

Cape Gauge Club

HO Scale Free-Form Modular Railroad Group

Module Standards and Construction Guidelines

Version 1.5

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1.0 Overview

The main purpose of this modular group is to provide a place to operate highly detailed HO on 3.5 modules depicting the South African Railways in a realistic fashion.

These standards are based on the American and European Free-mo standards and guidelines, with changes to suit South African requirements.

Operating trains is the important aspect of meets, so the layout will follow a 'free form' configuration featuring end-to-end, or out and back operation. An important aspect is that it will feature a single track mainline with passing loops. The modules are viewed from both sides and are designed to be reversible, and can be placed in any configuration.

The era and philosophy of the modules are to reflect a South African Railways 'secondary main line' character, with steam and diesel motive power. It is not envisaged to have electric traction and overhead catenary at this stage. However this is open for review should sufficient interest be forthcoming.

This type of operation requires end points in the form of reverse loops, a turning wye, or stub end yards. These stub end yards will have manual turn tables at the ends to turn locomotives. The layout may then take on the form of an 'out and back' and 'point to point' operation. Between the end points are modules which carry the single track main line from one end to the other. Large modules may be assembled from small easily transportable 'sections'. The construction of narrower modules or sections is permitted to allow for branch line tracks that can diverge from the mainline.

The club will encourage members to use track plans that either reflect open countryside or town/industry/yard scenes. It is desirable to have a reasonable mix of the above elements to allow for interesting operating sessions

Continued access to the layout at set-ups requires that members contribute to the building, running and teardown of the layout at a set up. After participating as a Guest, members are expected to design and construct a Free-mo compliant module.

Please understand that a good looking and functioning module requires a certain level of commitment of time and money. If you are not prepared to make those investments then this club is not for you. Locomotives and rolling stock must be in good operational and aesthetic

condition. Any problematic equipment that detracts from the layout or its operation can be removed by the Standards Inspector at any time.

We are an open, friendly, welcoming group and have a strong interest in having as many members joining in the fun. But individuals must understand that module owners invest a considerable amount of time and money and have an expectation that their access to the layout will not be hindered by activities of non-owners. Module owners acting as Operating Chief of any event, have the right to deny access to their modules and the layout by non owners.

2.0 Module Frames

Definition:

Module; any layout component (or group of sections) meant to be operated as a single unit in a fixed configuration. A module can have any number of sections. Both ends of a module must comply with the Free-mo physical and electrical standards as contained in this document.

Section; A part of a larger module, complete with benchwork, track, scenery etc. Except where otherwise noted, standards for module end interfaces do not apply to their inter-section interfaces, as these are considered to be internal to the module.

“Frames” refers to a modules structural frame including endplates, sides, interior supports, legs and braces. There are no requirements to use specific materials or construction methods, however careful consideration should be give to weight, strength and ease of transportation. It is recommended that the frame sides be built from high quality ply wood or MDF.

It is required that the end plates used are the laser cut MDF plates supplied by the Club. This is to ensure accurate interfaces between modules.

Dimensions; MAINLINE. Width; 610mm. Length; is free but must be in multiples of 200mm.

MINI-MO; Width; 400mm. Length; is free but must be in multiples of 200mm.

Height of module top from floor; The nominal height measured from floor to the top of the **Main Track rail** is 1270mm adjustable 25mm either side of this datum by means of screw adjusters in each leg.

Width Length and shape; Only the width of the endplates is specified, otherwise free. Only end plates supplied by the Club may be used.

End plates must be parallel to each other vertically, and perpendicular to the track both vertically and horizontally. They must be flat with no bowing or twisting.

Sides and Fascia; Fascias must be smooth and made from solid sturdy material, 12mm plywood or MDF is recommended. The sides must be painted with Dulux Indian Ivy 1 acrylic paint.

Recess items like turnout point controls and throttle panels to prevent accidental damage and injury to operators.

Label electrical switches and other operational items when their function is not obvious.

All 'towns' or industry siding names must be clearly marked on the fascia sides to aid with 'card order' and time table operation. Remember that other members have to operate modules during meets and in your absence.

Legs and Bracing; each module must have legs that support the module free standing. Each leg must include vertical adjustment of plus and minus 25mm to compensate for uneven floors. Sections permanently 'coupled' to form a module, may have adjacent legs omitted, but the module owner must be able to demonstrate the stability of his modules in this instance to the satisfaction of the Standards Inspector. It is recommended that the legs are made from 25mm square tube, painted gloss black. The legs must be capable of being securely attached to the sections and/or modules.

Module to Module attachment; M8 x 35 x 1.5 mm pitch bolts with fender washers either side of the end plate with wing nuts are to be used. If desired, a dowel system can be used to help with initial lining up, until the joining bolts can be fastened

3.0 Track

Track;

The following are types of track allowed for use on modules.

- 1) Tillig HOm brand flex track, or sectional track segments. No sectional tracks curves as the radii do not meet the Club standards.

2) Peco, only Peco part number SL400-009 wooden sleeper flex track may be used. The Peco 009 points may not be used as the radii do not meet the Clubs standards.

3) Bemo/Shinohara, either the wooden or steel sleeper track may be used

It is recommended that the wooden sleeper track is used for the Main Line. Steel sleeper track may be used for sidings or branch lines.

All track and sleepers must be suitably weathered.

Points

Only Tillig points with part numbers Ti-83341 and Ti-83342 may be used. For 'wye' points part numbers Ti-83380 and Ti-83382 may be used. If a double slip is used only part number Ti-83391 may be used.

Bemo or Shinohara large radius HOm points may be used. No points with a radius on the inner rail of less than 800mm may be used.

Sub-Trackbed, or Table Top; construction and materials are free, but must be built to prevent sagging or flexing and must be installed to comply with the endplate requirements.

(see section 2 Module Frames)

In designing and constructing the sub road bed, module owners should take into account that the world is not a perfectly flat table top. Allow for terrain both above and below the trackbed

Trackbed; All main line track is to be laid on 5mm cork track bed with chamfered edges to replicate the 'fall' of the ballast. It is recommended that the freely available MidWest Products cork road bed is used. **Ballast;** only Woodland Scenics, Medium-Grey Blend may be used on the Mainline. Their Fine-Grey Blend may be used on branch line and sidings.

It is recommended that the ballast be weathered by means of dry-brushing or air brush techniques.

Please ensure that flange ways on track and points are kept clear of ballast.

Mainline Location; Single track mainline centres must cross the modules endplate centreline precisely. This is not a requirement for section endplates, allowing for curved mainline track within modules. The mainline track **MUST** run precisely perpendicular both horizontally and vertically for a minimum of 150mm from each endplate. Otherwise track location is free within limits of curves and points. This guideline ensures that there is at least 300mm of straight track between reverse curves on adjacent modules.

All siding and passing loop tracks are to have a minimum centre to spacing dimension of 55mm. All additional tracks crossing a module endplate must respect this spacing of 55mm from the mainline track.

Rail top heights must be the same at the endplate, and must extend for 150mm from the endplate.

All rails must end exactly at the vertical edge of the endplate. It is recommended that the sleepers are removed from the last 25mm of track, and the rail soldered to either a firmly affixed circuit board tie plate, or to 2 brass screws screwed into the endplate. Remember to cut a slot in the circuit board along the track axis to prevent short circuits.

If the rails are to soldered brass screws are used at the ends of the modules, it will not be necessary to remove the sleepers for the last 25mm, however rail chairs should be removed for the same distance to allow for minute adjustment of track gauge at the endplates. The centreline of all tracks shall be 100mm or more from the sides of the modules or sections at all times.

These joints are critical to reliable operation, so great care and accuracy must be exercised.

Curves; The minimum radius curve is 1000mm on the mainline and through tracks such as passing loops

All spurs, servicing tracks, yards tracks, branch lines and similar non through tracks will have a minimum radius of 750mm.

While these are the minimum radius required it is strongly recommended to use the largest practical radius wherever possible.

There must be at least 300mm of straight tracks between reverse curves, on mainline and branch line track, within individual modules.

All mainline curves should include easements. There are numerous articles on the net to help, see www.modeltrains.com/od/layoutconstruction/tp/curve_easements.htm.

For the sake of simplicity and reliability, super elevation of curved track is not permitted.

Grades; Note: grades are possible within a large module, as long as nominal rail-top height is 1270mm from floor at both endplates of the module. US Free-mo standards have a provision for grades across multiple modules, but for simplicity the Cape Gauge Club presently does not allow this until further notice.

Points operation; All turnouts must either controlled locally, either electrically or manually, or by DCC. If controlled manually, a physical lock must be incorporated in the actuation mechanism to prevent closure rail movement.

The only electrical point motors allowed will be of the slow motion type, i.e. Tortoise, Tillig designed for fitting under the baseboard or sub roadbed.

Electro magnet type actuators that are used on top of there base board are not permitted.

To avoid duplications all DCC decoder addresses must be registered with the Standards Inspector.

Point frogs; must be positively powered from stock rails to avoid reliance on the contact between point and stock rails to conduct power through points into the frog.

For guidance on preparing points see, <http://www.wiringfordcc.com/switches.htm>.

In order to prepare the specified Tillig point for DCC operation, to thin jumper wires need to soldered under the point, joining the track rails to the closure rails. (See photo).

The diverging track of points may be located within the 150mm straight at the end of a module so long as the mainline is on straight track.

Point controls should be situated on the fascia, and not on the scenery surface.

Passing loops, Sidings and Spurs; to be known as secondary track. Both rails to all passing loops, sidings and spur tracks must be gapped from the main track rails, for full electrical isolation to ensure main track short circuit current detectors are not affected by trains on sidings and branch lines tracks.

Clearances; all clearances (curves, tunnels, structures etc.) must meet NMRA standards. Potentially every type of rolling stock will run over all modules, so clearances must accommodate the largest locomotives and rolling stock.

Magnetic type uncouplers hidden under the track and ballast may be used on spurs and sidings only. They may not be placed on the Main line.

The position of these uncouplers must be marked by painting the sleepers light grey at either end of the uncoupler.

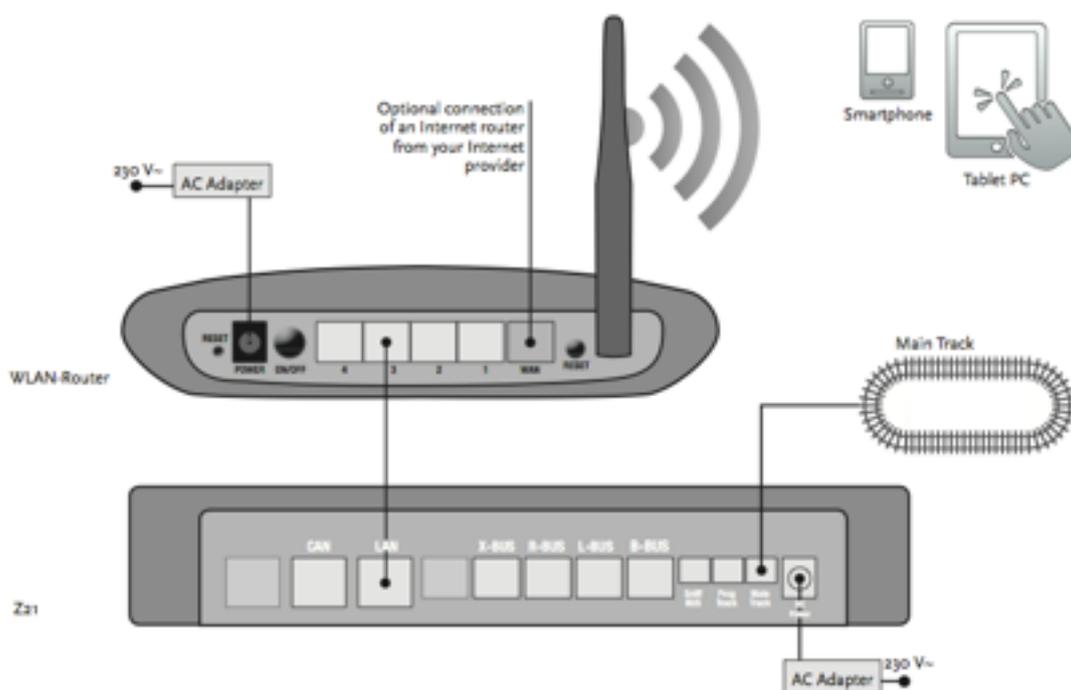
Electrical.

Architecture; All modules will be equipped with two standard electrical busses. The first will be the Mainline power and signal bus. The second will be the passing loop, siding and spur trackage bus. (Secondary track)

Any other power requirements to operate point motors, lighting, animation features etc, on individual modules will be the responsibility of the module owner. These ancillary power supplies must be totally independent of the Power busses and must not interfere in any way with their operation.

Control System: Will be the Roco z21 system combined with a WLAN router, and one Power Booster module. The main controller, booster and router will be supplied by, and will be the property of the club. Individual members are responsible for supplying their own hand throttle compatible with the system.

By incorporating the WLAN router allows members to use an iPad or certain smart phone as a controller/throttle.



Bus wiring;

The track bus is a four-wire track power daisy chain bus that jumpers the mainline track and secondary track power from one module to the next. It uses two 6 pin DIN audio connectors at each end of each module. The two connectors form a male and female pair, cross-wired to allow a module to be rotated (reversed) and still maintain correct track polarity.

The pin outs are as follows;

Pin 1=Red

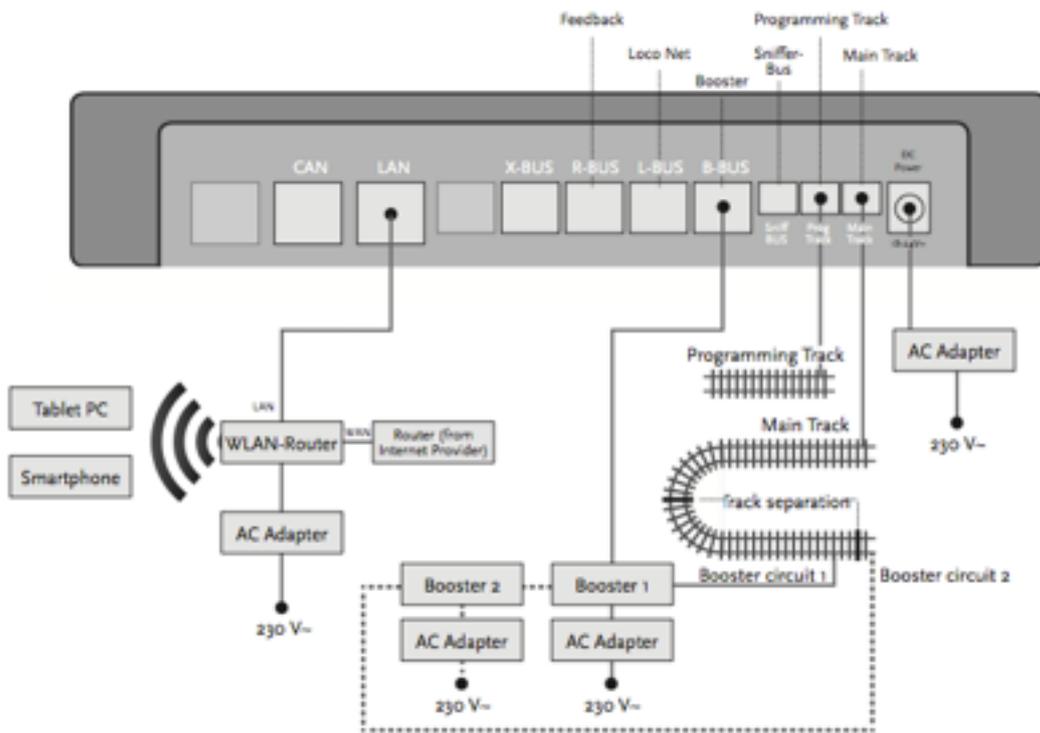
Pin 2=Black

Pin 3=Blue

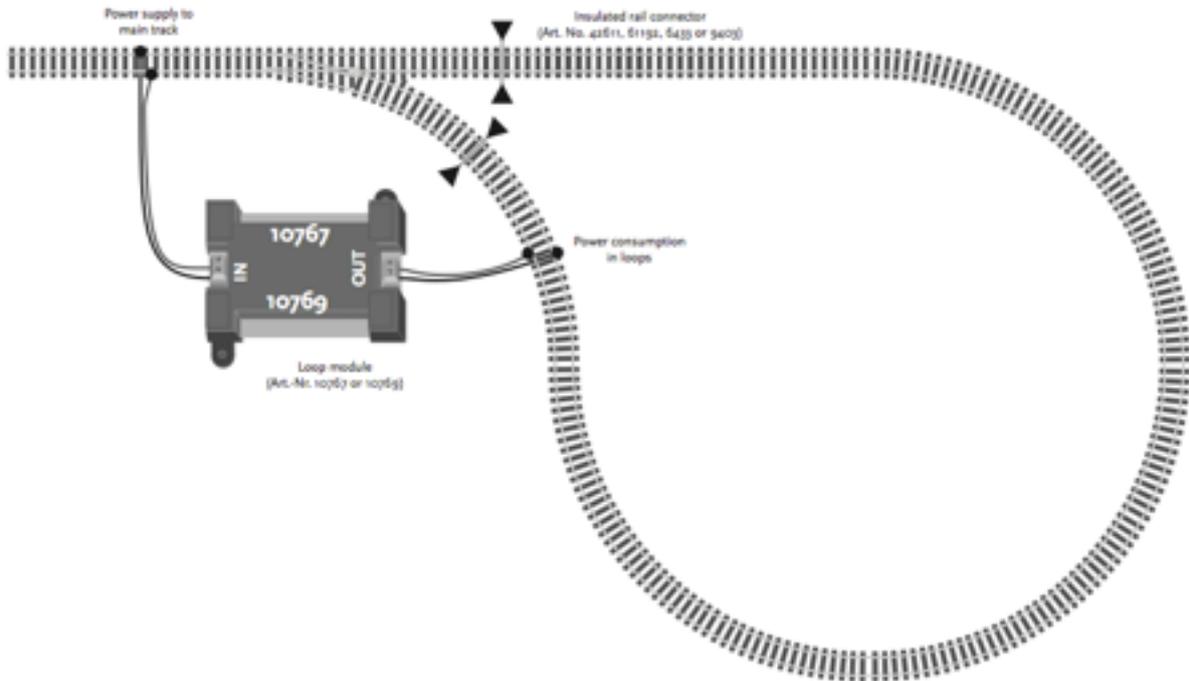
Pin 4=Brown

For the purposes of the Cape Gauge Club, the pin numbering on DIN plugs is as follows. When looking at the mating face of the male or female connector, Pin 1 is the first pin clockwise from the latch, and is numbered in a clockwise direction from there.

The X Bus or control bus



The owner of modules that incorporate a reversion loop or turning wye will be responsible for the supply and wiring of the required Reverse Loop module. The reversing loop or wye must have the required insulating rail joiners installed on two legs of the reverser section.



Scenery.

Scenery material and techniques; scenery must depict realistic South African rail oriented scenes, with prototype locations preferred. Where scenes are ‘freelanced’ the structures and scenery must be identifiable as South African in character.

Due to the current restriction of grades on modules, it is also required that the terrain and vegetation type used on individual modules should be of the typical 'highveld grassland' type. It cannot be stressed highly enough that the scenic standards on the individual modules must be to the highest standard.

Scenery and track side structures must allow hand cleaning of all tracks using an abrasive block type cleaner.

Ballast; only Woodland Scenic Medium Grey blend ballast may be used on the main line track. It is recommended that this can be weathered by dry bushing or air brushing after gluing down.

Woodlands Scenics fine medium grey blend may be used on yard or industry spurs or branch lines.

End profile and landscape; a flat scenery profile is used at module ends. Landscaping at module ends must be designed smoothly flow into adjoining modules-avoid features such as roads and lakes terminating on the module end plates. For a distance of 150mm from the ends of the individual modules the terrain should be relatively flat, and the vegetation should be grassland of varying length.

Scenic contours within a module are between the flat end profiles, the entire module does not have to be flat. In fact **totally flat** modules are **discouraged**.

Backdrops; are not allowed as the modules are meant to be viewed from both sides and are meant to be reversible.

Protection; it is permissible that clear Perspex or Lexan barrier of 150mm above track height is affixed down both sides of the modules to prevent rolling stock etc from falling off of the module, and to prevent damage from spectators at shows.

Ground Cover and scenic materials; attached in the addendum is the list of scenic materials and colours that are to be used on individual modules. Should a member wish to deviate from this prescribed list, permission must be obtained from the Standards Inspector.

Trees and bushes; all trees and bushes are to be of a South African flavour and realistic colouring. Please observe prototypical scenes and try and replicate them as faithfully as possible.

Structures and vehicles; all structures are to faithfully replicate South African architecture. No obviously European and American kit structures. The vast majority of South African structures related to railways are predominantly made of brick, dressed stone or corrugated iron. Likewise pay attention to the types of bridges used, predominantly Warren or Pratt

truss, plate girder. No wooden trestles. Try and accurately represent the track drainage, and use SAR prototypical culverts etc.

Vehicles, are wherever possible to be of types that were available in South Africa during the time period. **ONLY** 1:87 scale vehicles from recognised fine scale producers like Herpa etc are allowed. Remember to change the steering wheel to the RHS of the vehicle, and if the scene requires it, install a driver.

Likewise with figures, and don't forget to reflect our ethnic diversity.

Time period: Due to the current range of commercially available products from various manufacturers, the period modelled will be primarily encompass the era of the 1960's to the 1980's.

The colour schemes for goods stock will be the red-oxide and silver, and for passenger stock will be the red and grey of the SAR.

Respect the elements that make up a scene. If your scene depicts the 1960's, as depicted by vehicles, road signs, advertising signs etc, it would be incorrect to have the relatively recent blight of squatter camps in the scene.

Locomotives and Rolling stock

Wheels; the tyres are to be of metal construction.

The wheels are to be clean and the back to back spacing must meet the gauge that will be developed by the Club.

The flange contours must comply with the RP-25 standard or have equivalent flange depth. It is strongly recommended that all rolling stock use the Steam Era Models W3 and W3L wheel sets.

Rolling quality; All rolling stock must be able to roll freely down a 3% grade.

Bogies; must pivot freely, and have sufficient articulation to negotiate all points, curves and vertical curves as specified in section **4.0 Track**.

Bogies must be prototypical of the bogies used on the SAR.

Must have slight lateral rock on at least one end (three point mount)

Couplers; only Kadee No. 178 couplers to used.

The coupler heights and trip pin heights must comply with the Kadee coupler height gauge. Knuckle and centring springs must work freely.

The coupler trip pins may be cut off at the bottom of the coupler body.

Weight; all rolling stock must be weighted to within +10% and -5% of the NMRA specification. See Addendum.

Locomotives; must be equipped with DCC decoders compatible with NMRA DCC compliant standards.

Locomotives must use 4 digit addresses, and wherever possible it should be the locomotive cab number. If not the address must be clearly marked on the underside of the loco.

Analog conversion (DC operation) must be disabled to prevent runaways.

All locomotive addresses must be registered with the Standards Inspector.

Standards; the Cape Gauge Club is trying to raise the level of SAR modelling, and therefore it is preferable that all rolling stock and motive power be prototypically correct and detailed. The saying of 'quality before quantity should apply.

All locomotives and rolling stock must pass a track test for compliance with the above standards prior to operation on the Club modules.

Addendum.

Scenic materials and colours; List of approved colours and products for grass cover.

Noch.

Flock grass 6 and 12mm long

- 1) Wild grass Wiese.
- 2) Wild grass Beige
- 3) Streugras Sommerwiese
- 4) Streugras Waldboden

Heki.

- 1) 1840 Wildgras Savanne
- 2) 1841 Wildgras Fruhlinsgras
- 3) 1842 Wildgras Sommergras

Other ground cover products from these manufacturers as well as others like Silflor, Woodland Scenics etc, are approved, but ensure that complimentary shades are used.