

# Norwood Model Railroad Club (NMRC)

## Free-mo Mini-Mo Standard

Adapted from The Official Free-mo Standard (8-14) which can be found at [www.free-mo.org](http://www.free-mo.org)

(The Official free-mo standard is in light blue text. If some section of the Official standard is not being adopted, it is struck through. The Official standard is in Times New Roman font. **The Norwood Standard uses the Official standard with changes marked in dark red text using Comic Sans MS font. The Norwood Model Railroad Club Mini-Mo Standard will be abbreviated as "NMRCmm Standard" throughout this document.**)

## 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.**

## 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 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. **Please note that NMRCmm Standard is for interoperability with other Norwood modules. By staying very close to Free-mo's standard, small modifications to your module will allow for 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). **Norwood has decided to begin using an adaption of the Free mo modules with single-track **Branchline** mini-mos.**

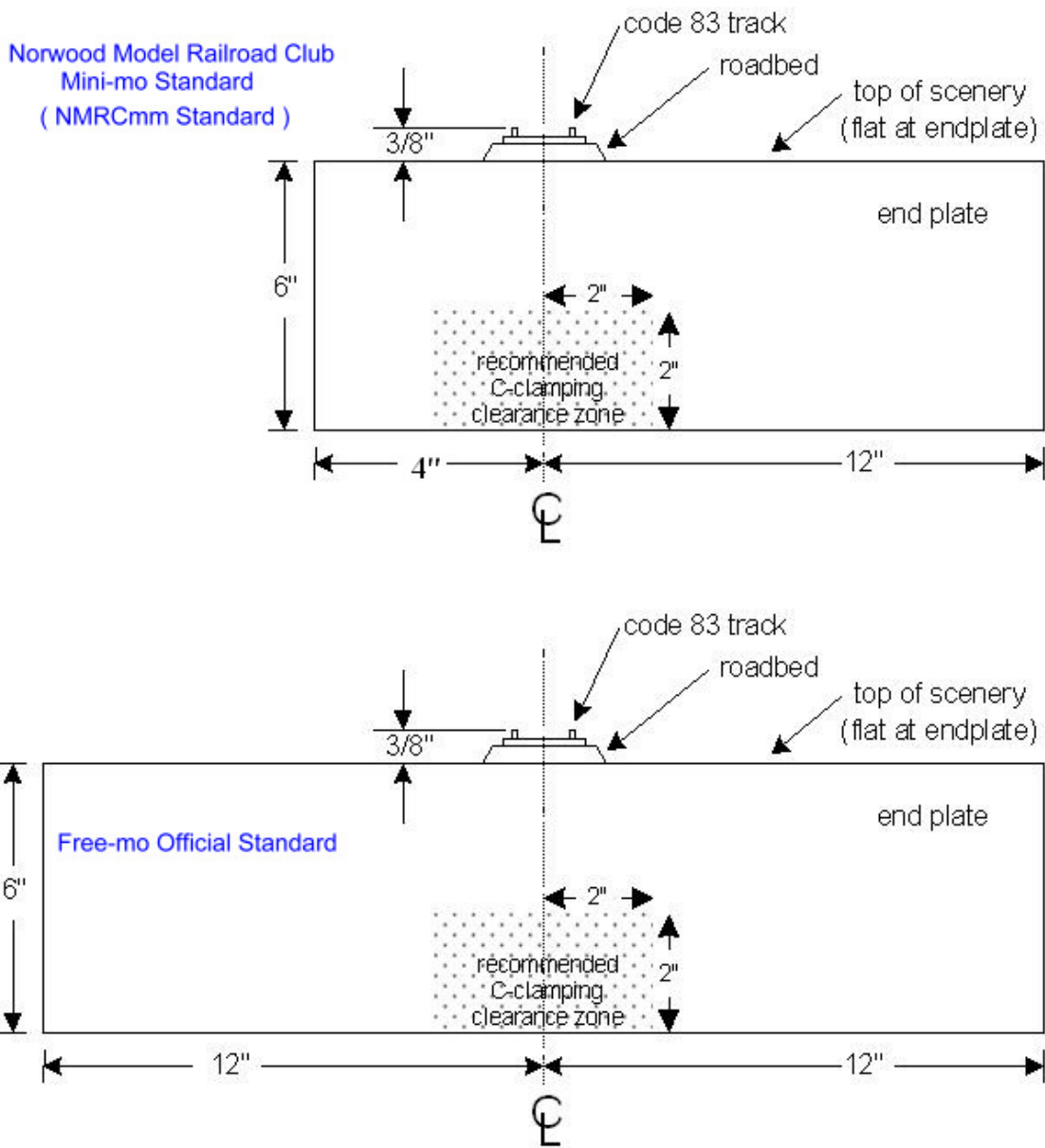
S1.6 Mini-mo type modules are intended to be a Free-mo subset and not replace or exclude an equivalent length standard module. Full width modules are generally more stable and should be used wherever possible. **The club's original intent is to incorporate the mini-mos into our current Norwood two-track module layouts.**

## 2.0 Frame and Legs

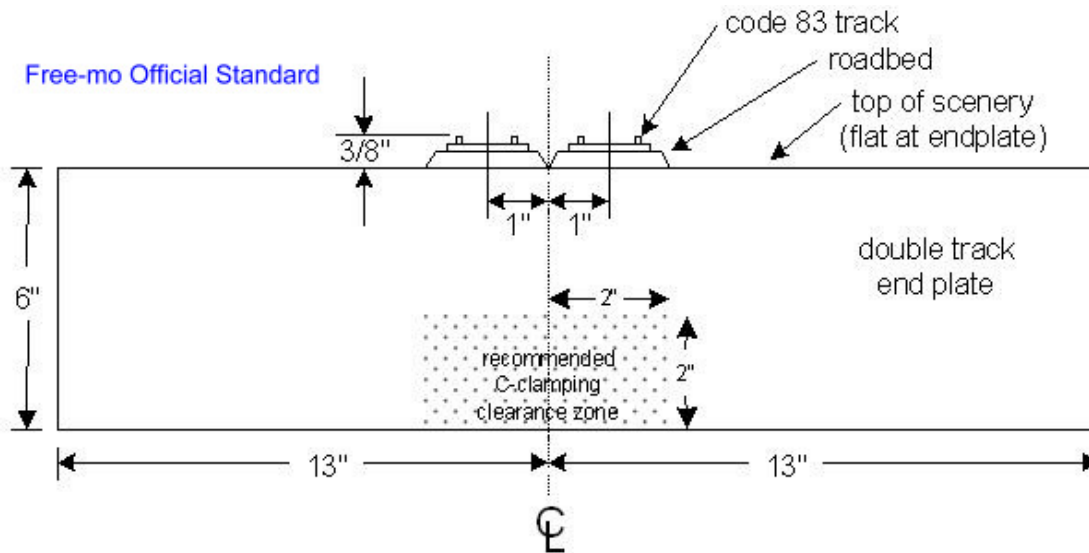
S2.1 Endplates shall be 3/4" plywood or equivalent (birch plywood works well) to provide sufficient strength for clamping to adjacent modules. (FAQ 2.1, RP2.1.1)

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.~~ **The NMRCmm Standard endplate shall be 16 inches wide by 6 inches tall. For clarity, the Free-mo Official Standard drawing is shown and the NMRC Standard drawing is shown.**



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~~ **45** 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.~~ There is no maximum railhead height within a module but each end plate must meet at the 45" height.

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).

A suggestion is nylon feet from Outwater Supply Company. This product can be found on page 240 of their online catalog [http://www.outwatercatalogs.com/lg\\_display.cfm/page/240/catalog/Master\\_Catalog\\_Vol\\_42](http://www.outwatercatalogs.com/lg_display.cfm/page/240/catalog/Master_Catalog_Vol_42)). We have been using the Windsor model.

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)~~ **The centerline of the main branchline for trains traveling through the module must be 4" inches or more from sides. Spurs and passing tracks may be closer than 4".**

~~S3.3 On a Single-track module, the through track shall be centered on the 24-inch endplate. (FAQ 3.4)~~ **the through track centerline shall be a 12" offset from one side of the module.**

~~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.

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

S3.9 There shall be a minimum of ~~8 1/2~~ inches of straight track between reverse curves. Recommended practice is 12 inches of straight track.

~~S3.10~~ **RP3.10** Track on the through route of a Mainline module ~~must ALL~~ is recommended to be Code 83 nickel-silver rail ~~without exception~~. Code 100 may be used but transition joiners are required.

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) **This Norwood standard is not a Mainline Module but a Branchline Module.** The club has decided on a 22 inch minimum radius on the main branchline traveling through the module. Spurs and side tracks may be smaller but I would recommend no curves under 18 inch radius on passing tracks for reliable operations.

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. **This does not apply because this standard is for a branchline but it is recommended.**

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 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

**(Note: we are making large deviations from the Free-mo Official Standard for wiring to save cost and use familiar connections. I have left the Official Standard to allow you to provide wiring to make it easily adaptable to the Free-mo Official Standard)**

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

S4.2 Track and accessory bus 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 Bus. Even better is 12 or even 10 AWG Stranded wire.

S4.3 The LocoNet bus shall be telephone type 6-conductor cable. **Having a LocoNet bus wire is not required for the Norwood Standard.**

S4.4 There shall be a 4 (or more) position barrier strip under the module at each end for track and accessory bus wire hook-up. **2 position barrier strip is the minimum.**

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 bus. (FAQ 4.1)~~ **use flat trailer plugs, one male and one female for the track bus. We are using the black and white wires on the trailer plugs. Because the module can be reversed. The plugs need to attach to the modules at the barrier strip so they can be changed at setup time. The plugs should NOT be hardwired to the track bus wire.**

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 Bus.~~

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~~
- ~~• Male contact 1 left rail~~
- ~~• Female contact 2 left rail~~
- ~~• Female contact 1 right rail~~

S4.8.2 ~~Double track~~

- ~~• Male contact 2 right rails~~
- ~~• Male contact 1 left rails~~
- ~~• Female contact 2 left rails~~
- ~~• Female contact 1 right rails~~

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 bus 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 bus. (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).~~

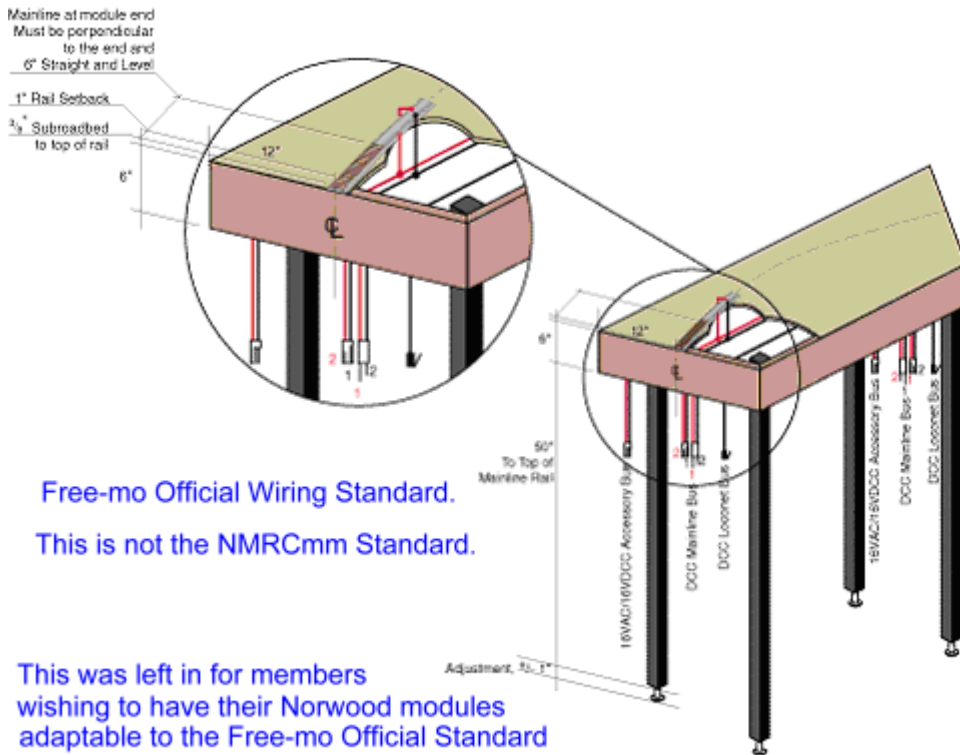
~~S4.14 To connect the DCC bus between modules, a 2-foot RJ12 to RJ12 type straight through cable is utilized.~~

~~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.~~

~~S4.15.1 For the LocoNet, a 4 foot RJ12 to RJ12 type straight through cable is utilized.~~

~~S4.15.2 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. The use of the Norwood Model Railroad Club Green Paint for the fascia. This color is "ACE Fallen Water"

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.

### Revision History

8-15-2014 Created as a draft by Larry Mitchell for review by Roger Miller.

1-8-2015 Review at January Meeting 2015. Changes edited from meeting.