

DIS-109

TPWS METHOD 3 AND FLASHING ASPECTS

Issue 5

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SSISPG DIS-109: TPWS METHOD 3 AND FLASHING ASPECTS

1. Document Status

This SSI SPG Discussion Document supersedes the previously approved Issue 3. Issue 4 of this document was approved, subject to minor amendments now incorporated, at the SSI SPG meeting on 6th November 2002.

2. Background

Problems have been encountered with signals capable of displaying flashing yellow or flashing double yellow which are fitted with TPWS using Method 3. The symptom was first observed at Newton and at Woking, and resulted in signals capable of displaying a flashing aspect reverting to red when ordered to clear from red to flashing yellow.

3. Initial Analysis

Initial analysis of the symptoms suggested that the problem arose from the RECR relay (see SSI8500G Figure G22 or Typical Circuit T34034) being slow to drop. If the signal clears from Red to Flashing Yellow, and this happens to occur during the flashing off period, the signal module will enter red retaining because it senses the flashable output to be drawing current when it should not. AEA Technology rail have confirmed that this is the expected response in these circumstances.

The initial analysis suggested that the problem should only happen with interlockings using software SSI4303-D2 or earlier (Newton used C5 software and Woking D2). Later versions introduced an intermediate yellow for one cycle when stepping up from red to a higher proceed aspect. However, the same phenomenon has now been discovered at Guildford, which uses 2 MHz interlockings with SSI4303-G2 software (which incorporates the aspect climbing feature).

4. The Guildford Situation

The signal concerned is signal GD829, which is in rear of the junction signal GD831. See Figure 1.

Because of inadequate braking distance between GD829 and GD831, GD829 is approach controlled whenever GD831 is at red. This control is included in the ASD data for GD829 as follows:

```
G s 7 \
    if ( TCDV o or TCDW o or S831 set <r )
    then if R831A(M) s
        then S831 seq 4+fy , G s 7654
        else S831 seq 4 , G s 7654
    \
    if TCDW o then L829TOR1 s \
    \
    . / ASD
```

Hence when the route is set from GD829 to GD831, in the absence of an approaching train, GD829 remains at red until the onward route from GD831 is set and the latter clears to yellow with route indicator (there being no additional controls in this case), whereupon GD829 attempts to clear from red to flashing yellow, and the problem occurs.

The answer lies in the nature of the “aspect climbing” feature. SSI8003-10D section 1.2.4 describes it precisely as follows (my italics):

“If the new aspect calculated is less restrictive than yellow, and *immediately prior to the processing of the aspect sequence command*, the aspect control bit of the signal (see Chapter G Section 1.2.4) has just changed from clear to set, and the signal is capable of displaying a single yellow aspect, then the signal is held at single yellow for one major cycle.”

In the Guildford case, the aspect control bit will have been set at the time of the setting of the route from GD829, whereas the clearance of GD829 has been delayed until the onward route setting from GD831 releases the approach control on GD829. Thus the clearance of GD829 does not immediately follow the setting of its aspect control bit, and the aspect climbing feature does not operate.

When the signal module exits temporary red retaining, if it hits the flashing -on period, the signal will clear correctly to flashing yellow. If it hits another flashing-off period it will go into permanent red retaining. In the case of GD829 the tester did not manage to get this to happen.

Tests were also conducted on two of the six signals in rear of GD829 which currently have TPWS commissioned.

- GD767 failed its module output interface permanently on clearing from red to flashing double yellow (test tried only once!). This signal (on module