



## STEAM Railroad Module Guidelines

This project will test your skills in Science, Technology, Engineering, Art and Math (**STEAM**).

**Scientifically** determine which adhesives work best for joining different construction and scenery materials.

Use **technology** to control the operation of the railroad using electrical and computer components (DCC).

**Engineer** a sturdy module constructed to stand up to shipping and for years of use. Apply your **art** skills to create fabulous backdrops, structures and scenery. Make sure to use your **math** skills to get all dimensions correct, so your module can combine with other modules to create a larger railroad.

1. Modules will be judged on quality of construction, adherence to guidelines, performance of motive power and rolling stock, design creativity, quality of the backdrop, and the realism of the track work, structures, and overall scenic beauty.
2. A group or individual may decide to create multiple modules to allow for creation of elevated track work and various types of scenic options like hills, mountains, rivers, bridges, lakes and roads, or an even more complex industrial design.

If that is the case, we suggest you create three to four modules to make your own miniature railroad. Modules that only combine with that individual's/group's other modules, do not have any requirement of where tracks are placed between modules.

However, connecting tracks between modules must be ballasted, removable, and should be at least 6" in length. Quantity does not outweigh Quality in judging.

3. There are 4 different types of modules that can be made.

**2' Straight** – 2' W x 4' L

**Transition** - 2' W to 3' Wide at the other end x 4' Long. Transitions are either Left or Right. The 2' end determines if it is a left or right module.

**3' Straight** – 3' W x 4' L

**Curved** – Left or Right turn

Curved and Transition modules require greater engineering and will receive extra credit in judging.

4. Basic construction uses 1" x 6" (3/4" x 5 1/2") lumber for the box frame, cross members and leg bracing. 2" x 2" lumber (1 1/2" x 1 1/2") is used for the legs.

Other basic construction materials are: 3/4" plywood, 1/2" homasote, and 1/8" masonite.

The plywood and homasote are used for the roadbed construction. The masonite is used for the fascia and the backdrop. If a module uses risers or requires L girders, we suggest using 1" x 4" material.

5. Electrical wiring will be color coded. There will be two sets of Buss Wires on each module, the Main Buss and the Feeder Buss. The Main Buss wires should run 6" from the rear of the module. The Feeder Buss wires run approximately down the center of the layout.

All buss wires must be stapled to the bottom of each cross member. (Leave enough room between the red and white Feeder Buss wires to be able to work easily on each to provide connections to the rails.) Buss wires must be 16 gauge solid copper.

The red buss wire will be located toward the front of the layout and the white buss wire will be located toward the rear. Buss wires should extend 6" past the end of the module and will have 16-14 AWG female insulated disconnects on the left end and 16-14 AWG male insulated disconnects on the right side.

6. Track feeder wires will be the same color as the buss wires, and be 20 - 22 gauge solid copper. The rail closest to the front of the layout will be fed by the red buss, and the rail toward the back of the module will be fed by the white buss wire. Follow good model railroading wiring practices. Feeder wires should be soldered to the rails or rail joiners.
7. The layout will be wired for DCC (Digital Command Control) operation. A plug-in panel for the hand held throttles (Cab Bus Fascia Panel) must be located in the second bay on the left side of the module. We suggest North Coast Engineering (NCE) model #UTP. It will be located in the center of the bay and the top will be 3" below the main layout surface. You must provide two Cab Buss cables (6 conductor flat cable) with 6 pin 6 conductor RJ11 connectors on each end. The length of the cables is 5 feet.

If more than one module is created, only the left most module needs a cab buss fascia panel. However, the length of the right hand cable must be determined to allow it to be plugged into another's module. (Ex: If you have three 4' modules, the length will be 13 feet. You need eight feet - the length of two modules, plus the 5' necessary to connect to another module.)

If more than two modules are created, they must install a DCC circuit breaker in the left most module. This will create a power district protecting their modules and those following their modules to the right side. We recommend an EB1 from NCE. Please refer to the wiring diagram in this document.

8. All track and turnouts will be code 83 nickel silver and Ho. You can choose flex track, module track or you can hand lay your own track. Extra credit will be given for hand laid track and turnouts. You do not need to do the entire module in hand laid track, but may choose to do some for the experience and possible extra credit.

Each module will have two tracks to connect with another's module. Tracks to be located 2 ½" and 5" on center from the front of the layout. Do not count the dimension of the fascia in making this location. Your tracks must end 3" before each end of the layout.

There must be four connecting tracks 6" in length that are ballasted to match the ballast used on their module. One end of this track will have insulated rail joiners and the other will have metal rail joiners that can be slid back completely so that no portion of the rail joiner extends beyond the rail. This will allow for effective connection between modules.

9. A masonite backdrop will be attached to the rear of the module using #6 x ¾" round head screws. Cut the masonite to 18" in height and as long as necessary to go from one end of your module to the other. The bottom of the backdrop should be mounted so that the top is 13 ½" above the module base (37") and the top will be 50-½" off the floor.

Paint it with Benjamin Moore #790 Bayberry Blue (or equivalent) on the front and flat black on the rear. Once the backdrop is painted the sky blue, you should make every effort to make it realistic and match the scene of your module. A white paneling trim cap will be placed on the top edge.

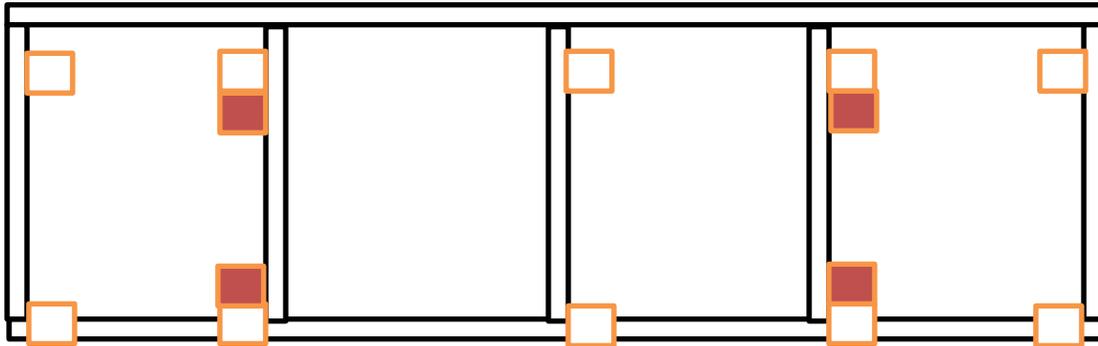
10. An 11-1/2" masonite fascia will be attached to the front of the module using #6 x ¾" round head screws. The fascia needs to be painted flat black, and mounted so that the top is ¼" above the basic module height (37"). If you have scenery that goes higher than the base of the module you might want to have your fascia be higher and follow the contour of your scenery.

11. A black plastic layout skirt will be attached to both the fascia and the backdrop of the layout using 1" wide Velcro pieces. Place the loop material at the top of the skirt. (We suggest stapling the loop material to the skirt, as well as using the adhesive on the Velcro section.) The hook material will be applied 2" on center from the bottom of the fascia and even with the bottom of the backdrop. Use enough pieces spaced along the layout to support the skirt efficiently.

## Straight Modules:

4' Long

Cross members 1' on center minimum. If you are using risers we suggest every six inches.



2 foot module cross members are 22 1/2" in length. ( $3/4 + 3/4 + 22 \frac{1}{2} = 24"$ )

3 foot module cross members are 34 1/2" in length. ( $3/4 + 3/4 + 34 \frac{1}{2} = 36"$ )

Corner braces are 2" x 2" lumber 5 1/2" long. Dimensions of 2" x 2" lumber are actually 1 1/2" x 1 1/2". All joints should be glued and joined using countersunk screws. #8 x 1 1/2" Phillips or square drive Dry Wall screws work fine for this construction.

Do not drive screws into the ends of the 1 x 6. Only drive screws into the corner braces. Make sure all corners are square and screws are below the surface of the board.

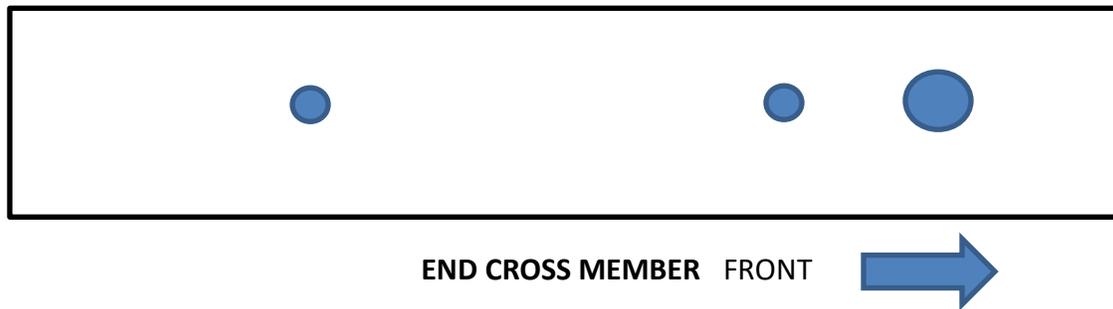
Legs are 2" x 2" x 36" (red) and should have cross bracing so that they remain square and can be removed and stored as a unit. Design of the leg bracing is up to you. The legs will bolt to the cross member in two locations using 5/16" bolts, nuts and washers. Location of the holes should be at 2" and 4" on center from the top of the cross member and centered in the 2 x 2.

Bracing between the two leg units is not required but suggested. If present, these should be removable and use bolts, nuts and washers for attachment. Legs also require an adjustable mechanism at the bottom which should not exceed a 1/4" in height when fully closed. This will make the dimension from the floor to the top of the layout at 37" (3/4" plywood, 1/2" homasote, 36" leg, 1/4" adjustment mechanism). If the adjusting mechanism measures more than 1/4", adjust the leg height to obtain the 37" dimension.

End cross member dimensions for the 5/16" bolt holes to connect modules are 3" from the top and 5" from the end on center. This applies to both 2 and 3 foot wide modules.

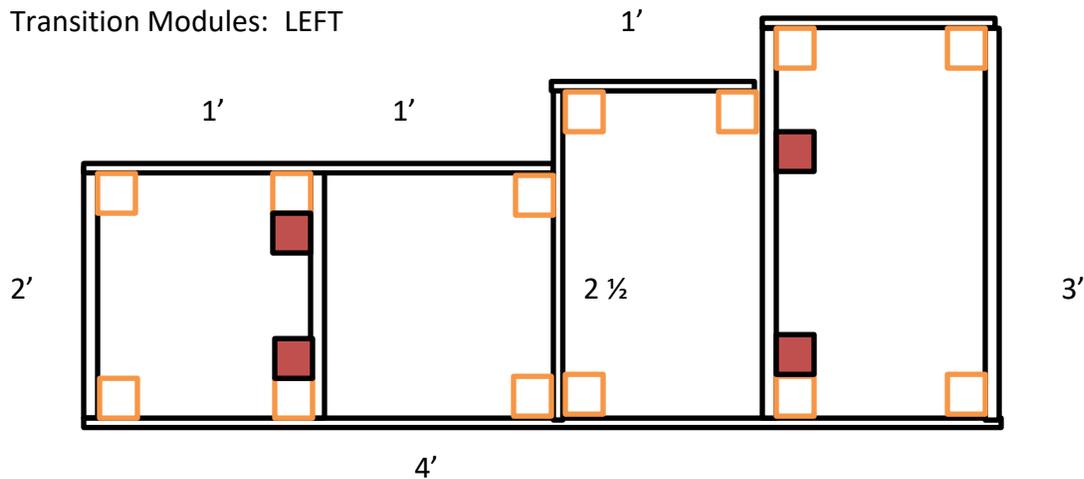
There will also be a 1/2" diameter hole drilled in **each** cross member to allow the DCC Cable Buss to be run through the module. This hole will be 3" from the top and 3" on center from the front of the module - except on cross members where the legs will attach.

On these cross members the hole should be located 5" in from the front.



Modules are connected using 5/16" x 2" hex head bolts. Nuts are 5/16"-18 and use 5/16" x 1 1/2" washers on both sides of the modules. Each participant is required to bring enough bolts, nuts and washers to connect all of their own modules together (if more than one module is created), plus 4 extra sets to connect their module(s) to those of other participants.

Transition Modules: LEFT

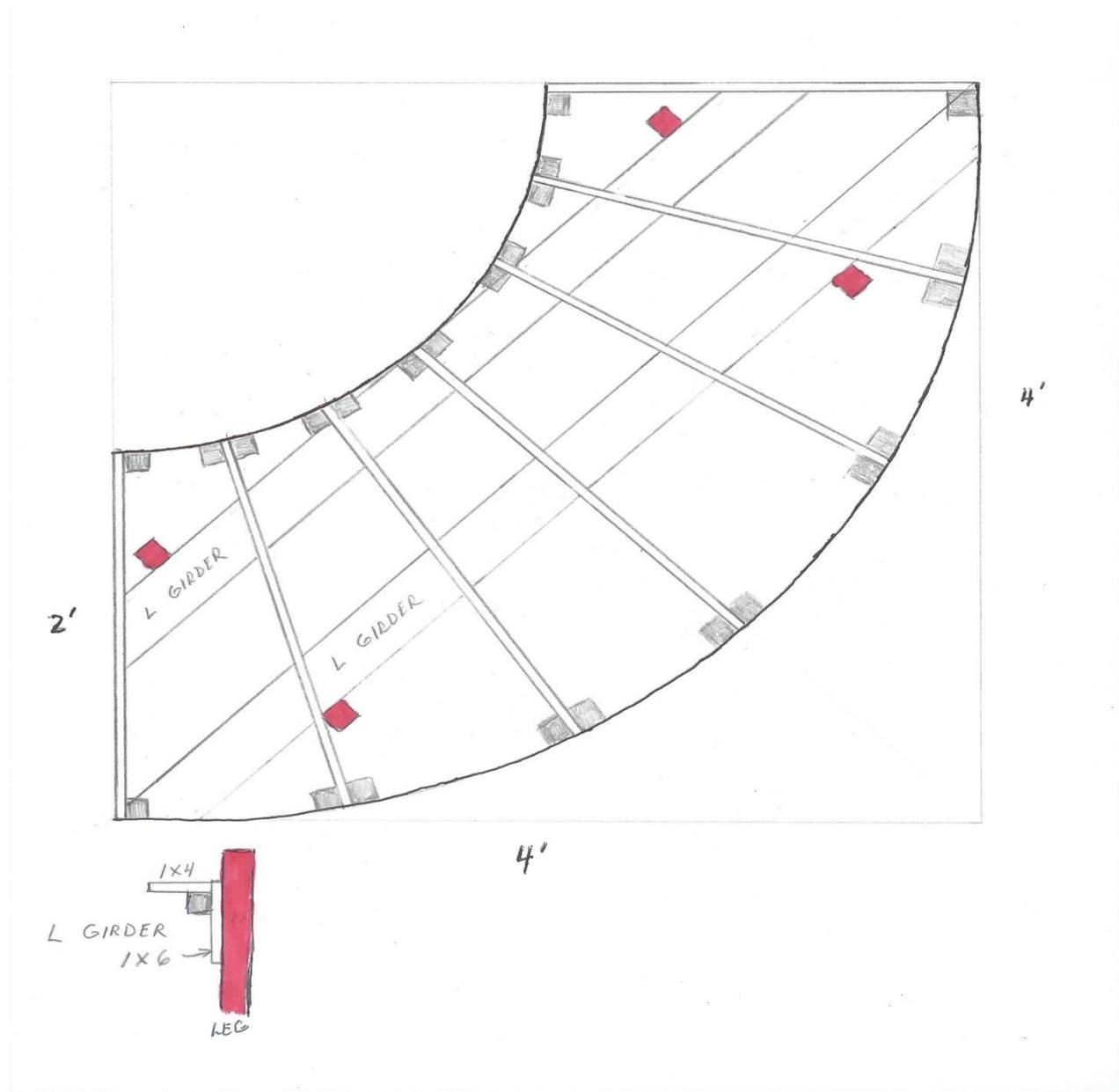


## Curved Module – Left

Note: 2 x 2 blocks need to be long enough on the front to accommodate mounting the fascia, and those on the rear must be long enough to accommodate the attachment of the backdrop.

Legs will be attached to the L girder on the long side of the girder. Remember that the legs must extend to the top of the cross members in order to get the correct height dimension.

2 x 2 bracing on the L girder does not need to be the entire length of the girder. You only need them where you will be screwing the girder together. Remember to glue all joints.



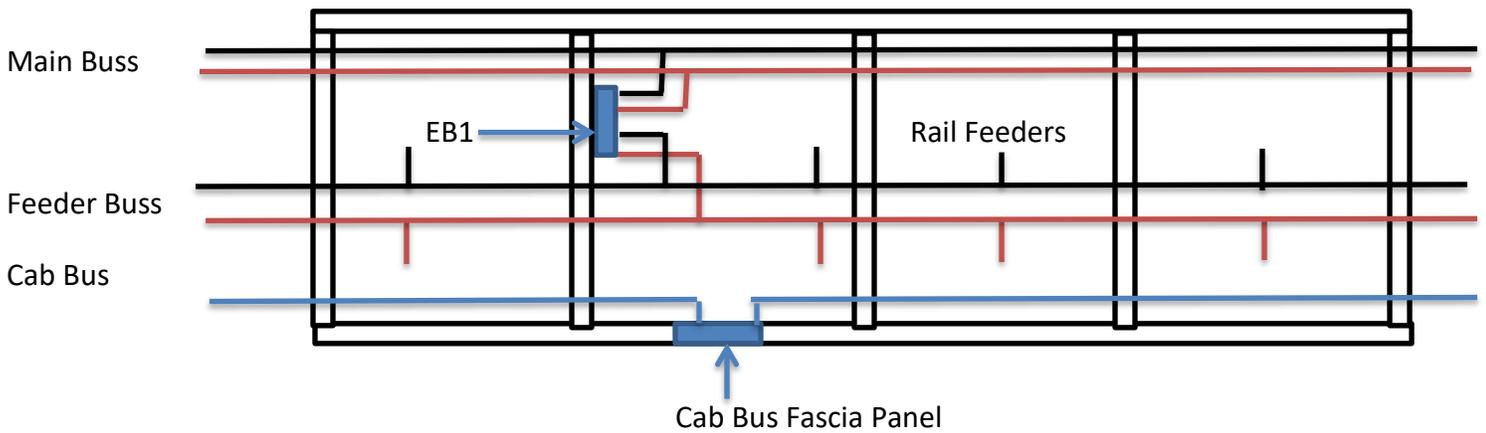
## Wiring Diagram:

The black line represents the White Buss wire.

This diagram shows where the EB1 circuit breaker will be installed and how it is wired.

Whenever an EB1 is installed, do not connect the feeder buss to the module on the left as it creates a new power district at that point.

If your module doesn't require an EB1, then you need not supply these wires.



Questions: Email Ken Jaglinski, Trainfest Chairman at [info@trainfest.com](mailto:info@trainfest.com)