

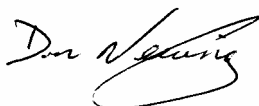
DIS-145

MCB Level Crossing Controls

Issue 4

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This document contains 32 pages and was approved (subject to minor amendments now incorporated) by SSISPG at the meeting of 12th December 2007.

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1. DOCUMENT STATUS

This is an approved SSI Signalling Principles Group (SSISPG) discussion paper. Draft 3 was approved at the SSISPG meeting on 12th December 2007, subject to minor amendments incorporated in issue 4.

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3. INTRODUCTION

This document has been produced for the approval of MCB level crossing interfaces to be used on the Colchester – Clacton and other projects. The methods are derived from those originally used on Leeds North West, and subsequently used on other projects such as Woking-Surbiton and Nottingham. Details have been updated to the latest MCB typical circuits X70000-series drawings, dated 07/04/2007.

This paper details the interfaces required for an MCB crossing with CCTV -monitoring, auto-lower, auto-raise, absent control, and bi-directional working. The appropriate interfaces should be omitted where a particular feature is not required. An annotated extract of the MCB typical circuits, showing the interfaces required, is given in appendix B for reference. This should also be referred to for the applicable layouts.

The level-crossing circuits need to be interfaced to the SSI for interlocking purposes. It is strongly recommended that the interface TFMs should be housed inside the crossing REB, for reliability and to avoid having to repeat the TFM output relays into the crossing REB.

In addition, the SSI may, optionally, also be used as the transmission medium between the signalbox and the level-crossing for the crossing controls and indications, saving the provision of a separate TDM system and telecom channel.

Exactly what interfaces are required will depend on the method of control, method of train detection, and crossing features to be implemented. However, a typical TFM analysis is given in appendix A.

Where (X) appears in the data, this should be replaced by the two or three letter abbreviation for the crossing name. Note that the typical circuits do not include the level-crossing name in the relay titles, and this convention is followed for the SSI TFM outputs. However, as an SSI may interface to two or more MCBs, the SSI latches must include the appropriate level-crossing name, and this convention is followed for the TFM input names.

4. TRANSMISSION OF CONTROLS

For a CCTV crossing, the control circuits (shown on sheet X70021) may be transmitted in one of three ways:

4.1 Controls via SSI, with TFMs at the Signalbox

With this method, the SSI forms the transmission link between the signalbox and the crossing. The button and switch contacts are input into TFMs at the signalbox, and output via TFMs at the crossing.

In order to minimise transmission delays, each output TFM at the crossing should ideally be numbered such that its OPT data is processed in the same or next minor cycle as the IPT data for the corresponding signalbox input TFM. Two pairs of TFMs should be numbered half a major cycle apart, with the STOP function transmitted through both pairs of TFMs, in order to further reduce the transmission delays of this function. So, for example, on an LDT system, the input TFMs at the signalbox might be numbered S01 and S33, and the corresponding output TFMs at the crossing numbered S04 and S36.

To minimise the processing time, the outputs are controlled directly from the IPT file, as shown below.

*I01

```

                                     /7 not used
                                     /6 not used
                                     /(PIC)NPR
if G s 5 then G04 s 7 \
if G s 4 , G c 3
    <locking conditions, see section 8.1>
then G04 s 6 \
                                     /(MAN RAISE)NPR
if G s 3 then G04 s 5 \
                                     /(AUTO RAISE)NPR
if G s 2 then G04 s 4 \
                                     /(MAN LOWER)NPR
if G s 1 then G04 s 3 , G36 s 4 \ /(STOP A)NPR
if G s 0 then G04 s 2 \
                                     /(CC)NPR

```

. /end of tgm 01

*I33

```

                                     /7 not used
                                     /6 not used
if G s 5 then G36 s 7 \
                                     /(CAM 1)NPR
if G s 4 then G36 s 6 \
                                     /(CAM 2)NPR
if G s 3 then G36 s 5 \
                                     /(AUTO LOWER)NPR
if G s 2 then G36 s 4 , G04 s 3 \ /(STOP B)NPR
if G s 1 then G37 s 7 \
                                     /(DAY)NPR
if G s 0 then G37 s 6 \
                                     /(WIPER)NPR

```

```

"L(X)(ALOWER) 3                                     /(AUTO LOWER)NPR(a)
if G c 3 then S101 clear auto , S102 clear auto \ (a)

```

. /end of tgm 33

*I34

```

                                     /7 not used
                                     /6 not used
if G s 5 , G c 4 then G37 s 5 \ /(ABS)NPR
if G s 4 , G c 5
    <locking conditions, see section 8.1>
then G37 s 4 \ /(ABS)RPR

```

. /end of tgm 34

(a): disabling auto-lower to also disable signal auto buttons, where required. See section 9.3.

4.2 Controls via SSI PMUX

With this method, the SSI again forms the transmission link between the signalbox and the crossing. However, in this case, the button and switch contacts are input into the SSI PMUX in the conventional manner, and used to control the TFM outputs at the crossing. This method gives a slightly better response time than using TFMs at the signalbox, but cannot be used with VDU-controlled SSIs (as they have no PMUX).

In order to minimise transmission delays of the STOP function, this should again have duplicated outputs, one from each TFM, with the two TFMs numbered half a major cycle apart.

As the PMUX is effectively a TDM system, a (CC)CR control is required, which must be output on the same TFM as the (CC)NPR.

Note: this method of using two STOP outputs at the crossing replaces a previous arrangement, which had TFM and PMUX inputs in parallel at the signalbox controlling a single STOP output at the crossing.

Buttons requiring an immediate response are processed in PBK data:

PBK data

```

B(X)(PIC)TM s    =Q(X)(PIC)
B(X)(RAISE)F s   =Q(X)(RAISE)
B(X)(STOP)F s    =Q(X)(STOP)
B(X)(LOWER)F s   =Q(X)(LOWER)
B(X)(CC)F s      =Q(X)(CC)N
B(X)(CC)TM s     =Q(X)(CC)C

```

Processing of the button being released is done in POD data. Likewise, processing of switch positions is done in POD data, so that the latches are brought into correspondence with the switch positions after interlocking start-up. Although these

requests will not be logged on the Technician's Terminal, the corresponding TFM outputs will be.

POD data

/Picture

```
if B(X)(PIC)TM s , L(X)(PIC) xs then =QX(X)(PIC) \ .
```

/Manual / Auto Raise

```
if B(X)(ARAISE)N s , L(X)(ARAISE) xs then =Q(X)(ARAISE)N \
if B(X)(ARAISE)R s , L(X)(ARAISE) s then =Q(X)(ARAISE)R \
if B(X)(RAISE)F xs , L(X)(RAISE) s then =QX(X)(RAISE) \ .
```

/Stop

```
if B(X)(STOP)F xs , L(X)(STOP)F s then =QX(X)(STOP) \
```

/Manual Lower

```
if B(X)(LOWER)F xs , L(X)(LOWER) s then =QX(X)(LOWER) \ .
```

/Crossing Clear

```
if B(X)(CC)F xs , L(X)(CC)N s then =QX(X)(CC)N \
if B(X)(CC)TM s , L(X)(CC)C xs then =QX(X)(C C)C \ .
```

/Wipers

```
if B(X)(WIPERS)N s , L(X)(WIPERS) s then =Q(X)(WIPERS)N \
if B(X)(WIPERS)R s , L(X)(WIPERS) xs then =Q(X)(WIPERS)R \ .
```

/Floodlights

```
if B(X)(DAY)N s , L(X)(DAY) xs then =Q(X)(DAY)N \
if B(X)(DAY)R s , L(X)(DAY) s then =Q(X)(DAY)R \ .
```

/Camera 1

```
if B(X)(CAM1) s , L(X)(CAM1) xs then =Q(X)(CAM1) \
if B(X)(CAM1) xs , L(X)(CAM1) s then =QX(X)(CAM1) \ .
```

/Camera 2

```
if B(X)(CAM2) s , L(X)(CAM2) xs then =Q(X)(CAM2) \
if B(X)(CAM2) xs , L(X)(CAM2) s then =QX(X)(CAM2) \ .
```

/Absent Switch (may be common to several crossings)

```
if B(ABS)N s , L(ABS) s then =Q(ABS)N \
if B(ABS)R s , L(ABS) xs then =Q(ABS)R \ .
```

/Auto-Lower Switch

```
if B(X)(ALOWER)N s , L(X)(ALOWER) xs
then =Q(X)(ALOWER)N
\
if B(X)(ALOWER)R s , L(X)(ALOWER) s
then =Q(X)(ALOWER)R
\ .
```

PRR data/Picture

*Q(X)(PIC) L(X)(PIC) xs .
 *QX(X)(PIC) L(X)(PIC) s .

/Manual Raise

*Q(X)(RAISE) L(X)(RAISE) s .
 *QX(X)(RAISE) L(X)(RAISE) xs .

/ Auto Raise

*Q(X)(ARAISE)N L(X)(ARAISE) s .
 *Q(X)(ARAISE)R L(X)(ARAISE) xs .

/Stop

*Q(X)(STOP) L(X)(STOP)F s .
 *QX(X)(STOP) L(X)(STOP)F xs .

/Manual Lower

*Q(X)(LOWER) L(X)(LOWER) s .
 *QX(X)(LOWER) L(X)(LOWER) xs .

/Crossing Clear NPR

*Q(X)(CC)N L(X)(CC)N s .
 *QX(X)(CC)N L(X)(CC)N xs .

/Crossing Clear CR

*Q(X)(CC)C L(X)(CC)C xs .
 *QX(X)(CC)C L(X)(CC)C s .

/Floodlights

*Q(X)(DAY)N L(X)(DAY) s .
 *Q(X)(DAY)R L(X)(DAY) xs .

/Wiper

*Q(X)(WIPERS)N L(X)(WIPERS) xs .
 *Q(X)(WIPERS)R L(X)(WIPERS) s .

/Camera 1

*Q(X)(CAM1) L(X)(CAM1) s .
 *QX(X)(CAM1) L(X)(CAM1) xs .

/Camera 2

*Q(X)(CAM2) L(X)(CAM2) s .
 *QX(X)(CAM2) L(X)(CAM2) xs .

/Auto Lower

*Q(X)(ALOWER)N L(X)(ALOWER) s .
 *Q(X)(ALOWER)R L(X)(ALOWER) xs
 S101 clear auto , S102 clear auto . / (a)

/Absent Switch (may be common to several crossings)

*Q(ABS)N L(ABS) xs .
 *Q(ABS)R L(ABS) s .

(a): disabling auto-lower to also disable signal auto buttons, where required. See section 9.3.

OPT Data

*004

```

if L(X)(PIC) s then G s 7 \           /PIC NPR
if L(X)(ARAISE) xs , L(X)(RAISE) s
    <Locking conditions, see section 8.1>
then G s 6 \                           /MANR NPR
if L(X)(ARAISE) s then G s 5 \         /ARAISE NPR
if L(X)(STOP)F s then G s 4 \         /STOP A NPR
if L(X)(LOWER) s then G s 3 \         /LOWER NPR
if L(X)(CC)N s then G s 2 \           /CC NPR
if L(X)(CC)C s then G s 1 \           /CC CR
/ output 0 : H/DGPR

```

. /end of tgm 04

*036

```

if L(X)(CAM1) s then G s 7 \           /CAM1 NPR
if L(X)(CAM2) s then G s 6 \           /CAM2 NPR

if L(X)(ALOWER) s then G s 5 \         /AUTOL NPR
if L(X)(STOP)F s then G s 4 \         /STOP B NPR

```

/ outputs 0-3 used for Down Line Locking Functions

. /end of tgm 36

*037

```

if L(X)(DAY) s then G s 7 \           /LIGHT NPR
if L(X)(WIPERS) s then G s 6 \         /WIPER NPR
if L(X)(ABS) xs then G s 5 \           /ABSENT NPR
if L(X)(ABS) s
    <Locking conditions, see section 8.1>
then G s 4 \                           /ABSENT RPR

```

/ outputs 0-3 used for Up Line Locking Functions

. /end of tgm 37

4.3 Controls via TDM

With this method, the controls are transmitted via a separate TDM system, independent of the SSI, exactly as shown on sheet X70021.