Radio controlled model railways – the next big innovation?

By Graham Morfoot

The introduction of commercial Digital Command Control for model railways some 20 years ago was one of the most significant technological advances the hobby has seen in recent times. Embraced by many established enthusiasts, DCC has also become the first choice for new starters building their first layout and it looks like the control system is here to stay for a long time yet; unless of course something else comes along to steal the show. That show-stealing perpetrator could well be radio control.

Aircraft and ship modellers, and many live steam garden railway operators, are familiar with radio control systems which offer complete wireless remote control for models that all carry their means of propulsion on-board, either as fuel or as batteries. Such systems have been around for years, but only recently have steps been taken to apply the principles to smaller scale railways, probably as a result of the introduction of smaller batteries with increased power capacities.

One company in particular, Acc+Ess Ltd of Bowermadden, Caithness, has been busy developing a potential radio control system called Protocab for use with (at least) 4mm and 7mm scale railways and is poised to launch it in the UK very soon. Meanwhile, UK modellers have been working independently on their own RC systems using devices manufactured by small specialist firms.

So, could the next quantum leap in model railway technology be the adoption of wireless radio control for locomotives? To find possible answers to that question we asked Graham Morfoot, himself a pioneer of radio control in OO9, to tell us about his achievements and the benefits he thinks the technology can unleash.

Tate's goes wireless

My OO9 layout, *Tate's Railway*, as featured in the November 2014 RM, had been suffering from problems with poor power feed through the track and points. Using a Relco to keep the track clean, and adding extra weight in the small OO9 loco models, improved the situation a bit, but running was still not as good as I wanted – enter conversion to on-board battery power and wireless radio control.

A friend Roy Coxon, who has experience with radio controlled boats, built all the components for me which use the same RC technology as used in miniature helicopters. Basically the motor in each locomotive is connected to a small rechargeable battery via a tiny control circuit board and radio receiver (I used a Hyperion LiPo battery and a DTRC RX41d-22-v5-W receiver: see supplier panel). The only other connection is a fine wire antenna for radio signal reception; the actual circuitry is very simple as shown schematically in Fig.1. The battery on my OO9 loco featured in this article is small enough to fit inside the hood, I made the whole body removable for charging purposes, so the assembly also includes a suitable socket, as per photo 1.

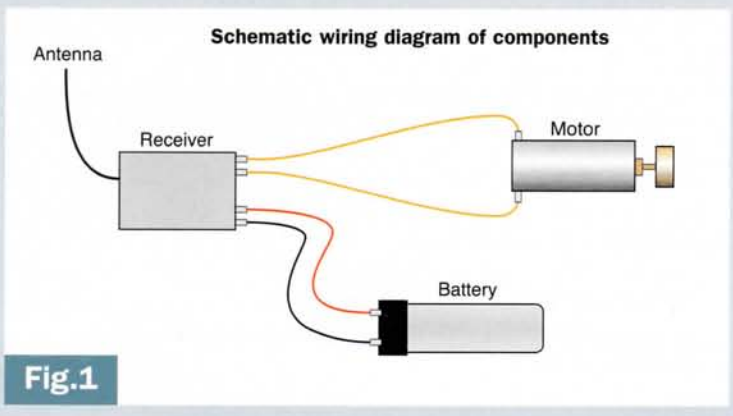


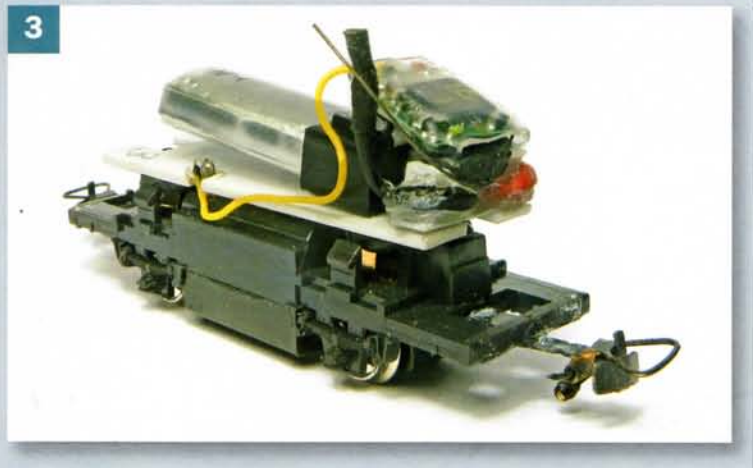
Fig.1

A scene on the author's layout, Tate's Railway, on which he uses radio control for some of the 009 locos. *Photography by Paul Bason*

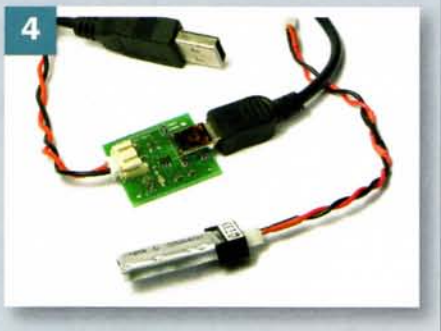
To fit all these parts after temporary removal of the body, the feed wires from the wheel pick-ups to the motor were isolated. Then, a mounting plate was made from plasticard to fit over the motor on which the battery socket is mounted, with the receiver circuit board on top of that – all as seen in photo 2. When connecting wires make sure they are protected with shrink tube to avoid a short, which could destroy the receiver. With the battery plugged in the whole assembly beneath the body looks like that shown in photo 3.

It is best to use a 'W' suffix specified receiver too, as these are supplied with wires already attached, making installation easier. Moreover the receiver is best placed in the cab to allow the antenna, which is a

It all fits under the body of this 009 diesel. The tiny LiPo battery is fitted with a plug which clips into the socket (see photo 2 left). Heat shrink insulation is used on all soldered joints.



With the battery plugged in you can see how compact is the assembly. The thin wire antenna is located in the cab for good reception.



The charging circuit board with battery connected by red and black leads. Power for charging comes from a computer via the USB cable.

thin wire, to receive the signal. Placing it under the bodywork, especially if this is made from brass, will make reception less effective. On the receiver the black and red wires always go to the battery, the remaining two, which vary in colour but are both the same colour, are connected to the motor.

The battery itself can be purchased on-line from Micron Radio Control and the charger from Robotbirds (see supplier panel for full details). The charger will need a socket fitted that is compatible with the terminals on the battery and when assembling and charging, ensure the battery is connected to correct polarity, otherwise it is an instant re-purchase of parts! The charger comes with a USB plug which allows recharging from a computer or via a mobile phone charging transformer as shown in photo 4.

Speed controller/transmitter

This item combines both the traditional train speed controller and the radio transmitter. It is made by DTRC Control Systems, a small independent manufacturer of miniature RC devices which supplies items assembled and in kit form, some specifically for railway models. The unit I use is a Deltang Tx20, as shown in Photo 5, which is a simple hand held battery powered unit. It operates on DSM2 protocol (an international standard for radio control) and has the following features;

The radio transmitter box doubles as the train speed and direction controller – all very conventional, really.

- Black push-button for 'binding' or 'latching' the selected receiver to the transmitter.
- Red push-button ON/OFF.
- Knob (top right) for momentum/inertia adjustment if required.
- Knob (top left) for selecting a receiver (or 'channel'). There are 12 channels on this unit which means up to 12 receiver-fitted locos can be accessed.
- Knob (centre) which is the speed and direction control, with a centre off position.
- Toggle switch in centre, which is not in use.

Operation

After installation each receiver needs binding (or latching) to the transmitter. To do this power up the loco (by plugging in the battery) and at the same time, select a channel on the transmitter then hold down the black binding button until the LED on the receiver stops flashing.

That receiver is now bound to that channel (Note that with the Tx20 you have to label the channels yourself with numeral decals or paint - so you could put your loco numbers down instead of single digits). After that it's simply a matter of using the hand-held transmitter as a normal train controller for speed and direction.

Testing and implications

The LED on the loco receiver will be lit constantly until the battery power is low, then it will start to flash as an indication that recharging is required. I found that running time with a small OO9 motor was approximately 3-4 hours, depending on the load, and the battery took 25-30 minutes to recharge.

With this method of powering a model locomotive there is no need for any power to the track, eliminating the need for separate transformers, track wiring looms, or the need for frequent cleaning of the track. Point frogs don't need wiring for polarity changes either, so as you can see, a lot of traditional wiring work is completely unnecessary with this system. And because there is no electrical connection to the rails, it is also possible to run the loco on the same tracks as those powered for either 12V dc or DCC control.

I also tested the range of the system and the loco functioned properly at a distance of 25' from the transmitter. The loco also ran for two days constantly at an exhibition with no problems at all. Whilst the system has clear benefits, certainly for home use, I am not sure of the implications of using it alongside other layouts at an exhibition which may be using radio control as well, or indeed other Wi-Fi devices such as internet routers for tablet and mobile phone train controller apps. I would have thought that too many RC devices in close proximity must eventually result in cross channel interference – perhaps a radio control guru out there could advise?

Conclusion

As well as loco speed control, there are receivers available with extra functions to allow lights etc., to be operated, and also devices to control lineside accessories such as point and signal motors.

The cost per loco is about £32.00 for the receiver, battery and socket, and a controller/transmitter and charger will cost between £32.00 and £65.00 depending whether you buy it as a kit or ready assembled. Although I remove the battery for charging, it is possible with larger locos to fit charging sockets and on-off slide switches. The latter being useful anyway as when a loco is not being used (ie between operating sessions) the battery must be isolated, otherwise the receiver will constantly search for a control signal, draining the battery in the process.

In theory the system can be used with OO and larger scale locos. The receiver would easily fit in the loco, as it is only slightly larger than a typical DCC chip, but the size of the battery required to match the power needed for heavier trains may be too big for housing in the bodywork. I would advise anyone contemplating this system for larger scale locos that they should carry out some experiments of their own first, or wait to see how the new commercial products perform.

Supplier information

Transmitters and receivers:
Manufactured by DTRC Control Systems (www.deltang.co.uk/index.htm) available from Micron Radio Control (www.micronradiocontrol.co.uk)

Batteries:
Hyperion LiPo available from Micro Radio Control (as above)

Battery connectors, charging socket and corresponding plugs:
Robotbirds (www.robotbirds.com)

Battery charger output connector:
Hobby Electronics (/www.hobbytronics.co.uk)

For information on the forthcoming Acc+Ess Protocab system visit www.protocab.com