# Alsager Railway Association

*SPECIFICATION FOR 00 SCALE (4mm) MODULES*

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Contents

1 Background

- This specification is intended to allow members of ARA to build inter-operable modules.
- It is intended to allow the assembly of large layouts running many trains in a prototypical manner.
- This is made possible by DCC and the use of DCC is assumed in this specification.
- this specification allows maximum flexibility for the module builder.
- This specification is heavily based on that of the NMRA British Region for their HO modules. The author of this paper is indebted to them for the work they have done.

2 Features

- A module can contain any number of baseboards and the internal baseboard joints in a module do not have to conform to modular specifications.
- Modules are not reversible.
- There is no restriction on module width other than at the module's ends.
- There is no restriction on the length of modules, baseboards or adapter boards.
- A module can have any number of module ends. One for terminals, two for typical main lines, three for wyes, four for junctions, or as many as the builder requires.
- There is no requirement that the sides of a module should be straight, or parallel to each other.
- There is no requirement that the end-boards at opposite ends of a module should be parallel to each other
- There is no restriction on making curved modules apart from the minimum radius requirements and the need for a 150mm straight at module ends.
- There is no restriction on the method of point control, but see E3 as regards electrical arrangements.
- This specification assumes that DCC will be used.
- This specification assumes all modules will be double track
- It also assumes a degree of accepted practices, e. g. all end boards are set accurately at 90 degrees to the baseboard tops and thus the track. Also that adequate width of materials will be used for the construction of the modules, especially end boards where strength and rigidity will be needed most. In other words, common sense is assumed.

3 Definitions

Baseboard:- An individual board carrying a section of model railway. It may or may not meet these specifications.
Module:- A section of model railway mounted on one or more baseboards. The outer ends of the combination of baseboards must meet the 'Physical' specification below. Overall, the combination meets the electrical specification.
Adapter Board:- A baseboard that allows modules built to this specification to be attached to those built to a different specification.
Specifications:- The specifications are those parts of this document that must be followed when building modules. Physical standards have designations such as Pnn; electrical standards are designated Enn

4 The Specifications

4.1 Module Requirements - Physical

A module must feature one or more modular ends. Modular ends come in one type to cater for double track - see P3 below. Modules are not reversible.

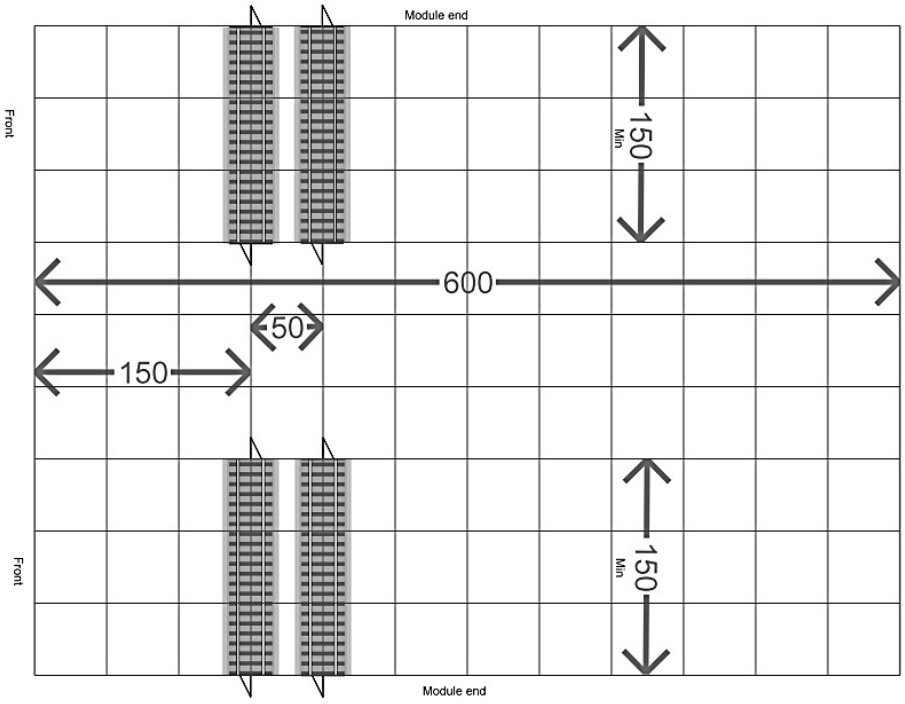
P1: Module shape restrictions

- The module may be any length.
- Apart from the end dimensions as defined in P3, the rest of the module can be any width.
- The sides of the module do not have to be parallel and may be straight or curved.
- The ends of the module do not have to be parallel but should be straight, flat and at right angles to the baseboard top.

(note it is envisaged that ARA will produce an engineered template to manufacture module endplates. Alternatively ARA may get module ends laser cut from plywood professionally)

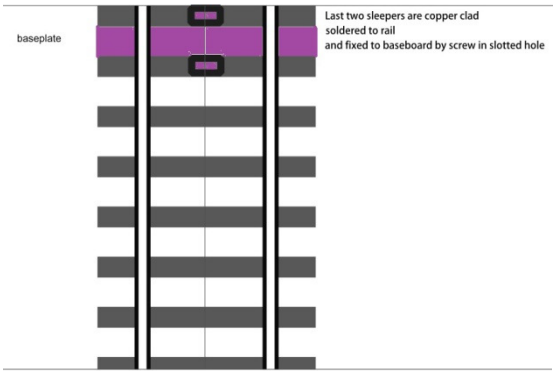
P3: 600mm wide Double track module end

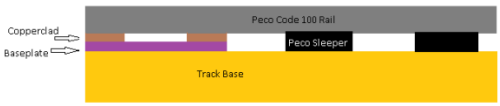
- Width of the modular end must be 600mm.
- One track must be mounted 150mm (nominal) from the front edge of the module,
- the second at exactly 50mm track centres.
- The tracks must be at 90 degrees to the module end and
- continue straight for 150mm from the module end.



P4: Treatment of Rail Ends (TBC)

- Rail ends should be firmly fixed to the module surface,
- for example by soldering to copper-clad sleepers firmly fixed to the board or by soldering to brass screws.
- It is recommended that the rail ends be soldered to two copper clad sleepers.
- Those sleepers fixed to a baseplate to bring ensure the copper clad is the same depth as the Peco sleeper.
- Each sleeper is slotted to fix to the track bed. This allows slight lateral movement to ensure module tracks align correctly.




P5: Module end boards

- End boards must be 100mm high.
- The surface of the end boards must be flat, vertical and at right angles to the track bed.
- Whereas most module schemes use clamps to join modules, it is deemed inadequate for a club setting.
- All module ends will use a system of alignment dowels and bolts. Male dowels at the left hand end looking from the front and female component to the right.
- Sufficient space should be left clear behind the end board for bolting.
- The end boards of a module must be constructed with sufficient strength to accept an adjacent module being C-clamped to it.
- At the outer ends of any multiple-board set up, the main running tracks must be at the prescribed height (see P7 below) with no gradient, i. e. at 90 degrees to the perfectly vertical end.
- See Appendix 1

P6: Module sides

- The height of a side must match that of an end board at the point where they meet.
- Apart from this restriction, sides may be any height and their top may extend above or below the track to allow for fills, cuts, bridges etc.

P7: Module height

- The nominal TRACK BASE height is 920mm.

P8: Supports

- Legs must be fitted with adjusters or spacers that allow the track base height to be adjusted in the range 910mm to 930mm.
- Modules must be self-supporting at their outer ends and not 'lean' on an adjacent module.
- Boards with a single leg unit are allowed within a multi-board module.

P9: Track

- Main line tracks must be code 75 (Peco code 75)
- Spurs and sidings can use other rail sizes.

P10: Track Geometry

- Main tracks, or any other tracks designed for use by through trains, must have at least 900mm radius curves and Large Radius points/turnouts.
- Spurs and industry tracks must be at least 600mm radius and can use sharper turnouts.
- The straight between reverse curves must be 300mm minimum.
- There must be no main line gradients.

P11: Scenery

- In order that visual continuity across module joints is not compromised, scenery at module ends must be roughly flat with no features (such as roads, rivers or track other than the modular tracks) crossing module joints

P12: Track Base

- This to be agreed.

4.2 Module Requirements - Electrical

- This section assumes a DCC system.
- Power & Control is divided into
  - Traction
  - Accessories (see E3 to E6)
  - Auxiliary Power
- Traction is supplied by DCC Command Station, Booster(s) and handheld Cabs/Throttles either wired or wireless.

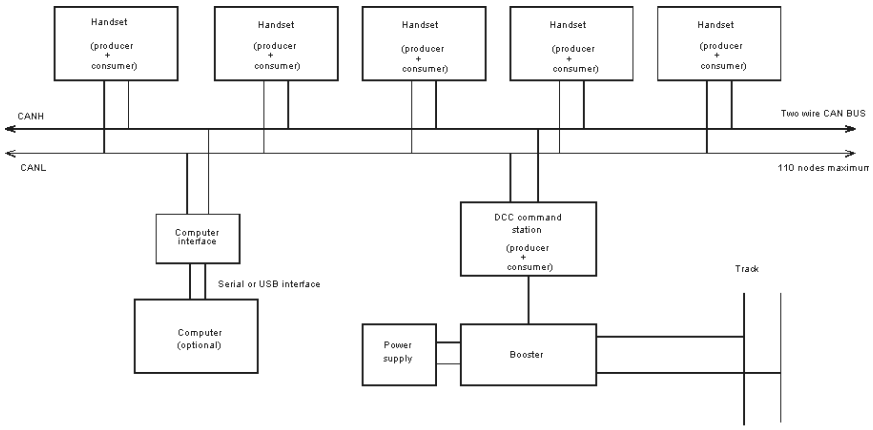



Figure 2 CBUS Basic arrangement for DCC 'CAB' bus.

- 12Volt DC auxiliary power bus
- These requirements can be met using MERG components. The Cabs are actually fed via the CANBUS which simplifies wiring.
  - DCC Power Bus
  - CANBUS consists of two pairs CAN pair and 12v pair for the CABs

4.2.1 Electrical Specification - Mandatory

E1: Mains Power

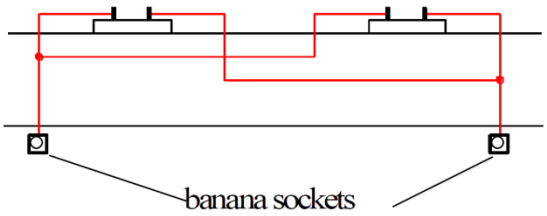
There should be no mains power on any module.

E2: Track Bus Requirements

- The track bus is a two-wire bus that provides commands and power to the locomotives and lighted cars.
- It should be permanently mounted under the module.
- At the ends of the module it should be terminated in banana connectors as shown below.
- The key parameter is the voltage drop along the bus. This depends on the bus itself, how many locomotives are operating, whether they have sound, whether there are lighted passenger cars and so on.
- Rail joiners should not be relied upon to pass current and data between track sections. Ideally wire droppers should be soldered to each track section and attached to the track bus below the baseboard surface.
- The layout could be split into power districts with separate boosters.

Inter-module connections
There are two options for inter-module connection of the track bus. These are compatible.
Option 1

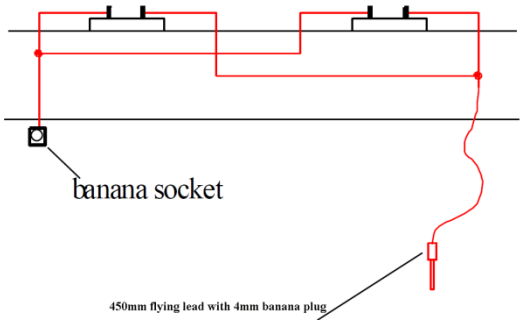
- The two track busses are brought to banana sockets at the module ends as shown below.




- Separate jumper leads, with banana plugs at both ends connect between the modules.

Option two

- In this option, the left hand rail (viewed from the module end) is connected to a banana socket as in option 1. The right hand rail is connected to a flying lead fitted with a 4mm banana plug. This lead should extend 450mm beyond the module end.




Track bus colour code
All track bus wiring at the module ends should be of two colours.
Since modules are non reversible,
we need one colour for the front rails and another for the rear rails.

Wire Size.

| | |
|---|---|
| Droppers | 15amp Fuse wire with sleeving |
| Track feeds | 16/0.2mm multistrand wire |
| DCC Bus | 32/0.2mm multistrand wire minimum |

E3: Pointwork
Any method of point control may be used. However, any electrical switching in pointwork should use appropriate electrical switches and not rely on point-blade contact. If remote control of pointwork is fitted (for example via DCC accessory decoders) a local means of turnout control should also be provided.

E4: Points/Turnouts

- Turnouts should be wired in the so-called "dcc friendly" configuration.
- Members will have their own preferences for electrified and insulated frogs but they should adopt the best practices for each to make them as DCC-friendly as possible.

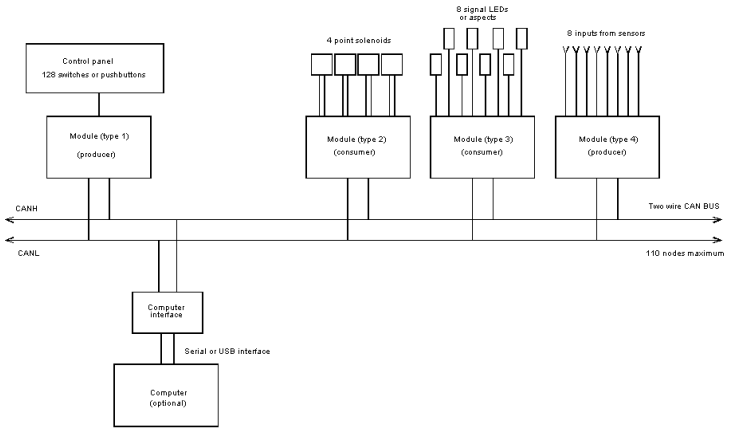
- For example, Peco electro-frog turnout packaging includes the manufacturer's recommendations for making them DCC-friendly. This involves adding wires across the closure and stock rails and snipping the wire connecting the switch rails to the frog rails.

E5: Ancillaries/Servos/Solenoids/CANBUS Modules
Wire Size
Solenoids 16/0.2mm multistrand wire
Otherwise 7/0.2mm multistrand wire

E6 : Ancillaries/Servos/Solenoids/CANBUS Modules
Power Supply
Other than DCC traction, everything else will be powered by 12V DC.

4.2.2 Electrical Specification - Advisory

E7 CANBUS
Accessories inc points and signals may be operated via CANBUS
Given the nature of building a module layout it is impractical to have a central control panel for points and signalling. Each module must therefore have arrangements to control not only those tracks off the mainline but the through tracks and their pointwork as well.
It is envisaged that for any signalling or route setting against the mainline through traffic, a switchable dead/braking section is inserted in advance of that location.
Any local control is the choice of the module builder, however, it should be powered from 12V. It is recognised that most solenoid drivers are either 15-16V AC rectified to 20+V or 20-24V DC.
*In the absence of a 12V solenoid driver, modules can use one of the above power supplies.*
MERG have a 12V powered module CANSOL, which has a voltage doubler incorporated into the circuit.
The author of this document advises the use of MERG electronic modules.




The CANBUS should be a twisted pair. Probably best being a screened cable. (see E3)
(Ethernet/Telephone cable/screened twisted pair)

E8 12v DC POWER
I recommend one 12v power BUS. This to power CABs
Additionally modules will require their own 12V power bus for accessories/ancillaries.
(see E7 for possible alternatives)
Wire size 16/0.2mm or 24/0.2mm multistrand wire

Appendix 1

Module ends