NMRA HO MODULE SIG
(NSW Chapter)

SPECIFICATIONS AND STANDARDS

Revision November 2004

These standards have been agreed upon and approved by the financial members of the NMRA HO Module SIG - NSW Chapter. Any future change or modification to the standards requires approval by two thirds (2/3) of the SIG financial members. If a member wants to modify the standards for their individual module they should seek approval from the group PRIOR to construction.

The aim is to provide as much information as possible, so there is quite a lot of information to read through.

Before constructing your module we also recommend that you speak to other Module SIG members who can offer practical help and advice on techniques that have been already proven.

Members are encouraged to upgrade older modules to comply with the latest standards.

PREAMBLE

The HO Module Special Interest Group (SIG) was conceived by Geoff Hoad, Ken Edmier and David North in 1997. They were discussing the difficulties faced by members who either did not have the space for a layout, were unsure of their skills, didn't have the tools and/or had the desire to learn more about DCC and operations.

The intent of the SIG is to provide an environment within which individual members would be inspired and challenged to continually improve their prototype knowledge and practical skills and apply new technology and ideas as they evolve.

THE STATED AIMS OF THE SIG ARE:

- To promote the hobby of model railroading in general, and both the NMRA and Module SIG in particular, by constructing and maintaining an attractive and reliable modular layout.
- That the modules should look smart and be uniform in appearance. When assembled they should give all the appearances of a single layout.
- That DCC would be the operating system of choice.
- That uniform standards would be maintained. This would ensure proper interfacing of modules to provide mechanical and electrical continuity (i.e. track and wiring). Locomotives and rolling stock would comply with existing NMRA standards and recommended practices to ensure reliable operation

- That the highest quality of modelling would be encouraged.

- That the various skills of the members would be pooled and shared to improve everyone's enjoyment of their hobby.

- The concept of a Modular Layout was presented to the NMRA Australasian Region Board and official approval was granted for a Module SIG to be established within the Australasian Region.

- Meetings were held to discuss and determine what materials to use and to establish common standards to ensure ease of construction, consistent ease of set-up and reliability of operation.

- The SIG members started constructing modules in 1998. All new members paid a joining fee to cover the costs of common property (Ends, corners, crossover modules, wiring looms, joiners etc).

- We all had some fun and frustrations due to our initial lack of knowledge on the DCC operating systems (eg. 2 digit and 4 digit decoder addresses). Plus we quickly learned that the coordination of arrival time, and prior planning of how the modules would be laid out, was rather important if we were to be able to start operating within a reasonable timeframe.

- Early meetings were held in an undercover carpark at North Ryde. Gary Spencer-Salt of Model Railroad Craftsman loaned the SIG a SystemOne DCC operating system each time we set up and John Baker later generously allowed us the use of his large shed for a more permanent setup. This evolved into the current use by the HO Module SIG of a smaller but still good-sized layout set up at Kellyville.

- We have collectively learned much to pass on.

THE STATED AIMS ARE ACHIEVED BY:

- Establishing uniform standards for both the modules and their interfaces to ensure mechanical and electrical reliability.

- Promoting the use, understanding and acceptance of DCC operating systems and sharing experiences learned from using DCC.

- Providing practical help and advice on using, fitting and programming decoders.

- Providing a hands-on opportunity for modelers to control a train using the SIG's DCC system.

- Providing an environment for both running trains and realistic operations.

- Providing practical hands-on help and advice to new SIG members.

- Providing the environment for teaching, learning and practicing high quality modelling skills that may later be applied to members home layouts.

- Making welcome all NMRA members and guests and inviting them to share in our activities.

- Fostering good fellowship, camaraderie and having fun.

With these aims and actions in mind the following specifications and standards were created:

HO MODULE SIG SPECIFICATIONS AND STANDARDS

HEIGHT OF TOP OF RAIL

- The standard distance from the floor to the top of the mainline rail will be 1250mm.
- The adjustable glide provides adjustment of about 9mm either side of this height to allow for uneven floors.
- The 1250mm is achieved through the following standard components:
    - Track : Code 75 Peco - 4mm thick
    - Roadbed: Cork - 6mm thick
    - Module Top: - 12mm thick (Note 1)
    - Legs: Overall length excluding glide - 1200mm
    - Adjustable Glide: Cornall P750 - 5/16 x 1 in the centre of its adjustment range - 28mm end of leg to face of glide
    - (A glide is like a bolt with a large diameter, plastic coated head - an alternative to a castor on furniture legs)

(Note 1) Top must be 12mm overall. Eg. 12mm sheet or 6mm sheet with a laminated 6mm perimeter frame. MDF or PLY of 12mm measured thickness are acceptable.

CONSTRUCTION MATERIALS

Frames

- The standard module frame is 100 x 25 DAR (dressed pine: finished size 90mm x 19mm). The minimum stand-alone module length is 1200mm, and longer modules may be constructed in multiples of 600mm. Multiple modules may be constructed with an aggregate length based on this standard (i.e. 1800, 2400, 3000, 3600 total length). Side frames will be the length of the module. End frames and cross braces are 100 x 25 DAR and are 562mm nominal length. When combined with the side frames (2 sides @ 19mm finished = 38mm) the cross braces produce the standard module width of 600mm.
- Modules of 1200mm length require one cross brace made of 100 x 25 DAR located 600mm from the external interface. Two 50mm diameter holes are to be bored on the horizontal centreline of the brace, 200mm from each end of the brace to allow for the passage of the electrical cables. The 6 pin electrical plugs are located on each side of the brace, on the horizontal and vertical centreline, with the pins facing downwards.
- Modules or sets of modules 1800mm or longer require two cross braces made of 100 x 25 DAR located 600mm from the external interface (to enable electrical connection with the standard wiring looms). Two 50mm diameter holes are to be bored on the horizontal centreline of the braces, 200mm from each end of the brace to allow for the passage of electrical cables. The 6 pin electrical plugs are located on the outer side of each brace, on the horizontal and vertical centreline, with the pins facing downwards. (See Electrical Specifications and Standards for internal wiring required between these plugs)
- Nothing except legs is to be mounted on the inside of the modules within 100mm of the external interface.

Module Tops

- Module tops are to be 12mm thick at all points where they attach to the frames. Therefore the top can be a 12mm sheet, or a 6mm sheet with 6mm by say 25mm strap where the frames contact. Material is either MDF or preferably AA/BB Plywood.

Module Legs

The standards provide for two styles of module legs:

- *Wooden Legs*
  Constructed from 1200 x 75 x 25 DAR with a 1200 x 50 x 25 DAR attached to the 25mm edge to form an L shape in cross section. The long side of the L is parallel to the front and rear fascias of the modules. A 75 x 50 x 50 DAR is located in the V, flush with one end of the leg, which shall be the bottom of the leg. This is drilled vertically and a 5/16 T-nut installed to locate the adjustable glide - Cornall P750 - 5/16 x 1.
  Each leg is attached to the module with 1-1/2 x 1/4 W bolts and 1/4 T-nuts. The SIG will provide the required jig for drilling both the module and the legs. This ensures interchangeability of wooden legs.

- *Steel/Aluminium Legs*
  The standard metal leg is 1200 x 25mm OD x 16-18 gauge square tubing. The adjustable glide adapter is Cornall P306 - 1 x 5/16. The adjustable glide is Cornall P750 - 5/16 x 1. Each leg is attached to the module with a steel socket available from the SIG.

- Any knotholes or blemishes on the fascia are to be filled and sanded prior to painting. Modules are to be painted inside and out, sealing the timber to prevent swelling and warpage. The external standard colour is acrylic exterior Wattyl Pine Green. Paint can usually be supplied by the group on request, which helps to reduce costs and keep the colour uniform. It is recommended that the whole module be sealed with an oil based undercoat and the underside/inside be painted white to improve visibility for maintenance and repairs.

Backdrops

Each module shall have a backdrop made of 3mm three-ply wood. The side facing the module shall be A grade. The backdrop shall be 400mm high and the length of the module minus 6mm (3mm each end to allow for the plastic joining strip). The backdrop shall be fixed to the rear fascia of the module with 5 x 30mm pan Philips machine screws and nuts, (available from the SIG), with the bottom edge of the backdrop level with the bottom edge of the standard fascia. Marley plastic joining strip is used between the backdrops of adjoining modules. The backdrop shall be painted on both sides and all edges with the Module Backdrop Sky Blue paint available from the Module SIG.
(Paint Specification: Mitre 10 Accent Interior Low Sheen Acrylic white base 4 Litres with
Dulux tint: M = 1-1/2: EE = 3: B = 14)

Clear Acrylic Protector Strips

Each module shall have a clear acrylic protector strip affixed to the front fascia. The strip shall be 3mm thick x 80mm high clear acrylic and the bottom edge of the acrylic shall be 70mm above the bottom edge of a standard fascia. Therefore the fascia shall project 48mm above the top edge of a standard module. The length of the strip shall be the length of the module less 2mm (1mm each end to allow for clearance between strips). The acrylic strip shall be fixed to the fascia with 5 x 30mm pan Philips machine screws and nuts. These are available from the SIG. The holes' horizontal centreline shall be 13mm from the

bottom edge of the acrylic with the outer holes' vertical centreline being 150mm from the ends of the standard module and the other holes' centreline being spaced 300mm apart.

SCENERY & STRUCTURES

The standard ground cover within 100mm of the external interface is Woodland Scenics Earth Blend T49 and Grass Blend T50 applied to the bare painted module top to achieve a mainly grassy appearance that will match the first 100mm of the adjoining modules.

The standard mainline track colour is Floquil Rail Brown # 110007 lightly sprayed. The standard Mainline Ballast is Woodland Scenics Blended Grey Ballast B94, well bonded around the sleepers with an appropriate mainline ballast profile.

Scenery, track colour and ballast for the rest of the module is at the owner's discretion keeping in mind that the modules are geographically located in the midwestern prairies of the United States.

The design and paint schemes of structures should be compatible with the general geographic area described above and an early 1950s time frame.

MAINLINE LOCATION

The centreline of the rear mainline is 300mm from the front edge of the module. The centreline of the front mainline is 249mm from the front edge of the module. The centre to centre distance between the two mainlines is therefore 51mm which is the distance set by two Peco Code 75 points connected back to back with insulated joiners. The mainlines will cross the external interface at a 90 degree angle.

Module sets may have non-standard track connections at their internal interface.

TRACK, TURNOUTS & MODULE JOINER SECTIONS.

- The track standard is Peco Code 75.
- The standard module joiners are 100mm long and are supplied by the SIG.
- The mainlines will end 50mm from the external interface/s of the module.
- This leaves room for the joiner (2 modules @ 50mm each = 100mm).
- There shall be no curve or turnout closer than 50mm from the end of the mainlines (100mm from the external interface of the module).
- Turnouts shall be Peco Code 75 Electrofrog.
- Turnouts shall be manually thrown, using the vertical pegs on each end of the throwbar.
- A red plastic tube fitted to one end of the uncoupling tools is provided for this purpose.
- Please avoid using your fingers to throw the turnouts.
- Turnouts shall be modified to be "DCC friendly" and frogs shall be powered.
- The standard method of switching frog polarity shall be by use of a microswitch (see Electrical)
- The SIG will advise how to modify the turnouts to achieve these standards.

Please note that the modules follow US prototype, with right hand running (opposite to Australian practice). Therefore, trains on the rear main move from right to left when traveling in a forward direction. For operations, trailing point sidings are preferred. Large Radius turnouts (nominally 1524mm or 60" radius) are the standard for mainline crossovers. Medium Radius turnouts (nominally 914mm or 36" radius) are the minimum standard for tracks diverging from the mainlines.

Small Radius turnouts and Wyes, while not recommended, may be used if necessary on secondary and yard trackage. Straight parallel tracks shall be 51mm between centres which is the distance set by two Peco Code 75 points connected back to back with insulated joiners.

The minimum mainline radius shall be 30". Where parallel tracks are curved the distance between track centres shall be adjusted to allow clearance for 85' cars. The radius of the Peco Small Radius curve (nominally 610mm or 24") shall be the minimum standard elsewhere, but a larger radius is strongly recommended if possible.

PARALLEL SIDING TRACKS (TO ENHANCE OPERATION)

These siding tracks increase prototypical traffic flow during operating sessions by creating an additional runaround to those existing between the mainlines when two modules containing complementary sidings are coupled together. Their location is either in front of or behind, and parallel to the main lines. A Medium Radius Peco turnout shall be used to connect the siding to the main.

The siding shall terminate 50mm from either the left or right external interfaces of the module, depending on which way the siding faces (either left or right). The roadbed shall be 4mm cork to provide a prototypical siding profile. To connect with a complementary module's siding track a special 4mm thick x 100mm long joiner track will be required. If no complementary module is available a removable 50mm long insert fitted with track and bumper shall be required. As we need complementary pairs of modules with these siding tracks, please ask what exists before finalising your trackplan.

ELECTRICAL SPECIFICATIONS AND STANDARDS

It is a principle of DCC operation that every piece of track must be powered. Each piece of rail is wired with appropriate colour coded feeders (droppers) soldered to the main pair of wires. The wire colour for the front rail of any track is red. The wire colour for the rear rail of any track is black.

A least two cup hooks are to be screwed into each side frame under the surface of the module top to locate and keep separated the power bus loom and the control bus and prevent them from hanging down below the fascia.

Control Bus

The control standard is NCE Powerhouse or Wangrow SystemOne using walkaround throttles.

Compatible radio throttles are permitted.

As the NCE UTP Fascia Panel is used, throttle cables require RJ12 terminals on both ends NCE 524-0209.

An NCE Cab Bus Fascia Panel #UTP is to be fitted as near as possible to the middle of each 1200mm module while avoiding the centre brace, with the bottom edge of the UTP 20mm above the bottom edge of a standard module. These are mounted with the LED hole below the two sockets so that the socket pins are protected from dust and dirt. (The UTP is 50mm deep so the bottom edge of the acrylic protector strips are level with the top edge of the UTP, allowing the UTP to be removed if necessary without removing the acrylic strip).

For longer modules or sets of modules one UTP is required for each 1200mm or part thereof of module length. They should be evenly spaced along the module fascia/s. Each panel shall be mounted flush with the fascia for appearance and to protect the panel during transportation.

At least one mobile phone holder swivel mount shall be provided for each module to locate a handpiece when not in use (these come in plug and socket pairs part #449 from theclipco.com or from the SIG). The socket is screwed to the right side of the module or UTP, utilising one of the acrylic protector strip mounting holes. The plug is mounted on the cab bus handpiece. For longer modules or sets of modules, additional swivel mounts should be added to complement the number of UTPs. Modules with busy switching areas may add extra swivel mounts. Common property modules with a UTP should also contain a swivel mount socket.

Power Bus

The SIG uses a 6 pin male connector attached to the cross brace/s as previously described, at both ends of modules for the connecting loom. These and the connecting loom are available from the SIG. Farnell part number 152574 "Nylon Plug and Socket 12 Way 10A." www.farnell.com (the plug is cut in half to provide two 6 way connectors.)

Looking at the installed connector, with the pins facing downwards, the wiring code from left to right is:

RED	Primary Track Power Bus
BLACK	" " "
WHITE	Secondary Track Power Bus
BLUE	" " "
BROWN	Auxiliary Power Bus 15 volts AC
GREEN	" " "

Module Power Bus (from the above loom to droppers)

The standard is 50 x 0.12mm stranded twin flex red/black, rated at 50VDC 5A nominal. DSE W2022
This should be attached to the under surface of the module with 5mm flat cable clips DSE W4020

Track Droppers

The standard is 10 x 0.25 mm stranded single core flex, rated at 4.5A nominal

- Front rail - Red DSE W2240
- Rear rail - Black DSE W2242

Powered Frogs

The standard is 10x 0.25 mm stranded single core flex, rated at 4.5A nominal

- Front rail to microswitch - Red DSE W2240
- Rear rail to microswitch - Black DSE W2242
- Microswitch to frog - Yellow DSE W2244
- Microswitch DSE P7802 (Modified - refer SIG for details)

Auxiliary Power Bus 15 volts AC may be converted to 12 volts DC through a bridge rectifier for DC auxiliary power on each module individually if required.

All electrical joints are to be soldered and insulated. Insulation standard is Heatshrink or Jaycar Starbrite Liquid Electrical Tape in Red or Black.

Module Short Circuit Protection

The purpose of each module having its own short circuit protection with light bulbs is twofold.

A) If a short occurs on a module the remainder of the modules are not affected and trains not on the shorting module will continue running
B) As modules are typically 1200 – 1800 long, the number of locos and lighted passenger cars, and therefore amount of current draw likely, should be within the range of the protection device.

The method of short circuit protection adopted by the SIG is an 1156 Phillips globe (GM automotive indicator lamp) wired in series on the black track power wire.

We use a Ba15s Globe holder suitable for a 1-1/8" hole. (These were typically used in GM vehicles for rear indicator lamp holders).

The wire from the centre contact goes to the black terminal on the Farnell male 6-pin plug fitted to the module. A black wire soldered to the body of the globeholder is joined to the black bus wire supplying power to the rear rail droppers on the module. The globe holder is used to easily change broken globes without disturbing the wiring.

NB. The globeholder must be on the supply side of ALL track droppers.

Each module must be electrically isolated by using insulated track joiners on all rails of one end of each of the track joiner sections.

In operation, if a short occurs, the globe will glow brightly, limiting the current at the short and giving a visual indication that a short circuit has occurred.

(Location of lamp on the module: information to be added)

CLAMPING MODULES

Modules are clamped together with a 3" C-clamp or equivalent clamping device approved by the SIG.
At least one clamping device per module or set of modules is to be supplied by the owner.

Module sets that will always be mated may have a non-standard clamping arrangement at their internal interface, subject to the approval of 2/3rds of the module owners.

ROAD CROSSINGS, BUILDING & PLATFORM CLEARANCES

All parts of any road crossing will be 0.5mm lower than the rail. Flangeways through such crossings will comply with NMRA standards. A scale 3 feet (10.5mm) is the minimum clearance required between the outer edge of the closest rail and any obstruction. It is recommended that all clearances be checked with the NMRA Standards Gage where applicable.

LOCOMOTIVES AND ROLLING STOCK USED ON THE MODULES

- Locomotives are to be fitted with a DCC Decoder that complies with NMRA standards.
- It is recommended that rolling stock be weighted to comply with NMRA recommended practice.
- It is recommended that rolling stock be fitted with knuckle couplers - Kadee metal recommended.
- It is recommended that rolling stock be fitted with metal wheels, properly gauged.

COMMON PROPERTY

By nature of its function and design some of the dimensions and standards applicable to the standard modules have been modified for the common property. Deviations of this nature shall to be subject to a majority vote of the SIG financial members.

Common property is owned by the SIG (not by the members of the SIG) and should the SIG disband the common property is transferred to the Australasian Region and would become an asset of the Region.

THE MODULAR CONCEPT

As the concept of the Module SIG is to have a series of modules that can be joined together in any combination, trackwork should not extend across the external interface of a module or set of modules unless with the express permission of the owner of the adjoining module. As common property is owned by the SIG secondary track from other modules shall not be laid across common property.

Visitors are most welcome to ask for an invitation to come along.

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