

LSC DCC Address:
(DCC fitted)
6885

Mark's Trains - DCC / DC Locomotive Servicing Controller Installation and Operating Instructions

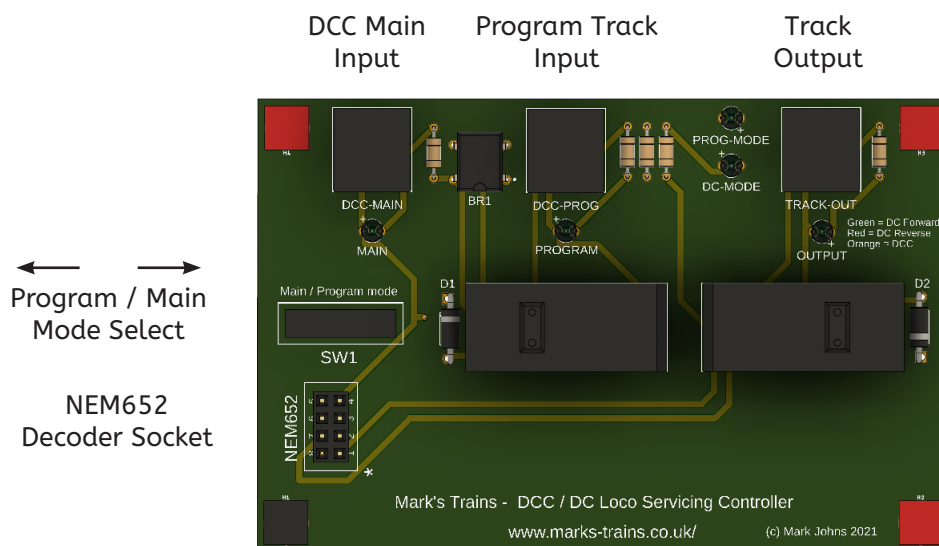
Introduction

The DCC / DC Loco Servicing Controller was designed through necessity of having to constantly swap between the DCC Command Station and a DC controller. We were testing locomotives and running them in on analogue DC control, and after a DCC conversion testing and programming the loco on the DCC system. This meant each controller had to be connected and disconnected from the test track so that both systems were isolated from each other.

The DCC / DC Loco Servicing Controller was initially designed and created back in 2016 as a box with two toggle switches and some wiring inside, and has seen constant daily use ever since without fail for 5 years. There is no longer a need for a DC controller and swapping plugs over, simply flicking a switch changes over from DCC to DC track power.

As part of our 5 year celebration of business, the design has been streamlined and manufactured as a PCB to allow other modellers to make use of this controller. Some improvements have been made so that switching between DCC and DC can be achieved by activating a function key on your DCC controller instead of using a physical switch. A physical switch is still used to change between main track power and programming track power, this is a safe-guard to prevent inadvertent programming of locomotives.

PCB Overview



Getting Connected

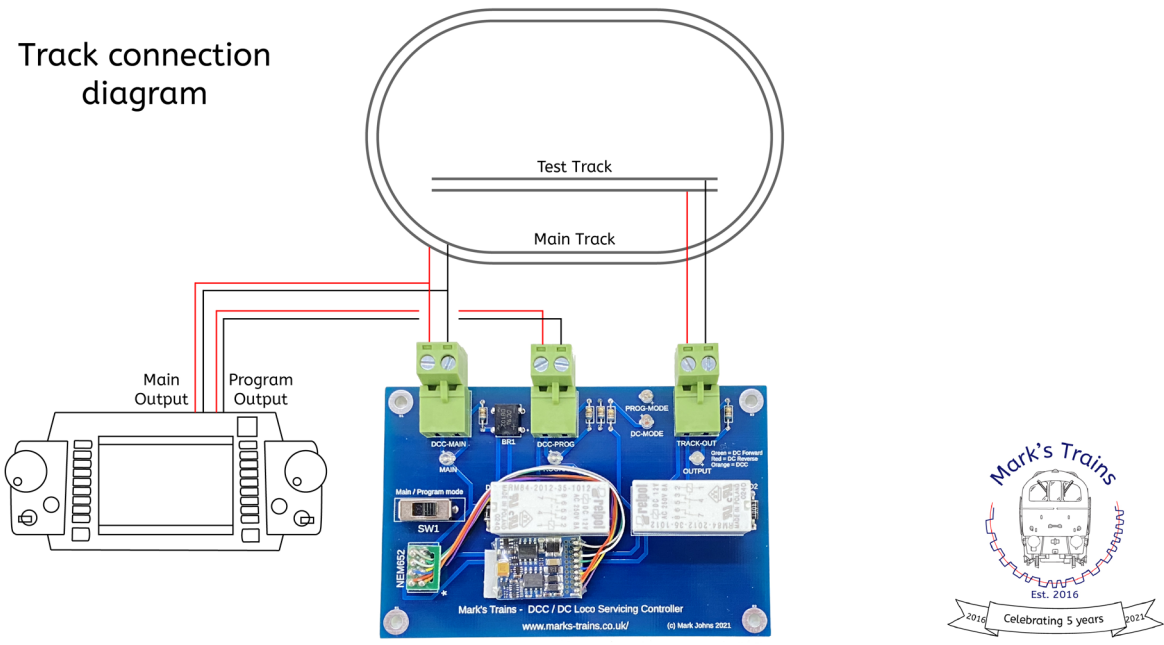
Connection to the Loco Servicing Controller is quite simple. Connect the main DCC track output from your command station to the DCC main input terminal on the PCB (removable plugs with screw terminals are provided with this product), if you have a programming track output from your command station this can be connected to the program track input terminal.

However, a programming track input isn't needed for the controller to operate correctly as not all command stations have a dedicated track output. The Locomotive Servicing Controller has been designed with this in mind.

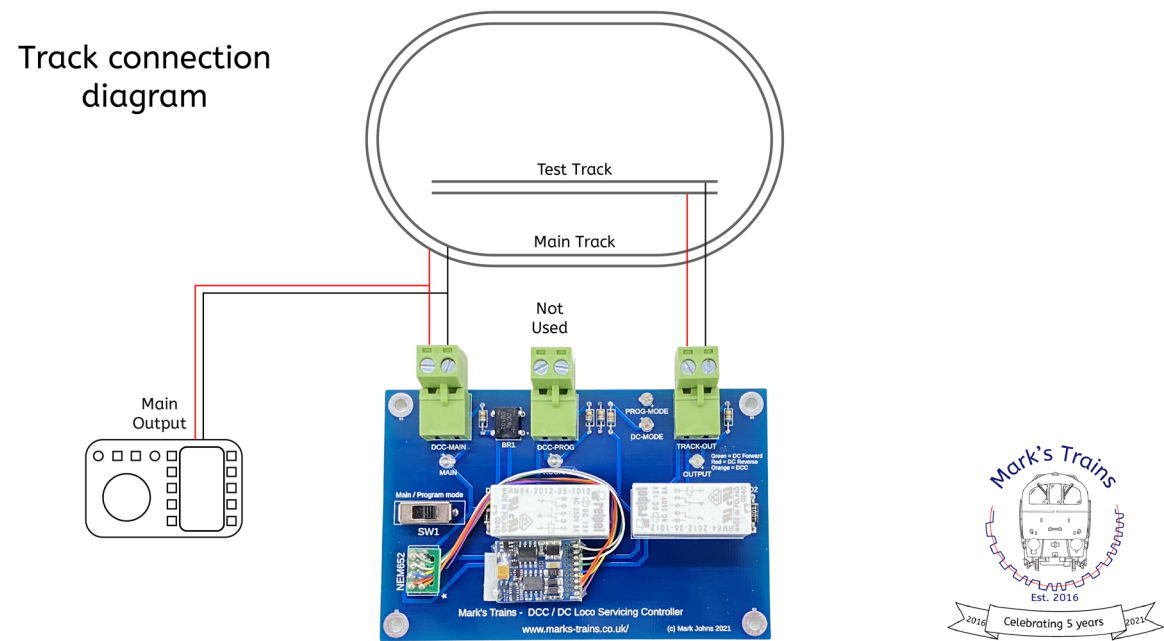
Connect the track output from the Loco Servicing Controller to your test track.

The two wiring diagrams below show you how to connect the Loco Servicing Controller, depending upon the DCC command station you use and their outputs.

DCC command station with 2 track outputs (Main & Program)



DCC command station with single track output



For Loco Servicing Controllers shipped without a decoder, install a suitable decoder onto the PCB at the NEM652 8-pin socket. Pin 1 has been marked with an index star at the bottom right corner of the silk screen print, pin 1 is the orange motor wire in case you need assistance in decoder plug orientation.

We recommend installing a Zimo MX600R 8-pin decoder as this provides a really smooth DC output. Loco Servicing Controllers shipped with a pre-fitted decoder will have a Zimo MX600R decoder installed.

The Locomotive Servicing Controller is now ready to use.

Operation

The two DCC inputs (Main & Program) have a power indication LED below their respective terminal connectors, and will illuminate Green when their input is live. A currentless program track (such as with ESU ECoS command stations, for example) will have a dead output until CV's are being read or written, in this case the LED will only illuminate when programming is active and remain off when idle.

The track output LED will illuminate Orange when the output is DCC - either from the main DCC input or programming track input. Under DC output the LED will illuminate Green in forward direction and Red in reverse direction when a speed has been set on your controller. The LED will remain off at speed step 0.

Two reminder LED's are provided between the program track input and track output terminals, to indicate Programming Mode and DC Mode being active. When the Locomotive Servicing Controller is set to operate in Programming Mode the corresponding LED will illuminate Red to warn that the programming track input has been selected. When DC Mode has been activated the corresponding LED will also illuminate Red to warn that the track output is DC instead of DCC.

Most decoders now support analogue DC operation, however it is worth noting that there are some exceptions to this, and a DC output will likely blow a decoder that does not support DC operation.

To control a locomotive on DCC ensure the Main/Program Mode switch is set to 'Main' by sliding it to the right (towards the relays). The track output LED should be illuminated Orange and normal DCC control of locomotives can take place.

Programming can still be undertaken On The Main and also in Program Track mode for those command stations with a single track output. However, it should be noted that programming under Program Track mode with the Locomotive Servicing Controller set to 'Main' can change settings on the decoder fitted to the PCB.

To prevent this from happening it is advisable to enable the decoder lock feature on the decoder fitted to the Locomotive Servicing Controller. If your decoder does not support a decoder lock, then you may simply disconnect the decoder whilst programming. DCC fitted Locomotive Servicing Controllers have the decoder lock enabled by default. For more information on decoder locking please read the relevant section at the end of these instructions.

Programming locomotives with a command station that has a separate programming track output, such as the ESU ECoS or Gaugemaster Prodigy Express/Advance systems, will have a direct connect to the PCB via the Program Track Input.

Ensuring the Main/Program Mode switch is set to 'Program' by sliding to the left, you are able to bypass the DCC signal from the onboard decoder (via the first relay) allowing you to make changes to your locomotive without this affecting the decoder.

The Program Mode LED will illuminate Red to remind you that programming mode is active, as some command stations may not allow you to operate a locomotive due to this mode being designed for CV changes only (currentless program track). Once programming has been completed you can change the mode switch back to 'Main' to test your locomotive.

Operating a locomotive on DC is a simple case of activating AUX1 on the onboard decoder, in most cases this is mapped to F1 (depending on the decoder installed, if not supplied with a decoder fitted already). The DCC fitted Locomotive Servicing Controller is supplied with a Zimo MX600R decoder and set to operate on F1 by default.

The DC Mode reminder LED will illuminate Red when DC mode is active, and the track output will now be a modulated (PWM) DC output. Applying some speed on your command station will move your DC locomotive on the test track, either forwards or backwards depending upon the direction set. When set to forward the track output LED will illuminate Green, and Red when reversing once speed has been demanded from your command station. On speed step 0 the track output LED will not be illuminated.

Other features

There are some features to note with the Locomotive Servicing Controller. The relays will feel slightly warm to the touch when operating - but not hot, this is a normal occurrence as current flowing through a small coil winding will produce some kind of heat.

The decoder too may also feel slightly warm to the touch, this is perfectly normal as well and in most cases goes unnoticed when installed inside a locomotive.

So there's nothing to worry about unless they are roasting hot. Most electrical devices will produce some form of heat when operating which is perfectly normal during use. Our prototype controller has been operating for 5 years without any issues despite constant daily use.

Due to the design of the circuit it is possible that with both Program Mode active and DC Mode active, both reminder LED's will be illuminated at the same time. This does not imply that both a DCC supply and DC supply exists at the track output terminals.

Here's a little explanation why; Activation of Program Mode energises the first relay which changes from the main DCC input over to the programming track input. This is fed to the second relay which when powered off is routed to the track output terminals.

Activation of DC Mode energises the second relay which isolates both DCC inputs at the first relay output, from the track output terminals, by changing over the switch position. It then simply routes the motor output from the onboard decoder to the track output terminals instead.

In any case the track output LED will indicate the state of track power, a DCC signal is modulated (similar to alternating current) meaning two LED's facing in opposite directions will illuminate at the same time producing an Orange colour. DC current is directional, so in one direction the LED will be Green and in the other Red once speed has been requested by the command station.

Decoder locking

To prevent locomotive programming from making inadvertent changes to the onboard decoder, it is advisable to enable the decoder lock feature on the decoder fitted to the Locomotive Servicing Controller.

DCC fitted Locomotive Servicing Controllers have the decoder lock enabled by default.

The Zimo MX600R decoder lock uses **CV144** set to a value of **64** (Bit 6 active) to prevent service mode programming.

Other systems use two CV's; **CV15 & CV16**. CV16 is the lock (or locking number) and CV15 is the key (or un-locking number). Both CV's can accept a value between 0 and 7. The system was designed to address a single decoder on a locomotive that has two or more decoders installed, preventing both decoders from accepting CV changes when those changes were only directed at one of the decoders. You will need to read your chosen decoder manual to see if this feature is available, because a few do not utilise this system anymore.

By default CV15 & CV16 have a value of 0. Changing CV16 to a value of 1 (standard for a motor decoder) and leaving CV15 at 0 will result in the decoder being locked from further CV changes; except for CV15 which can still be programmed. Unless CV15 is set to match CV16 (in this case '1'), the decoder will remain locked.

For information, the following values are typically assigned to CV16 for the following purposes;

1 = Motor decoder, 2 = Sound decoder, 3 = Function decoder, 4 to 7 = Other user applications.

It is also worth noting that some decoder manufacturers implement a lock enable controlled by another CV, for ESU LokSound decoders CV124 must have bit 1 active (a value of 2).

Thank you

Finally the team at Mark's Trains would like to thank you for your purchase of this product. We hope that you find this to be a very useful tool, we certainly couldn't have done without it over the past 5 years of business.

Celebrating 5 years of Mark's Trains.

May 2016 - May 2021.