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Module

TPWS

For endorsement, authorisation and issue record of this document, please refer to the SSI Applications Manual Contents, NR/L2/SIG/17002.

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- These are presented in a red box **and with the word “shall” or a direct instruction.**

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Issue record

Issue	Date	Comments
6	04/06/2011	6 th Issue
7	03/03/2012	7 th Issue

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 03/03/2012.

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

1.1 General

The general requirements for interfacing TPWS are given in [NR/L2/SIG/10133](#) (Ref. 1).

Four methods of implementing these requirements for SSI signalling have been adopted, referred to as Methods 1a, 1b, 2, and 3.

The physical interface arrangements for these methods are described in [SSI8500D](#), Section 3.4.

Note that for all methods, the interface with Position Light signals associated with a Main signal (where fitted) will normally be handled in hardware, and the data methods described below are unaffected by the inclusion of such a feature.

The exception to this rule is in complex approaches, where separate control and/or proving of OSS and TSS is employed. Details of the arrangements for complex approaches are described in Section 6.

The following terms are used in the following sections:

TSS	Train Stop Subsystem, i.e. the TPWS subsystem controlling the Train Stop loop
OSS	Overspeed Subsystem, i.e. the TPWS subsystem controlling the Overspeed loop
SIM	TPWS Signal Interface Module, i.e. that part of TPWS equipment to which the control and proving circuits are connected.
Controlling Signal	The TPWS equipped signal to which an OSS relates (this may not necessarily be the signal to whose module the OSS is physically connected). Note that a separately controlled OSS may have more than one Controlling Signal, according to the lie of intervening points.
Path	A line of route between (typically) an OSS and its Controlling Signal via any intervening points. The term "path" is used as distinct to "route" because the path may exist whether or not a route has been set.
"on"	A red aspect
"off"	Any proceed aspect (including a position light aspect)
In advance	beyond the signal under consideration
In rear	on the approach to the signal in question

Note 1: This document is published after the completion of the TPWS retrofit programme. However, for consistency with [NR/L2/SIG/10133](#) and to allow for possible future modification to retrofitted schemes, the Sections relating to retrofit applications are retained.

Note 2: This document does NOT encompass any additional requirements arising from the implementation of [NR/GN/SIG/00028](#) (Ref 2). These will be dealt with fully in a future amendment to the SSI Applications Manual.

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1.2 Method 1a

Method 1a is the preferred method for interfacing TPWS to SSI.

In this method the V(Main)G output to TPWS is fed in parallel with the red lamp output of the module, and no separate output need be provided to control the TSS. A dummy output, repeating the state of the V(Main)G function shall be provided for use by the Diagnostic Processor in correlating TPWS proving. The dummy output need not be red retained, and may if necessary be on a different module (although use on the same module is preferred).

A separate VC input from the TPWS equipment shall be connected to the same module as the dummy output.

1.3 Method 1b

Method 1b (referred to as Method 1 in Issue One of this document) is an alternative data driven method.

A separate V(Main)G output is provided to control TPWS. The V(Main)G output shall be energised whenever the red lamp output is energised. The output shall be red retained, thus it will be normal for the signal red aspect to be controlled from output 7 and the V(Main)G from output 3. A separate VC input is provided for TPWS proving. The V(Main)G output and the VC input shall both be on the same module that controls the associated signal's main aspects.

Method 1b is no longer the preferred method, but may continue to be used where already applied. It may continue to be applied at signals with position light aspects with all associated OSSs controlled separately from the TSS (as in complex approaches), Use of Method 1b in these circumstances avoids the use of an additional (PL)VR relay.

1.4 Method 2

Method 2 uses additional trackside hardware wired to existing SSI signal outputs. No additional data is required to control TPWS.

Proving of TPWS is via a relay VCR, which will be normally energised, and de-energised in event of a TPWS fault. Interlocking data is required to incorporate TPWS proving into signal controls, and Diagnostic data to provide fault information.

1.5 Method 3

Method 3 uses hardware interfaces only, and no data changes are required. It is intended for retrofitting to commissioned CIs only, when data changes are not practical. It is not considered further in this document.

Method 3 should not be used for new signalling schemes.

1.6 Signaller's Indications - Retrofitting Requirements

When retrofitting to commissioned CIs, there is a requirement that TPWS proving be incorporated into the lamp proving of the TPWS fitted signal, such that lamp proving is lost if the signal is called to display a red aspect but TPWS is not proved. There is no requirement for a separate indication of TPWS failure to the Signaller; a signal showing a red aspect with TPWS not proven is indicated as though it were "lamp out".

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1.7 Signaller's Indications - New Scheme Requirements

For new schemes, TPWS proving is handled separately from lamp proving. The correct functioning of TPWS shall still be proved in the aspect controls of signals in rear (as for lamp proving), but a separate indication of TPWS failure for each equipped signal is required on the panel or display system.

The TPWS failure indicator is normally unlit, and is illuminated flashing in event of TPWS failure. A single test button is also required for each CI. When activated, this will illuminate steady all the TPWS failure indicators which are otherwise unlit. Indicators already reporting faults will continue to flash.

1.8 Approach Release Relief Feature

The Approach Release Relief feature is based on [NR/GN/SIG/00028](#) Clause 2.17 plus further application guidance from Network Rail. Any deviations from this are advised below.

This Approach Release Relief feature is provided to allow the signal in rear of an approach controlled TPWS fitted signal to clear when TPWS has failed. This signal clearing is permitted if the TPWS fitted signal is approach locked, ready to clear and is only held at red by the approach release control (and aspect restriction controls if applicable). This early application of the approach locking confirms the Signaller cannot cancel the route from the TPWS fitted signal and then immediately set a conflicting route.

The approach locking is applied early for all routes from the TPWS fitted signal, every time the signal is in the process of clearing with a TPWS failure. It is applied at the point that it may be required by the signal in rear to clear, i.e. when the TPWS fitted signal has a TPWS failure, is approach locked, ready to clear and is held at red by approach control only. As the method adopted cannot fail to apply the approach locking to the TPWS equipped signal if a TPWS failure is present with this signal ready to clear, then proof of this approach locking applied in the signal in rear may be omitted.

It should be noted that only applying the approach locking early in the event of a TPWS failure does not strictly comply with Clause 2.17.2. Network Rail has agreed to the application being delayed until it may be needed (i.e. for the clearance of the signal in rear), but this has been taken further by also only applying it if it is needed (i.e. there is a TPWS fault). However, this does agree with the objective of Clause 2.17.2. It also limits the inhibition of warning route step up to just when a TPWS failure occurs (see the last paragraph below) and eases testing.

If the Conditional Two Reds Rule also applies - see [SSI8003-85](#) - then the approach locking is applied earlier still and the signal's 'tisp' code is set to zero if the 'stick' bit is set, in accordance with this rule. (The Approach Release Relief feature alone does not require the signal's 'tisp' code to be set to zero as the approach locking is not applied until the 'ascon' bit is set when program action will zero the 'tisp' code anyway.)

If this feature is required when retrofitting, it shall be applied in such a way that it is effective when the signal in advance has failed for reasons of TPWS failure only, i.e. if the TPWS failure is combined with a signal lamp failure (as might happen if tail

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cables were severed), the release feature shall not apply. This requires the use of a separate input for TPWS (i.e. use of methods 1a, 1b or 2).

Note that the signal in rear will still be allowed to clear if the signal ahead has a failed route indicator (route indicator proving not being undertaken until the signal attempts to clear). However, as the onward route will be set and locked, there is no additional risk associated with the train over-running the signal with the TPWS failed.

A side effect of applying approach locking early to all routes from the TPWS fitted signal is that any warning routes from this signal will be prevented from stepping up in the event of a TPWS failure. This is due to the stepping up requiring the signal to be free of approach locking. This side effect is an accepted disadvantage as the potential train delay from this is less than the otherwise incurred delay of calling a train past the signal in rear at red.

1.9 Complex Approaches

In complex approaches where one OSS may be required to relate to more than one signal, or vice versa, OSSs may need to be controlled and/or proved separately from TSSs. General guidance on the hardware aspects of application of TPWS and SSI to complex approaches is given in [SSI8500D](#) Section 3.4, and guidance on the required data methods is given in Sections 6 to 9 below.

Separate control of OSSs may also be employed for simple approaches where local circumstances dictate.

1.10 Self Reversion

If trains are regularly required to stop immediately in rear of a signal (as may be the case in station platforms), it may be necessary to place the Train Stop loop immediately in advance of the signal. If the overlap track joint is close to the signal, a train, on starting off and occupying the overlap track circuit, may cause the signal to revert to red and to cause the Train Stop to be activated before the TPWS receiver on the train has cleared the TSS loop, thus being tripped.

Circuits have been developed to delay the energisation of the TSS in such circumstances for relay applications, and an equivalent circuit has been produced for use with Method 3 for retrofit applications (see [SSI8500D](#) Section 3.4). When using Method 1a or 1b, the preferred solution for SSI is to delay the reversion of the signal to red by implementing either last wheel or second track circuit replacement, as described in [SSI8003-10](#) Chapter G.

1.11 Constraints on Connection of TPWS to Non Red Retained Outputs

The following constraints are applied to the connection of TPWS equipment to SSI because of TPWS product acceptance considerations.

"Where TPWS equipment is connected to an SSI output which is also used by a non TPWS function then the TFM output shall be red retained and the function shall only drive the most restrictive aspect of the signal to which the TPWS equipment applies."

Where this condition cannot be met, an interface relay shall be used.

While the above relates purely to hardware, it may influence the Method to be adopted for any individual signal, and thus the required data.

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1.12 VCR Timers and Latches

The data examples in the following Sections employ timers or latches to allow for delays in the following:

- Prevention of reversion of the signal in rear to red when the button of the Controlling Signal has been pulled and before TPWS proving can reasonably be expected to have been established.
- For retrofit applications in complex approaches, prevention of temporary extinguishing of the indication of the Controlling Signal (when points in rear of the signal are swung by route setting or keying).

In order to confirm that the above effects are suppressed in all circumstances, the delay required is 3 major cycles which is achieved in this application by using three latches or a timer value of 4 seconds. Where controls are passed across an interlocking boundary a timer value of 6 seconds should be used.

An earlier latch delay method used only two latches, this giving a 2 major cycle delay. This may not be adequate if a TPWS proving input is on a different module to that controlling the associated signal's main aspects.

Following interlocking start up the timers or latches shall be preset such as to enforce loss of TPWS proving until such time as it is established. Timers should be set at start up to a value of 254, and final timing latches LxxxVCT3 should be set. See [SSI8003-10F](#) Section 1.6 for details of setting timers and latches at start up.

2 Methods 1a and 1b for Retrofit

2.1 General

The core data required for Methods 1a and 1b are virtually identical, except that for Method 1a the data will control the non red retained dummy output while for Method 1b the data will control the red retained V(Main)G output.

2.2 Interlocking Data Without Approach Release Relief

2.2.1 OPT Data

2.2.1.1 Method of Control

Where TPWS is controlled by a dedicated red retained output (as will be the case with Method 1b), the data to control TPWS shall be included within the aspect sequence data of the signal output special for the signal concerned. This will confirm that TPWS is energised when the interlocking is disabled. Because it is within the aspect sequence data, the data will need to be repeated for each route which can be set from the signal (each of which will have its own aspect sequence data).

Where TPWS is controlled by Method 1a, the TPWS equipment itself will be controlled by the RGE output of the trackside module, and is thus controlled from within the signal output special without the need for extra data. However, the dummy TPWS output, required for use by the Diagnostic Processor, also needs to be controlled, but in this case there is no requirement for the dummy output to be energised when the interlocking is disabled. The TPWS dummy output can therefore be controlled by a simple conditional statement.

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Both techniques are illustrated below. In later examples, in general only the conditional statement form is shown unless the aspect sequence data form shall be used (as in the case in some complex area examples). Note however that the option always exists to control dummy outputs from within aspect sequence data. Issues to be considered for the choice of control method are summarised as follows.

- Control from within aspect sequence data shall be used for control of TPWS functions from a dedicated red retained output, but need not be used for the control of dummy outputs.
- Control data for dummy outputs in the conditional statement form will in general be easier to understand, and will reduce the number of places within existing data that will require changes.
- Control from within aspect sequence data will require less additional processing time.
- Control from within aspect sequence data will, for signals with a small number of routes, require fewer additional bytes of data.
- Where, in the case of complex approaches (see Section 6), both red retained and dummy outputs are used to control TPWS functions from the same module, then for consistency the aspect sequence data form should be used to control (or at least to set the default state of) all of the TPWS functions.

2.2.1.2 Control from Aspect Sequence Data

If the form of control using the aspect sequence data is used, the following data should be included in the OPT Data for the signal concerned.

2.2.1.2.1 Route Select Data

Where route select data is employed (see [SSI8003-10G](#) Section 1.2), the “set red aspect data” which is invoked when no route is set, is modified to include the output used to drive TPWS:

G s 73 .

2.2.1.2.2 Aspect Sequence Data

Similarly, the telegram command at the start of each set of aspect sequence data (see [SSI8003-10G](#) Section 1.2.7) should be modified to set the TPWS output. A command to clear the output if a proceed aspect is output is then added at the end of the aspect sequence command. The aspect sequence data thus becomes:

G s 73 \
S13 seq 4 , G s 7654 , G c 3 . / ASD

Similar controls should be added to the data for any position light aspects.

2.2.1.3 Control by Conditional Statement

If the form of control using a conditional statement is used, the following data should be included immediately after the output special for the signal to control the dummy output (assuming that the dummy output is on the same module as the Controlling Signal).

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```
if S11 set r then G s 3 \
```

```
/ S11 TPWS Dummy
```

If the TPWS dummy output is on a different module to the Controlling Signal (Method 1a only), a non current telegram command should be used in place of the current telegram command above.

2.2.2 IPT Data

2.2.2.1 Method Using Timer

The TPWS proving input should be used to control a timer named in the form "ES<signal-name>VC". This timer is used to register the state of TPWS proving and to allow for a two or three major cycle delay in the onset of TPWS proving when the signal changes to a red aspect.

The following form of data should be included immediately following the signal input special for the signal concerned.

```
if S11 set r , G c 3
then if ES11VC > 4 then S11 clear lp \
else ES11VC = 0
\
```

```
/ TPWS fault
```

2.2.2.2 Method Using Cascaded Latches

If sufficient timers are not available in the interlocking, cascaded latches may be used. Three latches are required, named "L<signal-name>VCT1", "L<signal-name>VCT2" and "L<signal-name>VCT3". The data then becomes:

```
if S11 set r , G c 3
then @11VCT
else L11VCT1 xs , L11VCT2 xs , L11VCT3 xs
\
```

```
*11VCT
if L11VCT3 s then S11 clear lp \
if L11VCT2 s then L11VCT3 s \
if L11VCT1 s then L11VCT2 s \
L11VCT1 s
\
```

```
/ TPWS fault latches
```

```
/ TPWS fault
```

2.2.2.3 Input on Different Module to Signal

Where the TPWS dummy output and proving input are on a different module to the associated signal (Method 1a only), then the TPWS proving input should be used to set a latch LS<signal-name>VC. A test on this latch unset is then used in place of the direct telegram test G c 3 in the above IPT data, e.g. the data for the method using a timer becomes:

```
if S11 set r , LS11VC xs
then if ES11VC > 4 then S11 clear lp \
else ES11VC = 0
\
```

```
/ TPWS Fault
```

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2.3 Interlocking Data With Approach Release Relief

In the IPT data below, the TPWS equipped signal's lamp bit is no longer cleared by a TPWS failure if this signal is ready to clear except for approach release controls. The IPT file data below also approach locks this signal early in the event of a TPWS failure if it is ready to clear, etc. This results in the signal in rear being able to clear in the event of a TPWS failure, with the TPWS equipped signal approach locked once it is ready to clear, etc. No change is required to the signal-in-rear's OPT file data.

2.3.1 OPT Data

OPT data for cases with Approach Release Relief is the same as for those without it, see Section 2.2.1.

2.3.2 IPT Data

Lamp proving is forced to the clear state if TPWS has failed and the aspect control bit of the TPWS signal is not set. Thus the signal in rear will only be held at red if the TPWS signal is not ready to clear when TPWS is not operational. (A test on the TPWS equipped signal's approach locking is not included - see Section 1.8.) Where there are other controls after aspect control that prevent the signal from clearing, other than route indicator proving, these shall be considered individually.

The approach locking is applied early in the event of a TPWS failure when the signal is ready to clear, i.e. the 'ascon' bit set. Note that the control tables shallust indicate this early application of approach locking. If the Conditional Two Reds Rule applies to the signal in rear, then the approach locking is instead applied earlier in accordance with this rule (see [SSI8003-85](#)).

The following data should be included immediately following the signal input special for the TPWS equipped signal.

However, the 'clear foal' test should be omitted if the data is being applied to automatic signals with TPWS, unless (unusually) the automatic signal has approach locking when the test would be necessary (in this unusual situation the data method could not be tested, and the indications may be affected).

2.3.2.1 Method Using Timer

If using the timer method described in Section 2.2.2.1, the data becomes:

```
if S11 set r , G c 3
then @11VCT
else ES11VC = 0
\
```

```
*11VCT
  if ES11VC > 4 / TPWS fault
  then if S11 set ascon
        then S11 clear foal
        else S11 clear lp
  \
\
```

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2.3.2.2 Method Using Cascaded Latches

If using the cascaded latch method described in Section 2.2.2.2, the data becomes:

```

if S11 set r , G c 3
then @11VCT
else L11VCT1 xs , L11VCT2 xs , L11VCT3 xs
\

*11VCT
  if L11VCT3 s                               / TPWS fault
  then if S11 set ascon
      then S11 clear foal
      else S11 clear lp
  \
  \
  if L11VCT2 s then L11VCT3 s \
  if L11VCT1 s then L11VCT2 s \
  L11VCT1 s
\

```

2.4 Diagnostic Data

The diagnostic data is the same whether or not Approach Release Relief is employed.

Using Method 1a, under correct operation, the state of the VC input from TPWS will track the state of the dummy TPWS output. A special fault message should therefore be generated dependent on the correlation of input and output. A typical Module Data Entry Form so amended is illustrated in Figure 1. Note that a critical alarm is generated, as the effect of this fault from the Signaller's viewpoint will be the same as a lamp out (see [SSI8003-10E](#) Section 1.2.6).

Using Method 1b, similar data is used, except that the actual V(Main)G output is used in place of the dummy output.

Note that the identities of separately controlled TPWS functions shall be distinct from signal identities (e.g. S11TPWS) in order for the Diagnostic Processor to handle them as separate functions.

3 Methods 1a and 1b for New Schemes

3.1 General

The general principles applied are similar to retrofit, except that the TPWS fault condition is handled and indicated separately.

Note that Method 1b should not be used for simple cases on new schemes, and is not described any further here. It may be used in certain cases of complex approaches as described in Section 6.2.3.

3.2 Interlocking Data Without Approach Release Relief

3.2.1 OPT Data (TPWS Signal)

The following data should be included immediately after the output special for the signal to control the dummy output.

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```
if S11 set r then G s 3 \
```

```
/ S11 TPWS Dummy
```

3.2.2 IPT Data (TPWS Signal)

The data is similar to that for retrofit, except that a latch named LS<signal-name>VFL is provided to record TPWS failure, instead of the input inhibiting lamp proving.

The following data should be included immediately following the signal input special for the TPWS equipped signal.

3.2.2.1 Method Using Timer

If using the timer method described in Section 2.2.2.1, the data inserted immediately at the end of the signal input special becomes:

```
if S11 set r , G c 3
then if ES11VC > 4 then LS11VFL s \
else ES11VC = 0 , LS11VFL xs
\
/ TPWS fault
```

3.2.2.2 Method Using Cascaded Latches

If using the cascaded latch method described in Section 2.2.2.2 the data becomes:

```
if S11 set r , G c 3
then @11VCT
else L11VCT1 xs , L11VCT2 xs , L11VCT3 xs , LS11VFL xs
\
*11VCT
if L11VCT3 s then LS11VFL s \
if L11VCT2 s then L11VCT3 s \
if L11VCT1 s then L11VCT2 s \
L11VCT1 s
\
/ TPWS fault latches
/ TPWS fault
```

3.2.3 OPT Data (Signal in Rear)

The TPWS fault latch is included in the Aspect Control Data of the signal in rear:

```
if S9 set stick
TEH c , TEJ c
S11 set lp , LS11VFL xs
\
. / ACD
```

3.3 Interlocking Data With Approach Release Relief

3.3.1 OPT Data (TPWS Signal)

The following data should be included immediately after the output special for the signal to control the dummy output.

```
if S11 set r then G s 3 \
/ S11 TPWS Dummy
```

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3.3.2 IPT Data (TPWS Signal)

The data is similar to that for retrofit, except that a latch named L<signal-name>VFL is provided to record TPWS failure. The approach locking is applied early in event of a TPWS failure if the signal is ready to clear, i.e. the 'ascon' bit is set.

3.3.2.1 Method Using Timer

If using the timer method described in Section 2.2.2.1, the data inserted immediately at the end of the signal input special becomes:

```

if S11 set r , G c 3
then @11VCT
else ES11VC = 0 , LS11VFL xs
\

*11VCT
  if ES11VC > 4 / TPWS fault
  then LS11VFL s
    if S11 set ascon then S11 clear foal \
  \
\

```

3.3.2.2 Method Using Cascaded Latches

If using the cascaded latch method described in Section 2.2.2.2, the data becomes:

```

if S11 set r , G c 3
then @11VCT
else L11VCT1 xs , L11VCT2 xs , L11VCT3 xs , LS11VFL xs
\

*11VCT
  if L11VCT3 s / TPWS fault
  then LS11VFL s
    if S11 set ascon then S11 clear foal \
  \
  if L11VCT2 s then L11VCT3 s \
  if L11VCT1 s then L11VCT2 s \
  L11VCT1 s
\

```

3.3.3 OPT Data (Signal in Rear)

Approach Release Relief is achieved by bypassing the TPWS health test in the Aspect Control Data of the signal in rear if the TPWS equipped signal is ready to clear, i.e. the 'ascon' bit is set. (A test for the approach locking applied early is not required - see Section 1.8.)

```

if S9 set stick
  TEH c , TEJ c
  S11 set lp ( LS11VFL xs or S11 set ascon )
\
. / ACD

```

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3.4 Panel Processor Data

The data is the same whether or not Approach Release Relief is employed.

For each TPWS equipped signal, a flashable indication identity of the form I<signal-number>TPWS shall be defined. A single button identity for the push-to-make test button named BTPWSTESTF shall be defined.

The TPWS indication should be controlled by the following conditional statement in the POD data.

```
if LS11VFL s
then I11TPWS sf
else if BTPWSTESTF s
    then I11TPWS s
    else I11TPWS xs
\
/ S11 TPWS
```

When using an IECC or other display system, the equivalent of the above panel indication data shall be provided within the system.

3.5 Diagnostic Data

The diagnostic data is the same whether or not Approach Release Relief is employed.

Under correct operation, the state of the VC input from TPWS will track the state of the dummy V(Main)G output. A special fault message should therefore be generated dependent on the correlation of input and output. A typical Module Data Entry Form so amended is illustrated in Figure 1.

Note that a critical alarm is generated, as the effect of this fault from the Signaller's viewpoint will be the same as a lamp out (see [SSI8003-10E](#) Section 1.2.6).

4 Method 2 for Retrofit

Method 2 is characterised by having a VCR input to a TFM (not necessarily the module which controls the associated signal), which is normally energised, and is de-energised in the event of a TPWS fault.

4.1 Interlocking Data Without Approach Release Relief

4.1.1 OPT Data

No OPT data is required for TPWS.

4.1.2 IPT Data

4.1.2.1 Minimal Data change Method

This method is only applicable if the VCR input is on the same module as controls the TPWS equipped signal AND Approach Release Relief is NOT required.

The VCR input should be included in the bits to be tested for lamp proving, i.e. the lamp proving bit in the signal memory will also be set to 0 if either the lamp or TPWS is reported as failed. The lamp proving input data thus becomes:

*I06 "S11 73 / Signal 11 lamp proving with TPWS

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This method has the advantage when used for retrofitting that the size and execution time of the data remains unchanged from the original data.

4.1.2.2 Latch Method

If, for reasons of input availability, the VCR circuit is input on a different module to the TPWS signal, then the VCR input should control a latch named L<signal-name>VCR, and a test on the latch included at the end of the input data for the TPWS equipped signal, immediately following the signal input special.

```
if LS11VCR xs then S11 clear lp \      / Clear lamp proving if TPWS fault
```

4.2 Interlocking Data With Approach Release Relief

In the IPT data below, the TPWS equipped signal's lamp bit is no longer cleared by a TPWS failure if this signal is ready to clear except for approach release controls. The IPT file data below also approach locks this signal early in the event of a TPWS failure if it is ready to clear, etc. This results in the signal in rear being able to clear in the event of a TPWS failure, with the TPWS equipped signal approach locked once it is ready to clear, etc. No change is required to the signal-in-rear's OPT file data.

4.2.1 OPT Data

No OPT data is required for TPWS.

4.2.2 IPT Data

Lamp proving is forced to the clear state if TPWS has failed and the aspect control bit of the TPWS signal is not set. Thus the signal in rear will only be held at red if the TPWS signal is not ready to clear when TPWS is not operational. (A test on the TPWS equipped signal's approach locking is not included - see Section 1.8.) Where there are other controls after aspect control that prevent the signal from clearing, other than route indicator proving, these shall be considered individually.

The approach locking is applied early in the event of a TPWS failure when the signal is ready to clear, i.e. the 'ascon' bit set. Note that the control tables shall indicate this early application of approach locking. If the Conditional Two Reds Rule applies to the signal in rear, then the approach locking is instead applied earlier in accordance with this rule (see [SSI8003-85](#)).

Data is added as follows:

```
if G c 3                                / TPWS fault
then @11VCT
\

*11VCT
  if S11 set ascon
  then S11 clear foal
  else S11 clear lp
  \
\
```

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Note that if the VCR relay is input to a different module to that controlling the signal, it shall be input to a latch, and a test on that latch used in place of the test on input bit 3 in the first line of the data example above.

4.3 Diagnostic Data

The data is the same whether or not Approach Release Relief is employed.

The VCR input from TPWS is permanently energised unless there is a fault. A special fault message should be generated if this input is not energised. A typical Module Data Entry Form so amended is illustrated in Figure 2.

5 Method 2 for New Schemes.

The general principles applied are similar to retrofit, except that the TPWS fault condition is handled and indicated separately, thus a TPWS fault latch is required whether or not Approach Release Relief is required.

5.1 Interlocking Data Without Approach Release Relief

5.1.1 OPT Data (TPWS Signal)

No OPT data is required for TPWS.

5.1.2 IPT Data (TPWS Signal)

The following data should be included immediately following the signal input special for the TPWS equipped signal (assuming VCR to be input on bit 3) to set the fault latch:

```
if S11 set r , G c 3
then LS11VFL s / TPWS fault
else LS11VFL xs
\
```

5.1.3 OPT Data (Signal in Rear)

The state of the TPWS fault latch is simply included in the Aspect Control Data of a signal in rear:

```
if S9 set stick
    TEH c , TEJ c
    S11 set lp , LS11VFL xs
\ . / ACD
```

5.2 Interlocking Data With Approach Release Relief

5.2.1 OPT Data (TPWS Signal)

No OPT data is required for TPWS.

5.2.2 IPT Data (TPWS Signal)

The following data should be included immediately following the signal input special for the TPWS equipped signal (assuming VCR to be input on bit 3) to set the fault latch and to apply the approach locking early:

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```

if S11 set r , G c 3
then @11VCT
else LS11VFL xs
\

*11VCT
  LS11VFL s
  if S11 set ascon then S11 clear foal \
\

```

/ TPWS fault

Note that the control tables shall indicate this early application of approach locking. If the Conditional Two Reds Rule applies to the signal in rear, then the approach locking is instead applied earlier in accordance with this rule (see SSI8003-85).

5.2.3 OPT Data (Signal in Rear)]

Approach Release Relief is achieved by bypassing the TPWS health test in the Aspect Control Data of the signal in rear if the TPWS equipped signal is ready to clear i.e. the 'ascon' bit is set. (A test for the approach locking applied early is not required - see Section 1.8.)

```

if S9 set stick
  TEH c , TEJ c
  S11 set lp ( LS11VFL xs or S11 set ascon )
\

```

. / ACD

5.3 Panel Processor Data

The data is the same whether or not Approach Release Relief is employed.

For each TPWS equipped signal, a flashable indication identity of the form I<signal-number>TPWS shall be defined. A single button identity for the push-to-make test button named BTPWSTESTF shall be defined.

The TPWS indication should be controlled by the following conditional statement in the POD data.

```

if LS11VFL s
then I11TPWS sf
else if BTPWSTESTF s
  then I11TPWS s
  else I11TPWS xs
\

```

/ S11 TPWS

When using an IECC or other display system, the equivalent of the above panel indication data shall be provided within the system.

5.4 Diagnostic Data

The data is the same whether or not Approach Release Relief is employed.

The VCR input from TPWS is permanently energised unless there is a fault. A special fault message should be generated if this input is not energised. A typical Module Data Entry Form so amended is illustrated in Figure 2.

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6 Complex Approaches - General

6.1 Introduction

In some circumstances, particularly in complex areas, points may occur between the OSS and its Controlling Signal. In the case of facing points, this may result in a single OSS being controlled by different signals according to the lie of the points. In the case of trailing points, more than one OSS may be controlled by a given signal. Both of these conditions may also occur in combination.

The application of TPWS in these circumstances is described in the TPWS Project document "TPWS Suppression and Complex Approaches", Ref. [TPWS/TGN/003](#), and is further described in respect to SSI in [SSI500D](#) Section 3.4.

6.2 General Guidance on SSI Applications

6.2.1 Guidance from TPWS/TGN/003

The following general guidelines for the control and proving of TPWS in complex areas are given in Section 7 of [TPWS/TGN/003](#):

Where a single OSS function applies to two or more signals, then this OSS should be energised by the point position in the selection circuit in such a manner that if the point detection fails then the TPWS will remain energised. The point detection relays used should be those for the points traversed by a move approaching the Controlling Signal.

Where multiple OSS functions apply to one signal then any loop which may be traversed by a route other than that approaching the Controlling Signal should have transmission suppressed. The point detection relays used to suppress the transmission should be those which divert the move away from the approach to the Controlling Signal. Note: This suppression is not required if the line speed for the diverted movement is lower than the set speed for the OSS concerned.

Where a single OSS loop has its fault reporting conditioned out (to reduce the number of approaches where the preceding signal is held at a restrictive aspect in the event of TPWS failure) then the point detection relays used shall be such that the fault reporting contact is not bypassed when the approach from the OSS concerned is set towards the Controlling Signal.

6.2.2 Control and Proving of TPWS by SSI

The above guidance is interpreted as follows in the application of control and detection circuits for use with SSI.

6.2.2.1 Control

The TSS of a Controlling Signal shall be energised whenever that signal is controlled "on".

A separately controlled OSS shall in general be energised at all times, and de-energised only under one of the following conditions:

- Where there is a path via facing points controlled to lead to a TPWS fitted signal which is controlled "off";