WHY DETECT OCCUPANCY?

Why would anyone need to know where a train is?
Can't you simply look?

That is a question someone asked at a hobby show where we were demonstrating our Quad Occupancy Detector. A great majority of model railroad layouts exist with no occupancy detection at all.

So why go to the trouble and expense to detect where trains are located?

LINE SIDE SIGNALLING

A major purpose of occupancy detection is for signalling. One of the functions of a working signalling system is to provide indication about track clearance. In order to make signals display properly, it is necessary to provide the signalling system with the information regarding what tracks are occupied and what tracks are vacant.

Track is logically divided into sections called blocks and some method of determining if the block is occupied or vacant is needed. With our Quad Occupancy Detector, the logical sections of track are physically separated by leaving or cutting a gap in at least one rail. Power to that rail is fed via the detector and it is able to determine occupancy by detecting the electrical current flowing to that section of track.

DISPATCHER OR TOWER CONTROL

Usually combined with line side signalling, the ability of a dispatcher or a tower operator to have a track display with occupancy indications is another reason for having occupancy detection. This is especially important when the dispatcher or tower operator does not have a clear view of the track.

AUTOMATIC GRADE CROSSING

One nice detail on a model railroad that tends to catch the eye of visitors is the grade crossing signals, with or without operating gates, that automatically operate. Even if the layout does not use line side signals, it will be necessary to detect track occupancy for the grade crossing signals.

While one could simply detect occupancy in the vicinity of the crossing, anyone who has spent even the smallest amount of time at a grade crossing knows there is a standard pattern about how the signals operate. Crossing signals start operating when a train is approaching, some amount of time before the train arrives at the crossing. The signals remain operating until a short time after the last car of the train has cleared the crossing.

This operation is the same, regardless of which direction the train is going. This makes the logic of how the crossing operates a little more complicated. From a detection point of view, it will require the knowledge of track occupancy for THREE sections of track. Two of these are the track approaching either side of the crossing, since it is necessary to know that a train is approaching well before it arrives at the crossing.

The third section of track is the track over the crossing, from about 25-50 scale feet on each side of the crossing. Some call this section the "crossing island". Crossing signals begin operating when either of the approach sections becomes occupied. They remain operating until both the approach section and the island section have become unoccupied.

As you can see, crossing signals can greatly increase the cost of detection, which is why a low-cost detector is important.

OUT OF SIGHT MONITORING

Many layouts have track that cannot be seen from the normal location for operators. Whether there is a diamond crossing not easily seen, or just a long out of sight run, such as climbing a helix, it can be beneficial to have indicators on a small panel.

Similarly, operating a hidden staging yard can be simplified when one has a way of providing train location information.

SIMPLE AUTOMATION

Major automation would naturally require full block occupancy detection, but this level of automation is somewhat rare on most layouts. There are some situations where a simple level of automation might be useful.

Picture operating a train to a passing siding where your instructions are to take the siding. You arrive at the siding and manually throw the turnout to take the siding. This manual operation is not going to be automated. However, instead of following the head end of your train as it enters the siding and then taking time to go back and realign the turnout for the main line, you want to have the turnout automatically return to the normal position after the train has cleared. Occupancy detection is needed to drive the logic that will automatically do this for you.