MODEL RAILWAYS ON-LINE

Signalling a Passing Loop

by *Paul Plowman*

This article looks at a number of ways in which a simple passing loop on a single-track branch line can be signalled.

Fig.1 shows the simplest form occupying the minimum possible space. In this example the loops will just accommodate the longest trains in use on the line with platforms extending their whole length. There are no trap points, and the minimum number of signals has been provided. The maximum permitted speed through the points when departing from the station in either direction would typically be 10 or 15mph. A higher speed of 20mph or more would require significantly more expensive turnouts. Since it is not possible in this layout for a train to make a fast run through the station without slowing down the distant signals would always be set at caution. They need not be worked from the signal box and would be fixed in the 'on' position. Alternatively, if one of the turnouts was left-handed as in fig.2 a fast run in the down direction would be possible and the Down Distant would need to be worked. Other signals provided are home signals (1 and 8) controlling entry to the station and starting signals (2 and 7) controlling departure.

In fig.1 the working of a train through the station is quite straightforward. The driver of a down train first sees the fixed distant signal and slows the train down. The signalman keeps the Down Home signal no.1 at danger until the train arrives and he can see that it has slowed to a safe speed. The signalman clears the Down Home signal and possibly the Down Starting signal no.7 as well if the single line beyond is clear to the next block point. The train enters the station with a speed restriction of 15mph starting at the home signal, the single line tokens are exchanged, and the train is ready to depart when the Down Starting signal no.7 is clear.

The purpose of the loop is to enable two trains to pass. With this simple form of signalling, where trap points have not been provided, it is the responsibility of the signalman to ensure safe working. Let us assume that two trains have been timetabled to pass at our station. The trains approach from opposite directions, the drivers see the fixed distant signals and slow down, preparing to stop at the home signals. Now the problem facing the signalman is that if he pulls one or both of the home signals off one of the trains might overrun a starting signal at the end of a platform and collide with the other train. The procedure is that the first train to arrive is made to wait at the home signal. In this example let us assume the Up Train arrives first. The signalman waits for the Down Train to slow to a safe speed and then clears the Down Home signal no.1 for the train to enter the station under the 15mph speed restriction. The Down Train must come to rest in the platform at the Down Starting signal no.7 before the Up Train is allowed to enter the station. Home Signals nos.1 and 8 are interlocked so that only one of them can be off at a time. Now there remains a possibility that the Down Train entering the station will overrun the Down Starting signal no.7 and collide head on with the Up Train

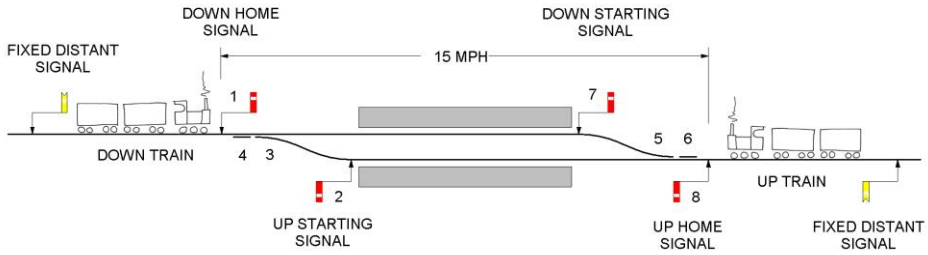

Figure 1: Simple Layout

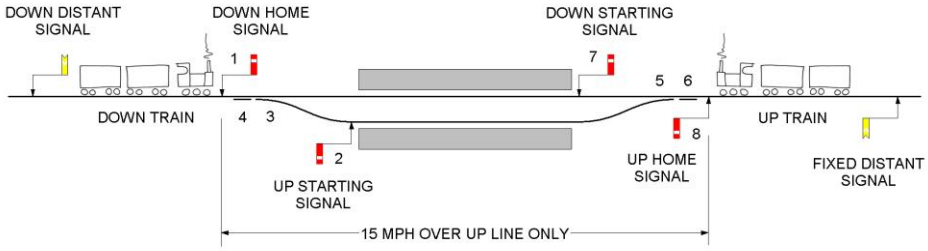

Figure 2: Possible fast run on the Down Line

Above: Hampton Lode Station on the Severn Valley Railway. The starting signal on the left is located on the end of the platform at the clearance point at the end of the loop. There is no trap point ahead of the train to prevent an overrun. The speed limit within station limits at Hampton Lode is 10mph.

waiting at the Up Home signal no.8.

At this point we need to introduce the concept of "signal overlaps". An overlap is the distance a train can safely travel beyond a signal at danger before it collides with something. The factors to be considered are:-

- The type of signalling installed, i.e. semaphore, 4-aspect colour light, 3-aspect or 2-aspect, which affects the warning given to drivers.
- The gradient. On a falling gradient a greater distance is required for trains to stop while on a rising gradient the overlap can be reduced if necessary.
- The braking characteristics of the trains using the line. Normally a regional standard would be adopted.

Typically the overlap on a mainline would be a quarter of a mile. In our example where the speed restriction through the station is 15mph or less the overlaps beyond the starting signals need be only 50 yards. So in the design of our station the distances between signals nos.1 and 2 also between signals nos.7 and 8 must not be less than 50 yards. In 4mm scale that is 1ft 11½in. Using Peco large radius turnouts for the track with the signals mounted on the platforms at the top of the ramps, this dimension would be just right.

If the Down Train does overrun signal no.7 then it should only be travelling at 15mph and would have a clear distance of 50 yards in which to stop before colliding head on with the waiting Up Train. Once the signalman has seen that the Down Train has come to a stop in the Down Platform he will pull signal no.8 clear for the Up Train to enter the station, having already returned the Down Home signal no.1 to danger. Tokens are exchanged, starting signals are cleared and the trains continue their journey.

This procedure for passing trains is slow and time consuming and often a great irritation to passengers who sense they are being delayed. Improvements come at a price which in this case is the cost of two trap points, see figure 3. Trap points provide unlimited overlaps beyond the starting signals nos.2 and 7. They may take the form of just a single point blade provided to derail trains overrunning the signals. However, if there is a possibility of a train carrying passengers being de-railed then Her Majesty's Railway Inspectorate require provision for measures to be taken, which will arrest trains safely. This involves the provision of a full turnout followed by a sand/ballast drag, a soft earth bank, a friction buffer stop or an adequate length of track equivalent to the free overlap required. If a length of track is provided this can double up as a siding or shunt neck into a goods yard. With trap points present the signalman follows the same procedure as previously described except that he may now allow both trains to enter the station simultaneously. Signals nos.1 and 8 are not interlocked in this example.

The provision of trap points is costly. In addition to the trackwork, signalling equipment is required to work the points.

Passenger trains run over the trap points in the facing direction requiring additional locking and detection. It has always been alleged that the Great Western Railway went to extreme lengths to avoid the provision of trap points to avoid these costs. A possible alternative is to provide an overlap inside the loop, see figure 4. I use the word "possible" because, depending on site conditions it might not

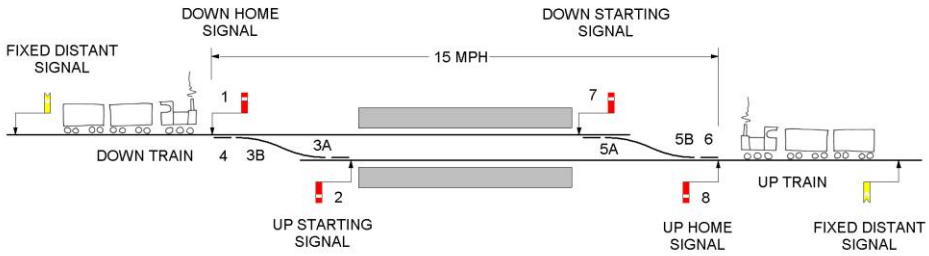

Figure 3: The simple layout with trap points added

Above: SR 02 Class 0-4-4T No.14 'Fishbourne' departs from Wroxhall with a train to Ventnor on a cold and wet day in March 1966. A full turnout has been provided as a trap with the track ending in a soft earth bank to the right of the picture.

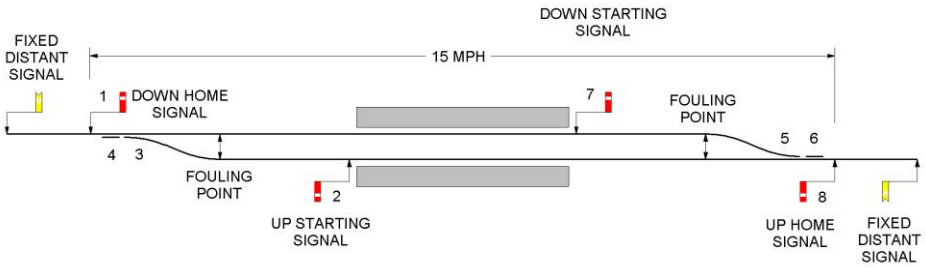

Figure 4: Loop extended to provide overlaps between starting signals and the fouling points

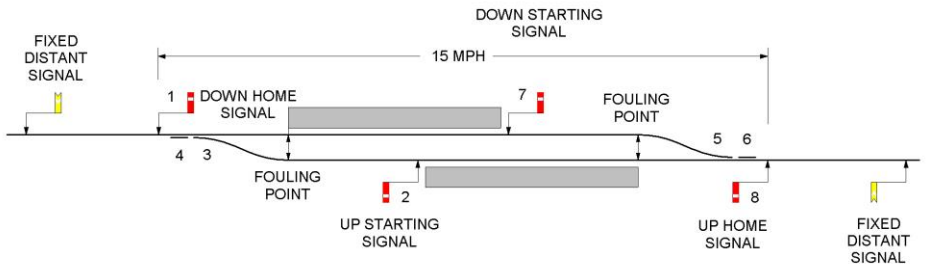

Figure 5: Platforms staggered to reduce overall length of layout

Figure 6: Overlap beyond signal no.2 is within the loop. A trap point is provided beyond signal no.7, which has the dual purpose as a shunt neck into the sidings.

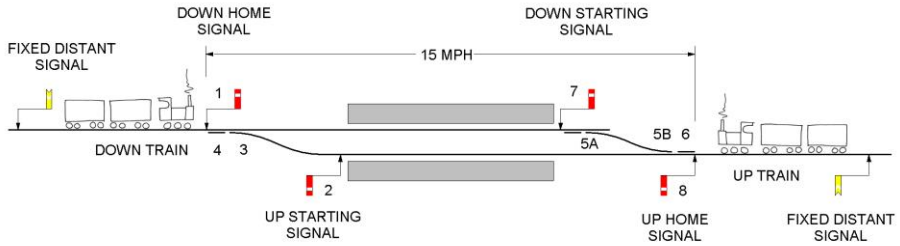

Figure 7: A trap point has been provided at only one end of the loop and no overlap as been provided at the other end. This trap point is of no practical use. If two trains are allowed to enter the station simultaneously there is a risk of the up train overrunning signal no.2 and colliding with the down train.

always be the cheaper solution. In this layout the loops are extended by 100 yards, i.e. 50 yards each side of the station. If the station has not already been built then the provision of staggered platforms, as in figure 5, can provide a saving of 50 yards of track. In both of these examples the signalman may allow both trains to enter the station simultaneously because if either of them overruns the starting signals then there is still 50 yards of clear overlap before the trains collide.

Just to add to the number of permutations, it is possible to have a trap point at one end of the station and an overlap within the loop at the other to allow simultaneous entry of two trains, see figure 6. In this example the trap doubles up as the entrance to the goods yard. If a train passes signal no.7 at danger it is switched into the siding.

A trap or overlap provided at only one end of the station serves no useful purpose as trains cannot enter the station at the same time. There is still a risk of an overrun, see figure 7. If trains are allowed to enter simultaneously and the up train overruns signal no.2 there is a possibility of them colliding. Trap point no.5A would only prevent the down train from overrunning. ■

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