

Module Construction Manual



for straight modules

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Introduction

After many versions of the construction standards, we have decided to simplify them. With each new module that we constructed we came up with a new and better way to do something. Instead of a step-by-step instruction manual of the construction, this guide will only give the critical details and dimensions. From there you can design and construct a module that meets the guidelines. This does not mean that you need to do it alone. There are many members that will be more than happy to assist. Please read this manual completely before beginning. With that, let us begin!

The Frame

There are many ways to construct a frame for a module. One is a rigid frame made with a 1" by X" outside with similar cross members. The second option is to adopt a hybrid design using 1" by X" outside and masonite cross members. The third option is to go completely into lightweight masonite construction. The only constraint is the durability and the legs, which we will get into later. For more information on lightweight module construction visit <http://www.free-mo.org/>. **Please remember however, we do not go by their standards or dimensioning. This is simply a reference to how a module can be designed.**

Physical Dimensions:

- Module depth: 28 inches
- Module width: 72 inches
- Fascia height (front and back): 4 inches
- End Profile Board: 1x6 cut to club profile. This is the only required part on the frame. The end profile contour is supplied in addition to this booklet. Cut the profile board to the exact contour to ensure a match to other modules. The end profile *must* be able to withstand 'C' clamps at a show.
- Rail height: 51 inches (when they are set up and leveled)
- Track centers from the front of the module: 9 ½ and 11 ½ inches (implies 2 inch centers)
- All wood including roadbed must be sealed for protection against moisture.
- No permanent feature of the module should extend outside the 72" x 28" frame including switches and structures. They must be removable for transportation if they extend outside this range.

Module legs:

- All CNYMOD modules must have legs that can fold inside the frame. (figures 1 - 6)
- Leveling legs must use inverted ¼-inch carriage bolts with matching nuts secured to the opposing end. (figure 1 - 2)
- When the legs are extended with leveling bolts retracted, the rail height must be 49 ½ inches.

Electrical Requirements:

- The club will provide all main bus wiring and 9-pin connectors.
- Mainline tracks must be electrically separated.
- All frogs on mainline turnouts must be powered using a reliable method.
- Auxiliary components should have 'kill switches' to shut them off.
- All electrical switches must be hidden or out of reach of the public.

Track Requirements:

- Mainline track: code 83
- Turnouts: minimum #8 on mainline
- End track 1 ½ inches from the end of the module.

Now that we have laid out the requirements, we will touch on some critical points that you must keep in mind during construction.

The Legs

The leveling legs must conform to club standards to allow easy adjustment at shows. As stated earlier, the levelers are 8 x ¼ inch carriage bolts with matching nuts. You will also need two t-nuts per bolt to hold it in place.

Figure 1 and 2: Leveling legs example

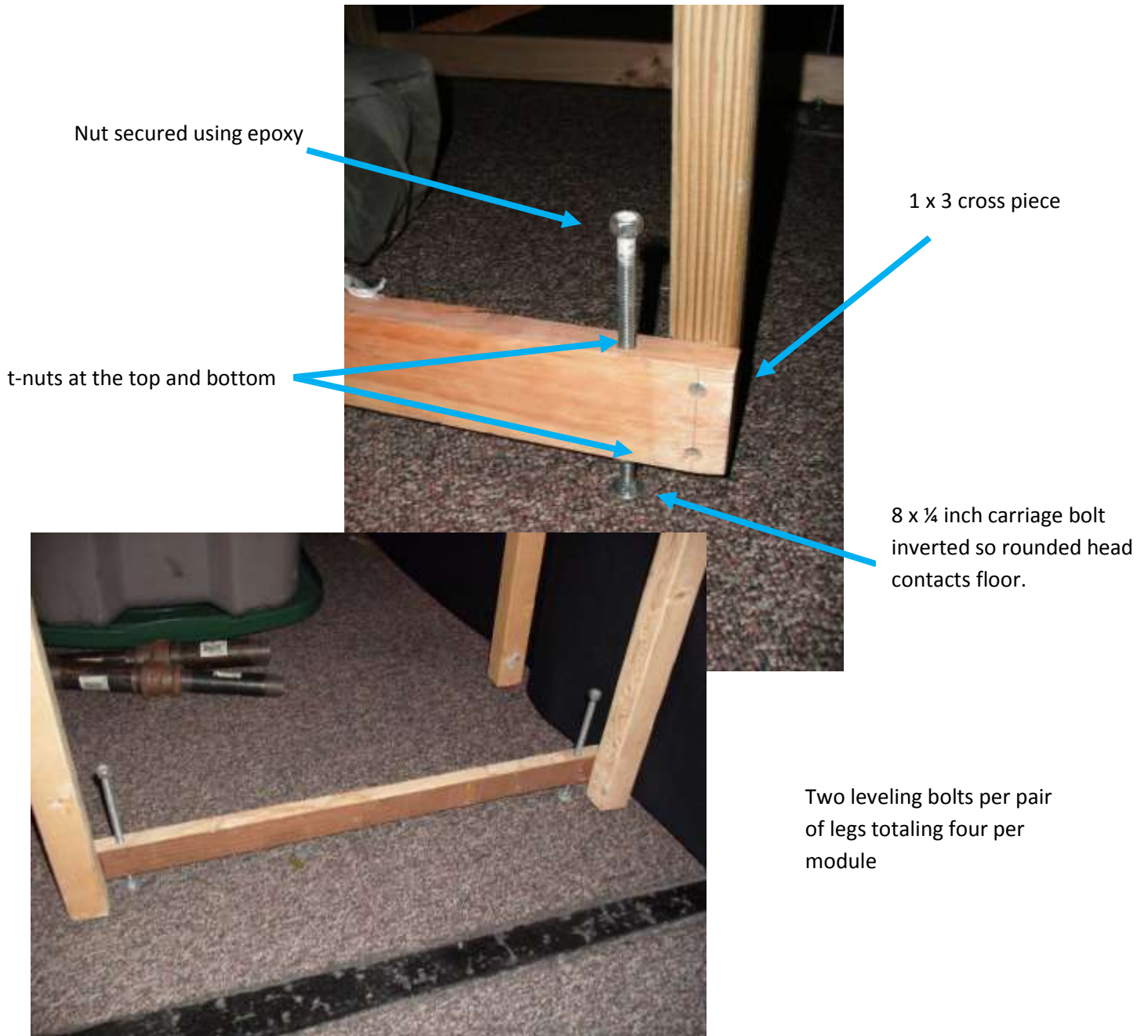
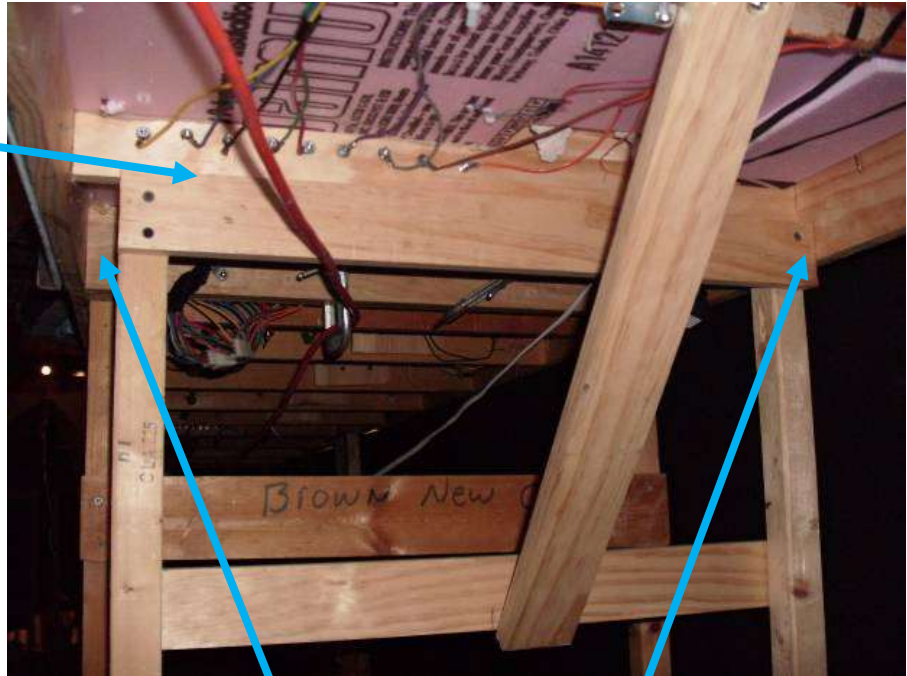
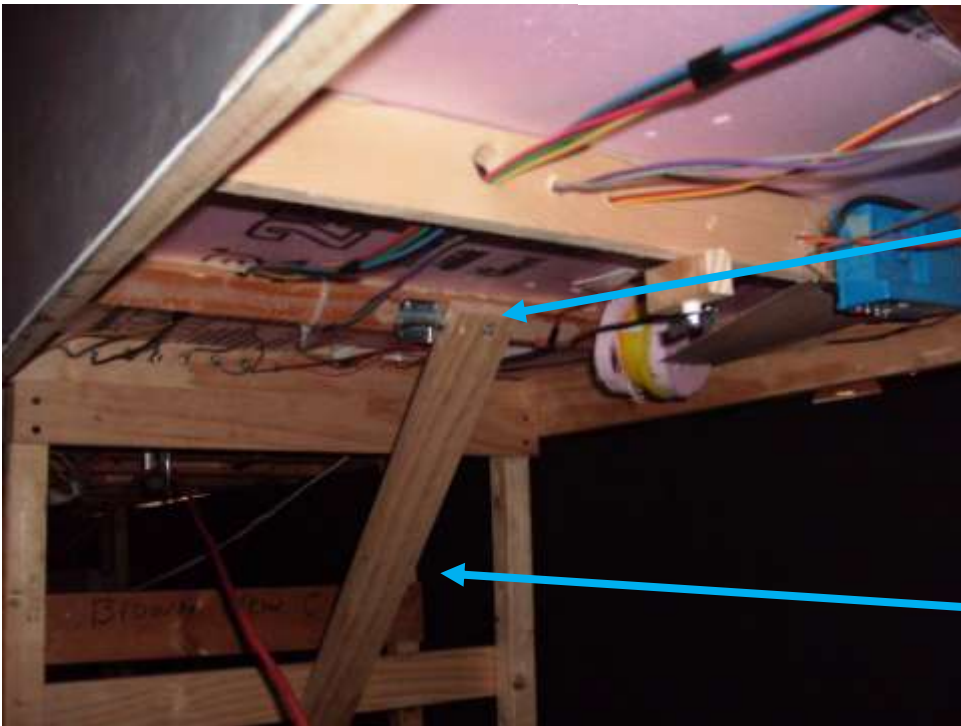


Figure 3 and 4: Folding legs example

A piano hinge is along this joint. Note the hinge is not load bearing. When in the standing position the joint is wood to wood.



Take note of the placement of the legs. Legs are not the full width of the module interior. They are shifted to one side to allow the opposing set of legs to fit.



Deadbolts are used to avoid the possibility of lost wing nuts.

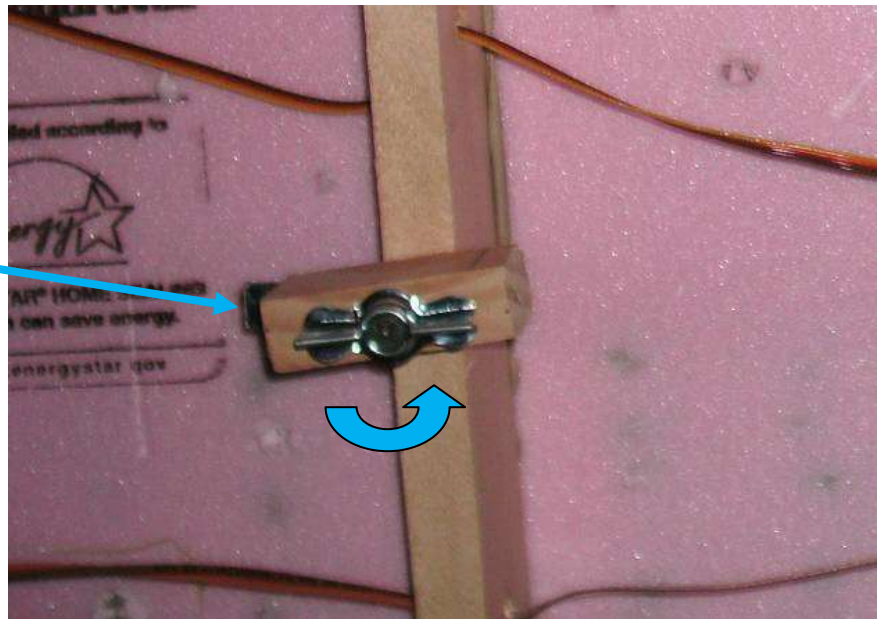
Angle braces hinge to fit when folded. The brace on one leg hinges on the module underside and deadbolts on the leg. The other angle brace hinges on the leg and deadbolts to the underside.

Figure 5 and 6: Secure Strap example



A piece of sheet metal on one of the leg pairs holds both sets in the folded position. The hole cut in the center is for the T-knob shown below. (Sheet metal is not a requirement. It is just the most durable solution. Experience shows that Masonite and Luan are not robust enough over the long-term.)

Sheet metal slides over a knob that holds the legs in the folded position.



Electrical: Take note along the planning process. All modules have a nine-wire bus for the various types of power. You may connect into whatever you need for your application. Remember to use 'kill switches' on all auxiliary components. Color code and purpose are as follows:

Orange	Outside track outside rail
Brown	Outside track inside rail
Grey	Inside track outside rail
Purple	Inside track inside rail
Red	DC +12
Green	DC neutral (not earth ground)
Black	DC -12
Blue	AC 12 volt
Yellow	AC 12 volt

(Note: 'outside' refers to the short side, where you measure your track centers from)

Take note at the arrangement for the DC bus. If your accessory requires 12 volts, wire Red to Green by default. Do not wire from Black to Green if all you need is 12 volts. Wiring Red to Black will give you 24 volts! The -12 bus is reserved for stall motor switch machines. This is discussed in more detail in the trackwork section.

Loconet: CNYMOD utilizes a DCC system from Digitrax. All new modules must have a DCC 'cab bus'. The requirements for a Loconet cable is a 6 conductor flat telephone or CAT-5 network cable. A male RJ-11 6P6C connector (like All Electronics CAT# CMP-6) is crimped onto the left side (looking at the front of the module). A matching female RJ11 socket (like All Electronics CAT# MT-111) is mounted under the right side of the module. Sufficient cable must be given on the male plug side such that it can plug into the next module's female plug.

The only requirement is your module passes through the Loconet. It is optional to install your own fascia mounted Loconet outlet. You may use a Digitrax UP5 or a standard 6-pin outlet. The club already utilizes both a Digitrax UR91 and a UR92 for radio-based operations.

Track: All CNYMOD modules must pass through at least two code 83 mainline tracks. Any other track on your module is as per your design and is therefore optional. We will get into the constraints for 'other' track in a moment. First, we will go over a few highpoints about the two mainline tracks. As previously mentioned, track centers from the front of the module are 9 ½ and 11 ½ inches. At the end of the module, track must end 1 ½ inches from the end and the remaining roadbed to the edge must be unballasted.

We have found that the track segments are best left unsoldered at their jointers to allow for expansion due to temperature. This means that there must be feeders to each section of flex-track. When securing the track to the roadbed use glue. Spikes are optional.

It is highly discouraged to deviate the mainline to one edge of the module away from the track center. S-curves are a nightmare for model operation especially due to the joints between modules. Turnouts on these curves are also highly discouraged. Even with #8 turnouts, the infamous long framed six axle passenger cars will split the turnout. That is why the diverging route on a turnout cannot be used for the mainline (regardless of the turnout size).

If all your module design calls for is the mainline tracks then you can skip to the next section. When planning your module be realistic when it comes to the trackage. Most railroads did not have a spaghetti bowl of track except in certain circumstances. This is usually in a city. Remember that your module will only cover a bit over 525 scale feet in length.

As stated above, all turnouts that service the mainline must be #8's. This is in situations such as crossovers and passenger station sidings. For tracks that serve industries, #6's can be used to get off the main as long as the continuing route of the turnout is the mainline. Once you are away from the mainline, any type of turnout may be used because mainline trains are no longer affected.

When choosing turnouts you should select a durable brand. Many turnouts on the layout are Atlas. These turnouts are good for switches that do not get thrown very often. Recently, newer modules have been using Peco turnouts. These are premium switches so you will pay more for them. They do however have some advantages such as snap position points. They tend to stand up to the abuse better over the long term. The third option is hand laying your turnouts. This can be done using a Fast Tracks kit or completely hand laid. Completely hand laying is for the experienced modeler who has made their own switches before. If you would like to try your hand at a Fast Tracks kit, ask one of our members. The club has a set as well as the local division of the NMRA available to rent.

When choosing switch motors it is good to keep a few things in mind. Mainline crossovers are the only switches that require a motor. You do not need to install motors on offline or diverging turnouts if you do not want to. Keep in mind that if the switch is on the mainline it needs to have its frog and points powered. Simply using a power routing turnout does not suffice. The frog and points must be powered using under table wires. This brings us to the selection of the motor itself. Some types of motors like Tortoise's have built in contacts for powering the frog. Others like Switchmasters need improvised contacts to route power. Motors must be stall type. This is your choice when it comes to the selection of the motor from here.

When wiring the motor itself, there are two options that you can use. As before mentioned there is a three wire DC bus; a +12, a Neutral, and a -12. A DPDT (double pole double throw) toggle switch can be used to simply invert the polarity of the Red (+12) and Green (neu) bus. It should be wired as follows:

Wire the Red bus to 'A', the Green bus to 'B'.

Wire a jumper from 'A' to 'F' and 'B' to 'E'.

Wire motor contacts to 'C' and 'D'.



Alternatively you can use a SPDT (single pole double throw) using all three bus wires.

Wire the Red (+12) to 'A'.

Wire the Black (-12) to 'C'.

Wire the 'B' terminal to one side of the motor.

Wire the other terminal on the motor to the Green Neutral bus.



You can choose either method of turnout wiring.

Scenery: With the frame, electrical, and tracks installed, it is time for scenery. It is in this category that our club is judged as a whole. Any new module must have scenery that is of equal quality with the rest of the layout. You are not alone if you do not know a lot about scenery. There are many in the club that can assist you if you need help. All you have to do is ask.

When placing scenery you must consider a few things. Our layout is themed from the Northeastern United States. This means no Death Valley or the Himalayas. When installing rock, remember that you are building a module that is designed to be transported. Therefore, it is not advisable to use tons of plaster.

We have listed a few tips below for various types of scenery. These are just suggestions. Feel free to use your own methods. Again, just remember to keep weight as low as possible.

The base for most scenery on a module is lightweight pink insulation foam. This can be found in most home improvement stores such as Lowes and the Home Depot.

Rocks: If you are making mountains, build up as much of the mountain as you can with additional foam. Once satisfied with the rough form you coat the foam with a hard shell of plaster. You can use products such as Plaster Cloth from Woodland Scenics or using Structo-lite plaster and paper towels. Rock forms

can be made using Hydrocal plaster or some derivative of Plaster of Paris in either commercial or homemade rock molds. Ask members before you go out and buy molds. Several members have their own molds and are happy to loan them.

Ground Cover: To 'plant' grass and other types of ground cover you first need to prep the area. Mix together a 50/50 blend of Elmer's white or yellow glue with a light to dark brown acrylic paint. This will cover area with a sticky surface to place down ground foam. It also covers up any lines or colors on your pink foam base. Sprinkle ground foam onto the wet paint/glue mixture. Use a variety of shades when laying ground foam. Ground cover can be purchased from companies such as Woodland Scenics.

Track Preparation: Spray the track at all angles with a red rust color paint (a can of spray paint works fine). To make the removal of the paint on the railhead easier, carefully apply oil to the top of the rail. When the paint dries the railhead will clean easily. The club uses Woodland Scenics Fine Light Gray Ballast for N scale. The HO scale version is too large of a rock size to be in scale. Apply the ballast by spreading a small mound along the center of the track between the rails. Use a one-inch soft bristle paintbrush to gently spread the ballast over the rails. Make sure the ties are showing, do not bury them. Prepare a spray bottle full of water. Put in five drops of dish detergent and mix. Soak the ballast thoroughly with the 'wet water' you just made in the spray bottle. Next, mix a 50/50 water to white glue mixture and apply liberally all over the ballast. Once the glue dries make sure to scrub off the glue and any remaining paint from the railhead or trains will not run.

Trees: Foreground trees should generally have the greatest detail. Here you can use Supertrees or a commercial readymade tree that looks first class. Background trees can be made from a variety of different methods. I will not go into all of them because there are hundreds of methods and each model railroader has different way of doing them. Your best option here if you are stuck is to ask.

Water features: Water can be done in a couple of methods. I will mention the two most popular methods used by the club. The riverbed should be prepped before you pour water. Paint the bottom with blues and greens to achieve a good color. Remember, the water you pour dries clear so the color of the paint is important. Note: deeper water has darker colors than shallow. Curved rivers are deepest on the outside edge of the turn. Even experienced modelers have to paint water several times to get the colors right. Do not worry if you don't get it on the first try.

- For still water in ponds and lakes, you can use a product such as Envirotex to create a smooth look. Envirotex can be found at art supply stores. (Envirotex 'flows' so be sure to dam up the area you want the water in. The dam can be removed once it sets up.)
- For moving water there needs to be ripples. This can be achieved with Matte Medium. This is a thicker solution than Envirotex and does not flow when wet. This is also an art supply.

Structures: This category is very loose. There are many types of structures. First is the built-up structure. These generally have lower detail so you may want to detail them before you install them. The second type of structure is the kit. This is by far the largest category of model railroad structures.

There are plastic kits, wood kits, resin kits, and plaster kits. Each requires a varying amount of effort. The third category is scratch building. This category consists of kit-bashes or the combining or rearranging of an existing kit and complete scratch building where you make the building from the ground up.

People and Automobiles: HO scale people can be purchased from companies such as Preiser. They are available in pre-painted and unpainted versions (unless you like to paint HO scale figures, buying them pre-painted is suggested). Vehicles are another large category. There are built-up's such as Mini-Metals that are perfect right out of the box. Kits from companies like Sylvan and Jordan are available as well. Remember, all vehicles on the road are not brand new. Some/most should receive a coat of Testor's Dullcote Spray Enamel or equivalent to take away the shine.

Backdrops: All CNYMOD modules have custom backdrops. While you are completing your module contact CNYMOD member Bill Brown. He will put together a custom backdrop for you.

Conclusion: After all of this please do not forget that you are a member of a large model railroading community. There are many different types of people with a wide range of knowledge within CNYMOD, the local Central New York Division, and the National Model Railroad Association. Do not be afraid to ask for help.

Local suppliers for products:

JR Junction Train and Hobby

2716 Erie Boulevard East

Syracuse, New York

315-451-6551

<http://jrjunction.com/>

Central Hobby Supply

102 Walter Drive

Syracuse, NY 13206

315-437-6630

<http://www.centralhobby.com/>

Borodino Scale Line

1040 Rt. 5 East

Elbridge, NY 13060

315-439-6956

<http://www.borodinoscaleline.com/>

Commercial Art Supply

35 Erie Blvd E, Syracuse, NY

315-474-1000

<http://www.wholesaleart.net/>

Manufacturer Sites: (most if not all is available at the local hobby shops listed to the left)

All Electronics

<http://allelectronics.com/>

Fast Tracks

<http://www.handlaidtrack.com/index-2.php>

Circuitron (Tortoise switch machines)

<http://www.circuitron.com/>

Switchmaster

<http://www.builders-in-scale.com/bis/sm-home.html>

Atlas Model Railroad Company

<http://atlasrr.com/>

Peco

<http://www.walthers.com/exec/page/manuinfo/v552>

Scenic Express

<http://www.scenicexpress.com/>

Woodland Scenics

<http://woodlandscenics.com>

Notes: