience, ability and understanding of marking diagrams during testing work.
  - o Experience, ability and understanding of the requirement to make changes to the diagrams to reflect where the installation differs from the design due to amendments during installation and seek authorisation prior to making changes
  - o Understanding that final testing diagrams need to be returned to the instrumentation engineer so that that an updated copy of the overlay drawing can be sent to update controlled drawings in accordance with TI 087.

## **Independence**

This TI requires independence between certain roles, the independence required is:

- o Overlay Drawings - shall be independently checked by the Instrumentation Engineer.
- o Installer – shall be independent from the Tester.
- o Tester – shall be independent from installer

## **Pre-Installation**

A detailed pre-installation site assessment is not necessary. General knowledge of the interlocking area together with reference to wiring diagrams using either eB Browser or office record copies should be adequate to produce site specific documentation. The following information shall be provided to the installation team:

- o Details of the Safe System of Work
- o Equipment Details
- o Installation Instructions
- o Details of disconnections and reconnections where signalling circuits are affected.
- o SMTH and installation test plans.
- o Logger overlay drawings.
- o Details of contact arrangements for notifying of site issues including authorisation of changes.
- o Contingency arrangements.

## **Overlay Diagrams & Installation**

II logger systems are purposely designed to be 'non-intrusive'; 'close proximity' monitoring is permitted, but, direct connection to signalling circuits is prohibited. Where measurements are required to be taken, these shall be made indirectly using only approved types of transducer or isolated probe and only the spare contacts of relays or purposely designed 'volt-free' contacts shall be used for monitoring purposes. The design and installation shall avoid introducing risk to wiring and equipment e.g. risk of physical damage. Where signalling circuit wires require to be extended to be routed through current transducers, the replacement wire shall be kept as short as practicably possible and adequately protected. Monitoring equipment powered from an a.c. signalling supply shall be connected via a dedicated isolating transformer unless it is confirmed that the equipment is fitted with an approved 'isolated' power supply. Power shall not be derived from any d.c. signalling supply.[NR/GI/U033] Most II logger types are fitted with power supplies approved for direct connection to a.c. signalling supplies. If in doubt consult the manufacturer's specification.

An overlay diagram, specific to each logger installation, shall be authorised by a competent instrumentation engineer. Three copies of the diagram are required:

1. The "master" office copy (to be retained by the SM&TE, can be held in electronic format).
2. Site "installation" copy (kept with the wiring diagrams).
3. The installers "record of installation".

The "record of installation" copy shall be endorsed by the installers with check marks to indicate wiring or contacts have been checked / tested / hand traced and any authorised changes. Any changes required to be made to the overlay diagram shall be authorised by the instrumentation engineer or someone to whom they have delegated their authority. Contact arrangements for authorising changes and escalating site issues shall be provided. Guidance on the production of overlay diagrams is given within this TI.

Installation work shall be carried out in accordance with the Signalling Installation Handbook, installation test plan & where the disconnection and reconnection of signalling circuits is required, appropriate SMTH test plans. Guidance on the installation of wires affecting signalling circuits is given within this TI. Guidance on the commissioning of loggers is given within this TI.

Upon completion of site installation the "record of installation copy" shall be returned to the instrumentation engineer who shall update any changes to the master record of the overlay diagram.

In order to allow for signalling records to be updated in accordance with TI087, arrangements shall be made for an updated copy of the master overlay diagram together with an amended copy of the location profile and other affected sheets to be sent to the design office. When available an updated copy of the maintenance drawings and overlay drawing shall be placed on site.

## **Guidance on the Production of Overlay Diagrams**

Contained within the TI Appendix are examples of Generic Overlay Diagram. Examples of specific overlay diagrams per Logger Manufacture and II Asset Type are available on Connect via links displayed on the Intelligent Infrastructure web page and via CCMS2. These diagrams are not to be considered absolute, they are not exhaustive, but are given as guidance and suggest the approach that should be taken so that there is consistent deployment and documentation of Intelligent Infrastructure Compliant Data Loggers across Network Rail Infrastructure.

The responsible Instrumentation Engineer shall take cognisance regional practice and check that the deployment encompasses any existing sound engineering approaches already used in the local area.

# TECHNICAL INSTRUCTION

TI 149  
Issue 2  
09/06/2011  
Page 4 of 13

The basis of the diagram is a graphical schematic of the Manufacturers Data Logger. In this section, all the relevant I/O connection names are shown. To comply with NR/L2/SIG/10064 General Instructions to Staff Working on S&T Equipment – NR/GI/U033 Use of Monitoring and Test Equipment, sufficient detail of the existing signal equipment has to be shown in the overlay diagram so to allow the data logger connection points / interfaces to the signalling system to be unambiguous. Generally this is taken to be:-

## Power Supply arrangements

This should detail the supply name, fuse / terminal number and fuse rating.

## Connections and Position of CT / Analogue Transducer

This will depend on where the CT has been designed in to measure the current, and might require the documentation of more than one wire passing through the CT depending on the type of circuit being monitored. Sometimes more than one pass of the monitored wire is required to get sufficient response from the transducer. Where a unidirectional CT is used the direction of current flow should be shown.

All connections to the analogue inputs should include function name. For example **125A WI** for 125 points motor current and **AA TR** for AA track circuit relay current.

The physical end terminations of the wire(s) passing through the CT should be shown to record the absolute position of the CT in the signalling system. For example, measuring point current with a single CT placed between the supply fuse and the relay circuitry, the fuse name and relay contact name(s) should be documented.

## Connections for digital inputs

Where the data logger is being used for event type logging these will be the primary inputs. However, they also need to be shown where the logger is using relay contacts to evaluate analogue measurement characteristics. E.g. for points the direction of movement.

All connections to the digital inputs should include relay name, contact and type of contact used. For example **125 NWKR, C1 C2, F**.

## Position of Data Logger within Relay Room, or Location Case

This is the physical location of the Data Logger within the Loc, R/R or REB

## Equipment or Component Specification

Where reference is made on the generic overlay diagram to equipment or component part numbers; the specified parts shall be used for the installation. This includes specified wire types and connectors.

## Guidance on the Installation of Wires Affecting Signalling Circuits

### Example 1): Points Motor Circuit Wires

Where wires affecting signalling circuits internal to an apparatus require to be removed from terminals the work requires to be carried out in accordance with Rule Book T1A Section 4. Where possible, arrangements may be made with the signaller to carry out this work between trains.

To allow the motor circuit wire to be routed through the current transducer, sufficient slack in the wire is required; this will usually require the affected wire to be renewed. With the agreement of the signaller, to allow the changeover of the wire to take place, the points may be restricted to the agreed position. With the appropriate measures in place, trains may continue to run over the affected points in the agreed position. Where possible, pre-plan the access arrangements with the operating department. Arrange a