



AUSTRALIAN RAIL TRACK CORPORATION LTD

Discipline: Engineering (Signalling)

Category: Standard

Testing of Interlockings – Maintenance Responsibilities

ESM-05-01

Applicability

ARTC Network Wide	✓	CRIA (NSW CRN)	✓
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Primary Source

SMP 22

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1.2	13 August 2010	All	Issued as final.

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1 Testing and Interlockings

1.1 Testing New Works and Alterations

Requirements for testing and certifying new works and alterations are detailed in Specification ESC-21-01 Inspection and Testing of Signalling – Roles and Responsibilities and Authorities.

1.2 Periodic Maintenance Interlocking Tests

Periodic maintenance interlocking tests shall be carried out by a Signal Engineer or suitably qualified person that has been accredited to test interlockings for the primary reason of checking the interlocking and ensuring that it remains in accordance with the locking tables or interlocking portion of control tables, the locking diagrams and the working sketches/signalling plans. See procedure EST-20-02 regarding the required competency to perform the testing.

The Maintenance Signal Engineer is responsible for adhering to interlocking test programs as set out in the Technical Maintenance Plan.

Copies of the Interlocking Test Certificates are to be kept in the Maintenance Signal Engineer's Office.

For mechanical and relay interlocking, form ESM0501F-01 Mechanical/Relay Locking Test Certificate should be used.

For new and altered works, form ESM0501F-02 Design Integrity/Control Table Function Test Certificate is to be used, which would also encompass the certification electrical testing of relay interlockings, inclusive of track locking.

Equipment that is permanently locked out of use is not required to be tested.

1.3 Mechanical Locking

Mechanical locks and mechanical interlocking frames are subject to wear and tear and do not have redundant interlocking.

Interlocking tests on mechanical interlocking frames of greater than four (4) levers shall be completed and certified on a S4.304A/B certificate by a suitably accredited Signal Engineer every two (2) years.

Mechanical interlocking frames of (4) levers or less shall be tested at least 4 yearly.

Note: the signalling and/or train movement overview must be visible to the Network Controller (i.e. Non Dark Territory) and the condition must meet the minimum requirement for application of the Tailored TMP maintenance periodicities otherwise the inspection and tests are to be conducted at least 2 yearly.

Locking tests are also performed to ensure that mechanical locking items (such as, releasing switch locks, annett keys, annett locks, duplex locks, half pilot staff locks, emergency locks, bolt locks, bracket locks, staff contact locks, staff drawer locks, key staffs, loose keys, emergency switch machine locks, SL and XL locks on points) are effectively operational, safe and secure, and in accordance with Locking Tables, Control Tables, Locking Diagrams and Working Sketches/Signalling Plans. A signalling maintainer may be trained and competency assessed to perform these inspections and tests.

Signalling notice boards are also to be checked as part of the interlocking certification.

1.4 Relay Interlockings

Standard relay interlockings and route control relay interlockings contain some redundancy for safety spread over the interlocking and control circuits.

Relay interlocking integrity may be reduced by mechanical deterioration of electromechanical relays or by the deterioration of circuit and/or equipment insulation through aging, termite or rodent attack, overheating, fire, lightning damage etc or by electrical leakage paths tracking across insulating surfaces.

Defects, mechanical or electrical, which hold a relay falsely energised, are likely to be brought to early attention due to the back proving or cross proving of relays or due to equipment malfunction.

However, defects of a type which result in part of the selection in an interlocking circuit being bridged out may not necessarily come to attention.

Reliable earth leakage detection equipment and bus-bar voltage leak to earth tests together with down proving of relays assist in guaranteeing the integrity of relay interlocking.

Relay interlockings shall be electrically tested and certified on a form ESM0501F-02 every five years by a suitably accredited Signal Engineer, in accordance with the locking tables or the interlocking portion of control tables except as follows.

Where the interlocking relays and interlocking circuits fully comprise:

- 1) plug-in relays; and
- 2) P.V.C. insulated and sheathed cables; and
- 3) double switched external circuits to relays used for interlocking; and
- 4) reliable earth leakage detection fitted to vital supplies for interlocking circuits;

The mechanical locking associated with relay interlocking areas, (eg., ground frames, releasing switches, annett locks and keys, E.S.M.L.'s etc), must be tested and certified at least every 4 years, if the condition is less than the minimum requirement for application of the Tailored TMP maintenance periodicities then the inspection and tests are to be conducted at least two yearly, in accordance with applicable Locking Tables, Control Tables, Locking Diagrams and Working Sketches/Signalling Plans, as described for Mechanical Locking, and the S4.304A/B certificate shall be completed.

1.4.1 Testing Interlockings

The testing Engineer must ensure that the interface used for testing does not have logic that will mask the locking performance of the interlocking. This may typically be in the form of pre-test functions in a control system that prevent a command being sent to the interlocking.

Where this is the case an alternative interface is to be used such as a hardwire local control panel. Where this is not available a local control function on a portable maintenance computer may be used.

1.5 Computer / Processor Based Interlockings

A four yearly check of the configuration of the data on all computer based signalling safety equipment is to be undertaken and recorded. This shall confirm the data and executive software versions, dates and checksums for each piece of equipment.

Where the data is on EPROM and the version details are not accessible electronically, then alternate processes to identify the version shall be applied with details documented in an Engineering Waiver.

For each Computer Based Interlocking the respective "Installed Data Form" shall be used. The delegated Signalling Manager shall issue upon request, a copy of the recorded configuration for this check. The Signal Maintenance Engineer / Manager shall record the actual configuration. Any differences shall be reported to the Configuration Manager for action.

The above processes shall also apply for coded track circuits that utilise processor based interlocking equipment. Computer based safety equipment in predictor level crossings is covered within the level crossing standards.

1.6 Periodic Maintenance Interlocking Tests

Form ESM0501F-01 is the form to be used as “Mechanical / Relay Locking Test Certificate”.

Form ESM0501F-02 is the form to be used as “Design Integrity / Control Table Function Test Certificate”

1.7 Documentation

Interlocking Tests shall be undertaken using the information on the locking requirements implemented. This is recorded in the Locking Table or Control Table. Where a Control Table is the record, this also contains other information which is not required to be tested as part of the interlocking test. The attached sample indicates the items in the Control Table that are to be tested.

As part of the preparation, the accuracy of the record is to be confirmed.

2 Appendix 1– Test Certificates (examples only)

MECHANICAL/RELAY LOCKING TEST CERTIFICATE

To be issued to the Project Manager or the responsible Signal Maintenance Engineer or Manager.

Commissioning Engineer for new works only:

Name: Signature: Date:

Purpose:

To Certify that * Mechanical / Relay locking is correct.

The * Mechanical / Relay Interlocking test at was completed and Certified correct

and are as designed, in accordance with the Locking table title / No.

Dated:

The test was completed on Date at Time

Accredited Signal Disciplinester Name: Date:

Tester Signed:

Received & reviewed by * Commissioning or Signal Maintenance Engineer or Manager

Signed: Date:

* Delete that not required

DESIGN INTEGRITY/CONTROL TABLE FUNCTION TEST CERTIFICATE

To be issued by the Commissioning Engineer.

Test Engineer Name: Date:

To be issued to: The Project Manager or the Responsible Signal Maintenance Engineer or Manager

Project/Job:

To Certify that * Design Integrity / Control Table Function Testing is correct

The * Design Integrity / Control Table Function Test at completed

and Certified Correct on at Time is in accordance

with Control Table Title / No.

Dated: and / or

Design Integrity Test / No. Dated:

Tester Engineer Signed:

Received by * Project Manager or the Responsible Signal Maintenance Engineer or Manager

Signed: Date:

* Delete Design Integrity Test where function testing is not carried out from signalling principles but directly from control table.

Engineering (Signalling) Standard - Form
 ESM-05-01 Testing of Interlocking – Maintenance Responsibilities



WORKING DRAFT

Form number: ESM0501F-01

MICROLOK CONFIGURATION DATA FORM

Interlocking Locality: Signal Job No: Circuit Book No.:

Commissioned Date: Project Name:

Remarks:

Location	Compiled File Name	Size (kb)	Date	Time	Address	Version	Checksum	Application Image CRC	Executive Version	Executive CRC

Example Only

<p>CONFIGURATION CERTIFICATION <i>(To be signed by the nominated Configuration representative)</i></p> <p>I certify that the data detailed above is a true copy of the Microlok data that is recorded in the Microlok Data configuration record.</p> <p>Signed: <input type="text"/> Name: <input type="text"/></p> <p>Position: <input type="text"/> Date: <input type="text"/></p>	<p>MAINTENANCE CERTIFICATION <i>(To be signed by the nominated)</i></p> <p>I certify that the data detailed above is a true copy of the installed Microlok data.</p> <p>Signed: <input type="text"/> Name: <input type="text"/></p> <p>Position: <input type="text"/> Date: <input type="text"/></p>
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3 Appendix 2 – Control Table example

				SHT 1 CT 192	
SIGNAL	57	ALSO SETS		TRAIN STOP	
ROUTE	57(S)	SET BY			
COMMENCE	57(S)	ASPECT	SHUNT		
FINISH	161(M)	AUTO-RECLEARING	NO	AUTO-NORMALISING	YES
REQUIRES ROUTES NORMAL	166(M). 168(M)B				
	SETS, LOCKS AND DETECTS POINTS		(@ - LOCKED AND DETECTED ONLY)	(% - OCCUPIED)	
NORMAL	103				
REVERSE	101				
	SET AND INDIRECTLY LOCKED				
NORMAL					
REVERSE					
SET POINTS IN SEQUENCE					
REQUIRE TRACKS CLEAR	C107.3A				
LEVER STICK	C107.3A		ROUTES OFF		
ROUTE LOCKING	BY TRACK CIRCUITS		AFTER USING ROUTE		RELEASED BY
	165AT. 161DT. 161CT. 161BT (168AT W 104R). 165AT. 161DT. 161CT. 161BT		166(M) 168(M)B		161BT % 90" 161BT % 90"
ASPECTS	C106.3B. C08.3AT. 161AT				
APP. LOCKED BY TRACKS					
RELEASED BY	C107.3A. C107.3B % OR SIGNAL NORMAL 120"				
REMARKS					
LOCATION CONTROL	HEXHAM / TARRO UP COAL - HANBURY JN.		DESIGNER: A.B. C		DATE: 14-09-98 03/03/2009

POINT: 103			
SET AND LOCKED BY ROUTES			
NORMAL	57(M). 57(S). 161(M). 164(M). 168(M)A		
REVERSE	162(M)A		
SET AND LOCKED BY RELEASES		SET ONLY BY RELEASES	
NORMAL		NORMAL	
REVERSE		REVERSE	
TRACK LOCKING 161AT, 164AT			
ROUTE LOCKING	ROUTE LOCKED NORMAL BY TRACK CIRCUIT	AFTER USING ROUTE	RELEASED BY
	C107.3A. C107.3B (168AT W 104N). 168BT. 168CT. 168DT	57(M). OR 57(S) 168(M)A	C107.3B % 105° 168DT % 150°
ROUTE LOCKING	ROUTE LOCKED REVERSE BY TRACK CIRCUIT	AFTER USING ROUTE	RELEASED BY
OVERLAP MAINTENANCE	BY TRACK CIRCUITS	AFTER USING ROUTE	RELEASED BY
	NORMAL	164BT	161BT % 90°
	REVERSE	C107.3B	161BT % 90°
REMARKS			
CONTROL LOCATION	HANBURY JUNCTION HEXHAM - TARRO	DESIGNER: A, B	DESIGN DATE: 14/09/1998 03/03/2000