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Level 2

Signalling Design: Module B10 -

Interlockings – Geographical Relay Interlocking Guidelines

Endorsement and Authorisation

For endorsement and authorisation, please refer to NR/L2/SIG/11201

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Issue record

Issue	Date	Comments
4	June 2011	Modularisation of handbook and guidance notes, contains content of former NR/GN/SIG/11600, Appendix F3.

Compliance

This Module is mandatory and shall be complied with by Network Rail and its contractors if applicable from 03/09/2011.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 3 (Option Selection) to continue to comply with the issue of any relevant Network Rail standards current when GRIP Stage 3 was completed and not to comply with requirements contained herein, unless stipulated otherwise in the scope of this standard.

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1 INTRODUCTION

This module describes the parameters to be considered in the design or selection of a geographical relay interlocking system.

[NR/L2/SIG/11201, Module B7](#), Section 3 laid down the requirements for interlocking controls and specified their tabulation in control tables. The application of the principles and requirements to route setting systems are summarised in [NR/L2/SIG/11201, Module B7](#), Section 7. This module demonstrates how those controls may be provided by the use of geographical relay systems. Figures:1 to 6 identify how the standard controls are applied to some common geographical interlockings and enable a comparison with the other interlocking systems.

2 GENERAL DESCRIPTION

A geographical relay interlocking (GRI) is a system for the control and interlocking of railway signalling functions by means of relays packaged in sets or units that are associated with specific signalling functions, such as points and signals, and to which connections are made in a systematic manner. The system should be adaptable for the signalling of layouts of a wide range of size and complexity. This may be accomplished by the use of a variety of sub-sets that may be connected in different configurations to form a customised signal set or point set, and thus reduce the number of relays required.

The wiring within the relay sets may be contained and sealed so as to be inaccessible to a maintainer, provided that suitable access is given to change relays, make inter-set connections and perform tests to identify failures. Such relay sets should be regarded as unalterable.

Relay sets should be identified with a code number. Sets that are regarded as unalterable should also bear a modification state. All such sets of a particular code number and modification state should be identical. If a set is required to have different relay pin codes, e.g. for timing purposes, this should be identified with a different code number.

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R O U T E R E Q U I R E S	Points Set or Free		Track Circuit	Routes and Sectional Route Locking Normal	Sectional Route Locking Released by Track Circuits Clear OR Occupied		Time \$46	Special Controls/Remarks										
	Normal	Reverse																
	Proves NZLPR * up (no reverse call) in the exit signal (M) or (S) UNR (initiation level).	Proves RZLPR * up (no normal call) in the exit signal (M) or (S) UNR (initiation level).			TPR of per- missive track to pick up appropriate UNR in exit set.	UNR proves opposing route stick (SR) up in each unit (no opposing route set).		Route APR up and UR down, plus SRs repicked to release the route locking.	Free-wired TJPR of permissive track to repick permissive track SR.	In the route (M) or (S) UNR, as appropriate.								
								Route Disable Control Provided										
S I G N A L C O N T R O L S	Points Set and Locked and Detected		Points Set & Detected N or R	Track Circuits Clear				Track Circuits Occupied										
	Normal	Reverse																
	NWCR (proves detection, LR down and contactors down) in the HR.	RWCR (proves detection, LR down and contactors down) in the HR.		(NWKR or RWKR) to pick up the HR, with free-wiring to hold it up while points swing.	TPRs in the HR line (proving level).				TPR or timer in the HR, chosen by appropriate straps or free-wiring in the entrance set, conditioned by the appropriate UR.									
R E Q U I R E S	Signals Alight	Track Circuits Occupied for \$40 to Inhibit Replacement	Stick Control Applied When Signal Off & Track Circuit Occupied		Special Controls/Remarks		A S P E C T I O N A L I G H T	Route Indication Alight	Aspect to be Shown	Next Main Signal:		Track Circuits Occupied						
	ECPR in the HR line.	Aspect Disable Control/Link Provided	Automatic Working Facility Provided	A W S	Permanent Magnet					A W S	Fed via UR(2) and UECR in the entrance set.		Aspect	Route Set	Banner Aspect			
													Free-wired meshed circuit.					As above.
A P P R O A C H L O C K I N G	Approach Locking Applied When Signal Clears (or Attempts to Clear or to Show a Route Indication) Unless Track Circuits are Clear		Signals ON and Free of Approach Locking		Approach Locking Released by Signal ON and Track Circuits		Time \$46		Special Controls/Remarks		T O R R							
	Approach locked when signal clears.				Options selected in the entrance set, using stored conditions in ASR, and proving signal SR down, to pick APR.		JR in the entrance set.											

Figure 1 – AEI-GRS/ScR Geographical Interlocking System - Signal Route & Aspect Controls

* the NZLPR was named RUPR and the RZLPR was named NUPR in the AEI-GRS system

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	Requires Track Circuits Clear	Set by Routes or Ground Frame	Requires Routes & Sectional Route Locking Normal or Points/GF	Sectional Route Locking Released by			Swinging Overlap Requires				
				Track Circuits Clear	Track Circuit OR Occupied	Time \$46	Track Circuits Clear	AND	Points Set or Free	OR	Routes & Sectional Route Locking Normal
POINTS CALLED N > R	N > R Disable Control Provided	NWUR(s), energised at the completion level, pick the NWR. Overlap setting uses the ZUR.	The LR requires all route sticks (UP and DN SRs) and LZRs (overlap route sticks) in the point set energised. These are de-energised at the locking level of the opposing route.	Route sticks latching up after signal on and set TPR clear.	Free-wired berth TJPR.		Free-wired TPRs cut into the ZUR.		Free-wiring cut into the ZUR.		The (M)UNR in the exit set extends the completion level feed to pick the ZUR.
	Set TPRs in the LR. Foul track circuits need additional wiring between point sets.										
POINTS CALLED R > N	As above.	The RWUR, energised at the completion level, picks the RWR.	As above.	As above.	As above.		As above.		As above.		As above.
	R > N Disable Control Provided										
TIME OF OPERATION LOCKING	EFFECTIVE	When Routes Used				RELBY	Tracks Clear or		Tracks Occupied	\$8	Secs
		Applies a control: (overlap route normal, - - - to the common leg of the point lock circuit.					--- OR berth track clear, -----		OR occupied -----	for a time)	

Figure 2 – AEI-GRS/ScR Geographical Interlocking System - Point Controls

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R O U T E R E Q U I R E S	Points Set or Free		Track Circuit	Routes and Sectional Route Locking Normal	Sectional Route Locking Released by Track Circuits Clear OR Occupied		Time \$46	Special Controls/Remarks				
	Normal	Reverse						Free-wired as appropriate.				
	NSAR up in the point set cut into the selection level. Flank points cut into the NSAR.	RSAR up in the point set cut into the selection level. Flank points cut into the RSAR.	B TPR in the exit set (ZXR or CXR).	NLR up in the entrance set. XLR up in the exit set. USRs up in the point sets. Set URs cross proved in the entrance set for different class routes normal.	NLR up in the entrance set, plus USRs in the point sets. LCR in the countermove set.							
								Route Disable Control Provided				
S I G N A L C O N T R O L S	Points Set and Locked and Detected Normal Reverse		Points Set & Detected N or R	Track Circuits Clear				Track Circuits Occupied				
	NWCR and NUCR in the first and second aspect lines in the point set.	RWCR and RUCR in the first and second aspect lines in the point set.	OCR in the exit set cut into the first and second aspect lines.	Set TPRs cut into the GR lines, i.e. A1 line (first aspect line). Flank tracks are free-wired to the set links.				TPR or timer in the first aspect line.				
R E Q U I R E S	Signals Alight	Track Circuits Occupied for \$40 to Inhibit Replacement	Stick Control Applied When Signal Off & Track Circuit Occupied	Special Controls/Remarks			ASP	Route Indication Alight	Aspect to be Shown	Next Main Signal:		Track Circuits Occupied
	Set ECPR in the first and second aspect lines.		SR in the GR lines (entrance set).	Free-wired as appropriate.			SE	Fed via set URs and UECR.		Aspect	Route Set	Banner Aspect
												As above.
		Aspect Disable Control/Link Provided	Automatic Working Facility Provided	AW	Permanent Magnet		AW					
				S	Electro-Inductor		S					
A P P R O A C H L O C K G.	Approach Locking Applied When Signal Clears (or Attempts to Clear or to Show a Route Indication) Unless Track Circuits are Clear		Signals ON and Free of Approach Locking	Approach Locking Released by Signal ON and Track Circuits		Time \$46	Special Controls/Remarks		TORR Requires Approach Locking Free and Tracks			
	Free-wired ATSR circuit (equivalent to TAR). Compound circuit for sections in rear ATSRs conditioned on point lock relays.			ALZR (equivalent to TASR) and the first track clear in series in the entrance set ALSR.		ALJR in the entrance set.			NSR in the ULCR feed path and the NLR pick up.			

Figure 3 – AGS/SGE/GEC Geographical Interlocking System - Signal Route & Aspect Controls