

LED LIGHTING FOR YOUR MODEL RAILROAD by Rick Wade

Many of you have been following the various threads here on MRH about using LEDs to light your layout. I've become a believer of using LEDs after seeing Michael Rose's layout and seeing how great they look (to me) in person. (<http://model-railroad-hobbyist.com/node/20664>). My current layout / room lighting is track style with 13 heads using halogen bulbs and about 550 watts of energy. I'm using halogen as I wanted bulbs that I can dim (yes, I know they make dimmable CF bulbs) and since the layout room is also my office I normally run the lights at about 50% dimmed. Now my layout room is small - 10ft by 12ft by 9ft high or 1,080 cubic feet.

Why switch from halogen to LED's? - two reasons: 1.) I like the way the LEDs look; and 2.) To reduce the amount of heat in my room generated by the lighting. If I run the halogens at full power it gets **HOT** in my little room! Now I'm not going to ditch the halogens as I'm going to use blue bulbs in them for "night time" running. I'm also going to segment the LED strips into groups so that I can have one or more on when I'm working, and turn them all on when I'm playing with my trains.

So far I have the following for my LED project: 1.) The 35 LED blank boards; 2.) The LEDs for the boards, and 3.) The power supply (a gift from Michael Rose - thank you again, Michael!). I still need to get 1.) The resistors (ordered from Bill B.); 2.) Solder (Shipped, but delayed by weather); 3.) Soldering station that is the same model Michael uses (shipped, but delayed by weather); and 4.) Magnifying hood - to see all of those tiny components.

Just after I posted this thread UPS delivered my soldering station. It wasn't cheap, but I wanted to do everything I can to insure success in soldering those tiny (to me) components. Here's a picture of the unit:



I already purchased a brass tip cleaner as I heard that they work much better than a sponge - and they don't need to be wetted. Picture from Amazon.com

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Well, not better eyes - but better magnification. I knew that if I'm going to be soldering these small components on the boards I need a new magnifier headband. I got one that has three different sets of lenses of different strengths so I can see what I'm doing! Picture from Amazon.com



I'm trying to improve my chances of success in assembling my LED boards so I order solder very similar to Michael's and it arrived today. I also ordered smaller tips for my soldering pencil.



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I happened to notice that Michael Rose was using a very small tip on his soldering iron - smaller than what came with mine. I got the info from him and ordered (3) three from Digikey. The tip that came with the iron is on the top and the smaller one is below it.



Here's the info on the tips I purchased. They come one to a pack. I have my larger tip in the package for storage.



I started assembling my LED board last night and wanted to share my initial thoughts on the process. First of all, I consider myself to have "average" soldering skills. I've done a lot of soldering in the past on larger items but this is my first try at soldering something this small (yes Michael, I know compared to what you solder the LEDs are not small ;-).

I noticed on Michael's soldering of the LEDs that he only tinned one of the pads on the board instead of both and this made me curious as to why. I emailed Michael and he surprised me by calling me to explain his reasoning. Here's his reasoning - and I must say I agree with it. When you put the LED on the tinned pad and heat the solder it sinks down and sits flat on the board. When you solder the other contact on the LED you do so by touch solder to the pad and LED thus securing the LED to board without creating any torque on the LED.

Now if you instead tin both pads when you apply heat to the pad on the first contact and push the LED down it creates torque on the LED as the opposing corner of the LED is higher do to it sitting on the tinned (unheated) pad. This results in the LED being canted on the board. Now when I heat the opposing pad and push down the LED there still is torque on

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it. It may not seem like a big thing but I don't want to do anything to reduce my chances of success on having functioning boards.

I used my magnifying head band along with the same soldering iron set at the same temperature and used the same solder. The first board was a little trying; however, I found that it became easier and I got quicker on successive boards. I ended up doing (9) nine boards that took me roughly 70 minutes. I have a total of 35 boards to do for my small layout.

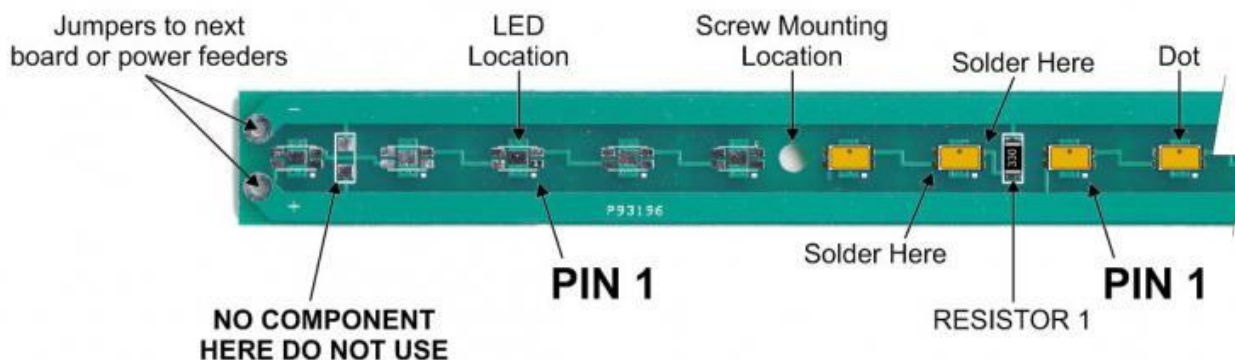
Do the boards work? I don't know because I still don't have my resistors which I hope to receive today or early next week. Michael gave me (2) 24 VDC power supplies - one for testing and one large enough to power my entire LED setup (Thank you again, Michael!!) I'll let you know if the boards work once I've completed the assembly. I will say that I don't find the soldering very difficult and actually enjoy the process!



From Bill Brillinger:

Does this cover the tips shared here?

- Solder Location
- Dot Orientation
- Resistor Labeled 330



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I want to thank Bill B. and Michael R. for their help and advice concerning the assembly of these boards. All in all I found the assembly fairly easy and enjoyable once I got the hang of it. Out of 35 boards I had (4) four boards that needed re-soldering on some contacts and (1) board that had a LED that would light. The LED was either defective or I damaged it during soldering. Here's a picture of the boards not illuminated:



Now that my LED boards are completed it's time to mount them. I won't be using a valance per say, but instead will have a 1" x 3" board on which they will mount. These mounting bars will be hung from the ceiling (which is 9 feet high) and be 30" to 36" above the layout. I don't want to block the view above the light bars as I'll have pictures along the top of the walls near the ceiling.

I couldn't find the same angle boards as Michael uses so I will be using quarter round that will allow me to mount the LED boards at a 45 degree angle. Here are a couple of the pictures of the start of attaching the quarter round to the 1" x 3"s:

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This morning I painted the LED hanger boards the same color as my walls in my layout room and got one set of eight LED boards mounted to the hanger board. My next step will be to wire them together - maybe even hang and test one!

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It took me about an hour and a half to paint the boards using two coats of the latex paint. I didn't paint the side where the boards mount as that won't show.

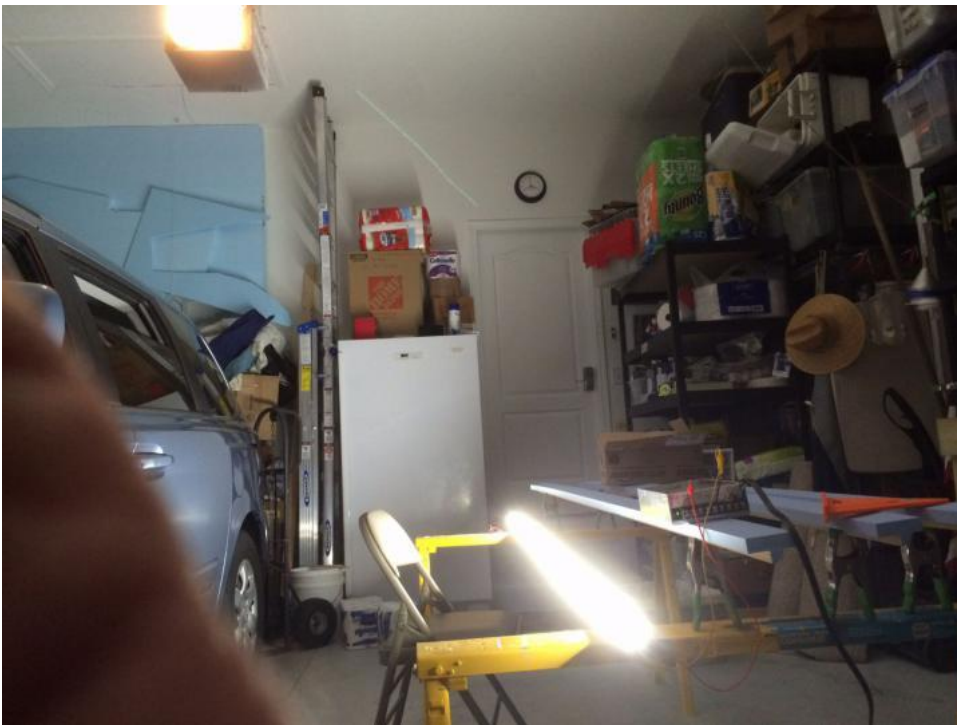
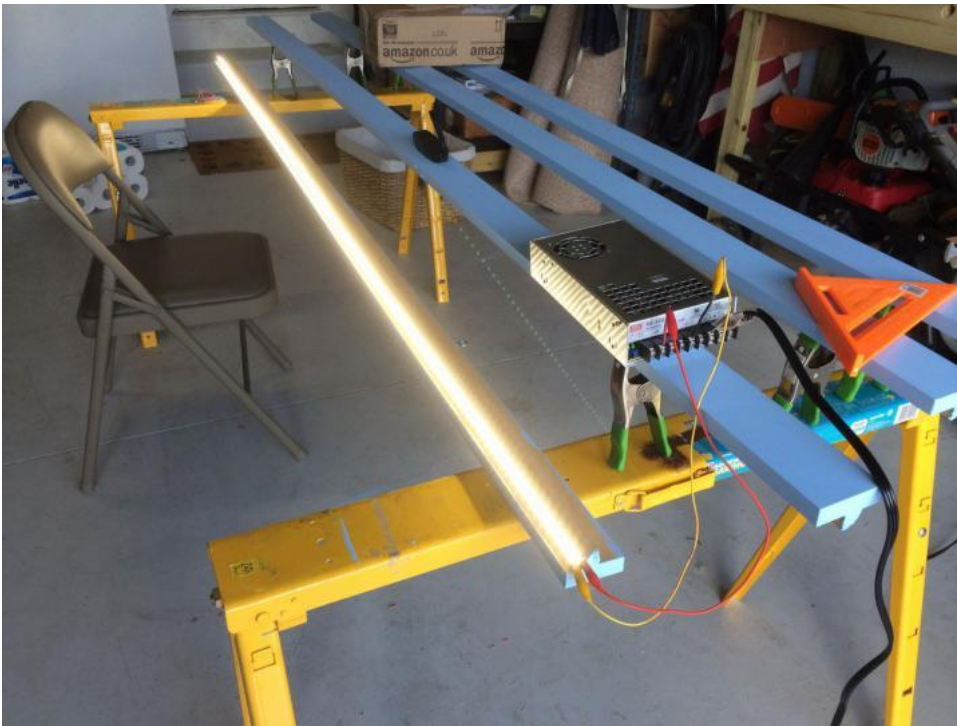


I used #6-1/2" screws to mount the boards and used a hand screwdriver instead of my drill as I didn't want to risk over driving the screws and cracking a board. I used a carpenter's 45 degree framer tool to make sure that the boards are as close to 45 degrees as I could get them.



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One down and three to go. The eight foot long light part has eight LED boards on it and boy is it bright! Here's a couple of pictures of it with the first one where the overhead garage door is open and the second one it is closed with no other lights on in the garage:



I took one of my completed LED light bars and hung it up in my room for testing and adjustment. Per Michael Rose's suggestion I hung it over the edge of my layout which in this case is 26" from the wall and set the height at 36" from the top of the layout. I used 36" since that worked out perfectly as the bar that later will be installed over my doors will have the bottom edge level with the top of the door opening. I took a few pictures of the layout area with both the

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halogen (4 x 50 watts each) and the one light bar (8 - foot long strips with 21 LEDs each) so you can see the difference. I will tell you that to me the LEDs look **MUCH** better in person the halogens!

This first picture is to show you the light bar to see how it looks hanging from the ceiling. No other room lights are illuminated.

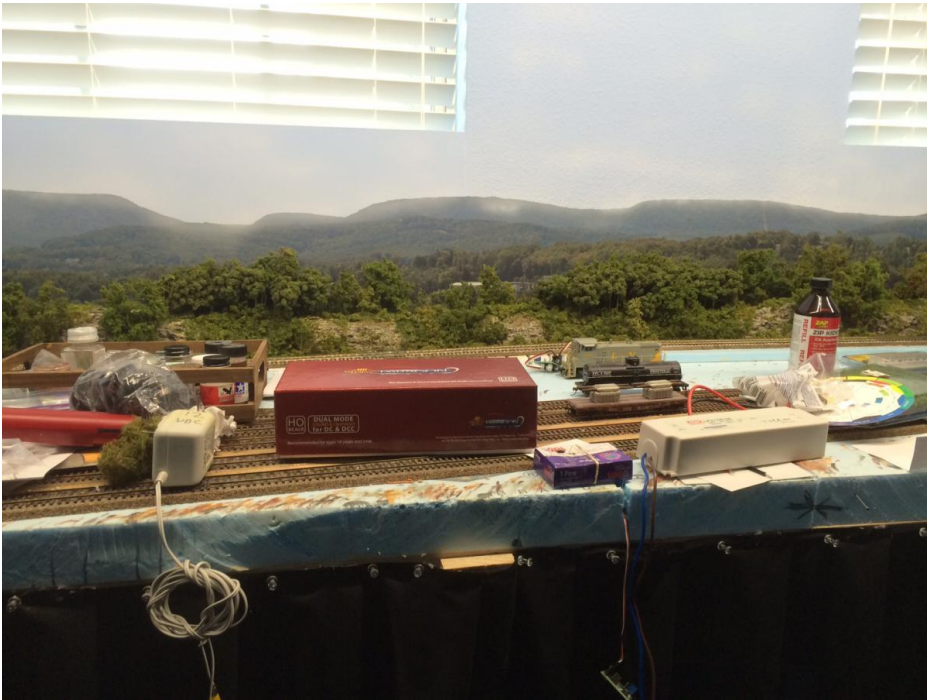


Here's a view of the hills and backdrop illuminated by the halogens. Note that besides the (4) heads that are aimed at the area there are ten other heads also on so some of the reflected light is added to this view.



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Here's the same view illuminated by only the LED light bar and no other room light:



Here's an angle view with the Halogen room lights on and no LEDs. You will notice that there is less difference between the pictures with the camera sitting on the layout:



Any finally the same view with only the LED light bar illuminated.

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In the last two days I've received orders for two items I need for my LED light system.

The first item is a remote switch to turn on and off the LED power supply. I don't have access to my light switch for my switched power outlet so I went with this \$20 item that gives me easy access to controlling the lights. Since I know that I'll lose the little remote I'm going to attach it to the door frame with some Velcro(tm) right next to the remote that I have that control my track light. The picture is from Amazon.com.



I also received my fan-less power supply. I could have saved a few dollars by going with the 240 watt unit instead of the 480 watt unit but that would leave me very little (maybe too little?) headroom to add more LED strips if I wanted to in the future. My thanks to Michael Rose for his advice on going with the larger capacity unit. The picture is from Digikey(r).

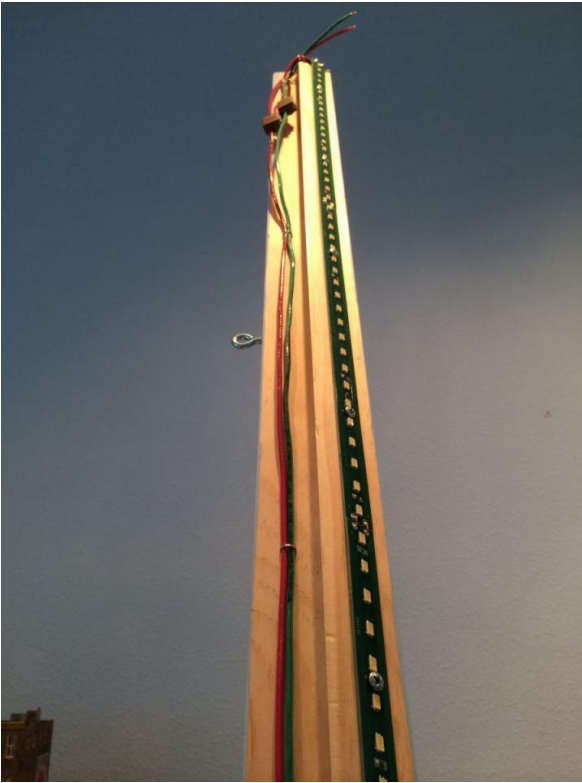
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I want to make sure that I have enough voltage (and amperage) to power the LED strips so I decided to run 12 ga bus wires on each of the light bars and feed them from each end. I decided to use the "suitcase" style connectors because of ease of use and I happened to have them on hand.



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I completed the task of hanging all four of the light bars and connecting them along with running the feed wires down the wall. Here are a couple of pictures:

The first picture shows the suspension system. I used screw in eye hooks on the bars and toggle style hooks in the ceiling connected with picture hanging wire. You will notice the one foot overlap of the boards in the corner. This allows better lighting in the back corner.



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This is a view from the door looking at the back wall which is 10ft wide



I've very happy with the new LED lighting!