

Oxfordshire Narrow Gauge Modellers (ONGM) Group 009 Modular Layout Standards

Version: 2.5 by Simon Elam

Introduction

This leaflet describes the standards which are being used by the Oxfordshire Narrow Gauge Modellers group for a 009 modular layout.

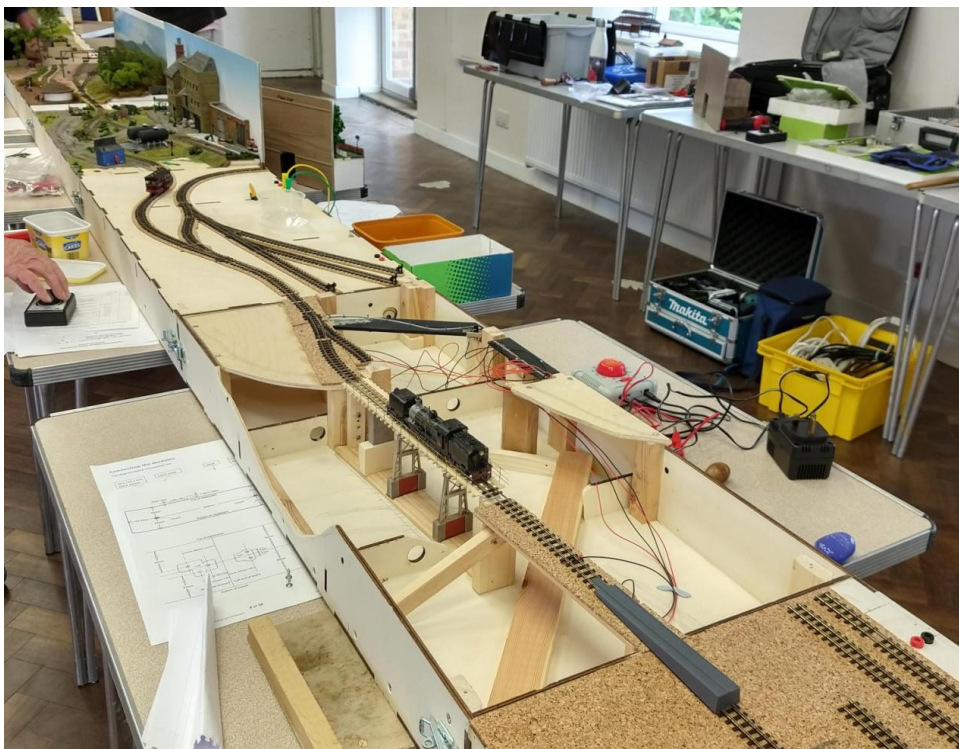


Photo 1: First joining and running session on 26 June 2021

Back in 'normal times' (pre-Covid) we had a face-to-face meeting on 6th March 2020 where 5 of us agreed we wanted a simple modular layout for the group, each module to be easily portable at around 3ft long, and simple so that both

novices and

experts could create a module. I was tasked with doing some research on possible standards. Subsequent Zoom meetings clarified 'simple' to mean keeping things electrically simple even if it reduced operational possibilities. The modules would just be placed on tables so we could avoid having legs with all the issues of support and attachment that arise. We would use latches to keep the boards together and short pieces of joining track to simplify track connection and compensate for some inaccuracies during building as we would not be able to meet for sometime. .

That we got everything running on our first physical meeting some 15 months later (after the lockdowns) is testament to the whole approach. Of course we learnt that some tweaks were needed which have been included in this document.

This document is designed to print as an A5 booklet using Adobe Reader's Booklet option in the Print menu.



Left
Photo 2:
Third joining
and running
session on 11th
October 2021



Photo 3
Panoramic view
of joined
modules on 11th
October 2021

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Background information

These proposals have been inspired by:

Beds & Bucks 009 Group

<https://009bedsandbucks.wordpress.com/linked-dioramas/>

Farnham MRC's modular 009 layout http://farnhammrc.org.uk/?page_id=3033

Freem009 by Paul Steedman uses a standard baseboard end plate laser cut by Grainge & Hodder, put whatever baseboard you like between the ends! 6 pairs of end plates would cost around £22.50 (in 2017)

<https://www.rmweb.co.uk/community/index.php?/topic/124103-freem009-a-modular-system-for-british-009/>

<https://www.rmweb.co.uk/community/index.php?/topic/121585-lynmouth-to-combe-martin-lb-modular-009/&/topic/121585-combe-martin-lb/?p=2676373>

Frem0n30 <http://frem0n30.uk/> Surrey & Sussex Blacksheep group - uses Fremo based standardised ends. Boards by both Grainge & Hodder and Tim Horn

miNi-track <https://www.ngaugeforum.co.uk/SMFN/index.php?topic=33275.0>

Free-mo <http://www.free-mo.org/standard/> not to be confused with its 'parent':

FREMO <https://www.fremo-net.eu/modulsysteme/baugroesse-h0/h0-europa/h0e/>

you need the German version of the page to get a working link to the 'handbuch' PDF which is in German but has lots of interesting diagrams!

NTRAK <http://ntrak.org/about/default.html> - see the downloadable PDF for details

Norfolk Group: 'Castleby ' 009 News March 2006

<https://grums009andgn15lines.blogspot.com/2018/01/norfolk-group-modules-mk2-post-under.html>

Apologies to all concerned for using/copying ideas, words and images without permission.

Scale and Gauge

009 or HOe (= 9mm gauge, 4mm or 3.5mm to the foot)

Scenic Modules

The standard scenic modules which we will model on are Grainge and Hodder 400mm wide, 900mm long baseboards

<https://www.graingehandhodder.co.uk/product-page/900-x-400-standard-module>

We will operate from the rear and view from the front.

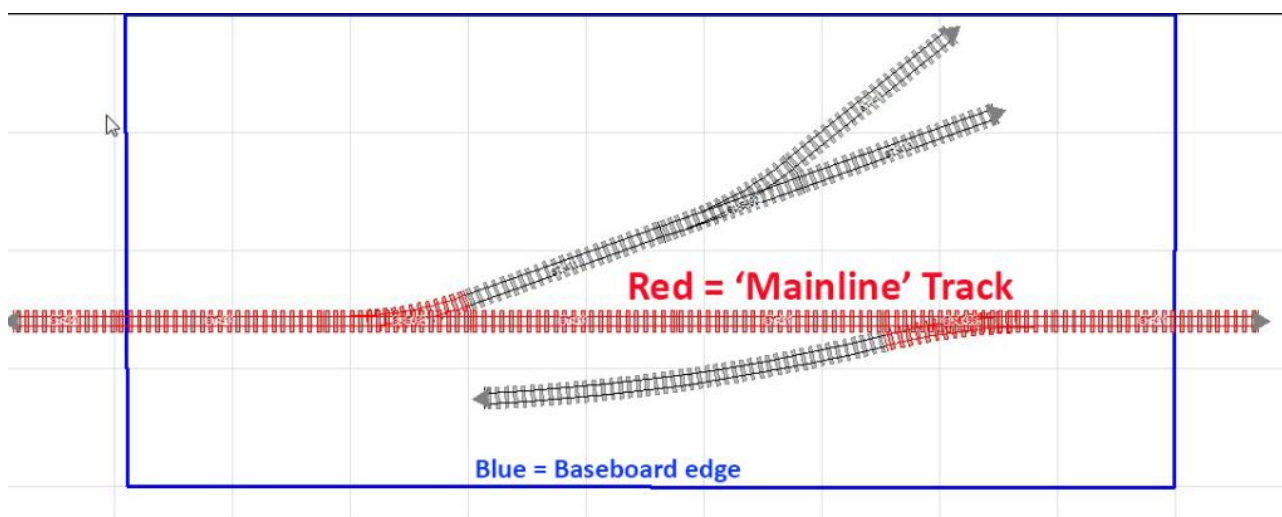
Modules may be constructed in other ways but the connection of one module to another will be by the same method.

The 'Mainline'

Definition: The mainline track is the track that runs from board to board

The standards only apply to the 'mainline' and passing loops.

Outside of the 'mainline' the modeller may do whatever they want, this is known as the 'Branchline'



Baseboards

These standards are centred around the Grainge & Hodder 900mm X 400mm self-assembly light-weight baseboard which are made from 6mm Ply (but website also mentions 5.5mm ply)

900mm X 400mm

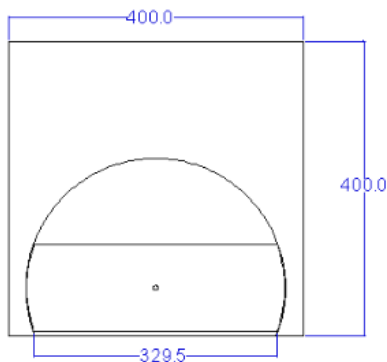


Other sizes available include

400mm X 400mm with joining plates on two sides

400mm X 200mm with joining plates on 400mm sides

400mm X 1200mm with joining plates on two sides



400mm X 400mm Head shunt turntable board

Scenic Board Ideas for 900 x 400 Boards

Though terminus – left hand end

Through terminus – right hand end

Passing loop station

Countryside

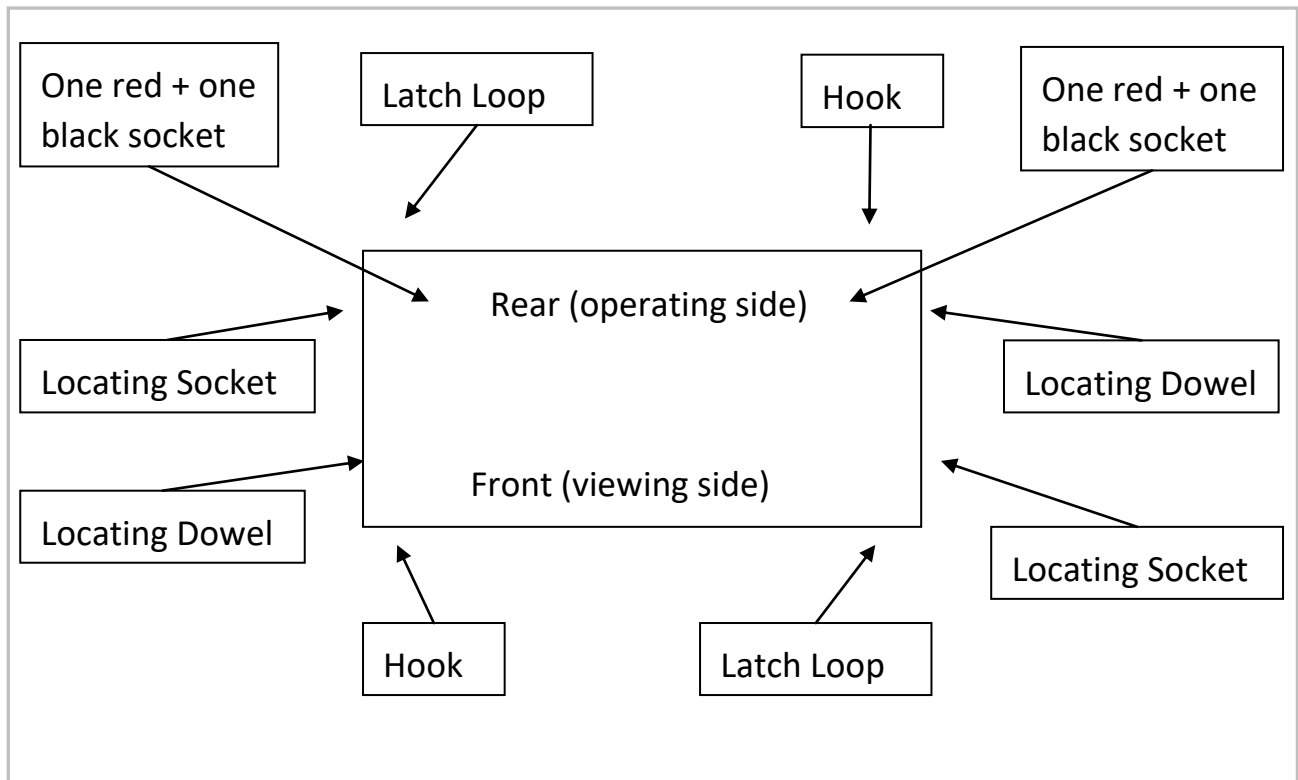
River and bridge

Industry / Quarry with through line

Fiddle yard (not scenic!)

Connecting the modules

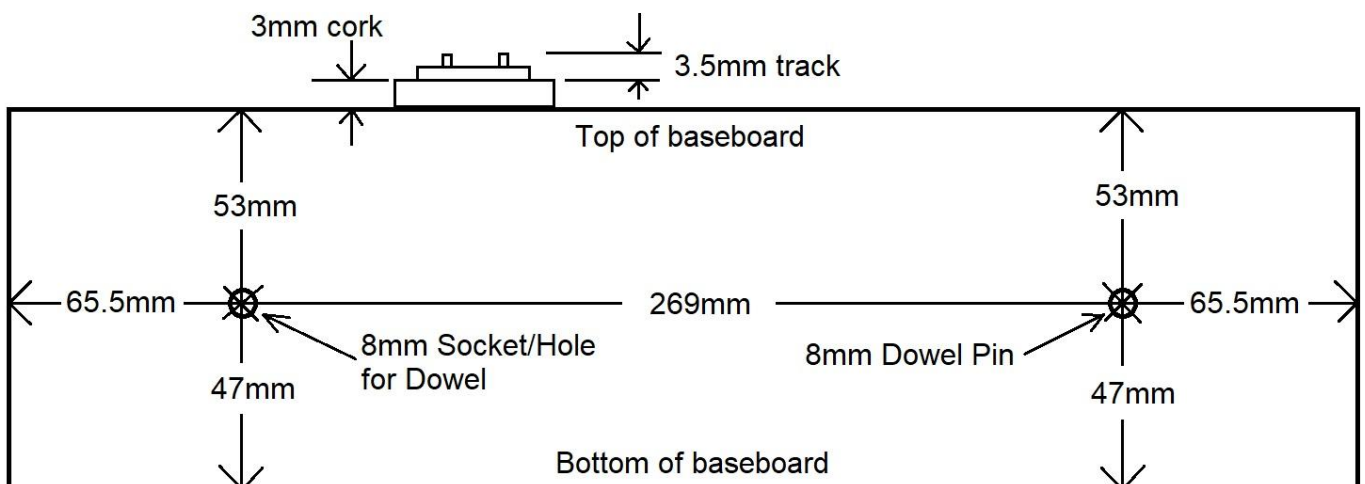
The diagram below summarises the positioning of the locating dowels and sockets, the clamping latches and hooks and the electrical sockets



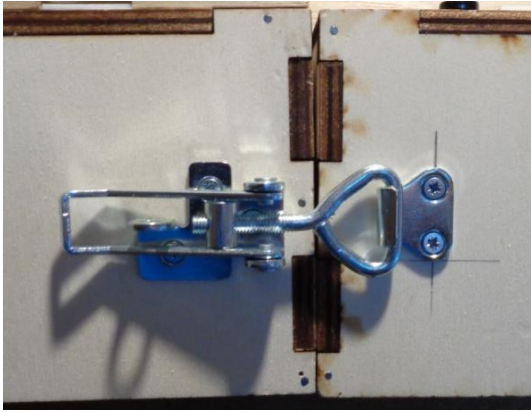
Aligning the modules

8mm round wooden locating dowels are used in the 8mm holes in the Grainge and Hodder boards. The male connectors will go on the front right and rear left of the module (seen from the front) and protrude about 5mm. The female connection goes on the left of the module.

The diagram below is provided for modellers who are constructing their own boards, or creating adaptors for their own boards.



Clamping the modules together



The modules will be clamped together using adjustable side latches, one at the front and one at the rear of each module

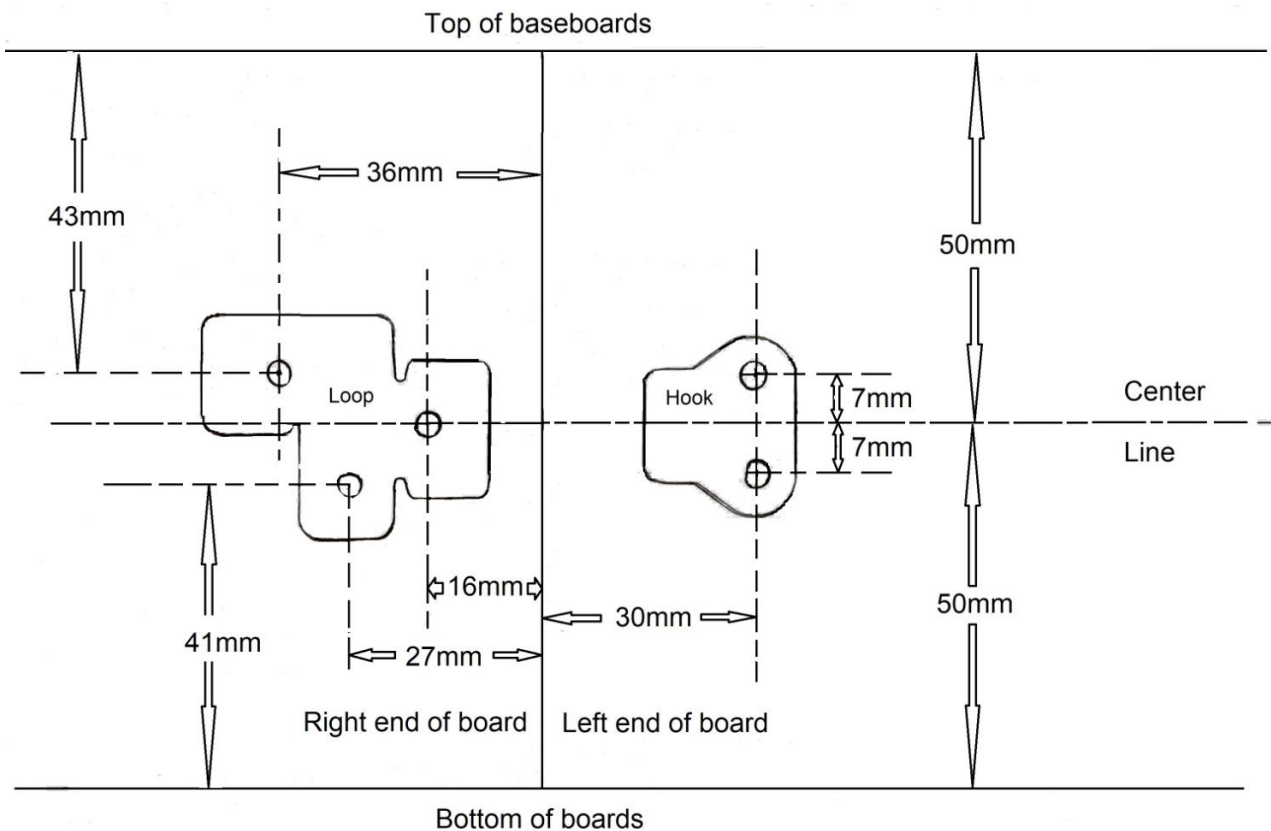
The latches will be positioned so the centre line of the latches is 50mm from the baseboard top. The loops will be positioned on the right hand end of the board (seen from the front), the hooks will be on left hand side, as in the above photo.



Adjustable latch fastener

<https://www.ebay.co.uk/itm/113920409896>

Fitting as below will allow a total tightening/loosening adjustment of about 5mm.



Track

Peco 009 Code 80 (Mainline or Irregular/Crazy sleeper) will be used on the mainline running across all modules.

Minimum radius of curves and points on mainline = 304mm (12 inches)

Points: Must be live frog to ensure successful running

PECO SL-E491 or SL-E492 Radius: 304mm (12 inches) Irregular Sleepers

Other acceptable points include:

PECO SL-E497 Y Turnout, Medium Radius, Radius: 457mm (18 inch)

PECO Mainline points (SL-E495, SL-E496) with 457mm (18 inch) radius

Point control is up to the modeller (hand operated, wire in tube, motors etc are all acceptable) and will be self contained on each module.

Underlay

Track is mounted onto 3mm cork mat or cork tiles. The cork can be either be self adhesive or glued in place with, say, PVA or Copydex.

High density cork sheet - 1000mm x 400 mm - 3 mm thick cut from 1M wide roll

https://spduk.co.uk/collections/model-railway-cork/products/236_model-railway-large-cork-roll-1-meter-wide-3-mm-thick?variant=20232887795766

Joining the track at module ends

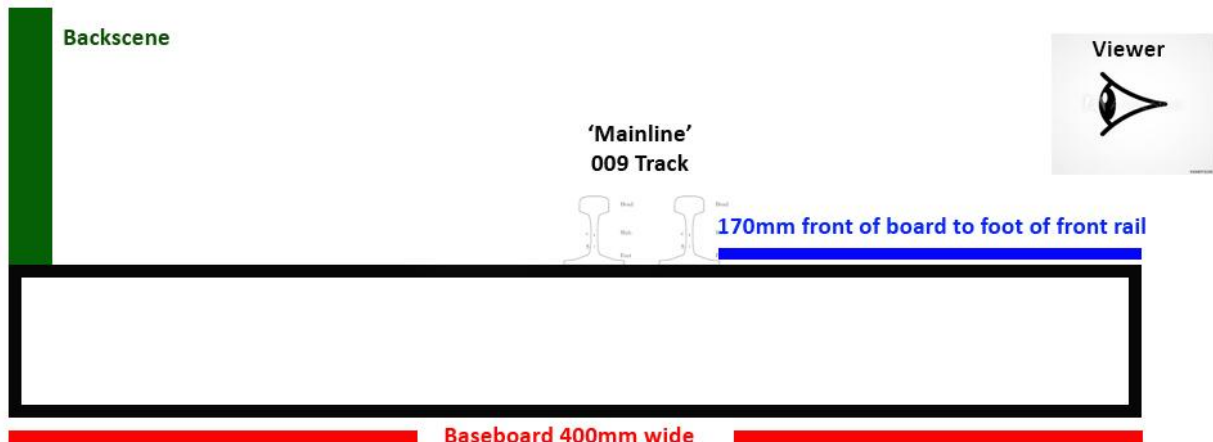
In order to ensure a smooth transition onto the module, reduce derailments and allow modules to be built completely independently pairs of modules will be linked by short pieces of track, nominally 40mm long.

This means the track at each end of the modules must be

- a. set back from the edge of the module by 20mm,
- b. straight for at least the first 20mm and
- c. at 90 degrees to the joining edge of the module for that first 20mm straight.

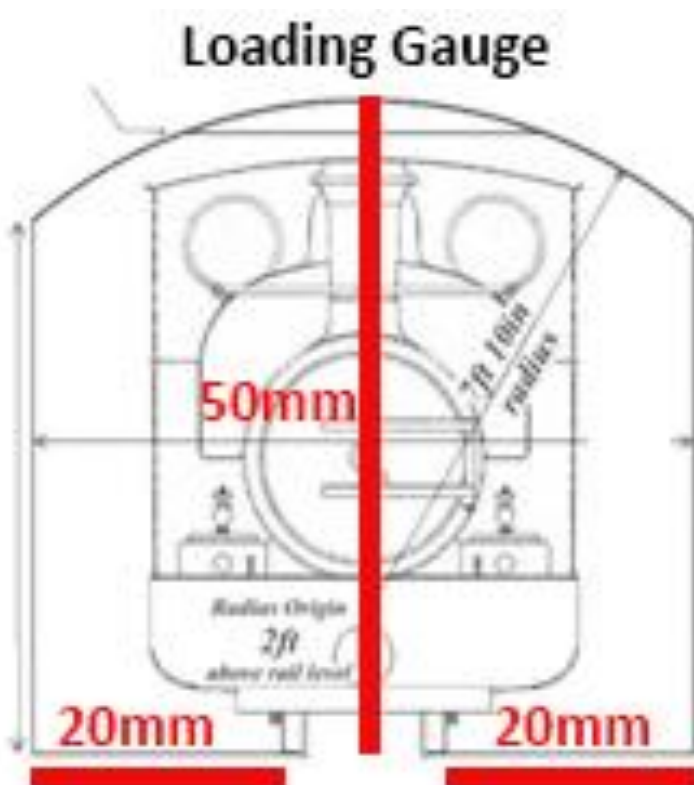
Position of the Mainline

At both ends of each module the distance from the front of the board to the foot of the front rail of the mainline track will be 170mm.



(Not to Scale!)

Loading Gauge / Clearances



Loading gauge will be a minimum of:

50mm high above rail height.

20mm either side of the outside of each rail

Where tunnels or bridges are on curves it is recommended the lateral allowance is increased from 20mm and the minimum height applies across the whole lateral allowance.

Platforms: maximum height is level with the top of the rail

The position of buildings and other features around curves must allow a PECO Lynton and Barnstaple coach to overhang the track without interference.

Off the 'mainline' – the branch line

Outside of the mainline (the branch line) modeller can use any type of track, any radius curve and any type of point they want.

If a modeller uses really tight curves or unusual track work it would be helpful if they can make a note of this on the rear of their module to inform / alert other users.

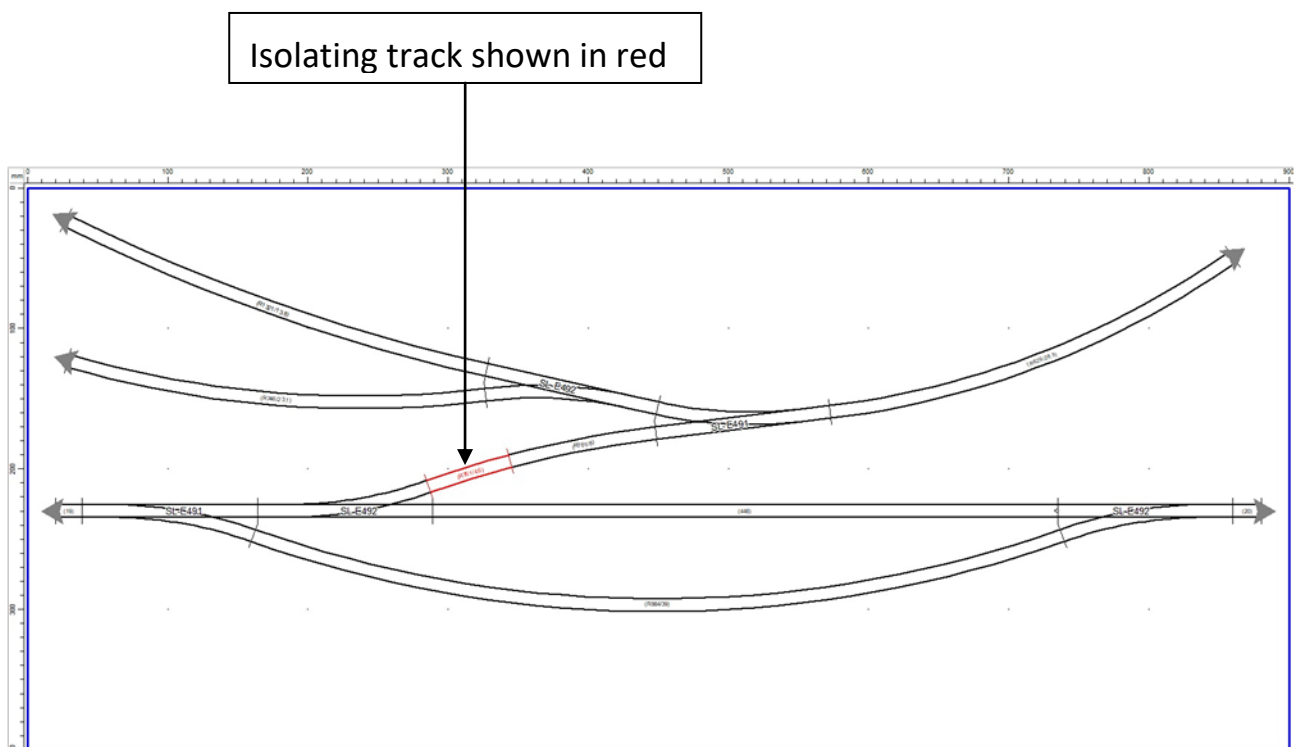
Isolating the branch line

If the modeller wishes to run DC or DCC trains on the branch line at the same time as mainline running then there must be a length of track between the mainline point and the branch line which is isolated on both rails at both ends and powered through a DPDT switch to ensure mainline power never reaches this type of branch line (see wiring diagram elsewhere in this leaflet). If branch line engines are radio controlled using their own batteries with isolated wheels then this rule can be ignored

This isolating track is expected to be at least 50mm long to accommodate a 0-4-0 or 0-6-0 loco.

The section will normally be off (totally isolated). It will only be turned on to run a train from the branch line onto the main line or vice versa.

This is to ensure a "run-away" engine will be stopped on the isolating track and will not act as a bridge between the main line and branch line controllers.



Electrics and Wiring

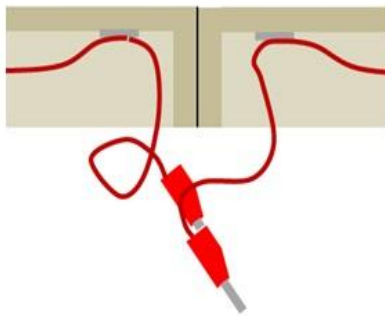
Power Supply for Mainline

Analogue 12V DC, or self containing radio control with insulated wheels.

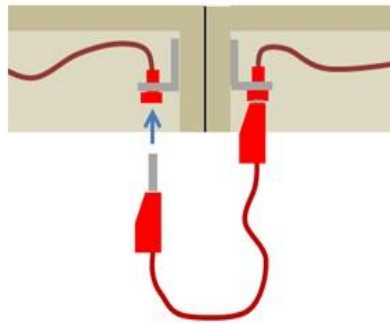
Just ONE controller will be plugged in to a collection of modules at any position along the length to control the main line.

Electrical connection of modules

The mainline track on each board will be connected to the next board using both track and plugs & sockets. 4mm stackable 'banana' plugs and sockets will be used. The aim is to run a pair of power supply wires along the whole length of the joined modules forming an electrical 'bus'. When viewing the module from the front, the viewing side of the module, red (positive) to rear rail of mainline, black (negative) to front rail of mainline.



Connection with stacked plugs.



Connection with leads and sockets.

Diagram from <https://www.rmweb.co.uk/community/index.php?/topic/124103-freem009-a-modular-system-for-british-009/>

Socket Positions on Baseboard



A pair of red and black sockets will be fitted to each end of the baseboard no more than 200mm from the ends of the board.

<https://www.switchelectronics.co.uk/red-4mm-panel-mount-test-socket-r1-22>

<https://www.switchelectronics.co.uk/black-4mm-panel-mount-test-socket-r1-22>



The sockets may be mounted on the top surface behind scenery or the back-scene. They could be fitted to the rear side of the baseboard however this may interfere with covers used to protect the layout in transport or storage or an add-on backscene.

Red and Black 50cm long Patch cables will be used to connect one board to the next.

<https://www.switchelectronics.co.uk/red-4mm-stackable-test-lead-500mm>

<https://www.switchelectronics.co.uk/black-4mm-stackable-test-lead-500mm>

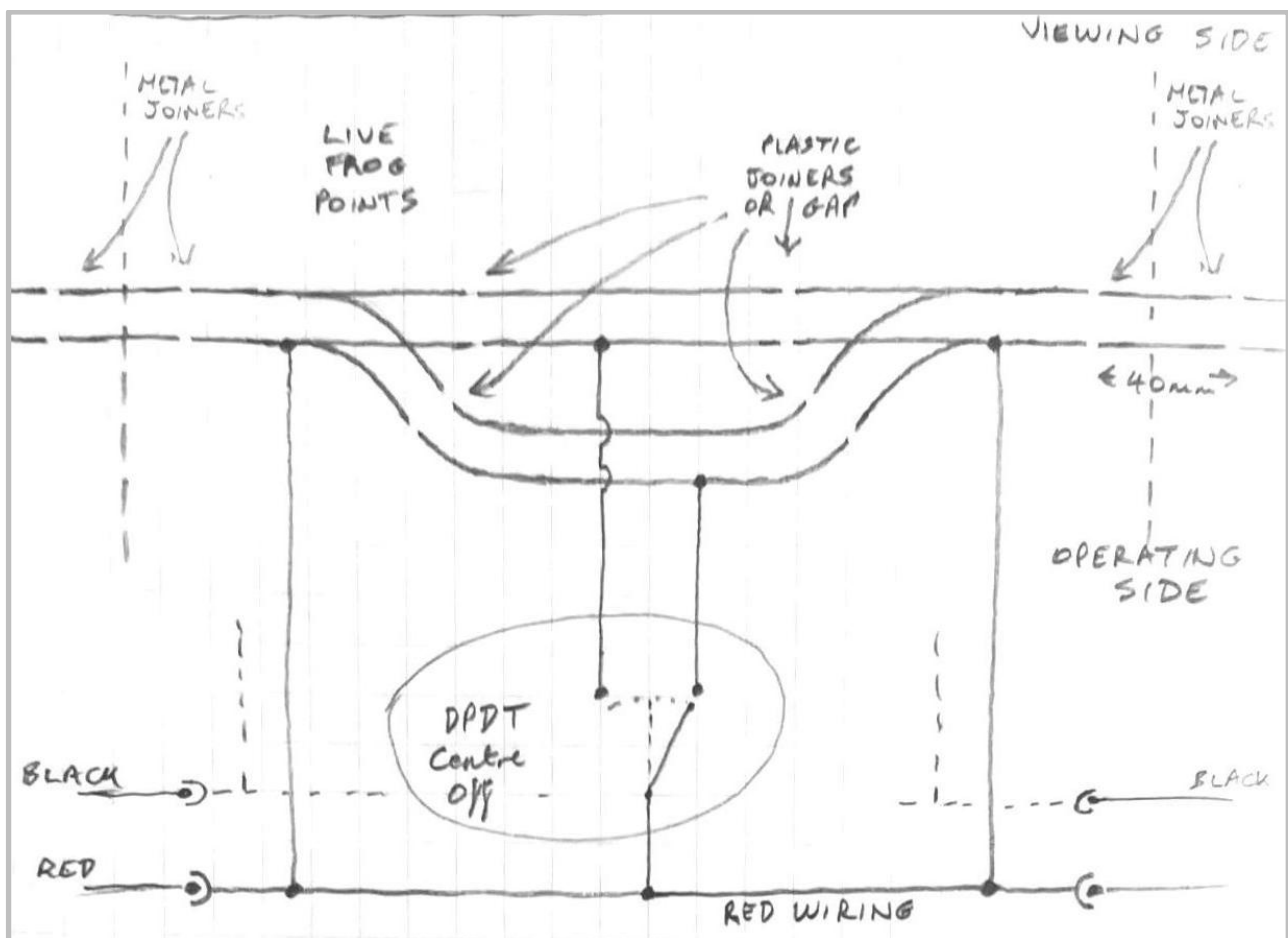
One half of a red patch cable and one half of a black cable can be used to connect to a controller. The controller can be added anywhere by stacking the plugs.

Wiring a Passing Loop

This enables a train to run on the mainline whilst another train is held stationary in an isolated loop. The loop is powered by the mainline controller. An alternative passing loop design is described in another section.

In order to keep the diagram uncluttered only the wiring for the rail on the operating side of the module, using red wires, is shown. The other rail needs to be wired in the same way using black wires. It will use the other 'side' of the DPDT switch.

Similarly the wiring and switch for the live frog has not been shown. This is recommended to augment the switching provided by the point blades.



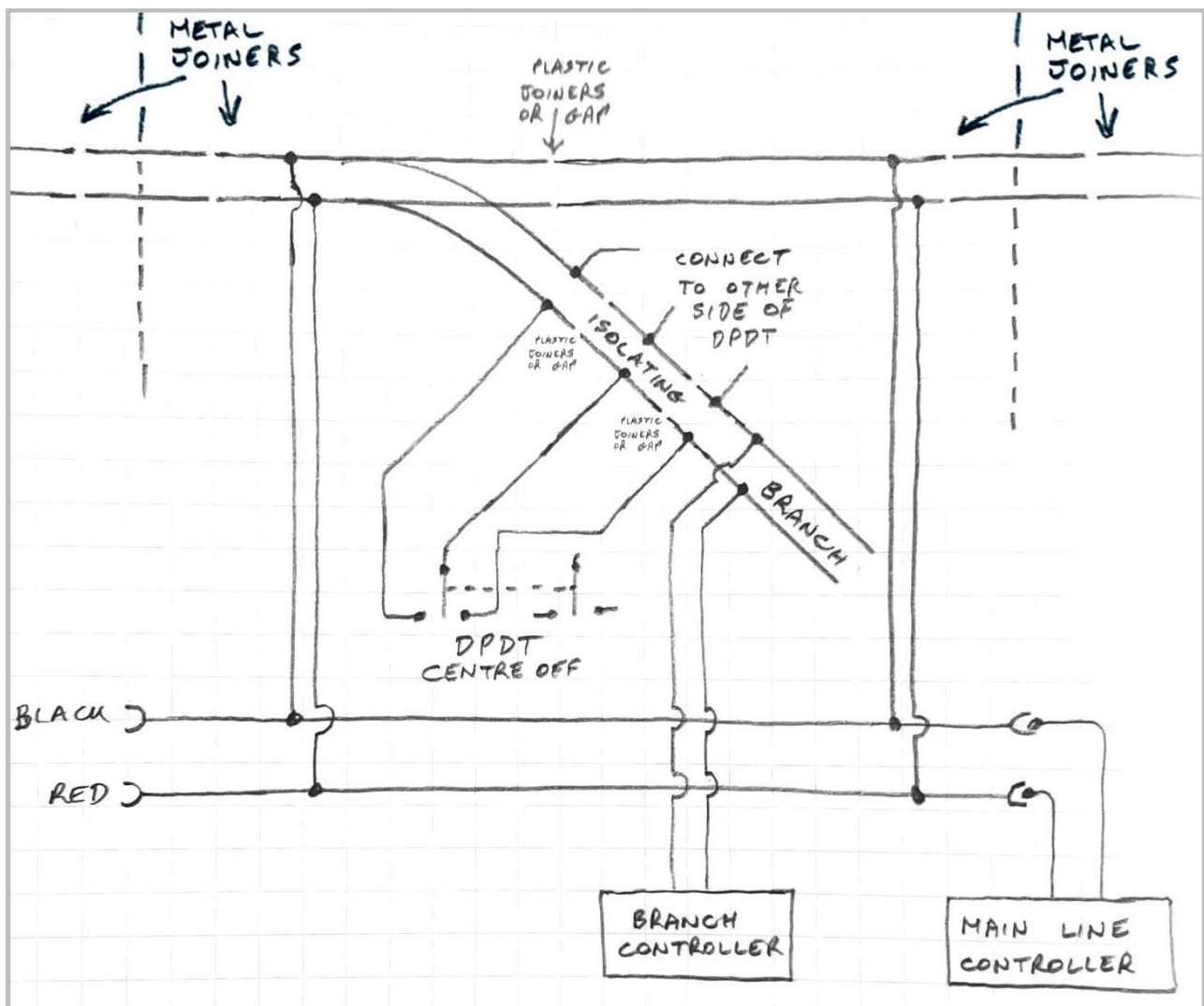
Power is applied at the toe of the points.

When the DPDT switch is at 'centre off' then both Passing Loop and Main Line section are isolated so trains will be stationary on this module whilst another train can be powered to move on other modules.

Wiring an Independent Branch Line

One or more trains can be operated on a completely independent branch at the same time as trains are operated on the main line. Ideal for a quarry or industry etc.

The branch Line and Main Line are separated by a short section of track labelled "ISOLATING" (at least 50mm long) which is normally switched off but can be controlled by either the Branch or Main Line controllers. This will help to prevent an engine shorting the two controllers together. Plastic rail joiners can be used to maintain the gaps, or simply a cut in both rails of the track, perhaps supported by a piece copper clad circuit board.

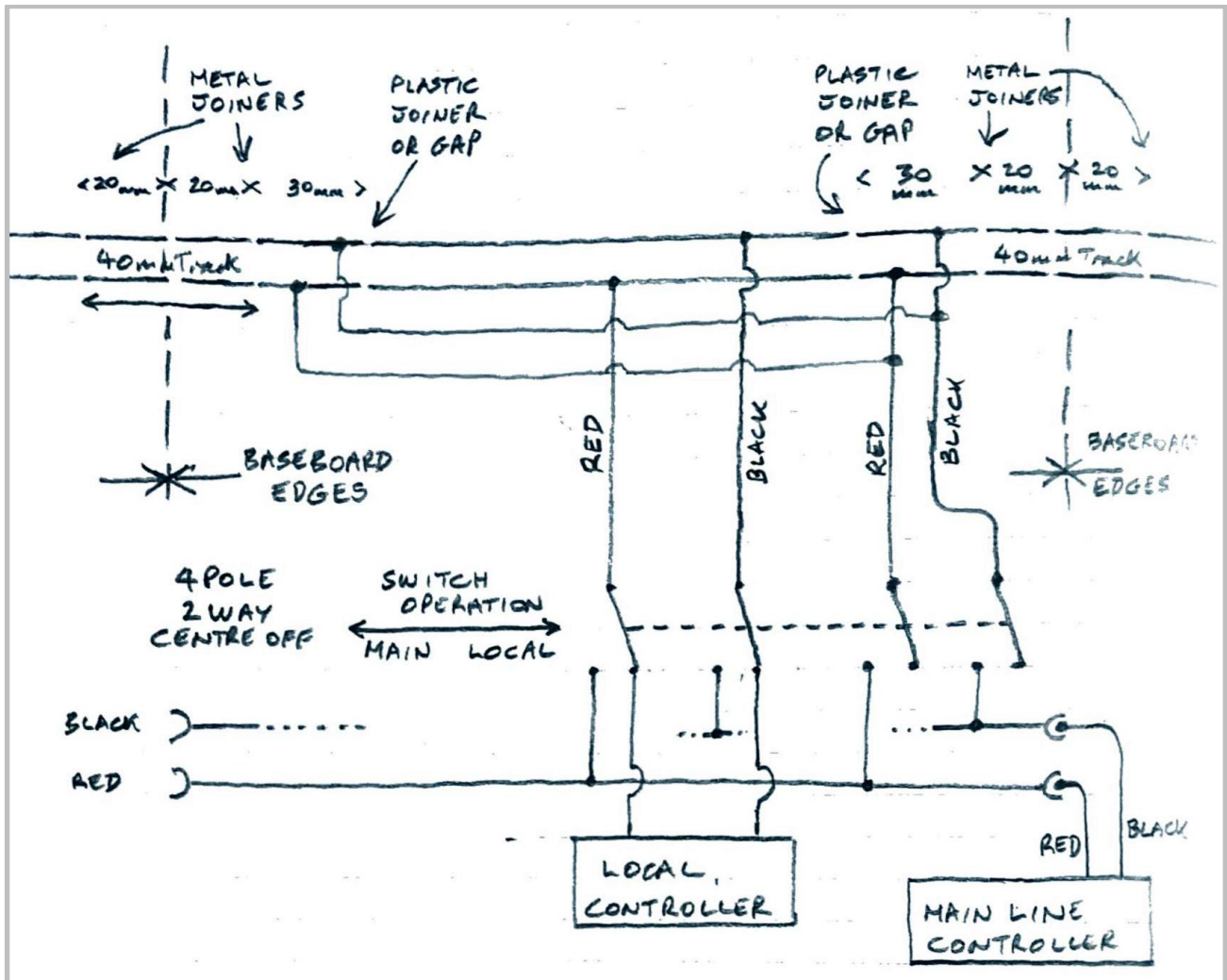


The track which crosses the baseboard edges (dashed line) is 40mm long and metal rail joiners are used.

The branch controller could be connected using green and yellow plugs and sockets.

Wiring an Independent Board

This enables mainline running across the board whilst also allowing the board to be isolated so that a branch line can make use of the mainline for shunting.



The diagram shows the whole board switched to the Local Controller (The Branch Line controller is completely separate)

This track on this module is joined to adjacent modules using special 40mm joining tracks. These tracks will incorporate an isolating gap on each rail, so they must be built on a small piece of copper clad board otherwise the tracks will just fall apart.

These special joining tracks ensure there is a 50mm isolating section at each end of the module to minimise the possibility of an engine under local control cannot accidentally shorting the main line track.

The local controller could be connected using green and yellow plugs and sockets.

Running two trains on the main line using a passing loop

Yes really! This seems to contradict a key objective of keeping things simple with just one train on the main line. However if the modelling group has, say, ten or more modules joined together then it may be desirable to split the whole layout into two or more sections to increase operational interest by running several trains simultaneously.

The type of passing loop module described here is designed to split the joined layout. Key features are:

- The red and black sockets at each end of the module are not connected to each other by bus wires (unlike other modules).
- Each end of the module is powered by a different controller.
- The wiring is designed such that the two controllers cannot be shorted together during a running session, not even by an engine bridging the electrical gaps in the rails.
- Patch leads can be used to link both ends of the module to make it function as a standard module with an electrically continuous main line. (Normally patch leads are not used in this manner on any type of module)
- A train can come from one end of the module into one side of the loop under one controller. It then leaves the other end of the module under the other controller. This is similar to 'cab control'.
- Each side of the loop is controlled from one end of the module or the other, or is isolated. The opposite side of the loop is always under the opposite controller or is isolated.

OxNGM Passing Loop Modules

Owned and described by Roger Tatton.

Our passing loop modules split the joined layout into two separate and independently-controlled halves.

They adopt the wiring for the Independent Board, with additions.

Two 900mm G&H boards have

- a through "main line" and passing loop on an upper level, connected to other modules at each end;
- a low-level quarry line, not connected to the main line.

MAIN LINE

Key features:

- The red and black sockets at each end of the module pair are not connected by bus wires (unlike other modules) so the modules are powered by different controllers.
- The wiring is designed such that the two controllers cannot be shorted together during a running session, not even by an engine bridging the electrical gaps in the rails.¹
- There are isolating sections at the outer ends of the pair of modules, powered by momentary switches to prevent shorts and manage unexpected train arrivals.

Through running - one controller and patch leads

- Patch leads can be used to link the outer ends of the module to make it function as a standard module with an electrically continuous main line. (Normally patch leads are not used in this manner on any type of module).

Through running - two controllers

- A train can come from one end of the module chain to stop on one side of the loop under one controller. It then continues under the other controller. This is similar to 'cab control'.
- Main line section switches are double pole, double throw, centre off, (DPDT c-off), aligned either to left or right with a centre off position between. Set to the left, the switch feeds "Left Power" to the track. Set right, the switch feeds "Right Power."
- Each side of the loop is therefore isolated, or can be powered by either controller.
- Trains cannot run through "non-stop" (unless the two controllers are matched and the switching is done "on the fly" on one of the loop sections).

Operation

to accept a train from (say) the left;

- 1 check the rotary switch is set to "MAIN";*
- 2 set the throat point to the loop road you want;*
- 3 set the loop road toggle switch(es) to the left for left power;*

¹ This is true of the approach tracks. Other sections might still cause conflict. See the *Operation* section below for a procedure which ensures there are no shorts.

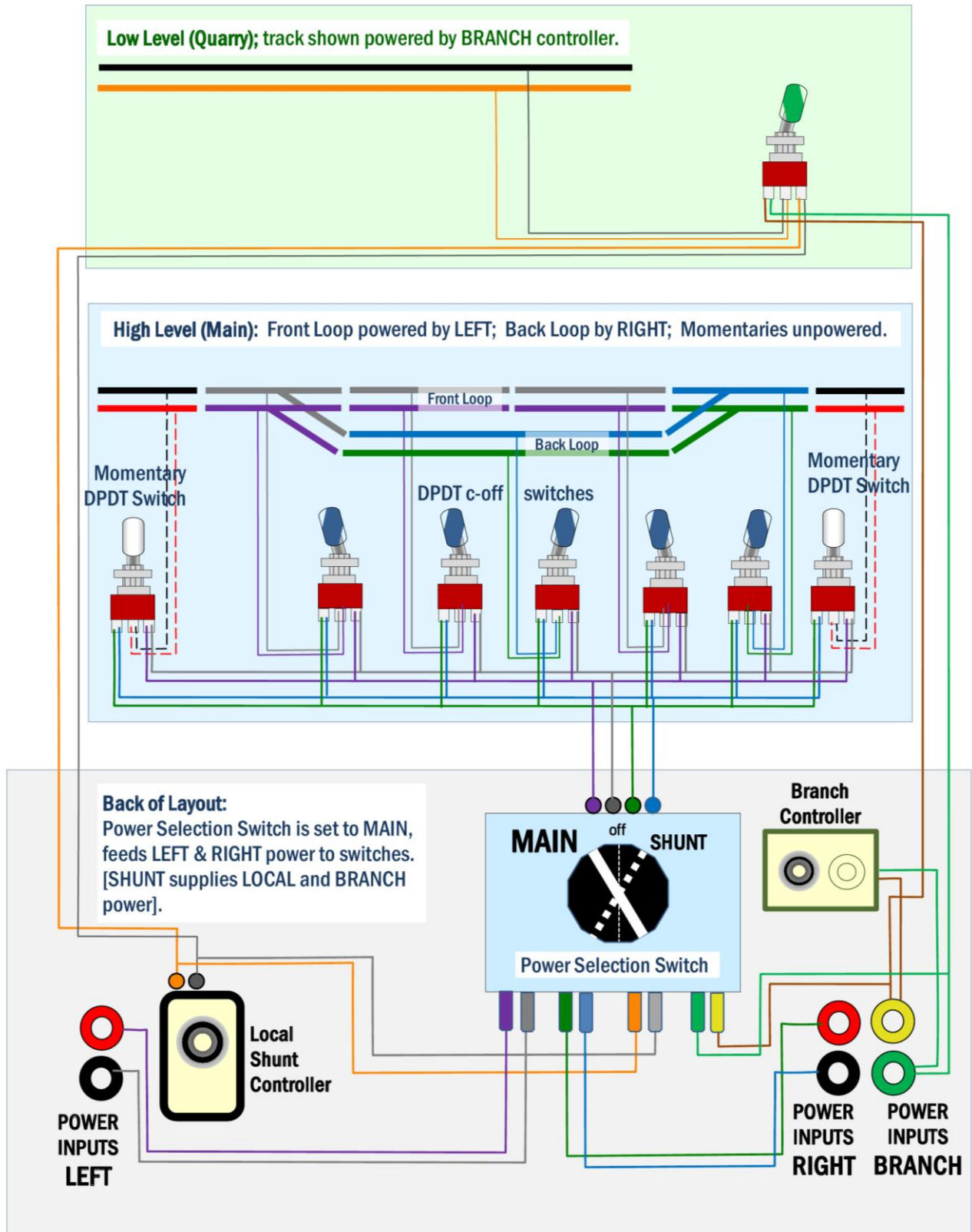
- 4 set the throat toggle switch to left for left power;
- 5 hold over to the left the isolated (white) toggle switch as the train approaches, until it has cleared the section;
- 6 signal to the operator when the train needs to slow and stop.
- 7 Once the train stops, immediately turn off all sections it has used.

Main line as a local terminus

- The upper level has a coach siding and a small yard. It can be an occasional starting-point and/or terminus for trains.
- To help with shunting, the upper level can be powered independently of the module chain. from a third independent on-board DC controller (Local Power) or from a DC or DCC system via the Branch Power inputs.
- A rotary switch allows the main line section switches the option of either Left & Right power, or Local and Branch power.

QUARRY LEVEL

- Train movements are independent of the upper level.
- Trains can “arrive” and “depart” via cassettes behind the rear of the layout.
- The quarry is not operated by the Left or Right controllers. It can be worked by either the local power controller or via the branch power input sockets.
- DPDT c-off switches set to the left supply Local power. Set to the right they supply Branch power.
- Small clusters of quarry wagons can be despatched off-scene for loading, returning full to be assembled into an outgoing train.
- Using two locomotives, one can be held on a loaded outgoing train to wait for another on a train of returning empties.



Wiring for other arrangements

The above wiring diagrams are intended to provide examples which can be adapted to individual need. The passing loop arrangement could be combined with the branch line, as in the track plan on page 10. The Independent Board arrangement is pointless (sorry) without a loop or sidings.

Back-scenes

The modeller may do whatever they want (no back-scene, back-scenes of any style and height, straight or curved everything is acceptable)

As a guide a 9 inch high back-scene or end-scene is suggested.

The fitting of the back-scene and especially the end-scenes must not interfere with the baseboard ends as provided by Grainge and Hodder. This means any end-scenes need to be self-supporting or supported by brackets, blocks, buildings or scenic features which are attached to the top surface of the baseboard

Lighting

The modeller can decide whether they want to light their module or not.

If included, backscenes and lighting must not stop the modules being joined together and must not interfere with the baseboard ends as provided by Grainge and Hodder.

QUESTION: Should we consider a standard approach to lighting e.g. some kind of modular gantry, say using LED strips and thereby reduce the need for multiway mains extensions?

Baseboard Legs

It is expected the modules will be placed on tables during group running days.

Therefore legs are not required and no standard is set.

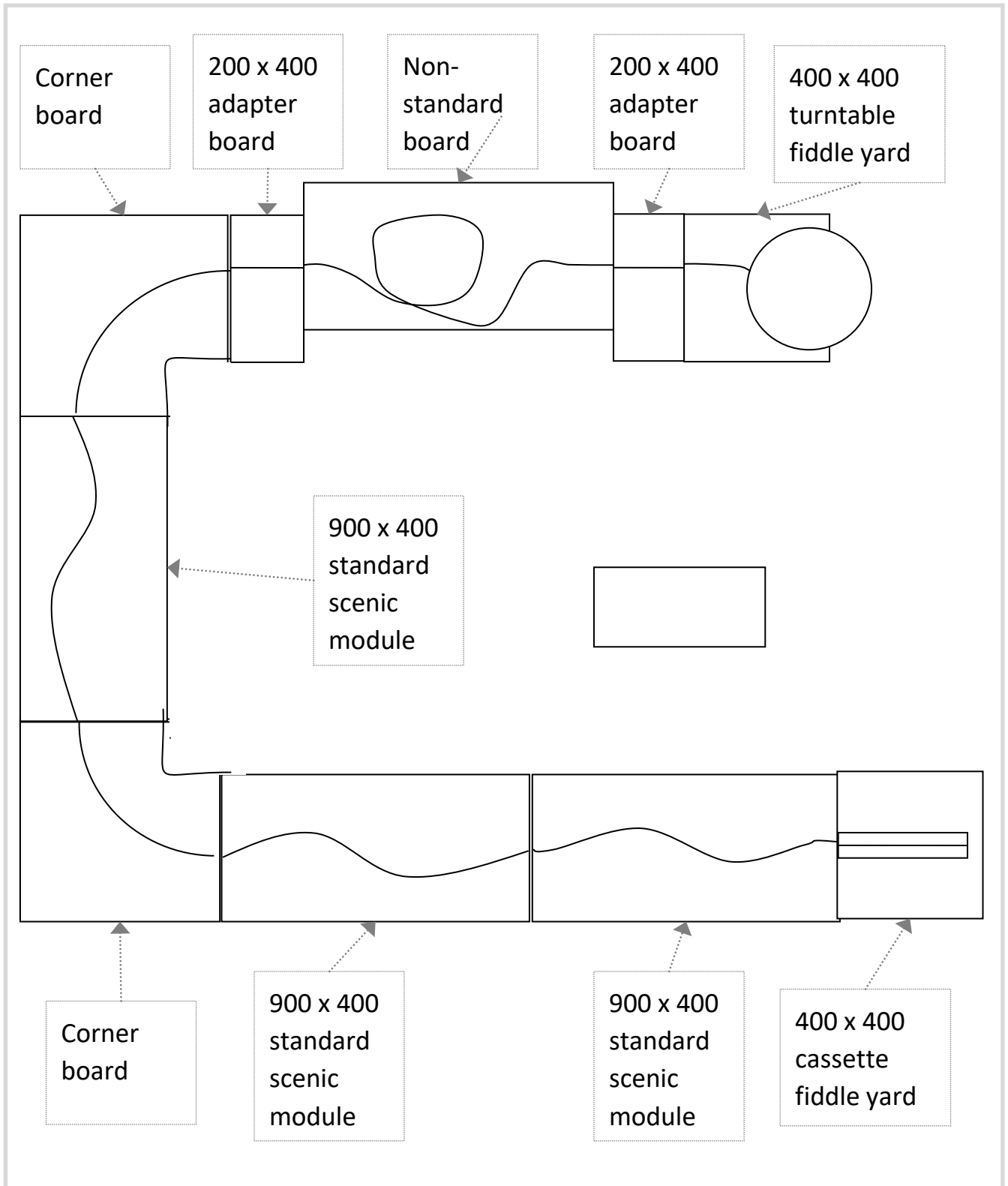
The alignment dowels will help to ensure the baseboards bridge any unevenness with the supporting tables, e.g. caused by the aluminium edging of 'GoPak' type tables typically provided by village halls.

Baseboard Decoration

The front face of the baseboard should be painted matt black. The ONGM group has a supply of paint for the purpose.

Example Layout Configuration

The diagram below illustrates an example configuration of boards for an operating event. The 'U' shape could enable one person operation.



Checklist for Exhibition / Open Day / Running Day

40mm lengths of track

Spare red and black patch leads (4mm banana plugs)

Spare pieces of track for cutting down to near 40mm

Spare PECO metal rail joiners (fishplates)

Spare wooden dowels for alignment

Controller for Mainline with connecting leads and 4mm banana plugs.

Lengths of track for cutting to fit

Track/rail cutter (e.g. Xuron)

Pliers

Side cutters

Wire Strippers

Soldering Iron

Solder for wiring

Pieces of cardboard to use a shim to level/support the boards

Scissors (to cut cardboard)

'Stanley' knife (to cut cardboard etc)

Shopping List

For one scenic module:

| Item Description | Supplier | Budget | Qty | Cost |
|---|-------------------------|----------|-----|---------------|
| 900 x 400 baseboard | Grainge & Hodder | £34.99 | 1 | £34.99 |
| 8mm wooden dowels | Simon Elam | £0.00 | 2 | £0.00 |
| Jar of black paint | Simon Elam | £0.00 | 1 | £0.00 |
| Cork mat 1000x400 | SPD Aylesbury | £2.76 | 1 | £2.76 |
| Draw Toggle Latch | John Adams Supplies | £3.25ea | 2 | £6.50 |
| 4mm Red Banana patch lead | Switchelectronics.co.uk | £1.15 ea | 1 | £1.15 |
| 4mm Black Banana patch lead | Switchelectronics.co.uk | £1.15 ea | 1 | £1.15 |
| 4mm Red Socket | Switchelectronics.co.uk | £0.56 ea | 2 | £1.12 |
| 4mm Black Socket | Switchelectronics.co.uk | £0.56 ea | 2 | £1.12 |
| Half Red patch lead for controller | Switchelectronics.co.uk | £0.58 ea | 1 | £0.58 |
| Half Black patch lead for controller | Switchelectronics.co.uk | £0.58 ea | 1 | £0.58 |
| DPDT Centre Off | Switchelectronics.co.uk | £1.10 ea | 1 | £1.10 |
| Total per person per module | | | | £51.05 |
| | | | | |
| 4PDT Centre Off (for independent board) | Switchelectronics.co.uk | £1.85 | | £1.85 |

Note the ebay listings shown in the main text may give a better price than using a suppliers website.

At the time of this update in March 2022 there seems to be an on-going shortage of some electrical parts at the prices shown in this leaflet, however alternatives are available, but they may result in the total cost being a few pounds more

Order Form

| Item Description | Price | Qty | Cost |
|--|--------|-----|------|
| 900 x 400 baseboard | £34.99 | | |
| 1200 x 400 baseboard | £46.50 | | |
| 400mm X 400mm with joining plates on all sides | £23.70 | | |
| 400mm X 200mm baseboard | £18.30 | | |
| 400mm X 400mm Head shunt turntable board | £32.30 | | |
| Cork mat 1000x400 | £2.76 | | |
| Draw Toggle Latch | £3.25 | | |
| 4mm Red Banana patch lead | £1.15 | | |
| 4mm Black Banana patch lead | £1.15 | | |
| 4mm Red Socket | £0.56 | | |
| 4mm Black Socket | £0.56 | | |
| Half Red patch lead for controller | £0.58 | | |
| Half Black patch lead for controller | £0.58 | | |
| DPDT Centre Off | £1.10 | | |
| | | | |
| Extras for branch line or independant board | | | |
| 4PDT Centre Off | £1.85 | | |
| 4mm Green Banana patch lead | £1.15 | | |
| 4mm Yellow Banana patch lead | £1.15 | | |
| 4mm Green Socket | £0.77 | | |
| 4mm Yellow Socket | £0.77 | | |
| Half Green patch lead for controller | £0.58 | | |
| Half Yellow patch lead for controller | £0.58 | | |
| Total | | | |