Michael Edwards' tramway:

C*onsisting of 22ft of 3.5 inch gauge track with overhead gantries, all wiring connections including automatic reverser, manual control box, two lamp stands and one each of:*

1901 East Ham Corporation Tram,

1903 Ilford Corporation Tram,

1935 HR2 London Transport Tram.

Written by Phillip Edwards.

There is a good description of the basic control method used in the tramway in Jonny's Meccano Magazine, October 2020 on page 12. This has been enclosed herewith, on the next page.

The trams were built in the '80s for the London Transport Museum Christmas time exhibitions that Michael organized. The tram selection system uses the overhead power wire as not only power to the tram's lights, but also to manage which of the East Ham or Ilford trams is operated from the power fed to the tracks. With voltage to the overhead wire turned off, both trams run. When the overhead wire is powered from +12V, one of the trams is switched on via a diode connected relay. The other tram, with its diode being reversed, has its relay unpowered. One red LED, at each end of the given tram also illuminates, indicating which tram is active.

Each of the three trams has a little toggle switch mounted between the wheels to completely turn off or on a given tram.

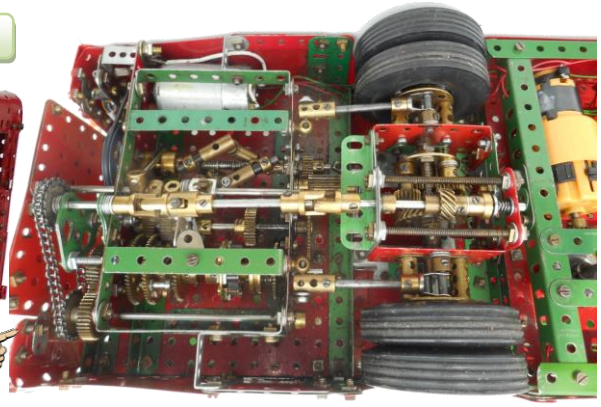
A Control box was built with an integral H&M resistive speed control mat, to set the max tram speed as well as travel direction. It also has a light circuit on-off-on switch which sets the polarity of the lights voltage feed and hence which tram operates. There is also a smaller switch to select either automatic reversing, or manual control mode.

An H&M 240V powered multipack DC power unit (model D.C. 60) powers the tramway. The control box has two dual input wires. One pair should be connected to each of the rear output terminals of the D.C 60 transformer. It does not matter which polarity the wires are connected with given the control box has reversing switches included. All connections from the control box out to the tracks are thereafter color coded and primarily use 5 pin DIN connectors.

The dual bogie based HR2 tram was built around 2005, and this has a simpler electrical system, comprising just the on/off switch between the bogies and internal lights. To operate this tram while one of the other two trams is also present on the track, one must either turn off the non-desired tram from its internal on/off switch, of just turn off the lights circuit from the control box switch.

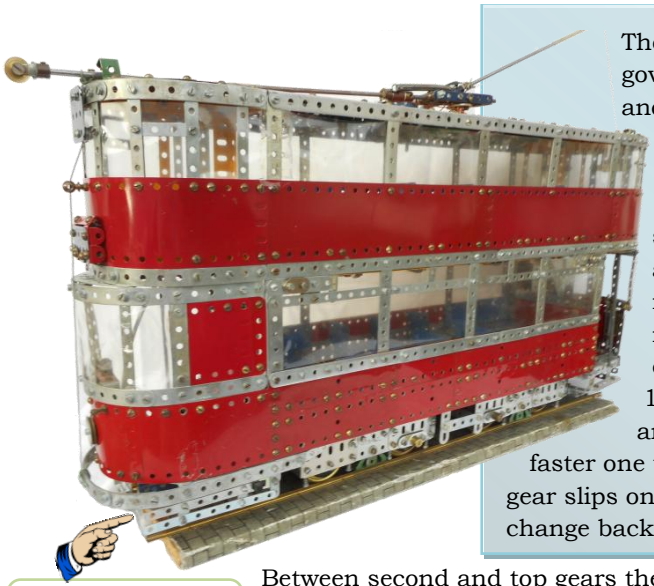
Bus and Tramway models - Michael Edwards - UK

Dennis Dart Bus



Bus drive train

I saw your article about the auto-reversing system for railed vehicles by Graeme O'Neill. I have been operating a far simpler system on my 3.5 inch tramway, built in the 1980's for a Show at the London Transport Museum. It has no complicated moving parts except a current reverser. At about 2ft from each end of the track there is a diode on one rail joining up a gap where the track is cut. A diode allows current to pass only one way. These are wired so that, when the tram approaches, the end of the track is dead and the model coasts to a stop. When the current reverses the end of the track becomes "live" and the tram proceeds in the opposite direction where the same thing happens. The auto-timer consists of a Meccano Crouzet motor driving a commutator using the half-on/half-off part to turn a relay on and off at regular intervals depending on the revolution speed. The power is wired into the relay so that it is reversed when it switches. The result is a regular movement of the model, with automatic stopping and waiting at each end of a 22ft track. To make the model more realistic I devised a speed control on the trams where a Meccano rubber band driven off an axle causes an Elektrikit wiper arm to travel across a resistance mat (produced by H&M as a spare) thus making the motor start slowly and gather speed. Once the arm has travelled to its limit, the rubber band simply slips on the axle. I have incorporated a boiler-end Meccano bell to "ding" as it travels. The traction power goes through the rails, one being a common earth with the overhead, which operates the lights. By this means the lights stay on when the motor is stopped. The overhead is a separate supply at 12V. A final touch is wiring a relay in each tram to read the direction of the light circuit so that two trams running simultaneously can be individually controlled. The bus is modelled on the Dennis Dart, often seen in the UK until recently.



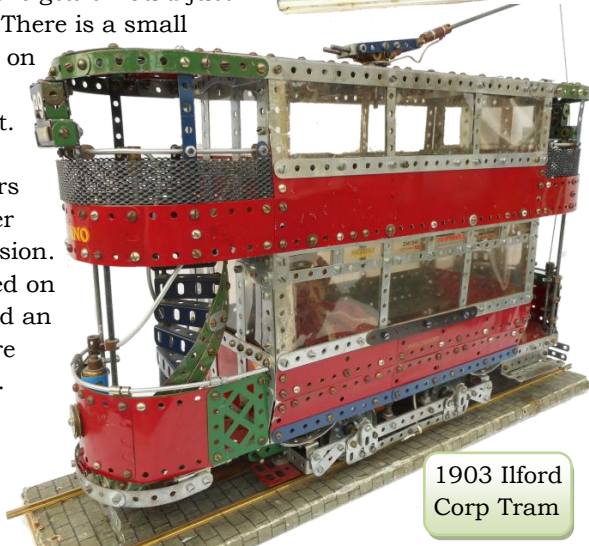
1935 HR2 London Transport Tram

The gearbox is operated by a centrifugal governor made up of couplings and collars and 3 central Meccano springs in a row. As it speeds up the weights fly out pulling the input shaft through the 3 sets of gears. As neutrals between the speeds would cause the model to stop and gears to crunch, I devised a neutral free transmission based on ratchets, which consist of 4 spring on a bush wheel clicking round a 19t pinion. Both neighbouring gears are engaged momentarily, but the faster one takes up the drive and the lower gear slips on its ratchet. Under load it will change back up again as the governor slows.

Auto Timer with a Crouzet motor and half-on/half-off commutator.

Between second and top gears there is an additional device which provides synchromesh allowing the gears to engage easily without pressure. There is also an automatic locking device to prevent gears changing whilst in reverse. This engages a non-ratchet gear, as otherwise the gears would just "ratchet" and the model would not move. There is a small spring on the input drive thrust bearing on the differential which absorbs the shock of the gear change, smoothing it out. The model is remotely controlled, including steering and opening doors operated by Power Drive Units under the flooring, and coil spring suspension. The model travels at a realistic speed on a long multi-core cable. The bus and an earlier version of the gearbox were featured in CQ83 in March 2009. The governor was described in MM December1966.

1901 East Ham Corp Tram



1903 Ilford Corp Tram

The Trams:

Both the Ilford and East Ham trams have similar underside construction. In contrast, the HR2 tram's underside is simple, comprising just one motor per bogie and a master on/off switch.

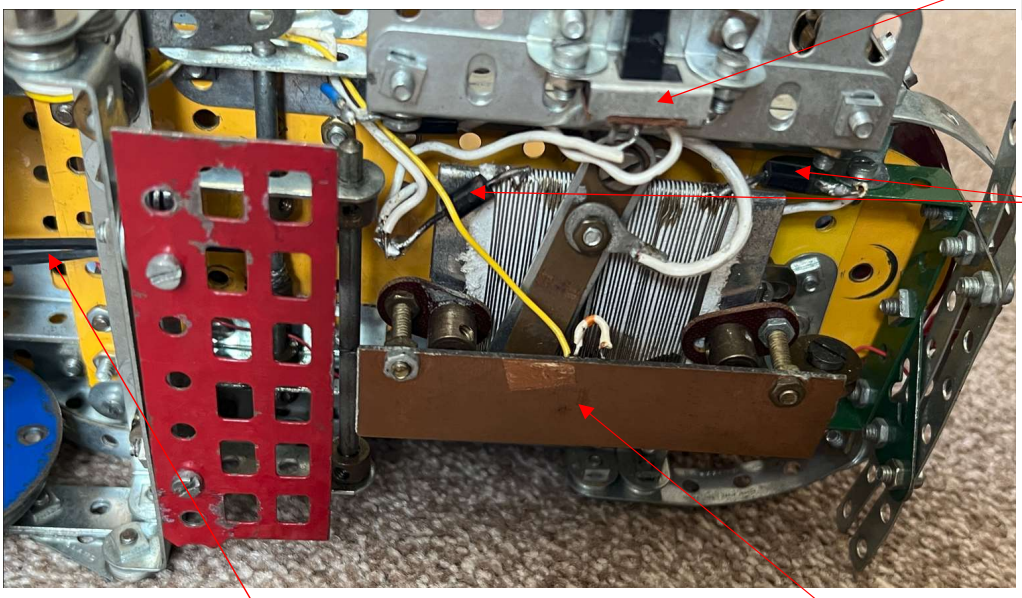
Slow start variable resistance, bell contacts and slow start bypass switch

Master on/off switch

Diode connected relay to enable/disable tram motion

Bell and actuator

Slow start Circuit:



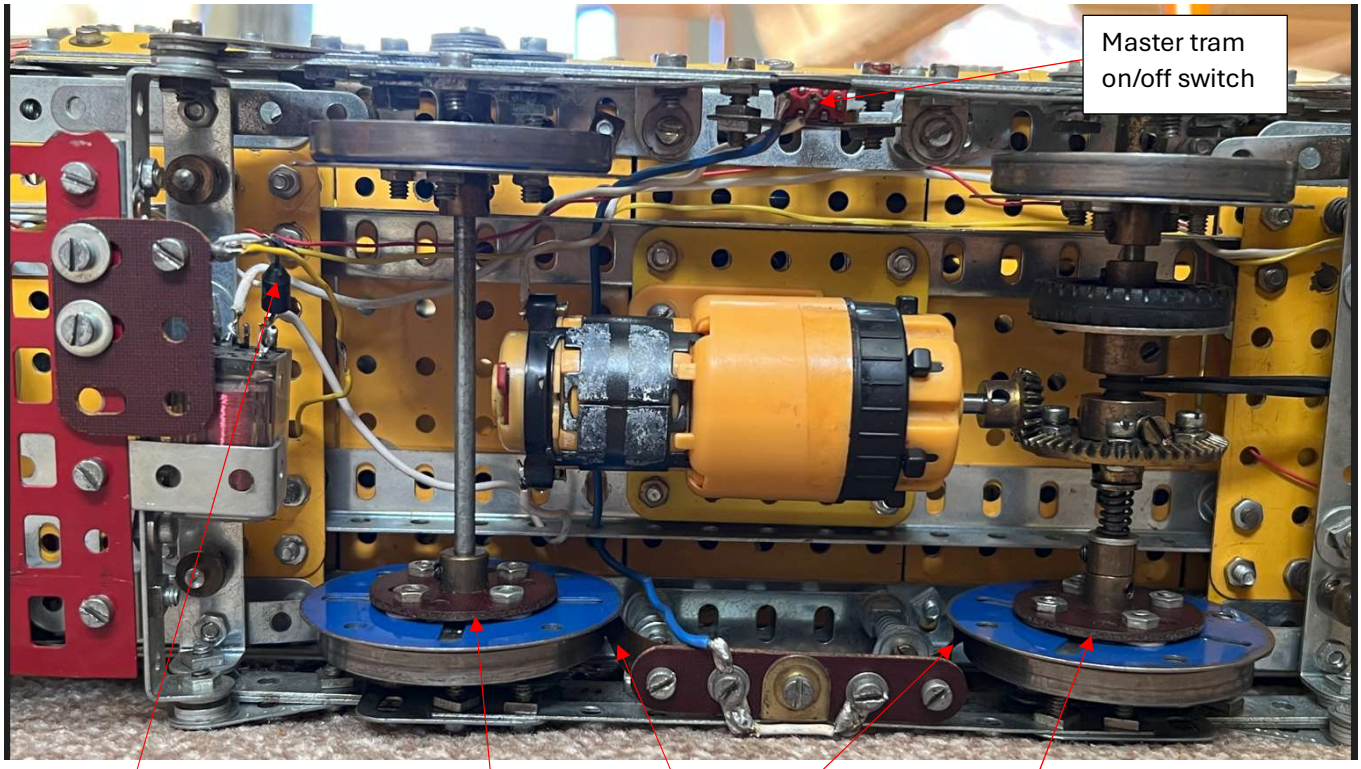
Slow start bypass switch

Series diodes to enable slow start from each direction

Meccano drive band from axle to operate string cord that pulls contact wiper left-right. It is crossed over itself to avoid touching tram framework

PCB with contact fingers cut into it to make bell ring

Drive motor, master relay, contact arms and master on/off switch

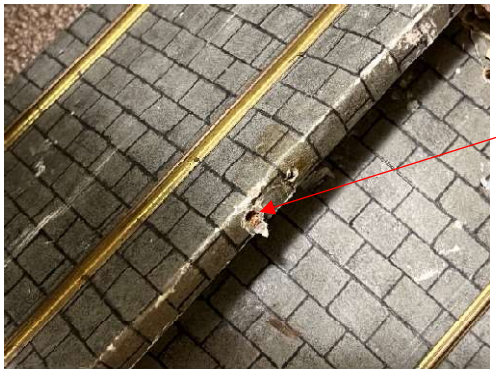


Setup: Setting out the track

There are 10 track sections, two with integrated diodes and bypass switches, that are used to isolate the end sections. One track section has a power feed wire permanently connected; this section should be placed approximately in the middle of the whole track layout.

All of the miscellaneous items to connect the sections (plus a few spares!) and the associated overhead wiring gantries can be found in the small tram shaped tin. The tracks are connected using brass clips to join the rails and bent thick wire pieces to hold sections together. Note these bent wire pieces are slightly different lengths, to allow for the hand drilled hole locations in the track bases. Simply chose the bent wire piece that best locates and holds two given track sections together.

The track sections all have a hole drilled in one side, which is used to locate the gantries. The track section should be arranged such that these holes are all at the rear; the side where the gantries will be.



Two track sections are used as the ends of the track. These have four upward protruding long screws as well as brackets onto which the wires from the lampstands can be connected.

The end gantry is connected like this:- the 3 hole girder is pressed up against the end of the track base and then the four long screws should locate with the holes in the gantry's bases. Use nuts to tighten down base to the board.

The track should be placed on the floor/tables so that the relative position of each section can be worked out.

For the full 22 foot length of travel, it should look like this:

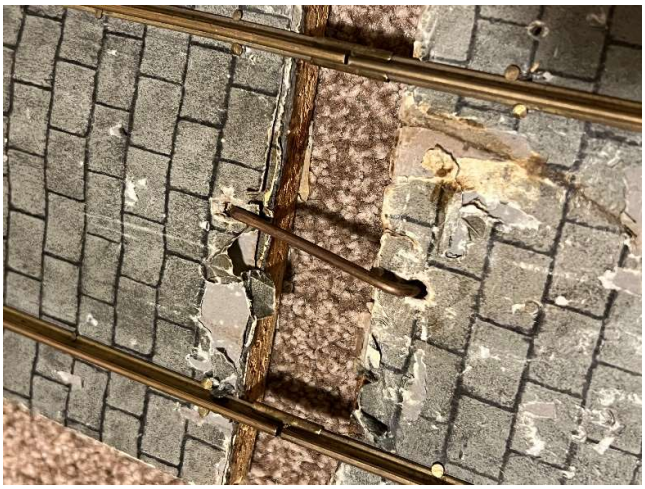
Notice the end section with its screws, the diode isolated sections and the main rail power feed section that has a wire connected to the rails.

Configured like this, there is just enough room to place one tram right up against the end of the track whilst allowing the ‘operating’ tram room to slow and stop after passing the isolation diode. Should all three trams need to be shown on the track at the same time, then move one diode isolation section inwards by one section, allowing room for the extra tram.

Setup: Connecting the track and gantries.

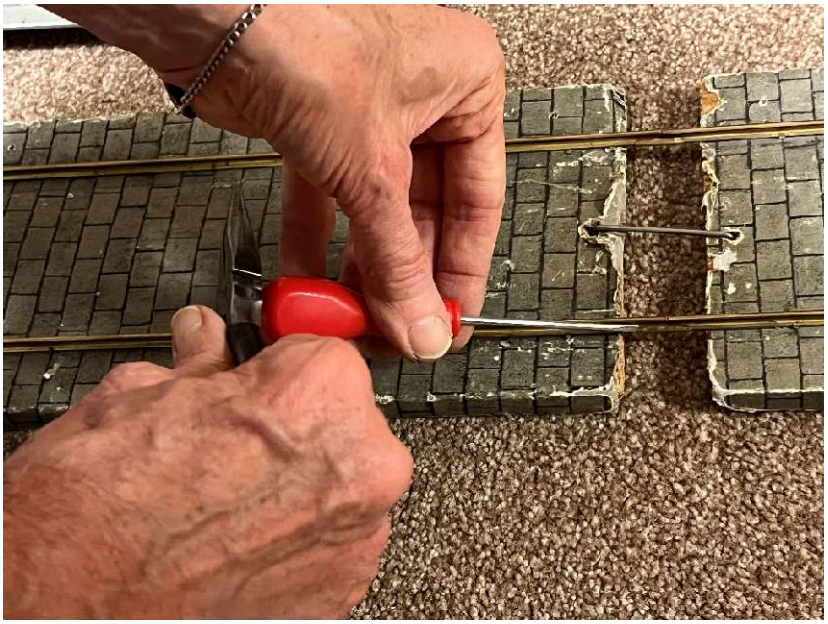
A pair of track clips are used to connect two track sections. Use pliers as necessary to squeeze the brass clip such that they make a good mechanical hold on at least one rail section.

Push the two sections together and pick a wire clip to hold the two sections in place.



Continue this process to lock all the track sections together.

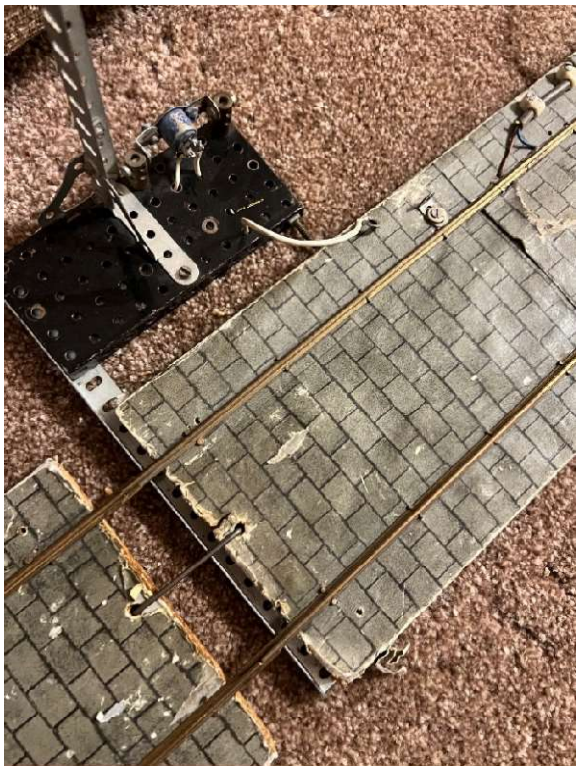
It might be found that after connecting all the sections, the track is not forming a straight path. To fix this, use a screwdriver and small hammer (or pliers) to tap a given piece of rail and/or a connecting clip, making the rail slide along its mounting wood base. Each rail is only held in place on the wood base by small pins; very similar to what is used in real life rail systems. No glue is used, allowing for repositioning of each rail as required. Repeat until all the track sections form a straight track.



Attach the end gantries.

One of the green boxes has thick card rectangular pieces in it, as well as folded V-shaped cards. The flat sections can be placed under the ends of a given track length should vertical adjustments be required to keep the track horizontal.

Attach the central overhead gantry (the one with the blue painted DIN socket) to the track section that has the integrated track powering wire. The gantry his held in place by its horizontal girder resting under the track base and the protruding screw locating with the hole on the rear edge of the track base section. Simply push the ganty's base towards the track until the long bolt is fully inserted into the wood base.



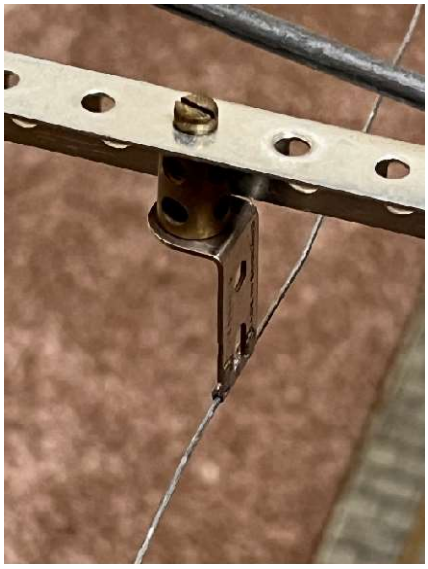
Place a V-shaped folded card under each gantry horizontal girder, to ensure electrical isolation of the gantry from both rails.

Setup: Connecting the overhead wire.

At this point all gantries should be in place. The overhead wire is rolled up and in one of the green boxes. Spare wire is also included for some future time when the current overhead wire gets to bent or dirty to continue being used.

Connect the wire to one end gantry, about 6 holes down from the top. The exact height is not critical as the tram's sprung overhead pickups can accommodate a wide height range for the wire.

Unroll the wire and attach it at the far end of the track. Slide each of the angle brackets that have metal tubes soldered to them so that the bracket lines up with its nearest gantry. Bold the bracket to the gantry using the supplied bolt and 2 hole coupling as shown.

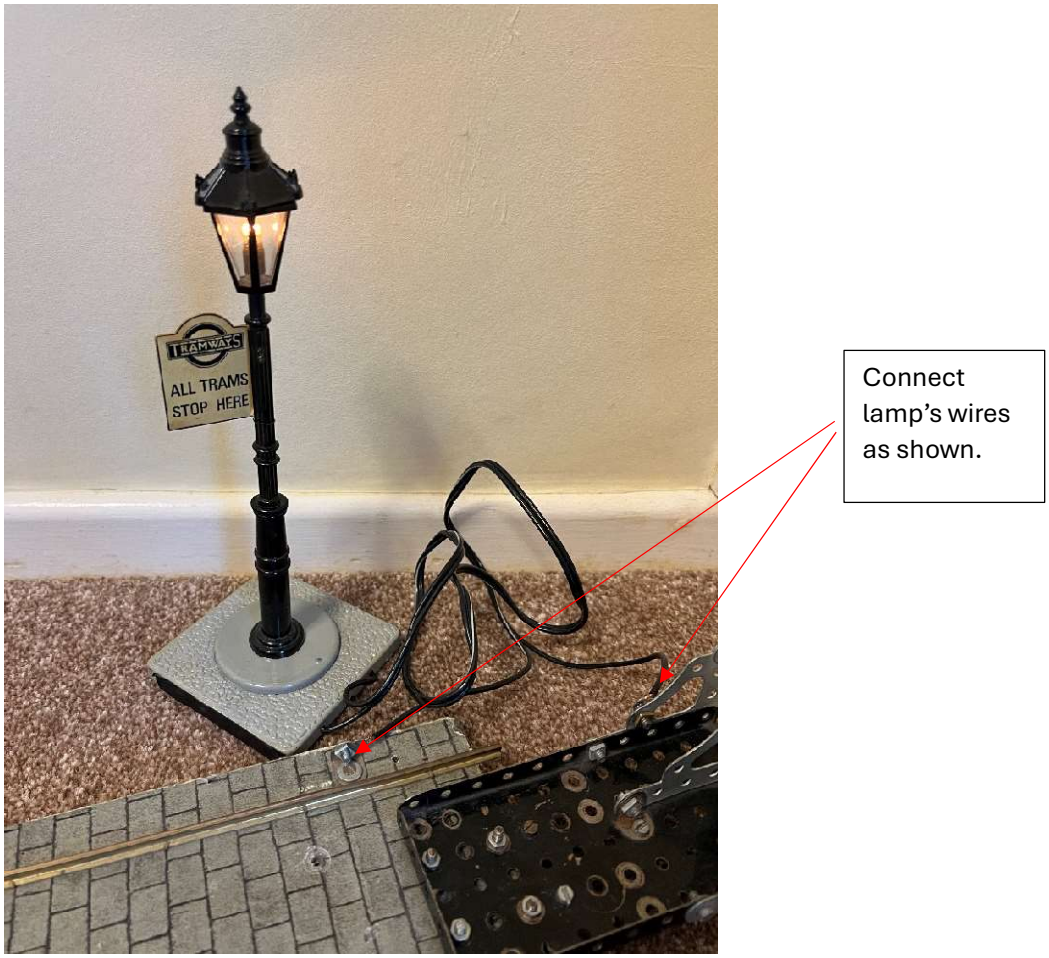


At this point the gantries should all be lined up and the overhead wire should be taut.

Setup: Connecting the power supply and controllers.

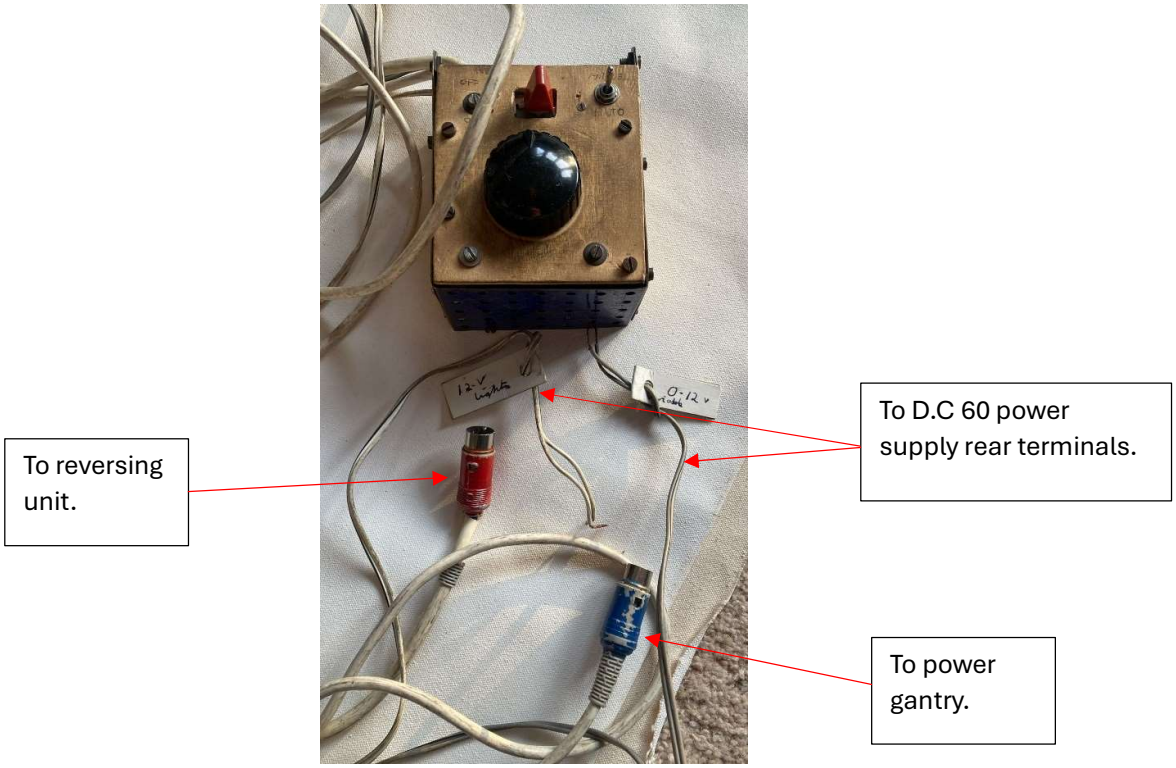
Connect the flying ground wire from the central gantry to the rearmost rail’s bracket. This connects the lighting ground circuit to that of the rails.

Connect a street light to each end gantry as shown.



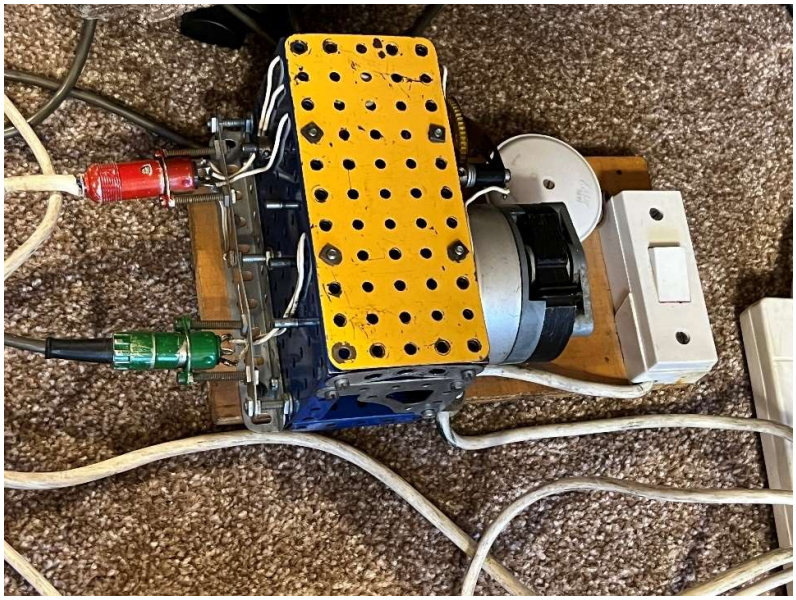
The control box has color coded DIN plugs, for connection to the main power gantry as well as the reversing unit.

Connect the control box's power input wire pairs to the D.C. 60 H&M dual power supply. One wire -pair goes to each of the rear outputs.



Place the reversing unit and control box close to the central gantry and plug the blue DIN connector from the control box into the blue DIN connection of the gantry.

Plug the green painted DIN plug on the end of the cable coming from the track rails to the green painted DIN socket on the auto-reversing unit. Connect the red painted DIN plug from the control box into the red DIN socket of the auto-reverser.

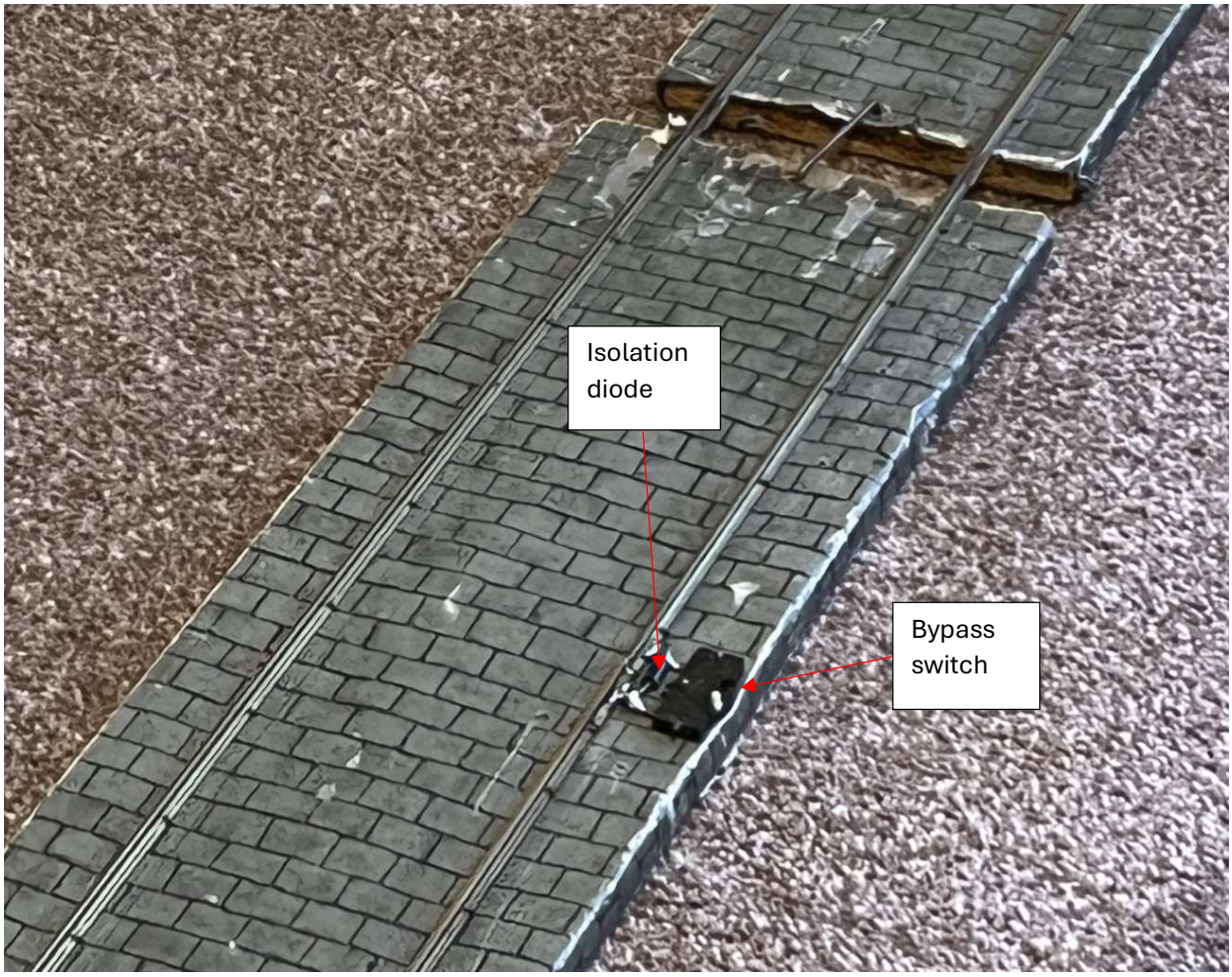


Set the controller's speed control to the central vertical (OFF) rotation for the initial setup. Put the overhead rail polarity switch in its central OFF position and set the auto-manual switch to MANUAL.

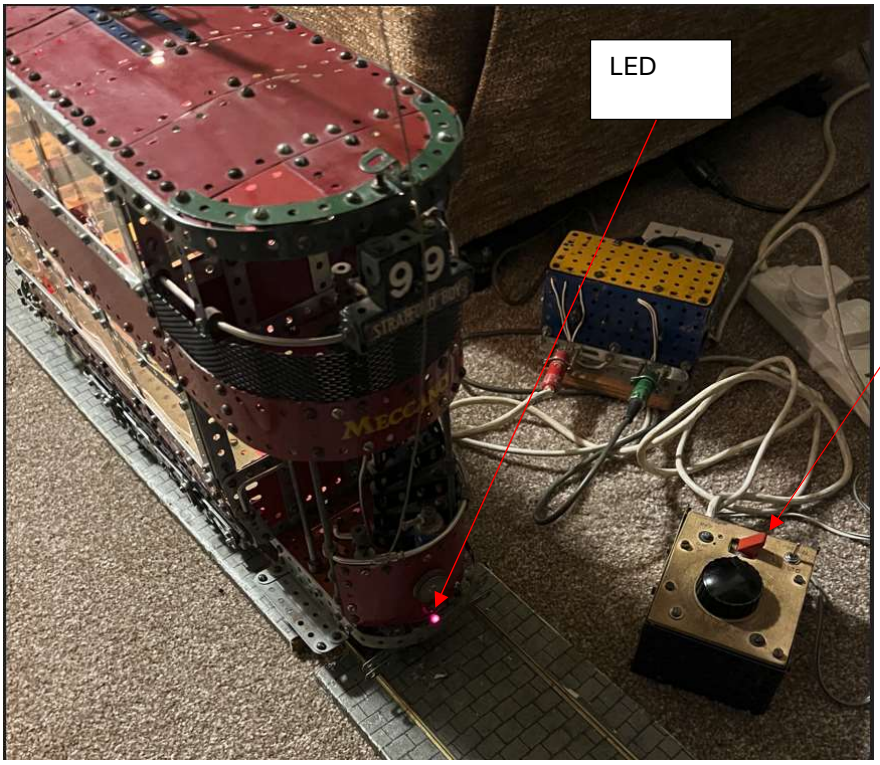
Overhead rail 3 position polarity switch

Running the first tram after track setup.

1. Place either the Ilford or East Ham tram on the tracks, somewhat near to the central gantry.
2. Ensure the manual control box's switches are set per the previous section.
3. Turn on the power to the D.C. 60 H&M transformer. At this point it does not matter if the auto reversing unit is turned on or off.
4. Rotate the speed control knob either clockwise or anti-clockwise and the tram should start to move. If even at full control knob rotation the tram fails to move, then toggle the tram's master on/off switch on the rear side of the bogie. That should solve the problem. If not, check the power drive motor in the bogie is set to run in either direction. The motor's gearbox should be set to 60:1 reduction.
5. Run the tram to the track isolation section near one end of the track and see if the tram stops. If it does not, then either the isolation diode is being bypassed by somehow the tram's motor's direction switch is set to the wrong direction (This is highly unlikely!)



6. Assuming the problem is the isolation diode switch, flip it to the alternative location and try the tram's motion again. If the tram no remains stationary, rotate the speed control knob to the opposite drive direction and run the tram to the other end of the track. Repeat the procedure to ensure the tram stops at the isolation diode location.
7. Unhook and raise the tram's pickup arm so that it rests on the overhead wire.
8. Use the overhead rail polarity switch on the control box and flip it to the left. Check to see if the tram's on/off LED is lit. If not, flip the switch to the other direction.



9. Rotate the speed control knob fully to the other direction and ensure the tram moves.
10. Did the tram automatically speed up and go ‘ding ding’ after starting to move? If not, flip the slow start bypass switch on the tram and try again.
11. At this point the tram should be fully functional, but in manual control mode.
12. Flip the control box’s ‘manual-auto’ switch to auto and ensure the auto-reverser’s motor is running. Sit back and watch. After a little while the tram will automatically start up and run to the far end of the track, then stop. Once the auto-reverser’s commutator has rotated 180 degrees, the track’s drive direction will swap and the tram will start up travelling to the other end of the track.
13. Swap the tram with the other one (East Ham or Ilford) and see if it operates correctly. If not, then go though sections 4-10 again ensuring the switches on the second tram are set correctly.

A note about running the HR2 tram: the control is basically the same; the control box sets the max speed and the auto-reverser will change it’s direction. The tram will stop at each end of the track at the isolation sections. The tram’s internal lights will work irrespective of which polarity the light switch is set to.

If anyone has questions about this write-up or the trams in general, feel free to email me.