

TECHNICAL INSTRUCTION

TI 033

Issue 1

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NETWORK RAIL - SIGNAL ENGINEERING

DOUBLE CUTTING OF BACK CONTACTS IN SAFETY CRITICAL CIRCUITS

Relevant Standards: GI/GN7517 Issue 1
T28307
T28312
T28317
T28325

1 – Introduction.

The principle of double cutting of safety critical circuits to avoid the risk of an earth fault bridging out contacts in one leg of a circuit has been a long standing principle. GI/GN7517 details the measures to be taken to prevent such a risk and also lists some situations where double cutting may not be appropriate.

In a recent issue of typical circuits for LED signals, the decision was made to double cut the feeds to signal heads since this provided a safety benefit, however this was applied to both front and back contacts. Subsequent review has concluded that whilst double cutting the feed to, for instance, the red aspect provides a safety benefit with regard to earth faults, it increases the risk of failure preventing the critical indication being displayed.

2 – Discussion.

In a typical 4 aspect signal head (either LED or conventional), an earth fault bridging out a single cut front contact could have the potential to display a less restrictive aspect (YY vice Y or, in a searchlight LED signal, Y vice R – red and yellow/green lit together).

An earth fault bridging out a back contact will always display a more restrictive aspect or a corrupted aspect (e.g. R and G vice G, Y and G vice G).

In the standard circuits, the back contacts are relied on to indicate the most restrictive aspects in the event of failure of the control circuitry. Double cutting these circuits introduces an extra risk of high resistance contacts preventing the red or yellow signal aspects to be displayed.

It should be noted that the risks of high resistance back contacts preventing the red or yellow aspect being displayed are small and that, in most circumstances, the train driver will not be approaching the black signal (lamp proving lost). Exceptionally he may be approaching a signal having already received a cautionary aspect or will have a forward route set (signal replaced on approach and fails to light).

Whilst the risks are relatively small, it has been concluded on balance that it is preferable NOT to double cut back contacts of relays where those contacts are used to drive the most restrictive/critical safety indication to drivers/road users.

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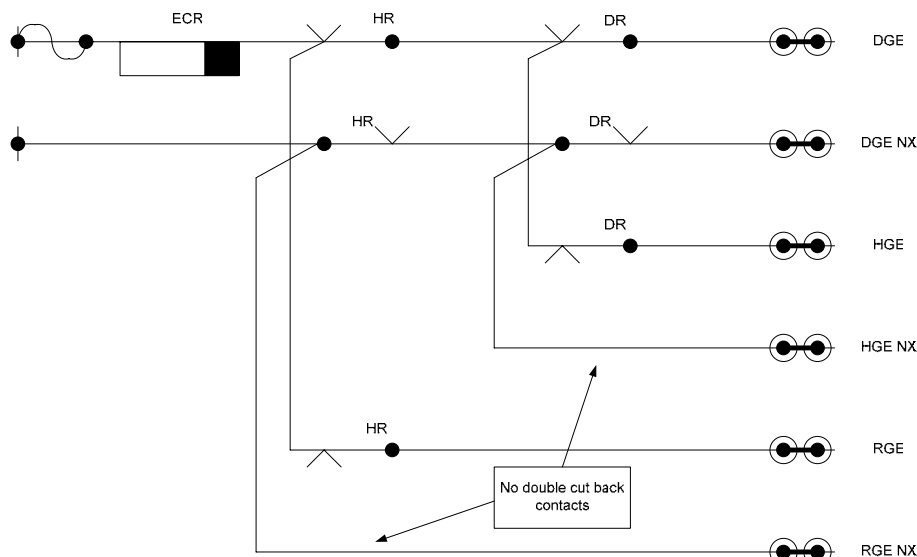
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3 – Application.

The back contacts of an HR/GR relay used to illuminate the red aspect or of a DR relay used to illuminate the first yellow aspect or the top yellow of a signal capable of displaying a preliminary caution should not be double cut.



Pending an amendment to the typical circuits for LED signals, back contacts in the NX110 feed to the signal head should be omitted.

END.

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