



Australian Model Railway Association

Free form module standard

Version 2.1
November 2022

Aim

The aim of this standard is to define the mechanical and electrical interface for single and double track free form modules, using DCC and Wi-Fi for operation of trains that comply with AMRA standards.

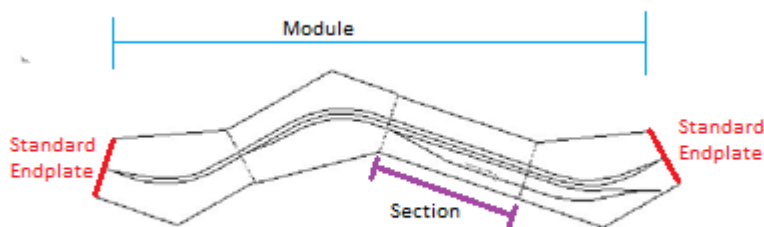
Note: Most mass produced trains comply with AMRA standards.

Introduction

Portable model railways are built in sections called modules. The idea of different people building separate modules and joining them together to make a large model railway has seen the development of many incompatible club standards. In 1989 the friendship association of European model railroaders was formed (FREMO) and developed a number of single track free form style module standards. Unlike the earlier module systems, the FREMO concept allowed for maximum flexibility in module design and has been adapted by various groups around the world.

Module Design

Modules can be constructed of any suitable material as long as it supports the track work and scenery with sufficient strength and stiffness. The shape, width, length and depth of the module can vary except at the module end board. Modules can consist of separate sections allowing greater design flexibility and ease of transport. The section end boards can be of any shape and size and use any method of joining which results in reliable operation. Each module and section shall be self-supported (minimum of 3 legs). The support legs shall have a minimum of 20mm adjustment. The fascia shall be painted satin Black on all external surfaces.



Module Clamping

Modules are joined together using clamps or alternatively using nuts, bolts and flat washers through holes provided in the module end boards.

When using bolts to clamp the module end plates, flat washers are to be used between the clamping bolt, end board and nut. The maximum bolt diameter to be used is 6mm.



Australian Model Railway Association Free form module standard

Version 2.1
November 2022

Scenery

All modules shall be covered by scenery.
Scenery colours and style are specified in the relevant scale and prototype specific Appendix.

Track

All track work shall be within the limits of the AMRA Fine Tolerance Track standards.
It is recommended that crossing V's and K's (Frogs) be of metal construction.

Minimum track radius

Minimum radius shall be equal or larger than what is calculated in the AMRA Minimum Radius standard.

Minimum turnout size is determined by the minimum radius of the turnout. Larger than the AMRA standard minimum values may be specified in the relevant scale and prototype specific Appendix.

Track centres and clearances

Minimum track centres and clearances shall be equal or larger than the values in the AMRA Track Centre and Clearance standard.

Track at the end board

The track height shall be 1200mm measured from the top of the rail head to the floor.

The rail shall be set back between 0mm and 0.3mm from the outer face of the end board.

The rail at the module end board shall be firmly attached by either soldering to screws or at least 2 copper clad sleepers glued in place using epoxy glue.

Tracks at the endplate shall be square and straight for a minimum distance of half the maximum length vehicle used. A larger value may be specified in the relevant scale and prototype specific Appendix.

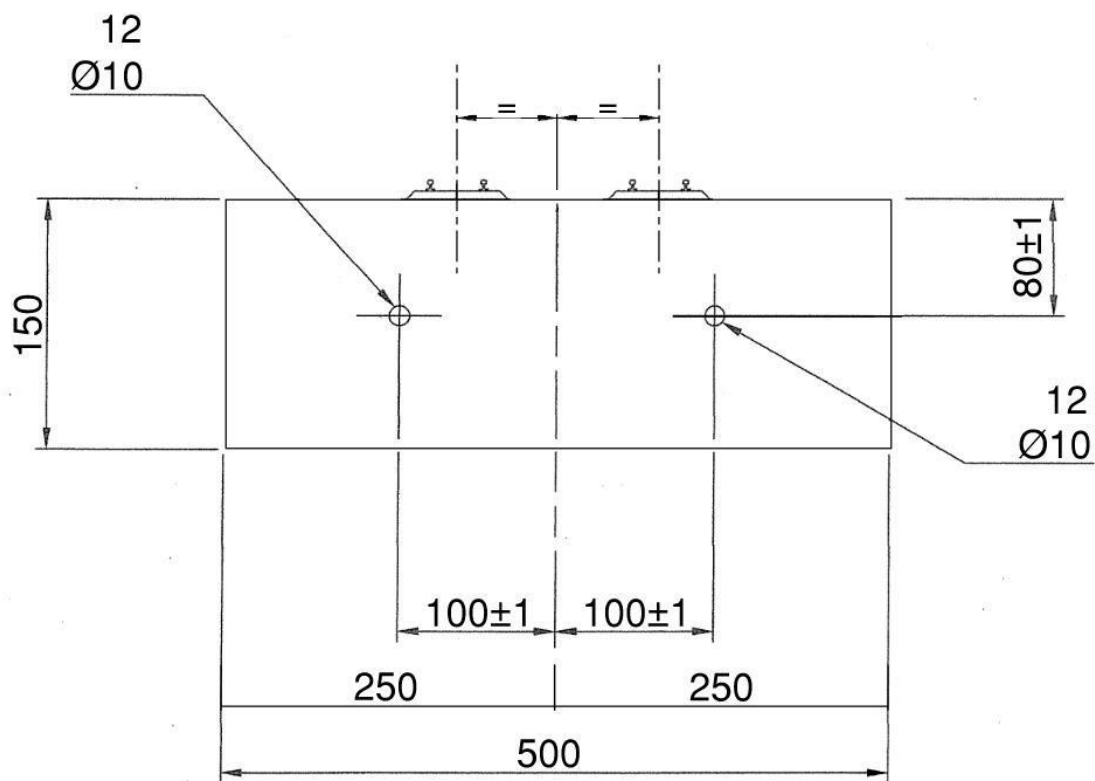
The height from the top of the rail to the endplate shall be the height of the track used and the scaled down nominal prototype ballast height of 600mm or specified in the in the relevant scale and prototype specific Appendix.



Australian Model Railway Association Free form module standard

Version 2.0
November 2022

Double track Module end board



All dimensions: mm

Tolerance unless otherwise stated: +/- 6mm

Minimum end plate thickness: 17mm

End plate material: Plywood

For double track modules each track shall be equally spaced from the centerline of the endplate. The track centre distance shall be equal or larger than the minimum track centre distance in the AMRA clearance and track standard for the minimum radius used. This value may be specified in the relevant scale and prototype specific Appendix.

Note: MDF or dimensional timbers are not to be used for the end board. Metal or composites of demonstrated stiffness and strength can be substituted as the end board material

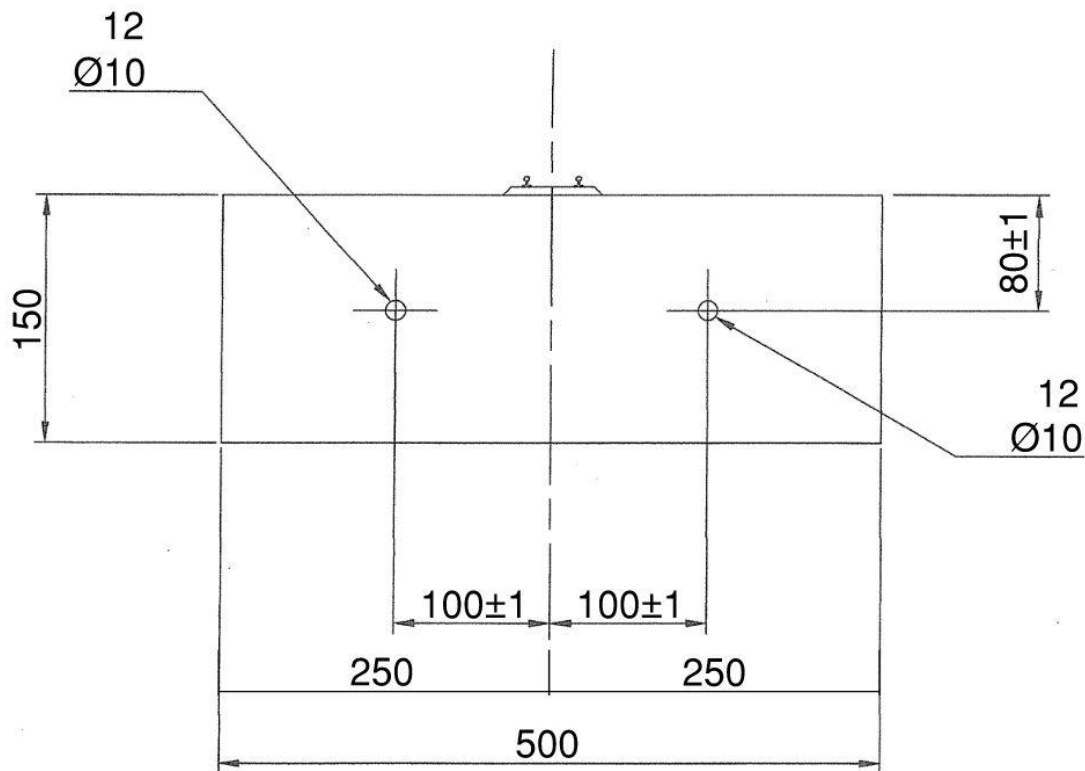
Rail joiners or bridging rails are not to be used at the interface between modules.



Australian Model Railway Association Free form module standard

Version 2.0
November 2022

Single track module end board



All dimensions: mm
Tolerance unless otherwise stated: +/- 6mm
Minimum end plate thickness: 17mm
End plate material: Plywood

For single track modules the track shall be centered at the end board.

Note: MDF or dimensional timbers are not to be used for the end board. Metal or composites of demonstrated stiffness and strength can be substituted as the end board material

Rail joiners or bridging rails are not to be used at the interface between modules.



Australian Model Railway Association

Free form module standard

Version 2.1
November 2022

DCC Wiring

Turnout controls

All turnouts will be wired so they can be operated from both sides of the module. It is recommended that the control buttons do not protrude beyond the fascia to avoid damage.

Track Power Buss

The track power buss uses 2 insulated wires to carry track power through modules. It is recommended that the insulation colours used be red and black.

The track power buss shall use a minimum 1.6mm diameter (14 AWG) copper wire or multiple strand cable with a minimum 2mm² copper conductor cross sectional area.

It is recommended the track power buss be twisted around each other to decrease electrical interference.

At the end board, the track power buss cable shall be terminated with a Black Anderson SB50 Plug with #6 AWG contacts.

The connector shall be mounted on the inside of the module end board facing down.

The right hand conductor shall be electrically connected via the track feeds to the right hand rail when looking at the end board. The left hand conductor shall be electrically connected via the track feeds to the left hand rail when looking at the end board.

Note: No accessories shall be powered from the track power buss

Track Feeds

The track feed wires shall use a minimum 0.5mm diameter (24 AWG) copper wire or multiple strand cable with a minimum 0.22mm² copper conductor cross sectional area.

Each rail shall have its own track feed wire including crossing V's and K's.

It is recommended that the feed wire insulation colours be red and black for the feed wires directly connected to the track buss and yellow for polarity switched feed wires from crossing V's and K's. It is recommended the inside underneath of the module be marked red on one side and black on the other side to match the wiring colours.



Australian Model Railway Association

Free form module standard

Version 2.1
November 2022

DCC Wiring

Accessory Power Buss

The accessory power buss uses 2 insulated wires to carry accessory power between modules. It is recommended that the insulation colours used be brown and blue.

The accessory power buss shall use a minimum 1.6mm diameter (14 AWG) copper wire or multiple strand cable with a minimum 2mm² copper conductor cross sectional area.

It is recommended the accessory power buss be twisted around each other to decrease electrical interference.

At the end board, the accessory power buss cable shall be terminated with a grey Anderson SB50 Plug with #6 AWG contacts. The connector shall be mounted on the inside of the module end board facing down.

Module Power Buss connection cables

Each module shall have 2 Power connection Buss cables, each 1m in length.

The track power buss connecting cable shall be terminated at each end with a Black Anderson SB50 Plug with #6 AWG contacts and will be straight through wired. The wires shall use a minimum 1.6mm diameter (14 AWG) copper wire or multiple strand cable with a minimum 2mm² copper conductor cross sectional area. It is recommended that the insulation colours used be red and black.

The accessory power buss connecting cable shall be terminated at each end with Grey Anderson SB50 Plugs with #6 AWG contacts and will be straight through wired. The wires shall use a minimum 1.6mm diameter (14 AWG) copper wire or multiple strand cable with a minimum 2mm² copper conductor cross sectional area. It is recommended that the insulation colours used be brown and blue.

Overload protection

Each module that has a turnout shall provide overload protection in the range of 1A to 2.5A between the power buss and track feeds or use 5W light globes in series with the turnout crossing V (frog) yellow wire.

Each module that has an accessory connected to the accessory bus shall provide overload protection in the range of 1A to 2.5A between accessory power bus the local accessory bus or accessory feeds.



Australian Model Railway Association

Free form module standard

Version 2.1
November 2022

Appendix 1

H0 standard gauge 1:87 scale Australian prototype

Track at the endplate

The height difference from the top of the rail to the scenery at the module endplate shall be 7.5mm. (This height is achieved if you use Peco code 83 track on 3mm thick underlay).

The track gauge at the end board shall be between 16.5mm and 16.6mm

The track shall be square and straight at the end board for a minimum distance of 140mm.

On double track module end boards, the track centerline spacing shall be 51mm +/- 0.1mm

Track Rail Height

Recommended rail height is 2.1mm (code 83)

Maximum rail height shall be 2.1mm (code 83)

Minimum rail height shall be 1.3mm (code 55)

Suitable brands of track are Peco, Walthers, Shinohara, Micro Engineering and Tillig.

Note: Peco code 75 track is not to be used as it has over scale sleepers for 1:87 scale.

Minimum track radius

Minimum track radius shall be 914mm (36")

Minimum track radius for S bends, turnouts and slips shall be 1067mm (42")

Turnouts

Recommended turnouts are:

Peco code 83 #8 radius =1702mm Electrofrog

Peco code 83 #6 radius =1092mm Unifrog

Peco code 70 #6 radius =1092mm Unifrog

Homemade turnouts built to the AMRA fine tolerance track standard.

Note: Turnouts built to the MOROP NEM 110, NMRA S3.2 and AMRA intermediate tolerance track standards are allowed.

Note: Peco Unifrog crossing V's shall be wired the same as Electrofrog crossing V's

Note: Peco code 75 turnouts and crossings shall not to be used as they have over scale sleepers for 1:87 scale.



Australian Model Railway Association Free form module standard

Version 2.1
November 2022

Appendix 1

H0 standard gauge 1:87 scale Australian prototype

Scenery

Scenery shall represent inland Australia.

At the ends of the module static grass can be used to help hide the join.

Buildings and structures shall be based on Australian prototypes.

Track ballast

Track ballast shall be Woodlands Scenics Fine Dark Brown ballast mixed in equal proportions with Woodlands Scenics Fine Grey ballast for the through tracks.



Australian Model Railway Association

Free form module standard

Version 2.1
November 2022

Appendix 1

H0 standard gauge 1:87 scale Australian prototype

Recommended scenery materials for Australian inland scenery

Brand	Type	Code/Description	Colour	
HEKI	Static grass	3363 Grafaser 100g 'Winterboden'	Dead/brown grass	
		3367 Grasfaser 75g 'Wildgras Wiesengrün'	Green/brown grass	
		3368 Grasfaser 75g 'Wildgras Waldboden'	Green	
	Foreground Trees	1971 10 tree armatures + some foliage 'Baum-Bausatz'		
		1940 Oak Tree x 1 - No foliage Excellent for large gum		
		1507 8 - 9" Linden trees x 2 - No foliage Excellent gum trees		
Woodland Scenics	Tree Armatures	114 ¾ - 2" bushes/small trees	Brown plastic trunks	
	Tree Armatures	57 2 – 3" small trees	Brown plastic trunks	
	Clump Foliage	FC181 165 cu.in. bag Ground cover and Tree Foliage	Burnt Grass	
	Clump Foliage	FC182 165 cu.in. bag Ground cover and Tree Foliage	Light Green	
	Clump Foliage	FC1644 50 cu.in bottle Bushes	Olive Green	
	Static Grass	FL631 50 cu.in bottle 'Wild Honey'	Fawn	
	Static Grass	FL632 50 cu.in bottle 'Harvest Gold'	Brown	
	Static Grass	FL634 50 cu.in bottle 'Light Green'	Light olive	
	FineLeaf Foliage	F1133 75 cu.in. box Bushes	Olive Green	
	Model Terrain	Foliage	500ml bag Tree foliage	Olive Green
		Foliage	500ml bag Tree foliage	Light Olive
Scenic Express	Foreground Trees	EX1228 8" White Birch Trees x 2 Good gum trees		
		Other smaller trees in 2 and 4 packs		
Mini Natur	Static Grass	006-34	Late Fall	
MRC (Also JTT Trees)	Small bushes or branches	95080 (Fb1001) – 1" to 3" approx. 100	Mid green	
Noch	Static Grass	Various		