Engineering Procedure

Signalling (Manual J)

CRN SP 052

GRADE CROSSING PREDICTOR

Version 1.1

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Document control

Revision	Date of Approval	Summary of change
V1.0	July 2011	New (not previously published)
V1.1	June 2015	Update to reflect CRN processes and Personnel structure

Summary of changes from previous version

Section	Summary of change

Contents

1 Introduction

Level Crossing Predictors, or Grade Predictors are used widely within the John Holland Rail Country Regional Network (CRN) as they generally provide the most economical warning systems for level crossings.

Varying train speeds on the line (an example would be a fast passenger service compared to a slow moving freight train) can be accommodated by the Level Crossing Predictors this produces relatively constant warning times for the approach of the different types of trains to the level crossing. Road user confidence is strengthened in that the warning times at a level crossing for approaching trains as excessive warning times are minimised.

There are two types of level crossing predictors approved for use on the CRN network; the Safetran systems GCP series and the GETS HXP series. Both systems employ two basic sensing means to control the warning systems.

The island track circuit is a track circuit that covers the track through the roadway and a short section to both sides. This track circuit is usually a high frequency (3 – 10 kHz) AC overlay which causes the crossing control to be in the alarm state whenever it is occupied.

Where the train speeds are relatively similar and there are no holding sections provided, a motion detection activated crossing may be used. This is to avoid the complications that arise countering train acceleration within the approach sections when prediction is used. To suit this arrangement the warning time of the slowest train to be encountered must not be longer than the design warning time + 10 seconds. The directional logic provided within the predictor may be used to ensure that tail ringing does not occur.

Level crossing predictors are ideally suited to open track conditions where trains stopping or shunting within the approach sections is not anticipated. Hybrid systems using level crossing predictors, fixed signals and track circuits designed to overcome problems cause by stopping or shunting are acceptable. The design must ensure that short warning times are eliminated and excessive operation of the level crossing minimised. Level crossing predictors should be the first choice for level crossing warning systems except where the following applies.

- There are less than 500 gross tonnes per week in train use of the line
- There are complicated shunting movements and the controls for the level crossing to prevent excessive operation or short warning times could be more effectively and economically accomplished by the use of fixed signals with fixed approach length control
- Where trains regularly terminate or stand for periods greater than 1 minute and this is within the last 50% of the nominal level crossing approach section

2 Rectification and Maintenance Activity

2.1 Introduction

This section addresses the requirements for recalibration following maintenance or track work operations.

2.2 Maintenance replacement of level crossing predictor modules

Depending on the nature of the replacement undertaken the level crossing predictor may prompt a complete recalibration of the entire system or a new setup for the particular module employed. The manufacturers' documentation should be consulted whenever a module is replaced. In the case of a prompted setup for a prediction track or island track; the calibration procedure for the track concerned in the manufacturers' documentation must be followed.

If the predictor prompts the reset of all functions to default values then all of the values given on the record card or circuit book must be re-entered. In all cases where a module has been changed in the predictor or it has been powered down all the setup values must be checked for compliance with the record card for the site. The recalibration or reset of the functions must not be undertaken with a train present.

2.3 Inspection of the Track Covered by the Level Crossing Predictor

The signal maintainer shall ensure that the length of the approach sections has:

- Track construction that is relatively consistent through the length of each prediction track,
- Any mechanical joints are correctly bonded out,
- All required insulated joints are in place,
- All couplers, shunts and dummy loads are in place and of the correct values and
- There are no extraneous connections to track or between the rails

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2.5 Maintenance replacement of leads, bonds, couplers, dummy loads or shunts

Where replacement of track equipment is required due to a defect the following must be followed

- Replacement of a single bond, track lead connection, shunt or coupler can be made without a track setup being undertaken provided the track voltage setup parameters as displayed on the level crossing predictor are unchanged from those on the record card.

- Replacement of a pair of track connections or a dummy load requires that a full track setup be undertaken for the track/s concerned including a linearization adjustment.
- If a temporary bond is added around a rail defect this is to be treated as for the failure of a single bond.

2.6 Maintenance attendance after track works

Where replacement of rail or upgrade of track occurs the following procedures must be applied**:**

- Replacement of a single rail, removal of bonded out joints or minor sleeper replacement can be made without a track setup being undertaken provided the track voltage setup parameters as displayed on the level crossing predictor are unchanged from those on the record card.
- Upgrade of a section of track requires that a full track setup be undertaken for the track/s concerned including a linearization adjustment.

3 Recording of set up values for Safetran Grade Crossing Predictors

The correct time and date are to be set in each level crossing predictor and the following sets up values are to be shown in the circuit book:

- Set Warning time
- Daylight saving time (N)
- Password enable/disable (E)
- Password
- Master slave operation (if required)

For each track controlled the following is to be given:

- Island Track frequency
- Island length
- Track name
- Length (ft)
- Prediction sense frequency
- Uni/Bidirectional
- Predictor/motion sense settings
- DAX offset (if applicable)
- UAX pickup delay (as required)
- ENA/UAX2 enable or pickup delay (as required)
- Switch to MS at EZ level (default 25)
- Enhanced detection (on/off)

4 Specific requirements for GETS HXP level crossing processors

The correct time and date are to be set in each level crossing predictor and the following set up values are to be shown in the circuit book:

- Set Warning time
- Daylight saving time (N)
- Password enable/disable (E)
- Password
- Master slave operation (if required)
- Auto RX (disabled)

For each track controlled the following is to be given:

- Prediction track frequency
- Approach track length (ft (m))
- Uni/Bidirectional
- CW/MD mode (CW)
- Advanced pre-emption (default 0)
- CWE warning time (default 0)
- Island Track frequency
- UAX pickup delay (as required)
- Offset distance (ft (m))
- MD restart setting (RX value)
- Sudden shunt zone setting (default 75)
- Post joint detection Rx value (o)
- Post joint detection timer (0)
- Positive start value (default RX value for 250m)
- Positive start timer (99)
- Any other special setup required for the application

Appendix A GE Harmon HXP-3 Forms

Grade Crossing Location Record

Cabinet Number (Option 90)_____

Location _____ Milepost_____ DOT_____ Date___ / ___ /___

Operating Program HPN _____ Version_____

System Monitor Program HPN _____ Version_____

Hardware Settings

Track 1 Master ☐ Slave ☐ RSI module frequency 4 kHz ☐ 8 kHz ☐

RSI LOS Jumper 0 ☐ 1 ☐ 2 ☐ RSI Fault jumper 0 ☐ 1 ☐

Approach configuration switch position: Normal ☐ Short ☐ Very Short ☐

Track 2 Master ☐ Slave ☐ RSI module frequency 4 kHz ☐ 8 kHz ☐

RSI LOS Jumper 0 ☐ 1 ☐ 2 ☐ RSI Fault jumper 0 ☐ 1 ☐

Approach configuration switch position: Normal ☐ Short ☐ Very Short ☐

Adjust Select Adjustments

No.	Adjustment	Default	Range	Track 1	Track 2
1	Approach Length	9,999	250 - 9,999	feet	feet
2	Warning Time	99	23 - 99	seconds	seconds
3	LIA	0	-9 to +9		
4	TC (1step = 32)	0	0 - 9		
5	MD Restart	99%	0 - 99	RX	RX

Option Adjustments

No.	Adjustment	Default	Range	Track 1	Track 2
1	TK-ENA*	UP	UP or dn	UP ☐ dn ☐	UP ☐ dn ☐
2	TK FO	0	84 - 999	Hz	Hz
3	CW/MD	d	C or d	C ☐ d ☐	C ☐ d ☐
4	UNI-BI	b	U or b	U ☐ b ☐	U ☐ b ☐
5	NBS-C	0	0 - 99	RX	RX
		9,999	RX dependent	feet	feet
6	CWEWT	80	0 - 80	seconds	seconds
7	LOS	16	4 - 99	seconds	seconds
8	IJ-LOS	5	3 - 99	seconds	seconds
9	BC	Frequency dependent	50 - 250		
10	P-COMP	0	0 - 10	degrees	degrees

AX Adjustment Options

	Default	Range	Option 11 - AX1	Option 12 - AX2	Option 13 - AX13
TK-ASN		1, 2, both	1 ☐ 2 ☐ both ☐	1 ☐ 2 ☐ both ☐	1 ☐ 2 ☐ both ☐
OF-TK1	0	0 - 9,999	feet	feet	feet
OF-TK2	0	0 - 9,999	feet	feet	feet
WT	99	23 - 99	seconds	seconds	seconds
MD-RST	99	0 - 99	RX	RX	RX
CW/MD	d	C or d	C ☐ d ☐	C ☐ d ☐	C ☐ d ☐
CJ-LOS	0	5 - 99 (0 = TTC)	seconds	seconds	seconds
PJ-DET	15	4 - 99	seconds	seconds	seconds
PJ-RX	15	15 - 80 (0 = disable)	RX	RX	RX
POS-ST	dn	UP or dn	UP ☐ dn ☐	UP ☐ dn ☐	UP ☐ dn ☐

No.	Adjustment	Default	Range	Track 1	Track 2
17 MDR-AX	OF-TK1	0	0 - 9,999	feet	
	OF-TK2	0	0 - 9,999		feet
	CJ-LOS	0	5 - 99	seconds	second
	PJ-DET	15	4 - 99	seconds	second
	PJ-RX	15	15 - 80 (0 = disable)	RX	RX
18	MD-TMR	10	10 - 99 (0 = disable)	minutes	minutes
19	MIN-WT	0	23 - 99 (0 = disable)	seconds	seconds
20 FS-DET	FS-RX	0	0 - 80 (0 = disable)	RX	RX
	FS-TM	10	0 - 99	minutes	minutes
21 POS-ST	POS-RX	0	0 - 80 (0 = disable)	RX	RX
	POS-TM	0	0 - 99*	minutes	minutes
22 AR	AR-RX	0	0 - 80 (0 = disable)	RX	RX
	AR-TM	10	0 - 99	minutes	minutes
47	ATO-RX	dn	UP or dn	UP ☐ dn ☐	UP ☐ dn ☐
48	PF	UP	UP or dn	UP ☐ dn ☐	UP ☐ dn ☐

* 0 = disable, 99 = continuous

Shunt Record

Approach 1		No Shunt		100% Shunt		50% Shunt		LIA Added
		RX	Phase	RX	Phase	RX	Phase	± 1 to ± 9
Track 1	Normal							
	Standby							
Track 2	Normal							
	Standby							
Approach 2								
Track 1	Normal							
	Standby							
Track 2	Normal							
	Standby							

Appendix B History Card GE Harmon HXP-3