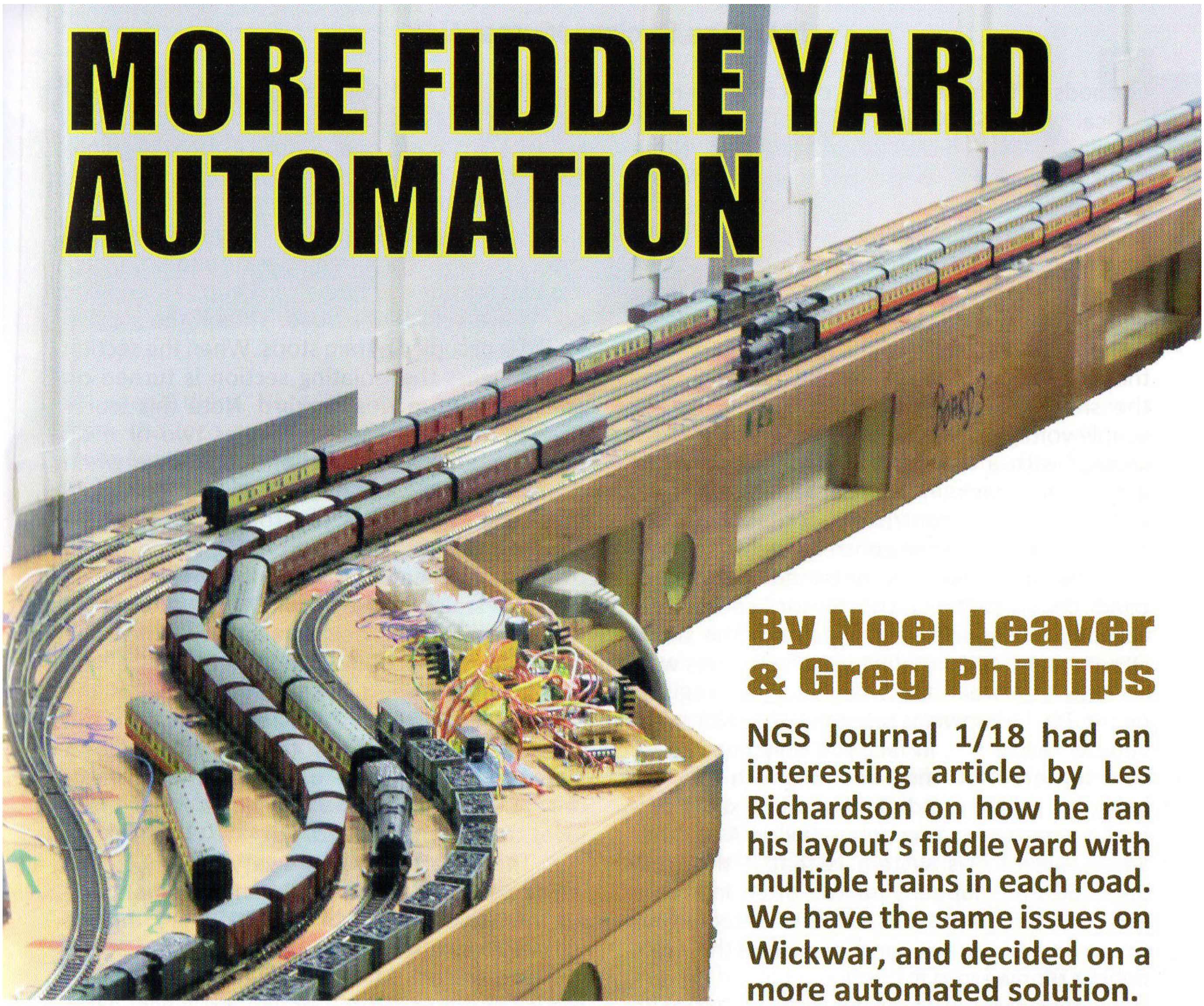


MORE FIDDLE YARD AUTOMATION

By Noel Leaver & Greg Phillips

NGS Journal 1/18 had an interesting article by Les Richardson on how he ran his layout's fiddle yard with multiple trains in each road. We have the same issues on Wickwar, and decided on a more automated solution.

We wanted to minimise the space taken by the fiddle yard while still being able to store lots of trains. The best use of space is to have long roads with an automated 'shuffle' to move trains up. That is, a fiddle yard road with several trains in it and when the first is sent out the second moves to where the first was, the third to second, on so on. To allow a mix of long and short trains we wanted a train to be able to occupy more than one fiddle yard section.

The layout is an oval and by using the curve at the exit end in addition to the rear of the layout we can fit four to six trains in each road, with space for three roads in each direction. We did not use the curve at the fiddle yard entry end to ensure that trains could disappear off scene even if the fiddle yard was full, and because it would have been difficult to fit six tracks round the 180 degree bend.

Our previous layout Basingstoke had a manual fiddle yard, though we had had several attempts to automate it, and it was one of the main sources of operator errors because it needed a lot of concentration. We wanted a solution that would minimise the chance of operator error, for example one that would not allow a train to be sent into a road unless there was space. So our requirements were:

- Trains to move up automatically
- Ability to mix long and short trains
- Highly reliable
- Little scope for operator errors
- Minimal changes to stock needed
- Works with either DC or DCC (we usually run Wickwar DC one way and DCC the other)
- Can be operated manually if necessary (for example if the electronics failed).

One advantage we had is that all of our the trains are loco-hauled - no DMUs or bankers - so the motor is always at the front of the train. The solution we arrived at depends heavily on this.

On Basingstoke we had tried many different methods of train detection - optical (infra-red), optical with added frequency to be detected (similar to TV remotes), and magnetic. None were fully reliable, partly because of different environments at different exhibition halls.

The best we tried was Train on Track Indication (TOTI), which is similar to track circuiting on the real railway. The track is divided into sections and a voltage put across the rails. If there is a vehicle in the section with wheels that conduct between them, electronics detects the small current flow. For DCC the normal supply voltage is always present, for DC a small voltage with a resistor to limit current is put across the track in addition to the normal voltage from the controller, so that there is a current even when the controller is off.

The loco itself is detected because it conducts current via the motor, and so are coaches fitted with lights fed from the track. Other stock needs modifying to have axles with a resistor between the wheels so they register on the TOTI – known as resistive axles. Not every vehicle needs this, in fact you only need to be able to detect the first and last with the first being the engine and the last, for example, a brake van with a resistive axle. A further advantage of this system is that if the train uncouples (as happens far too often in N) the end of the train will still be detected as occupying the track, and prevents the train behind running into it.

MERG (Model Electronic Railway Group) do a TOTI kit that works with DC or DCC and is fairly cheap. It works out at about £1.25 per detector and we needed 36 detectors for the whole layout. We put detectors on the rest of the layout as well so we could automate the signals and help prevent operator errors such as changing points under a train while it was entering the fiddle yard.

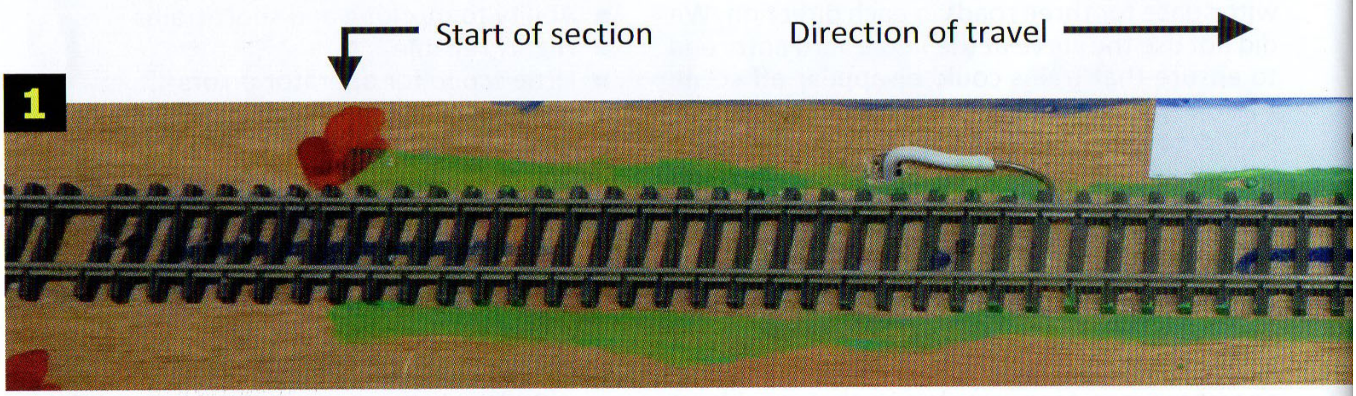
Each road of the fiddle yard is divided into equal length sections isolated on both rails at front and back. In addition a short section at the front of each section, the length of the longest loco plus stopping distance, is isolated on one rail (the left hand one in our case) - see photo #1. Note different roads can and do have different length sections.

For each section, when a train is detected the isolation section behind is turned off, or for the first section the fiddle yard entry track if the points are set for this road. Thus if the section ahead is occupied a train stops. When the section ahead clears the isolating section is turned on and the train moves forward. Note this works even if the train ahead occupies two or even more sections, as the section is only clear when the last vehicle is out of section.

For DC we use a controller for the fiddle yard, set to a reasonable running speed for all trains. In practice this is just sufficient so that the slowest train will move. There is another controller for the scenic section, which the operator uses to control the train. For DCC all the trains are set to run at a suitable speed for the front of the layout. Most trains in fact run straight through, only two or three local passenger trains need to stop, so the operator only needs to know the DCC numbers of these locos to alter their speed.

The system now works very reliably, in fact we can go for a whole day at an exhibition with an intensive service of a train every minute without a single crash in the fiddle yard, and it prevents crashes when trains uncouple and helps reduce operator errors. Derailments, uncoupling, and trains sticking can cause the trains not to move up, but the operator realises there is a problem – as he can't call on the next train - and can go behind and sort out the problem, usually coupling up stock or giving a loco a push and then scheduling it for a wheel clean.

However, to begin with it was far from reliable and we had to make a lot of tweaks and improvements. One problem was that we had made the isolation sections slightly too short, and a few locos failed to stop, meaning we had



to extend them. Note; the method of pick-up from the loco affects where it stops. Normal locos continue until the last axle with pick-up is an inch or so over the gap, the tender however might not pick up at all or might have traction tyres at the rear. For ones with 'American' pick-up where the loco picks up one side and the tender the other it depends on the pick-up on the side you are isolating. Union Mills and the Peco Jubilee both use this system but the opposite way round to each other.

The isolation gaps between sections are simple breaks in the rail. We found that these could sometimes close up and short, making the fiddle yard fail - particularly if it was hot. We glued slivers of plastic or put epoxy between the rail ends where this was happening.

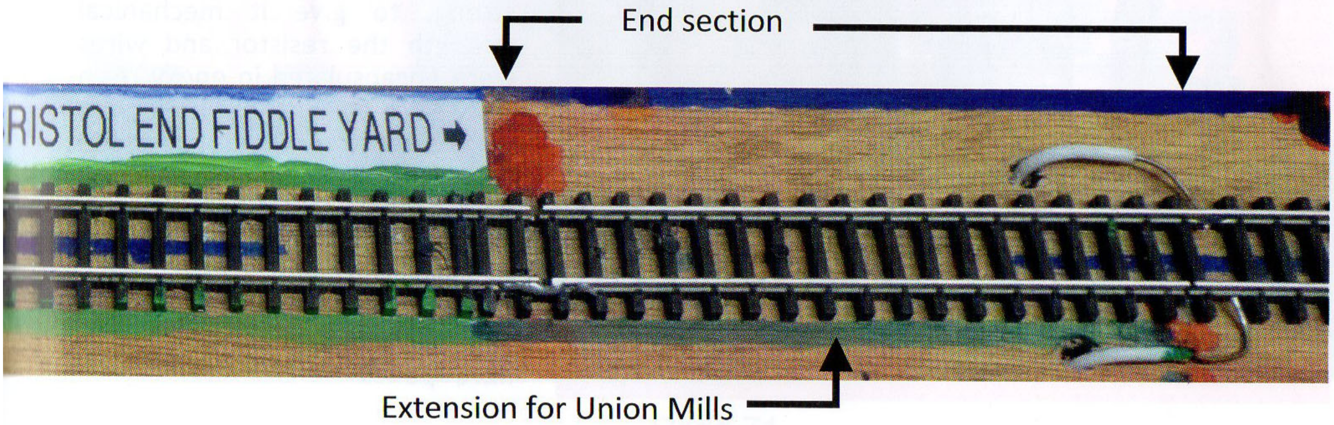
For double headed trains the two locos need to be electrically connected so that they both stop at once. This was done by running wires between the two locos. A further problem was that two 4Fs are longer than our isolation sections allowed for. We solved this by not picking up off the front loco, just the two tenders and rear loco. If it seems odd that we did not choose not to pick up off the rear tender, it is because the way the Farish 4F is wired it is easy to disable pick up from the loco (see photo #2).

On DC while most of the trains ran at about the same speed on a fiddle yard controller setting a few were much faster or slower, making it difficult to find a setting so they all ran without some going so fast they were in danger of leaving the track. The main culprits were a few of the old Farish which ran very slowly: this seemed to be weak magnets and we replaced them with neodymium magnets. Union Mills locos went too fast, they were slowed by adding a resistor in series with the motor.

The biggest problem we had was the sensitivity of the detection, which would either fail to detect a train (mainly on DC) or to pick up 'ghosts' and register a train that was not there. The latter was partly because we decided to mount all the TOTIs away from the layout, in a separate box for ease of maintenance and problem fixing (we believe this was a good decision) - see photo #3. It means there are long wires running alongside each other to the box. We solved it by a combination of putting a 5k resistor across the diode used by the TOTI and lowering the resistance for the resistive axles from 10k to 5k.

It should be realised that the MERG kits are intended for people interested in electronics who have good electronics skills. While a kit should work well used in a simple way, when you use them in slightly different ways or connect lots together expect problems and to have to diagnose what is happening and make some changes.

The final issue - which we knew of in advance - is that a single resistive axle is not reliable. A little bit of dirt and it fails to register, and the train behind runs into it. We have found that three axles give excellent reliability



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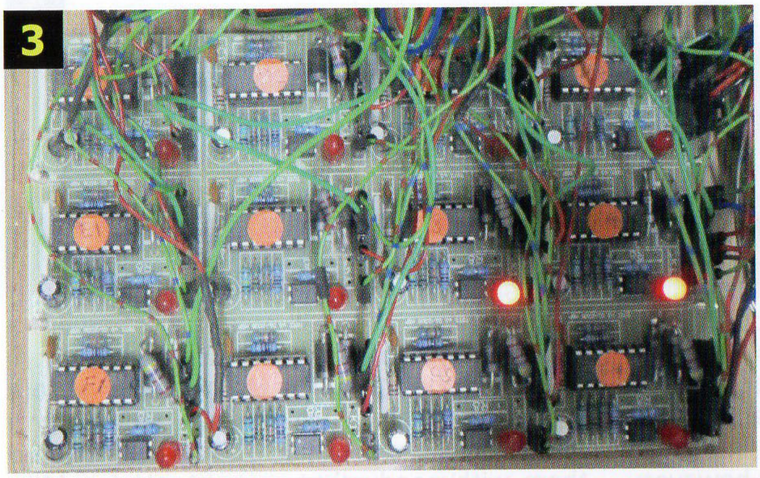

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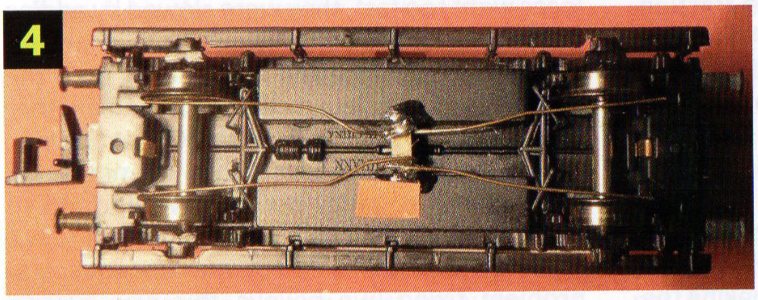

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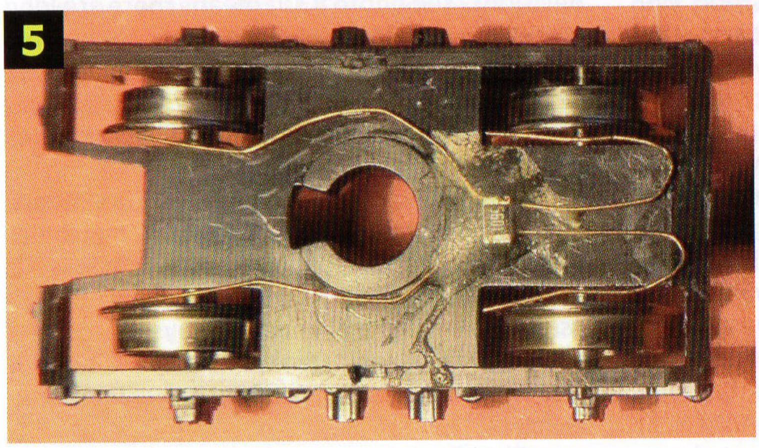

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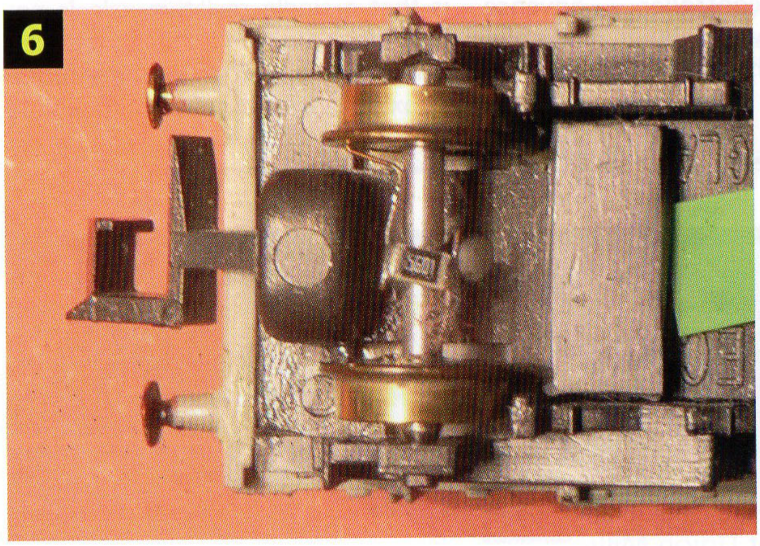

provided you add extra weight directly over the resistive axle so if the vehicle is only touching the rail at three points, as a 4-wheel wagon usually is, then both wheels of the resistive axle will be in contact.

The axles need to be in two different vehicles, otherwise if the rear vehicle derails there is no detection. We usually put them in the last and next to last coach, or the last and third from last wagon. You also need to keep the wheels very clean and we clean the wheels on these vehicles after every exhibition.

Resistive (Conductive) Axles

With about 24 trains in the fiddle yard we needed to provide about 75 resistive axles. You can buy these (with 10k resistance) as some DCC systems use TOTI detection, but the wheels are only suitable for US stock being too small for most UK stock.

Coaches fitted with pick-up for light bars, such as the Dapol Gresley coaches are easy. Just solder a resistor across the contacts on the bogie (or install lights). A similar arrangement can be done for other stock by fitting thin phosphor bronze pick-up wires to contact each wheel, connected to a central resistor.

I found the easiest way to do this was to start with a surface mount resistor (cheaply available from electronics suppliers) and solder a length of 36SWG phosphor bronze wire to each side, a bit longer than the wheelbase (Eileen's Emporium and other suppliers sell reels of this wire). As the solder pads on the resistors are not very strong, to give it mechanical strength the resistor and wires were encapsulated in epoxy resin glue. Stick the resistor under the vehicle in the centre and bend the wires so they gently touch the backs of the wheels (see photo #4). The same wipers can be used to power a tail lamp from the track.

Polish the backs of the wheels where the wires touch with a glass fibre pencil or wet and dry to remove the blackening as this improves the contact. This, of course this requires metal wheels, so if they are plastic then swap them for metal ones such as sold as spares by Farish.

For bogies, stick the resistor on top of the bogie, to the outside of the pivot hole, and bend the wire on that side double so it has enough spring (see photo #5 and #7). These show different positions for the wipers on bogies with photo #7 including wires to coach lighting

The other method we used was to attach a surface mount resistor to the axle and connect it electrically to the two wheels (photo #6). We tried conductive paint, but found the wheels unreliable. Our current method is to solder a short length of phosphor bronze wire to each side of a surface mount resistor and glue it to the axle with the wires bent to touch the backs of the wheels.

Operator Control

The two operators sit in front of the layout at each end and can see the front of their fiddle yard. That means knowing which train is next out they can check it starts correctly. Each has a very simple panel, in fact the first version had rather more lights and controls but we found they were unnecessary and confusing. There are just four switches to control the trains: a 3-way switch to select which road is being use; a biased-off call-on switch to start the front train in the selected road, a 'Fiddle Yard Off' switch to disable the fiddle yard that side, and a 'Scenic Power Off' switch to disable both lines in the scenic area (used if a train has derailed and is blocking the other track).

The points at each end of the fiddle yard operate together, and when a train is taken out the next train is not started until it has returned to its original road. This means trains can't be put back into the wrong fiddle yard road, and on such a simple layout this is operationally acceptable. A blue indicator light on the panel shows when a train is in the hidden section leading up to the fiddle yard and disables the call on and road change switches to prevent errors (the signals in that direction in fact provide the same indication, they are at stop only when a train is in this section). Recently we have added a video camera and screen so the operator can see the fiddle yard at the far end and some people find this easier.

If we were to use the goods yard, it would have a separate control panel, but shunting necessitates taking over both lines so we would not want to do it at exhibitions, and there was only one goods train a day that stopped at Wickwar.

The other controls are on the box containing the electronics at the rear of the layout. There are four switches to disable power to scenic area and fiddle yard in both directions. There are other switches to allow the fiddle yard sections to be controlled manually. The TOTI boards have indicators showing when they are detecting to aid problem solving.

We have a fixed allocation of trains for particular roads for exhibitions. This lets us put them in a sensible running sequence, take advantage of some roads having longer sections than others, and to make full use of the space in the yard.