The Official Free-mo Standard

Index

Legend

[S x.y, RP x.y, FAQ x.y, where x. and y are numbers - example: S2.15, F1.7, RP 5.11]

S = Standard. All Free-mo modules and participants must conform to the requirement/standard stated.

RP = Recommended Practice. These are procedures or specifications which are strongly encouraged for maximal reliability or fidelity.

FAQ = Frequently Asked Question/Answers which explain the reasoning behind a particular Standard or Recommended Practice.

1.0 Introduction

S1.1 The objective of the Free-mo Standard is to provide a platform for prototype modeling in a flexible, modular environment. Free-mo modules not only provide track to operate realistic models, but also emphasize realistic, plausible scenery; realistic, reliable trackwork; and operations. Free-Mo was designed to and continues to push the envelope of modular model railroading to new heights. It goes beyond the traditional NMRA closed-loop set-up in creating a truly universal "free-form" modular design that is operations oriented and heavily influenced by prototype railroading.

S1.2 Interoperability: The Free-mo Standard is a collection of requirements for building scale model railroad modules that can work together with little effort, even when they have never been assembled together before. The beauty of

the Free-mo standard is that it allows builders to replicate any freelance or prototype trackplan within your modules boundaries, yet can be combined for maximal interoperability with other Free-mo modules.

S1.3 A Free-mo module is a free-form module that conforms to the Free-mo Standard as outlined below. (FAQ 1.5)

S1.3.1A Free-mo module can be any length and the endplates can be at any angle to each other.

S1.3.2A Free-mo module can be one section or a set of two or more sections that form a module.

S1.4 The Free-mo Standard governs the ends of the module and basic track requirements. Most Free-mo modules have two ends, but modules can have one, two, three, or more ends. (FAQ 1.1)

S1.5 Free-mo modules fall into three basic categories:

S1.5.1 Mainline - Mainline modules represent Mainline rights-of-way. Mainline modules are designed with large radius curves and minimal grades.

S1.5.2 Branchline - . Branchline modules represent Branchline rights-of-way. Branchline modules can have smaller radius curves and steeper grades than Mainline modules.

S1.5.3 Mini-mo - Mini-modules (mini-mos) have endplates that are narrower than the standard width endplate. With this in mind, a mini-mo can be Mainline or Branchline module, single-track or double-track. (S1.6)

S1.6 Mini-mo type modules are intended to be a Free-mo subset and not replace or exclude an equivalent length standard module. Full width modules are generally more stable and should be used wherever possible.

2.0 Frame and Legs

S2.1 Endplates shall be 3/4" plywood or equivalent (birch plywood works well) to provide sufficient strength for clamping to adjacent modules. (FAQ 2.1, RP2.1.1)

RP2.1.1 Avoid Dimensional Pine Lumber for your frame work. It has a tendency

to warp and "cup" with age, throwing off track alignment. It has also been found that plywood (birch plywood works well) warps and twists less than dimension lumber (3/4 inch pine boards). (FAQ 2.1)

S2.2 Single-track endplates shall be 24 inches wide by 6 inches tall.

S2.3 Double-track endplates shall be 26 inches wide by 6 inches tall.

S2.4 Roadbed shall be 1/4 inch cork or equivalent on 1/2 inch plywood or equivalent. Foam tops are acceptable if braced to prevent sagging or flexing.

S2.5 The nominal and minimum height of the the railhead, at the end plate, is 50 inches from the floor. (FAQ 2.2, FAQ 2.6)

S2.6 On modules with grades, the elevation of the high end shall be some multiple of 3/4 inch above low end.

S2.7 The maximum height of railhead , at the end plate, is 62 inches from the floor.

S2.8 The module (set) shall have at least four legs and stand on its own.

S2.9 Legs shall have continuous adjustment of plus or minus 1 inch (screw type foot).

S2.10 The bottoms of the legs shall have rubber tip or equivalent floor protection.

S2.11 Modules may be used with operators and spectators on either or both sides. (FAQ 2.3)

S2.12 There are no special benchwork construction requirements for Mainline Modules in excess of the standards specified above (S2.1 through S2.11).

3.0 Track

S3.1 Modules shall use Flex or hand-laid track.

S3.2 The centerline of the all tracks shall be 4 inches or more from the sides of the module at all times. (FAQ 3.1)

S3.3 On a Single-track module, the through track shall be centered on the 24-inch endplate. (FAQ 3.4)

S3.4 On Double-track modules, the two through track centerlines shall be spaced precisely 2 inches apart and centered on the 26-inch endplate. (FAQ 3.5)

S3.5 Track on the through route must be perpendicular to the endplate for 6 inches from each end of the module.

S3.6 Track on the through route must be straight and level for 6 inches from each end of the module.

RP3.6.1 The points of a turn out should not be within 6" of the end of a module.

S3.7 Rail shall be cut off 1 inch away from module end; ties and ballast shall be continued to the module end for good appearance and matching with the adjacent module. Ties shall be notched under the ends of the rails and to the module end, to clear bridge rail joiners and provide freedom of adjustment for bridge rails. (FAQ 3.2)

RP3.7.1 To enable DCC power districts, your module must be able to accommodate insulated rail joiners at each Free-mo endplate.

RP3.7.2 Free-mo printed circuit board tie plates are recommended for ends. (F7.1)

RP3.7.3 Tie plates where the fitter rails go over should be excavated slightly to permit fitter rails to accommodate any vertical irregularity in track alignment between adjacent modules.

S3.8 Turnouts shall be at least #6.

RP3.8.1Turnouts on the module through route should be #8 or larger.

S3.9 There shall be a minimum of 12 inches of straight track between reverse curves.

S3.10 Track on the through route of a Mainline module must ALL be Code 83 nickel-silver rail without exception.

S3.11 Sidings, spurs and other tracks of a Mainline Module may be Code 83 or smaller, but shall be no less than Code 40.

S3.12 The Minimum permitted curve radius on a through route of a Mainline Module is 42 inches. This includes through track sidings and other tracks where through traffic will run. (RP 7.4)

RP3.12.1 While the minimum permitted radius of curves on the through route of a Mainline module is 42 inches, 48 inch and larger curves are preferred.

S3.13 Spacing between tracks on curves of a Mainline Module shall allow for long cars to operate without fouling each other; observe **NMRA Standards S-8 Track Centers** for "Class Ia" equipment.

S3.14 Mainline maximum permitted grade on the through route of a Mainline module is 2.0 percent (approximately 1/4 inch per foot). (FAQ 3.6)

S3.15 Vertical curves on the through route of a Mainline module shall be appropriate for Mainline operation of contemporary long cars, see **Standard S-7 Clearances and the NMRA Gage**, and **NMRA Recommended Practices RP-11 Curvature and Rolling Stock**.

4.0 Wiring

S4.1 Wiring consists of 2 pairs of buss wires (track buss and accessory buss) and a 6-conductor LocoNet buss cable.

S4.2 Track and accessory buss wire shall be 18 AWG stranded or larger.

RP4.2.1 It is recommended to use 14 AWG stranded wire for the Track and Accessory Buss. Even better is 12 or even 10 AWG Stranded wire.

S4.3 The LocoNet buss shall be telephone type 6-conductor cable.

S4.4 There shall be a 4 (or more) position barrier strip under the module at each end for track and accessory buss wire hook-up.

S4.5 All ends shall have a pair of 2-pin Jones plugs, one male and one female

(Cinch Part Number P-302-CCT and S-302-CCT or equivalent) for the track buss. (FAQ 4.1)

S4.6 All ends shall have a single, 2-pin trailer plug (Radio Shack Part Number 270-026 or equivalent) for the accessory power.

S4.7 All ends shall have a surface mount "6 conductor 6 position" module jack (RJ12) mounted to the inside of the endplate for the LocoNet Buss. .

S4.8 Through route wiring is as follows for Jones plugs (must be facing module end for correct perspective): (FAQ 4.2)

S4.8.1 Single-track -

○. Male contact 2 right rail.

0. Male contact 1 left rail.
0. Female contact 2 left rail.
0. Female contact 1 right rail.

S4.8.2 Double-track -

0. Male contact 2 right rail.
0. Male contact 1 left rail.
0. Female contact 2 left rail.
0. Female contact 1 right rail

RP4.8.1 - On double track modules, to facilitate optional train signaling/ detection, separate feeders are recommended for each track so that detection can discern a train on track A or track B.

S4.9 Track feeder wire must be 24 AWG or larger, but not longer than six inches to the track bus to avoid voltage loss.

S4.10 All turnout frogs shall be powered. Turnouts shall not rely on switch points to power the frog.

S4.11 Accessory power shall be approximately 16 volts AC or DCC. The buss is wired straight through. A bridge rectifier and filtering capacitor may be used to convert AC or DCC signal to DC. Applications that require AC or DCC signal may utilize power directly from the buss. (FAQ 4.3)

S4.12 Each module will have one dual flush mount "6 conductor 6 position"

modular jack (RJ12) faceplate mounted on each exposed side of module, for throttles. (**Digitrax UP-5 Throttle Jack** or equivalent)

RP4.12.1 For maximal convenience in areas where operators congregate (such as yard modules) one or more modules in these areas should have more than one set of throttle jacks per side.

RP4.12.2 On Multi-Section Module, each module sections should have a dual flush mount "6 conductor 6 position" modular jack (RJ12) faceplate mounted on each exposed side.

S4.13 All of the LocoNet connectors and associated cables need to be connected together straight through (i.e. pin 1 - pin 1, pin 2 - pin 2, pin 3 - pin 3, etc. ...note standard telephone cables are NOT wired straight through).

S4.14 To connect the DCC buss between modules, a 2-foot RJ12 to RJ12 type straight through cable is utilized.

S4.15 To connect a DCC booster to a module, There are two connections that have to be made. (1) The LocoNet (2) The Track Power.

S4.1.15.1 For the LocoNet, a 4 foot RJ12 to RJ12 type straight through cable is utilized.

S4.1.15.2 For the Track Power, a 4 foot cable with one female and one male 2 pin Jones plug on one end is used. It is plugged between interfacing modules and connected to the output of the booster.

5.0 Control

S5.1 LocoNet compliant DCC and accessories are standard for interoperability within and between Free-mo groups. For more information about LocoNet Technical specifications consult the **Digitrax** website.

S5.2 For a given turnout, turnout controls must be on all sides of the module or module section, excepting any endplates.

RP5.2.1 Turnout controls should be located on the fascia, and not on the

horizontal or vertical surfaces of your scenery.

6.0 Scenery

S6.1 All benchwork shall be hidden by some form of scenery.

S6.2 General module fascia color shall complement scenery and not draw attention from the scene.

S6.3 Scenery at the Free-mo standard end(s) shall have a flat profile 3/8" below the top of the rail on the through route.

S6.4 The through route shall be ballasted Woodland Scenics Fine Light Gray or equivalent,

S6.5 Standard rail color on the through route is Floquil/Polly-S Roof Brown or equivalent.

RP6.5.1 Ballast on Through route is to be weathered with a fine mist of thinned Floquil/Polly-S grimy black or equivalent.

7.0 Glossary

Branchline Module

Mainline Module

Mini Mo

Through Route

8.0 Revision History

Free-mo Standards & Recommended Practices Revision History

2008-03-16 -
Updated the links out to the NMRA site to the new NMRA site.

Changed a comma to a semicolon in S1.1 "...emphasize realistic, plausible scenery; realistic, reliable trackwork; and operations."

Attachment	Size
Module-Double-Track-Profile.JPG	23.57 KB
Module-Single-Track-Profile.JPG	22.11 KB
moduleisometric.gif	15.56 KB