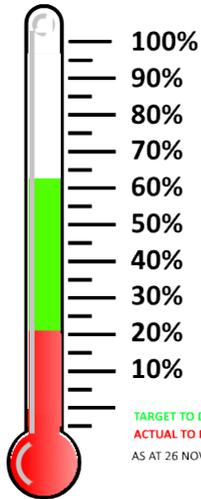
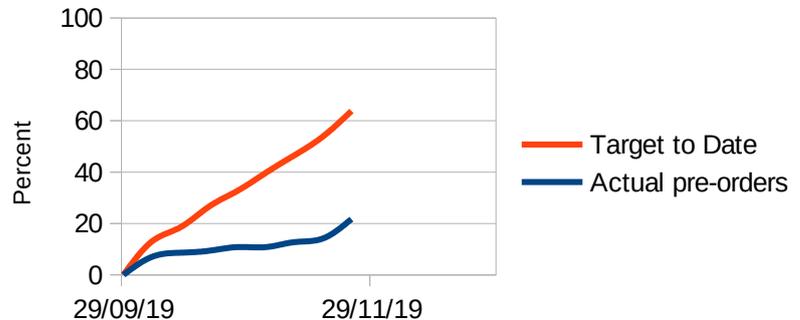


## New Product Pre-Orders Update- AFTER WARLEY!



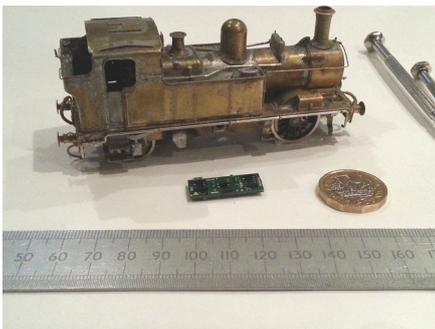
We'll report on the Warley show later in this Club newsletter, but the graph and thermometer shows a significant uplift from pre-orders received at Warley, and we're hopeful to get several more from new visitors to our stand who took the idea of using Protocab away for careful consideration! Club Protocab also signed up 20 new members, and we give them a warm welcome!



## The New Locomotive Control Units - Part 2

### Freeing the choice of motor voltages

Following on from the last Club Protocab newsletter, where we described the new LCUs, here are some more details of how the Protocab design and concept can benefit your modelling experience. New members can download previous newsletters from [protocab.com/news](http://protocab.com/news)



The 0554 LCU designed to fit into the sidetanks of a small 4mm tank loco. No, the 14XX is not now an 0-2-2T, the rear driver has been removed to fit the motor!

The two new models of LCU recognise the existing investment that most modellers will have in their loco fleets, traditionally powered by 12V DC motors, whilst also offering the opportunity for different voltage motors.

The 0554 provides for miniaturisation that exploits battery power's capability of driving motors other than 12V DC.

The 0505 is designed for 12V motors. It takes the nominal 3.7V from the Protocab battery attached to it and boosts the voltage as required by the 12V motor's speed, with the limitation of a maximum 9V output, which, we assess and based on existing experience, is sufficient for the sort of maximum speed that modellers generally require.

The 0554, on the other hand, boosts the 3.7V from the battery to a maximum 5V. This reduces the footprint required by the 0505 for the larger components to extend the boost range. The 0554 exploits the wide range of 5V or 6V motors that are commonly available (being used in e.g. camera mechanisms). It does not necessarily mean that it cannot be used with a 12V motor but when used with a 12V motor, it will only provide just under half the full speed (which may be acceptable for e.g. shunting locomotives). However, if the 12V motor is of an older vintage, it might not start turning below 5V, so would never turn with output from the 0554! The maximum current from both the 0554 and 0505 is 450mA and experience with the existing 0502 (which provides a maximum 500mA) indicates that this range is acceptable for a very wide range of motors.

There are a number of safety devices on the 0505 and 0554 LCUs. As with the 0502, these ensure that too high a current cannot be pulled by the locomotive's motor, thus potentially damaging the LCU and/or the battery.

#### 'Glide Control'

On the subject of motor voltages, let's consider the modeller's 'enemy' - *stiction!*

When a full sized locomotive starts to move, it is smooth, and the 'pull' of the train is apparent. With so many model locomotives, and particularly those of a vintage, the motor won't start turning until a certainly voltage has been applied to it and then it will rotate at a sudden high speed, so you get the 'jerk' start.

With the new LCUs, we attempt to overcome this by 'tricking' the motor into getting a short burst of higher voltage which is enough to rotate the motor and doing it often enough to perform a smooth take-off. It depends on knowing the difference between the speed setting on the controller and the actual motor speed and this is built into the new LCU series.

Continued page 3...

Order online: [www.protocab.com](http://www.protocab.com) or by telephone 07831 231164

## How we designed the 0502 LCU

For our new readers, we thought you might like to know how we considered the design of the existing 0502 Locomotive Control Unit. You can therefore evaluate just how much of an advance the new LCUs are!



Our primary consideration in designing the 0502 LCU was to be able to fit into as wide a range of locomotives as practical for this initial offering. The main factors were:

- as small a footprint area as would be practical
- ease of installation
- support for 12Vdc motors
- a simple means of switching the LCU on and off to preserve battery life
- support for a range of batteries

There was another consideration and that was the size of the batteries and how they would be recharged without removing them from the locomotive. Lithium ion batteries would provide a

higher energy density than e.g. nickel cadmium, rechargeable alkaline or nickel metal hydride chemistries, but we were aware that they are less easily obtainable in the small sizes we would require. They also need specific charging regimes that are more critical than the other chemistries stated above. Because the nominal output voltage of a single cell lithium ion battery is 3.7V, to provide output voltage for 12V dc motors might require batteries in series, maybe three to achieve 11.1V. This would bring its own issues for balanced recharging, not to mention the size required to accommodate this number of batteries. There was also the cost issue of two or three batteries. The upside, of course, might be three times the power output that would be obtainable from a single cell.

After plenty of experimentation, and equally extensive research, we determined that a single 3.7V battery could boost the voltage *inside* the 0502 LCU to as close as possible, the 12V maximum speed of the motor. The circuitry on the 0502 to boost the voltage would be much smaller than the size of additional batteries, connected in series to achieve the same voltage. In the event, we decided on a compromise maximum of 10.8Volts output, on the basis that 12Volt motors are rarely driven

at the full 12 Volts. This reduces the additional circuitry that would be required for the final 1.2Volts.

### Switching on and off:

We experimented with a physical switch, but concluded that this would inhibit the choice of locomotives where a suitable switch could be installed and operated. Instead, we opted for a touch sensitive switch - the 'Locoswitch' -



(the copper pad above) which could be installed e.g. inside the cab of the locomotive and operated by touching the outside of the locomotive.

### The radio:

Lastly, we decided on an internationally used standard that would provide for the optimum performance and availability of components and ease the testing and compliance, without having to obtain and maintain a special radio equipment licence. The circuit we developed avoided the need for an external antenna and proved to be an excellent choice for reliability and range.

The 'Locoswitch' which is attached to the 0502 as described above was installed because we needed a method to switch off the current flow from the battery when the loco was not in use. We could program the LCU to switch the battery off, but we didn't have a method to switch it on without the Locoswitch. One option might be to turn on the battery every so often, but we assessed

that this would create a significant drain on the battery, given the lengthy periods when the loco might sit on the shelf without being operated.

Several, but by no means all, Protocab Owners reported difficulty with the Locoswitch, particularly when installed in a metal bodied locomotive. We also assessed that the Locoswitch sensitivity (which we could adjust in updates to the

firmware) was causing some locos to switch on whilst 'in the box' so that the battery appeared to be draining more quickly than expected. Other Owners reported that the auto-off facility was proving difficult when the loco was in a remote location on the layout, needing to reach over to switch it back on. The solution is to eliminate the Locoswitch altogether in the new LCUs

## Ellis Clark LM&SR Black 5 for O gauge

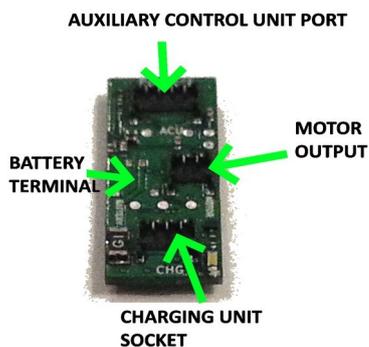


Black 5 in foreign territory! I took this photo at Brighton in 1965 and the fireman kindly took off the headboard so that I could get a full front photo!

A number of Club members and Owners have asked whether Protocab will work with the Black 5 that Ellis Clark is planning to introduce in 2020. I spoke with Ellis at Warley. Like us at present, he is in the pre-order phase for this model, so needs to gauge likely demand.

The motor he is planning to fit should operate under the 500mA stall of the present 0502 LCU and battery series. Of course, there should be plenty of room inside the tender for the Protocab components. Please write directly to Ellis (ellis@ellisclarktrains.com) if you would plan to buy one ready fitted with Protocab. It should be a popular prototype and, as you can see from the photo, was no stranger to regions outside the LMR!

## Installing the new 0505/0554 LCUs



The process for installing the new LCUs is the same as for the 0502, except that there is no need to site the LCU with respect to the former Locoswitch! The familiar connectors are still there, the output to the motor, the battery terminal (but see next paragraph) and the input from the charging socket. The auxiliary control unit (ACU) port is there too, for addition of other devices when available.

The 0505 and 0554 will also be supplied with the 9959 Heat Absorbing Pad and 9963 Heat Insulation Sheet to enable the

LCUs to be fitted in the loco, best secured with tape or a form of plastic harness, say. With further practice on typical installations and before going into final production, we may add some removable fixing ports to the board. If you have any views on possible installation options, we will be very interested to hear from you.

## A word about the battery connector

The red connector on the 1902-series batteries is replicated on the 1901-series cylindrical battery and the range of batteries in these series (to be described in detail in the next newsletter) is designed to provide the power for the higher power output of the 0502 and 0505 LCUs. However, the 0554 itself can be stressed if a motor tries to draw too

much power from the battery, via the 0554.

For that reason, we are limiting the range of batteries that can support the 0554 and, to ensure that suitable batteries can be fitted to the 0554, we are fixing the smaller capacity connectors to these batteries. A correspondingly smaller socket is present

on the 0554, which has the additional benefit of reducing the area taken on the PCB by the socket.

We have not differentiated between the different connector types in the preorder phase, but we will automatically allocate the correct battery connector when we are able to supply them.

The new LCUs take the battery powered wireless control concept far beyond traditional radio control methods.

Between them, the **0241 Touch Controller** and the **0505/0554 LCUs** create a combined control network that provides the foundation for a myriad of new and exciting control

opportunities that we will develop to enhance the two devices using the tried and tested 'Over-The-Air' update process already implemented with the 0201 Direct Controller and 0502 LCU. The 9801 Management App for Windows will be enhanced to provide a new range of management functions to support the extra facilities of the new

product devices, as well as support for iOS devices.

There are features on the 0505 and 0554 LCUs that are included for future development, protecting the investment you will make to complement your locomotive fleet..

## Warley 2019 Report



We can't tell you anything about any of the layouts or other trade stands really, because we were constantly busy throughout the two days, which was excellent. We met a great number of new friends, many of whom had not heard of Protocab and, of course, several old friends, some of whom had come to Birmingham especially to meet us. The stand we put together had three sections, as you can see in Brian Norris' photo. Alex (standing, taking essential water!) was running the 'doughnut' and we had eight locos available including the Oxford Models' Dean Goods. (We will shortly have some available for sale, ready to run with Protocab installed). Tony is seated in the centre and it was useful to have a desk to demo the 9611 Contact Charging and 9650 Wireless Induction Charging Units. Dan, who was away when the photo was taken, ran the tall table just behind our seated visitor's head. Dan demonstrated Protocab in an N gauge loco to much acclaim, as well as providing technical support to a number of Owners.

We are very grateful to Owners **Richard Archer-Jones** and **Mike Salter** for bringing their O gauge locos along and helping out on the stand! Their independent views of Protocab were much appreciated by visitors to the stand.

In the next Newsletter, we'll look at the new batteries and the 9650 Wireless Induction Charging System.

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