



Basic HO Module Standards

17 October 2009

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NMRA Compliance

Except as explicitly described below, MARRS HO modules shall be built in conformance to these applicable NMRA Standards and Recommended Practices (RPs):

- ♦ MS-1.0, Module Standards, Standard Gauges
- ♦ MRP-1.3, Recommended Practices, Standard Gauges, Modules
- ♦ MS-1.3, Electrical Standards for Modules, All Scales
- ♦ MRP-1.3, Electrical Recommended Practices, All Scales, Modules

Exceptions to MS-1.3 and MRP-1.3

Minimum wire gauge for track power shall be 14 gauge for all mainline power, except for track power leads/drops under one foot in length which may be as small as 22 gauge.

Instead of Cinch-Jones connectors, 30-amp Anderson PowerPole connectors will be used. (For a detailed description of PowerPole connectors and associated terminology, see Appendix 5.)

Black connectors will be used for the front rail of each mainline track, and red connectors will be used for the rear rail of each mainline track. ("Front" is defined as the normal viewing side of the module.)

At the right end of the module (as viewed from the front), the connectors for each mainline track will be paired black-over-red. At the left end of the module, this will be reversed, with the connectors being paired red-over-black.

No wiring carrying 110V power is permitted on the module.

Scenery Recommendations

Paint the sides of the rail before ballasting. Prototype rails are rusty rather than shiny. Floquil Grimy Black and/or Rail Brown are appropriate.

Although the plastic crossties of prefab track will eventually collect a coat of dust and become less shiny, it is recommended that they be painted before ballasting. Floquil Grimy Black mixed with varying amounts of Roof Brown will resemble creosoted ties of varying ages.

Use Woodland Scenics Gray ballast on Main tracks, Woodland Scenics Cinders on sidings.

Other considerations being equal, use Woodland Scenics Green Blend ground foam for the basic grassy cover.

Appendix 1: NMRA MS-1.0, Module Standards (HO/OO)

Height from Floor to Top of Rail	Hand Laid or Commercial Rail Code	Track Clearances H=Horiz V=Vertical	Interface Track Center Lines from Module Front	Track Setback From End of Module	Center Lines on Curves	Track Centers for Parallel Tracks
40" (1016mm)	100	H=1-1/32" (26.2mm) V=3" (76.2mm)	5" (127mm) 7" (177.8mm)	4-1/2" (114.3mm)	2-1/2" (63.5mm)	2" (50.8mm)

***Two through tracks required, Mainline. Others optional.

Appendix 2: NMRA MRP-1.0, Modules (HO/OO)

Minimum Parallel Tangent Track Length	Maximum Mainline Grade	Minimum Mainline Turnout	Minimum Mainline Radius ¹	Minimum ² Industrial Radius ³
3" (76.2mm)	3%	#6	36" (914mm)	30" (762.0mm)

¹Tangent track length is the distance from the end of the bridge track at the interface to the first deviation in mainline, i.e., a switch, curve, crossover, etc.

²This is the minimum radius according to Standard S-8, Class 1-A. It is suggested, however, that a larger radius be used.

³Sometimes referred to as "Short Line" or "Secondary" which allow for shorter radii curves including complete helix (loops) where the locomotive passes over the rear of its own train.

- ◆ Module width will be 24" minimum, 36" maximum.
- ◆ All trackage behind the mainlines shall be insulated from mainlines.
- ◆ All trackage behind the mainlines should have its own power source, separate from mainline power source.
- ◆ A maximum mainline grade according to MRP-1 for each scale/gauge may be used if proper care is given to the construction of sub-roadbed and grading back to 0° elevation; it should be noted that the use of grades may restrict the length of trains and require the use of more locomotives or power units.
- ◆ If uncoupler magnets are used on the mainlines, they should be the electromagnetic type. It is recommended that permanent magnets NOT be used on mainlines.
- ◆ All trackage behind the mainlines is not covered by NMRA Module Standards and is left to the discretion of the individual or group, with the exception of S-7 Standards pertaining to mainline clearances.
- ◆ If sky boards are used, recommended range is 8" to 18"; (optimum 14") scenery dividers are optional.
- ◆ Recommended roadbed can be cork, wood or Homosote.
- ◆ Legs should be 2"x2" construction with either 1/4" or 5/16" bolts in leg bottom for adjustment of 1", plus or minus; legs can be attached by way of slip-in boxes, bolts, hinges or cleated.
- ◆ Construction of module should be of either 1/2" plywood or L-girder top.
- ◆ Forward extension modules, i.e., those protruding toward the public viewing side rather than inward toward the back of module, will mark the "front edge of module" reference point as the point at which the front edge would be located if it were not extended outward. This is the point of reference for center lines of mains.
- ◆ Refer to **Figure 1** for more details.

Figure 1

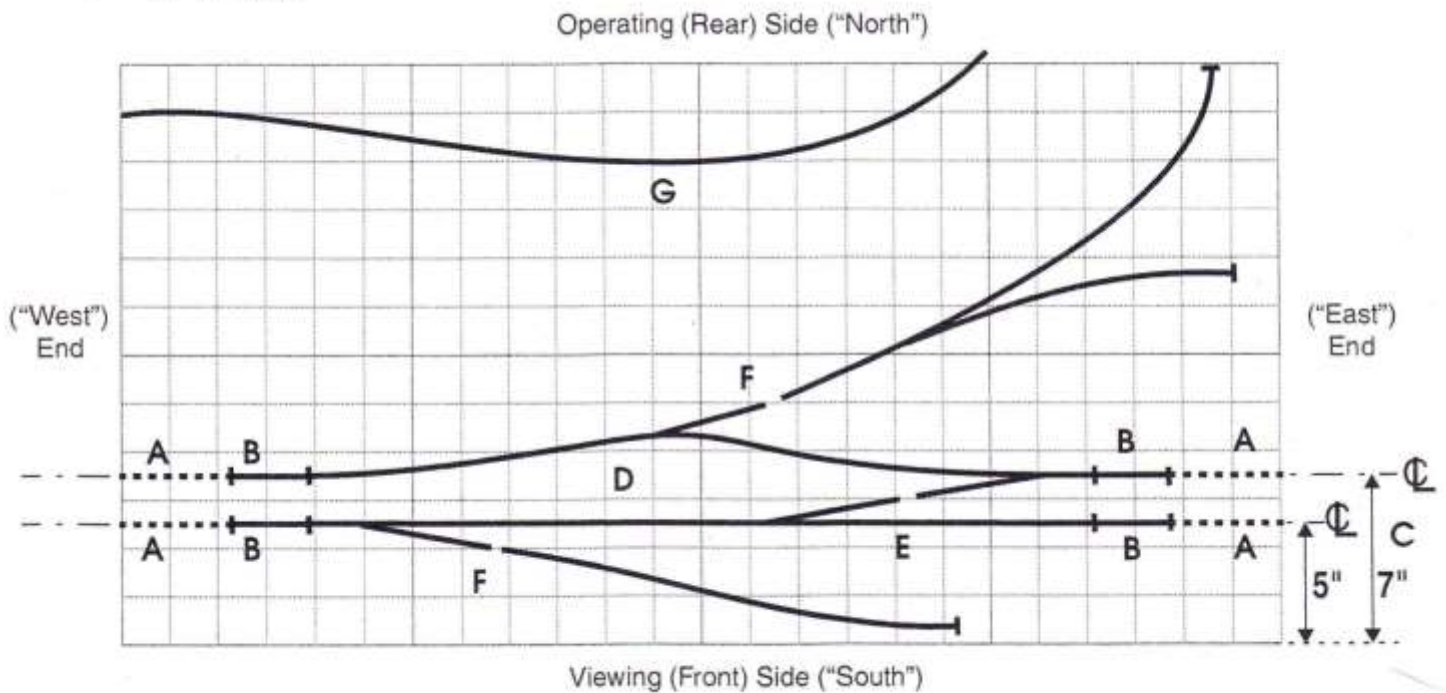


Standards for HO Scale Modular Layout (continued)

Summary of Track Placement Details

Scale: $1\frac{1}{2}'' = 1$ foot

48" module



Legend

- A** $4\frac{1}{2}''$ open space to allow for 9" connecting tracks between modules.
- B** Minimum 3" straightaway. These three inches must not contain curves, turnouts, crossings, etc.
- C** Track center lines 5" and 7" from front edge of module.
- D** Main tracks (minimum of 2) may be straight or curved (32" minimum curve radius).
- E** Crossovers must be gapped in both rails.
- F** Secondary tracks must be electrically isolated from Main tracks.
- G** Dummy tracks (not connected to other tracks) are permitted.

Appendix 3: NMRA MS-1.3, Electrical Standards for Modules

TRACK GAPS (INSULATED): Insulating material shall be used to fill rail gaps. No air gaps are allowed. Crossovers between mainlines and tracks leading from mainlines to other trackage on the module shall have both rails gapped (insulated). All tracks gapped for block control shall have both rails gapped (insulated).

Appendix 4: NMRA MRP-1.3, Electrical, Modules

Powering of local tracks, switch machines, building lights, etc., is the responsibility of the individual builder and should be separate from circuits which interface with other modules in a layout.

Modular layouts may be easily divided into control blocks for multi-train operations. Blocks will normally be used to control trains on your own module or group of modules. To insert a block, place insulated rail joiners at one end of each bridge track and unplug the connectors at each end of break.

Block control of mainlines must be approved by all module participants.

Use #22 to #24 ga **solid** wire soldered to the outside of rails for connection to track power leads. "Solder terminal Strips" make an easy to trouble shoot connection point. Use as many power feeds per tracks as needed.

NOTE: A single large power supply is used with the many throttles on large layouts. The three tracks **MUST NOT** have any common connection. **DO NOT** use "**COMMON RAIL**" wiring. Gaps must be used on both rails on any crossover tracks. If the three main tracks are part of a yard, it must be possible to isolate them electrically.

Appendix 5: Anderson PowerPoles

An Anderson PowerPole connector is a single-conductor connector, made up of a metal contact wiper surrounded by a plastic shell. The shells are available in various colors.

Each connector has a C-shaped "hood" and a rectangular "peg" molded into it. By convention, the hood is the "top" of the connector and the peg is the "bottom." An electrical connection is made by turning one PowerPole upside-down relative to another and pushing them together end-to-end; therefore, there are no "male" or "female" PowerPoles. (**Figure 2**)

PowerPole connectors are available in different amperage ratings, based on the size of wire they are designed to accept. For example, 15-amp PowerPoles accept 18-22 gauge wire; 30-amp PowerPoles accept 12-16 gauge wire (Note: for MARRS HO modules, 14 gauge wire is **HIGHLY** recommended). The 15-, 30-, and 45-amp versions use the same shell, and can be freely intermixed. Higher-rated connectors are progressively larger, and cannot be intermixed.



Figure 2: Red and black PowerPole shells, and a contact wiper.
Note the "hood" and "peg" on each shell.



Figure 3: PowerPoles joined "red over black."
Note the hood and peg positions.

The connectors are keyed so that they may be interlocked, either vertically or horizontally, to form multi-connector "blocks." For connectors joined vertically, they may be described as being one "over" the other. For example, a pair of PowerPoles "joined red over black" would refer to a red connector, attached to the top of a black connector. Note: "over" refers *only* to how the connectors are joined to each other. If a "red over black" pair is turned upside down as a unit, it's still a "red over black" pair. (**Figure 3**)