

# Detecting Sleeper Short Circuit

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## Abstract

Track circuit is the heart of Interlocking which detects the presence of train vehicle. Failure of track circuit leads to failure of interlocking which necessitate manual working that may lead to an unsafe situation. So it is most important of Signal Engineer to ensure that the track circuits are maintained properly and remain available. It may not be possible to achieve zero track circuit failure as the railway track is laid outside and open to all weather conditions as well as is accessible to public. So failures are expected and Signal Engineer should be ready to restore the failure in a reasonable time.

Track circuit failure due to sleeper short is one such failure that takes a lot of time to restore especially when the sleeper short is intermittent. Identifying this fault is a hard nut to crack. No scientific methods are available to locate the sleeper caused short circuit. Presently such failures are being identified through trial and error method. A few sleepers are isolated from rails to see whether the Track Voltage improves or not. If not, the same is repeated for next bunch of sleepers. This exercise is repeated till we reach the end of track. This method is very cumbersome, needs continuous support from associate Engineering department and may not be feasible in future with increasing traffic.

This article proposes a simple method to identify the short circuited sleeper with the help of a Compass.

## 1 Introduction

We know that a current carrying conductor has an associated magnetic field with it. Thus, if we bring a compass near a current carrying conductor, the needle of the compass will register a deflection because of the presence of magnetic field created by the current in the conductor.

When there is no current in the conductor, there will be no deflection in the compass needle.

Figure 1 shows the state of the compass when there is a current in the conductor. The needle will deflect from its normal position. When there is no current, there is no deflection in the compass needle.

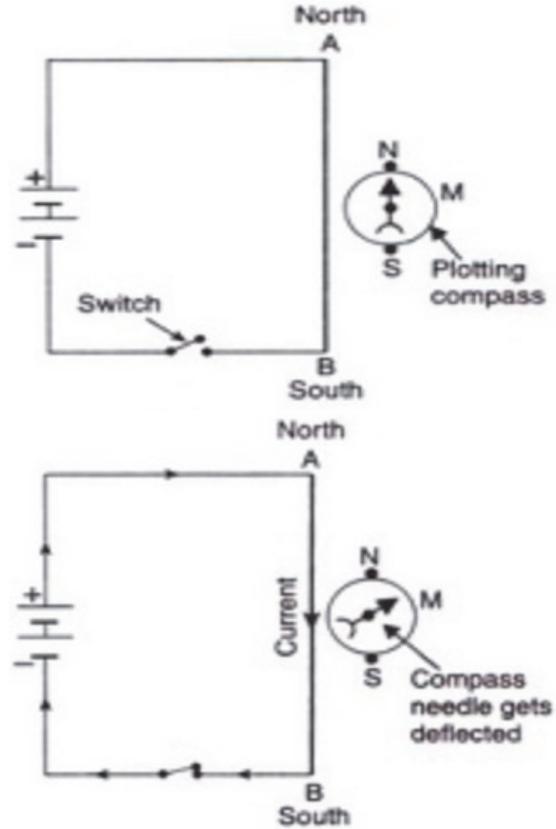


Figure 1: Magnetic field because of current flow

This principle can be used to identify the leaky sleeper.

## 2 Solution

In normal working of the track circuit, the current flows from positive limb of track feed end to negative limb through rails and relay. In the normal condition, all the feed end voltage available on rails reaches the relay end and track relay will be in picked up condition.

In case of there is a leaky sleeper, the voltage across relay may drop below the drop-away value as the current gets completed through short circuited sleeper. The result is track circuit failure. This may even happen intermittently. This is depicted in figure 2.

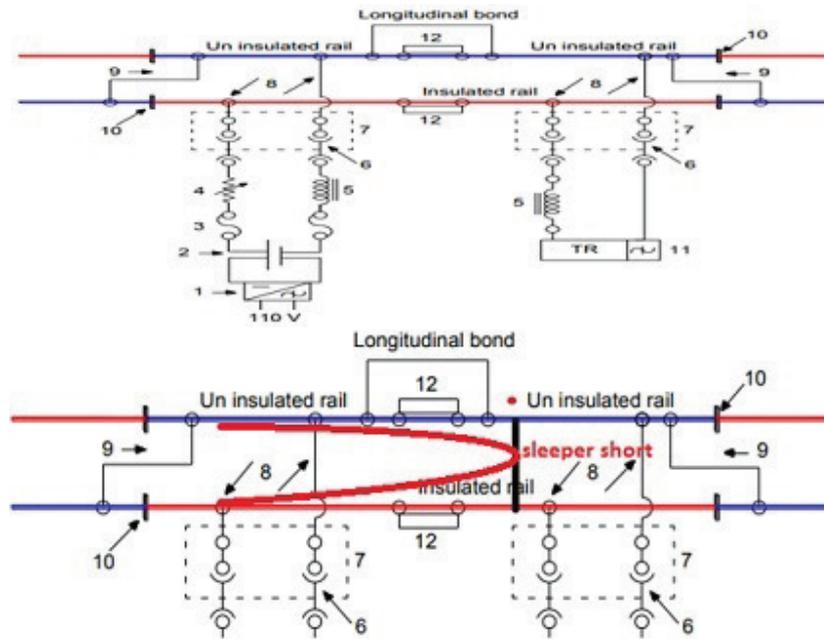


Figure 2: DC Rail Track Circuit

In failure condition, if we keep a compass on each sleeper, the compass will not show any deflection for normal sleeper. But in the case of a leaky sleeper, the compass gets deflected. This is because of the current flowing at the sleeper short location. The sleeper where the deflection in the compass takes place can be safely declared as short circuit sleeper and hence defective. We should plan for isolation/replacement.

### 3 Conclusion

This scheme has the following advantages.

1. Failure identification is easy.
2. Cost effective. Needs only a compass to identify the failure.
3. Most useful at girder bridges with channel sleeper locations.

T.Ramesh Babu is a Signal & Telecom Engineer with 19 years of experience on Indian Railways as an IRSSE (Indian Railway Service for Signal Engineers) officer. He has wide experience in open line/project execution/Railway Electrification. For his dedicated hard work resulting in substantial savings and quickest project execution, he received an award from Minister of Railways. He also received a Railway Board award in connection with project execution of Protection of Trains on the bridges during sudden/flash floods using GSM Technology. Currently, he is working as Professor Signal -1 at IRISSET, Secunderabad.




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*The information / views expressed in this paper is of the authors and are based on their experience. Comments / observations may be sent to the author at ps1@iriset.railnet.gov.in.*

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