

Introduction

Over the last few years, *Timpdon Electronics* has received a number of complaints from users concerning erratic operation of **UltraRad** vehicle control systems, mostly associated with erratic motor speed operation.

In almost all cases, investigation has shown that the root of the problem is the use of very cheap, poor quality imported motors, which generate vast amounts of radio frequency interference.

This Technical Note is issued to give guidance to model builders concerning the selection of motors for speed control systems in general, as problems are by no means restricted to the users of *Timpdon Electronics* **UltraRad** systems, but affect the products of many other model railway control system suppliers.

The Offending Motors

Almost without exception, users who have complained of problems have been attempting to use cheap imported 3 pole 3V motors, costing less than £0.50, which are not fitted with proper brushes but, instead rely on two small pieces of copper braid draped over the commutator to provide internal electrical connections.

Measurements on a number of these motors, using a spectrum analyser, show that they all generate very high levels of wide band radiated radio interference up to a frequency of at least 700 MHz. The interference levels are such that, at the short ranges present within a model loco, this interference can totally swamp any genuine radio transmissions used for radio control and also interfere with microcontrollers used within PWM speed controllers.

To put it simply, these motors are operating as powerful spark radio transmitters [Similar principle to that used by Marconi for the first radio transmissions a hundred years ago].

Most such motors examined had dimensions of 30mm long x 24 mm diameter, and were supplied by a number of electrical distributors and railway model builders.

Apart from removing the motor end cap to inspect the commutator arrangements, there is no instant physical way of detecting these motors, but a good giveaway is price. If the motor cost less than £1 it is quite probable that it is suspect.

From an operational standpoint, the most usual malfunction symptoms with *Timpdon Electronics* **UltraRad** systems are normal operation up to approximately 50% of maximum speed setting, after which the speed suddenly jumps to maximum and is uncontrollable.

The Solution to the Problem

Quite simple – fit better motors.

It has always seemed an anomaly to *Timpdon Electronics* that some railway modellers are quite happy to spend several hundred pounds on building a fine loco, another £100 on a set of **UltraRad** radio equipment and then expect to get perfect performance using a motor costing £0.50.

The motor is, in many ways, the most important part of the loco as it is this which provides the motive power and ease of running. Many perfectly good motors are available for not very much money, and it is well worth paying a bit extra for a good one.

Timpdon Electronics recommends motors supplied by **Model Flight Accessories** – website <http://www.mfacomodrills.com/motors/motors.html> – prices are very reasonable, and performance is excellent. Their motors are also sold by many good model shops – particularly those specialising in model boats.

The Caveat

Timpdon Electronics will not accept liability for malfunction of any of its speed control and radio control equipment used on vehicles which include motors of the type described above, which are not fitted with reasonable commutator brush arrangements.

We are prepared, however, to examine any motor submitted by users for examination and give advice on its suitability, in our opinion, for use with our equipment.

Please contact us if you want advice.