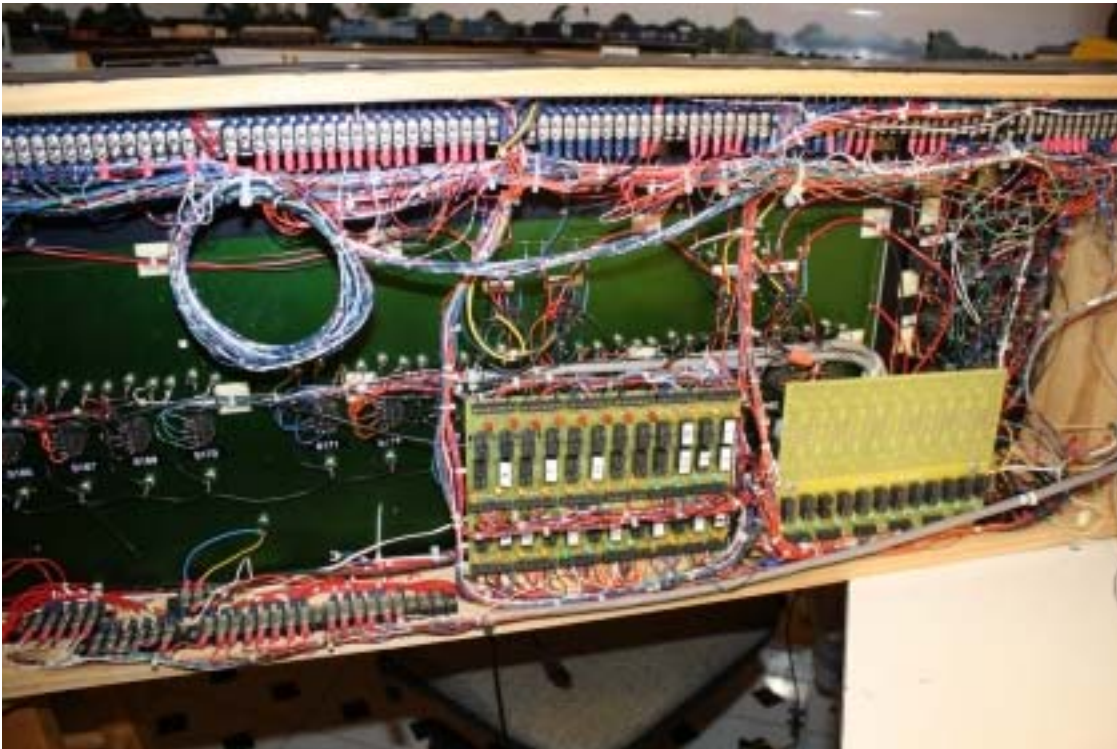


# 2018 NMRA Convention – Kansas City MO.

## August 5 – 12, 2018

### Documenting Your Layout

By Gene Jameson



I am sure that you are asking the question, “Why should I waste my time documenting my layout?” I know how it’s built; after all, I did build it!!”

To answer that question, what are you going to do when you have a problem with the wiring and you can’t remember how or why you wired an area the way you did!! How about the light in the “Such & Such” building has burned out and you used a special long life bulb. Now you can’t remember the number of the bulb or where you got it, what are you going to do? How about that diode matrix for switching your yard? How about the signal system? Do you think you are going to remember all of the details about your railroad years after you built it?

We spend hours working on the track plan. We ask everyone we can what they think about the track plan. We redraw the track plan and do it all over again. We repeat this several times until we are happy with the plan.

Then we spend hours constructing the bench work and laying the track. Once we have the track down and working as we planned, we start on the scenery, and building the structures for the layout.

Years from now, you are going to have problems with the layout. It happens to every layout in the world. You can have a layout that has operated for months with out a hitch, invite a friend over to see the layout and I can guarantee you, you will have problems. If you don't think this will happen, ask ANY model railroader if this has happened to them. The answer will be YES.

In our haste to build the bench work, we take short cuts. Some times these cause problems immediately, and sometimes it takes time for them to become apparent.

Case in point; I helped a friend build his layout; a double deck modular design. When we got the track in place, we test ran trains around the main line for several weeks. Then we started installing and testing the Tortoise switch machines. We were installing the Tortoise switch machines for a double cross over; we found that there was a 2 X 4 centered right where two of the Tortoise should go. It was not an option at this point to move the 2 X 4, so we had to come up with a solution. Had my friend drawn up a bench work plan and checked it against the track plan, he could have seen the offending 2 X 4, and could have moved it a few inches and the problem would have never happened. Just so you know it took us the better part of a day to solve the problem and get the two Tortoises installed.

The next question is "What do I need to document?" The answer is EVERYTHING!! Document the bench work, track plan, wiring (especially any reversing loops, wyes, or round house turn table and/or transfer table or other wiring that is complicated), placement of wiring blocks, insulated rail joints, and any other thing that you can think of. Remember, it is much easier to do this when you are building the layout than have to go back and do this later. If you plan on having signals, you **MUST** know exactly how the railroad is wired. Without the documentation for the signals, if you ever have a major problem, you will end up doing the documentation to figure out what is wrong with the signals.

A couple of years ago, I started planning for a "Proof of Concept" layout. This layout was a test bed for developing the software to control the signals and to dispatch the railroad. I knew it was going to be a real bear to wire the layout and debug the software. The layout looks very simple, an oval track on a 5 X 16 sheet of plywood. The layout has a track that dissects the center of the plywood to act as a reversing loop. The layout also has 12 turnouts on it. Sounds simple doesn't it? Well it isn't that simple!! The layout has 23 detected blocks, with 34 single head three aspect signals, four double head six aspect signals, two double head four aspect signals, two triple head nine aspect signals, one main line crossing from the industrial track that is dark territory (undetected and no signals), and a program track. The layout has two pass tracks that are detected and tied into the signal system. Can you see the need to document this layout? This layout is not that much different from most model railroad layouts other than its physical size.

If you are planning on having signals, you need to think about where they are going to be placed on the layout. You don't want to come out of a curve and be facing a red signal. Signals need to be placed in a logical location. Look at prototype railroads to see how they place their signals. Your track plan should show where all of the signals are going to be placed, and where all insulated track joiners are placed.

The first thing you want to do after you have the track plan is to draw the bench work plan. Use the same scale for the bench work plan as the track plan. Lay one drawing over the other and see if there are any conflicts. If there are conflicts, NOW is the time to correct them.

When you have all conflicts corrected on the track plan and the bench work plan, think about the wiring. The wiring for the layout should not just happen. Well planned wiring may still look some what like a bowl of spaghetti, but at least you will know where everything is going a year from now if you have a schematic. I can not stress it enough; neatness counts under the layout. The guests may not see this part of the layout, but you have to be able to figure out what is what when you have a problem.

As you lay track, wire as you go. You know where the track is going to be, so put the main track bus in first. That way, you can wire the track as it goes down. You can test every inch of track while you can get to the wiring with out anything in the way. If you are going to have signals, put the insulated rail joiners in at this time. Label all of the wiring, power districts, and reversing loops so you know what they are (see Figure 1).



Figure 1

Suggestion: Use at least 14 gauge wire for your track bus. If your main line is longer than 50 feet, use 12 gauge wire. You need track feeder wires no more that every six feet, and these should be no less that 28 gauge wire, 26 gauge is better. Draw the schematic as you go, while it is fresh in your head. If you don't know how to do a schematic, feel free to contact me I will be glad to assist you. I have included the basic electrical schematic symbols at the end of the handout.

If you are using DCC, install your cab bus when you install the track bus. Remember; keep these two buses separated as much as possible. If you are going to use fascia panel mounted connections for your throttles, rough them in at this time. Check everything out as you go!

The worst thing you can do is to do all of the track work, install the wiring and not test anything until you are finished with all the track work. If you have one set of track feeders crossed, it will short out the layout and you have no idea where this short is! Now what do you do? Go back and undo the feeders one at a time until you find the offending section of track.

If you have a very complicated track plan and are worried about getting the wiring correct the first time, try this. Purchase an old cheap boxcar at the next local train show. Paint one side, including half of the top and ends of the car one of the colors of your track bus wire. Paint the other side, the other half of the top and ends of the car with the other track bus wire color. Decide what color of wire will be to the front of the layout. Put the track wiring car on the track with the correct color to the front of the layout. Move the car as you wire, and it will help keep you straight on which color goes where. If you come to a place where the wiring will be crossed, you need to use a revering unit in this section of track.

If you have a 12 volt bus for the Tortoise switch machines, use a different color of wires for this bus so it will not be confused with the track bus. If you have a 5 volt bus for your signals and other layout lighting; use a different color combination than the colors than you used on the track and Tortoise buses. Suggestion: You could use red and black wire for the track bus, green for the DC ground, yellow for the 12 volt bus and orange got the 5 volt bus.

If you install terminal blocks (TB), number them and assign pin numbers to each pin. Remember, keep the same pin numbering scheme for each TB. Write the TB number beside the terminal block. Write the pin numbers next to the TB so you know how the pins are numbered. Label the connections so you know what they are (see Figure 2)

If you are using DCC and a stationary decoder to through your turnouts, write the address of the switch machine on the wood beside it. If you have missed writing all information down on your schematic, you can go back at a later time and get the information from under the layout. This more than likely will be when you have a problem with the railroad.

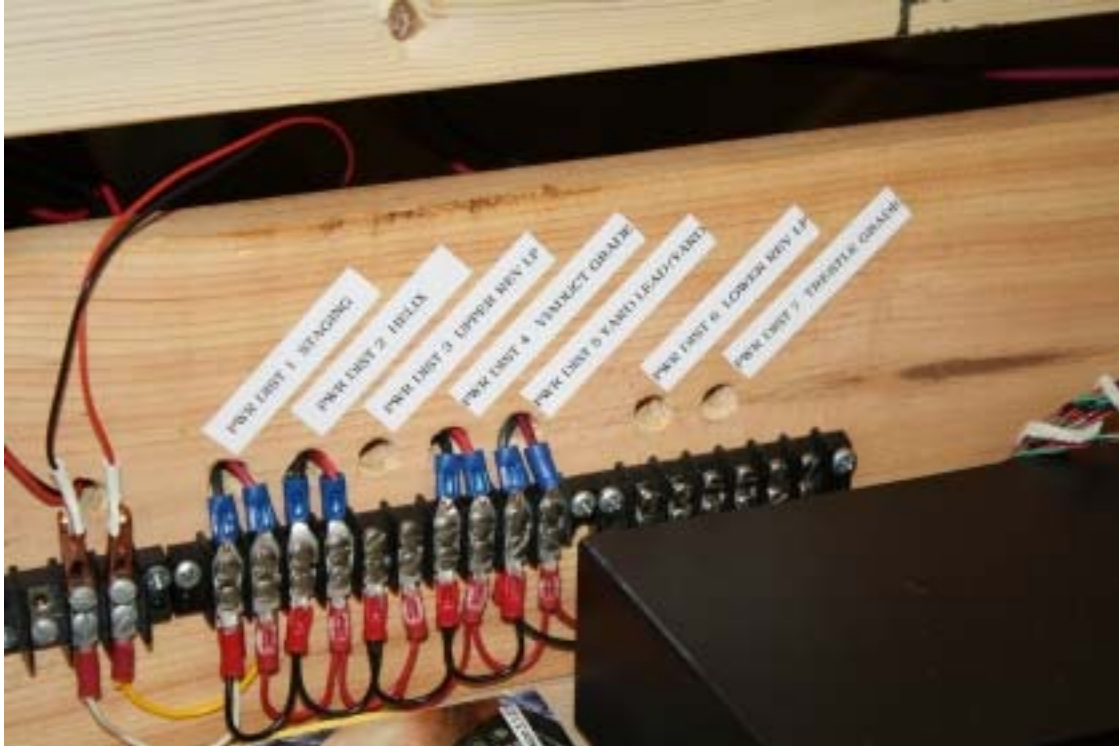


Figure 2

I downloaded a copy of everything that is associated with the layout. This includes the documentation for all the decoders that I use (both motor and sound decoders), the manual for my DCC system, block detectors, stationary decoders, Tortoise switch machines, and auto reversing modules. I also have a “hard copy” of the computer code for the layout. You want all of the documentation for your railroad in one place.

“OK, what do I do if I have already built my layout?” You do the same thing as described above. Get all of the documentation together for every electrical item that you have on the layout.

You will have to get under the layout and figure out the wiring. This is a good time to clean up the wiring mess that you made when you built the layout. If you used terminal blocks, number them along with their pins.

Take lots of pictures of the layout as you build it. Remember the old saying, “A picture is worth a thousand words!” You can’t have too many pictures of how you built the layout (see Figure 3). Make sure that if they are digital pictures, back them up some place safe. If they are “film” pictures, make sure that you know where the negatives are.

Another thing, do you know exactly what rolling stock and buildings you have? Do you know the value of the rolling stock and buildings? What happens if you have a burglar break into your house, or have a fire in your house; will your homeowners insurance cover the railroad? If you have a small collection of rolling stock and buildings, more than likely your homeowners insurance will cover it. However; if you have a very large

collection, worth many thousands of dollars, more than likely your homeowners insurance WILL NOT cover your railroad. Check with company that you have your homeowner's insurance with to see if your model railroad is, in fact, covered. Now is the time to find out, not when you are trying to file a claim.



Figure 3

Use Microsoft Office, Excel to make a spread sheet that shows the following:

1. Date the model was purchased.
2. What you paid for the model, remember the sales tax and/or any shipping charges.
3. Where you purchased the model.
4. Manufacture's item number or Walthers catalog number.
5. Any thing that you have added to the model, such as DCC decoders, sound systems, and other detail. Include the item number for anything that you added to the model.
6. Take pictures of EVERY model that you have, both rolling stock and buildings.

Remember, the better your documentation the better prepared you will be to defend your claim with the insurance company. Keep a "hard" copy of the spread sheet and an electronic copy. I am very lucky, my employer allows me to store personal data on my computer at work. I have a copy of my inventory on my work computer as well as the home computer. If you can't store the data on your work computer, ask a friend if you can store the data on their computer. While this back up file may not be completely up to

date, it is better than no back up at all. Remember, you want the back up file somewhere else, NOT on a computer in the same building in case of a fire.

NMRA offers an insurance coverage for model railroads. If you have a large collection of model railroad equipment, you may want to check their requirements and rates. A link to the NMRA insurance information is:

[http://www.nmra.org/national/insurance/model\\_collection\\_insurance.html](http://www.nmra.org/national/insurance/model_collection_insurance.html)

I hope that this handout has increased your understanding of how important it is to have your railroad documented. You really don't need all the documentation until you have a problem, then it is worth its weight in gold!!!

The most important thing about documenting your layout – Keep your sense of humor!

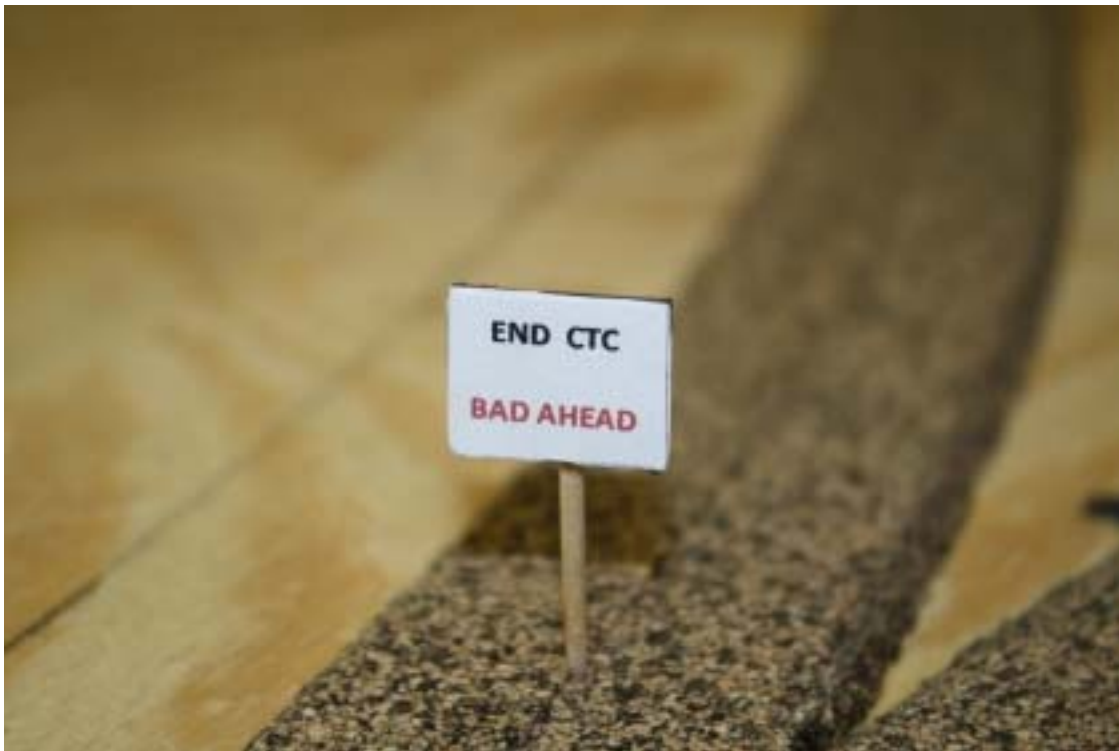


Figure 4

If you have any questions about doing documenting your layout, feel free to e-mail me at [b-n-ferrco@cfl.rr.com](mailto:b-n-ferrco@cfl.rr.com), or contact me through my web site, [www.b-n-ferrco.com](http://www.b-n-ferrco.com)

On my website under the heading “The Layout” there is a link to the “Proof of Concept” layout information. There you will find a copy of the schematic for the railroad. It will give you an idea of how a schematic should be drawn.

# Electrical Symbols

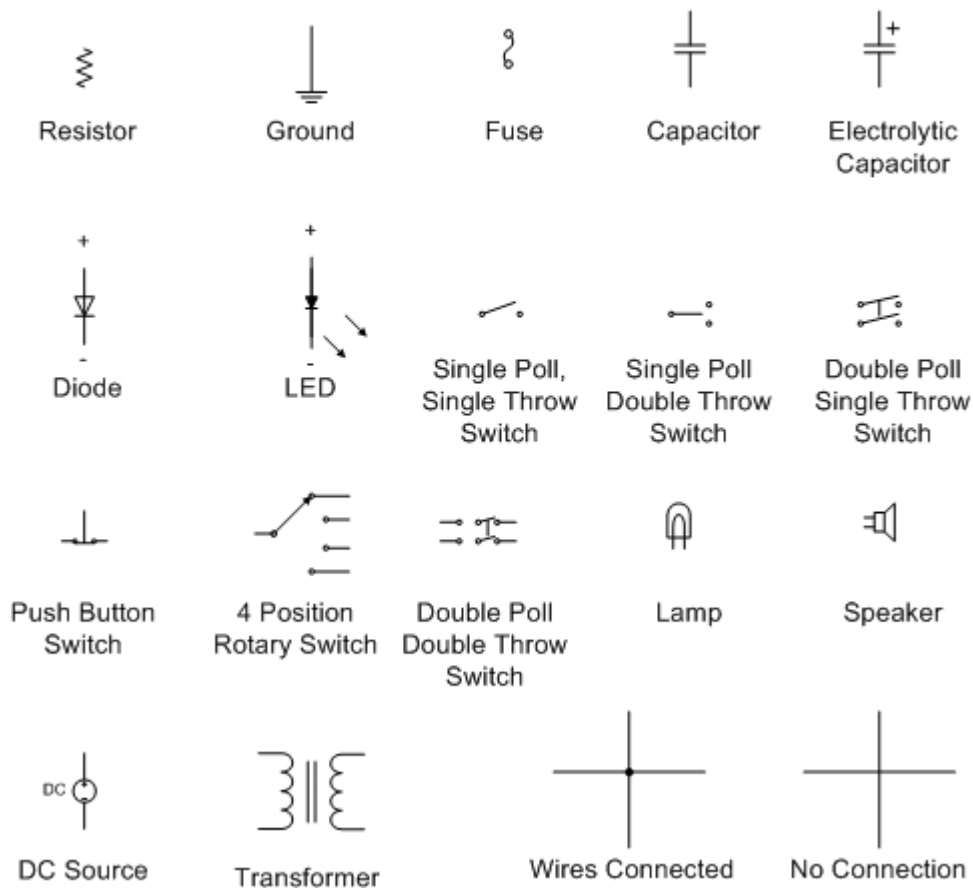


Figure 5

Industry standard names for schematic symbols:

Resistor = R1, R2, R3 etc.

Capacitor = C1, C2, C3, etc.

Diode = CR1, CR2, CR3, etc.

LED or Bulb = DS1, DS2, DS3, etc.

Fuse = F1, F2, F3, etc.

Transformer = T1, T2, T3, etc.

Switch = S1, S2, S3, etc.



Speaker = SPK1, SPK2, SPK3, etc.

Integrated Circuit (IC) = U1, U2, U3, etc.

Voltage regulator = VR1, VR2, VR3, etc.

Connectors (Jack – Male type) = J1, J2, J3, etc.

Mating connectors (Plug – Female type) = P1, P2, P3, etc.

Other items for importance:

The +, **DOT**, or **BAR** on an electrolytic capacitor **MUST** go to the positive voltage in the circuit. Some capacitors have a band with the “negative” sign on it to indicate the negative lead.



Figure 6

The **BAR** on a diode goes to the negative voltage in the circuit or to ground.



Figure 7

When installing a fuse holder, **ALWAYS** attach the input power to the back of the fuse holder.



Figure 8

**NEVER** wire power to a Jack.

## Drawing Schematics

Start on the upper left, work to the right and then down.

Number your pages.

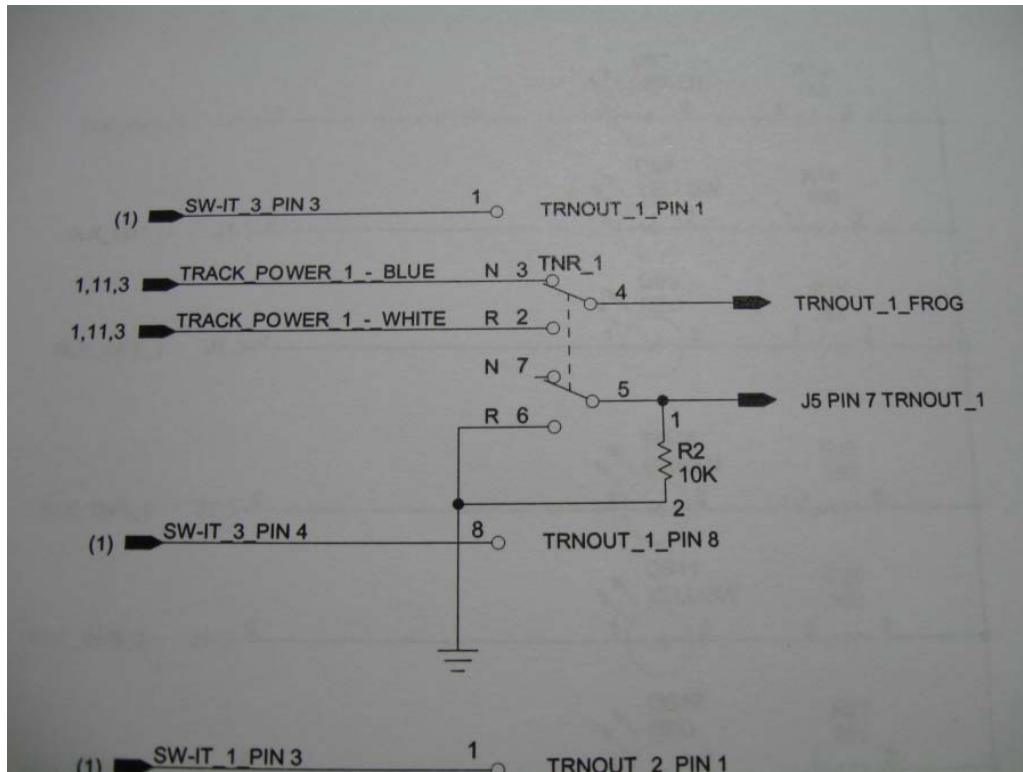
Name all bus lines, and keep them constant throughout the schematic.

Show page numbers for all bus lines, show all page numbers that the line is located on.

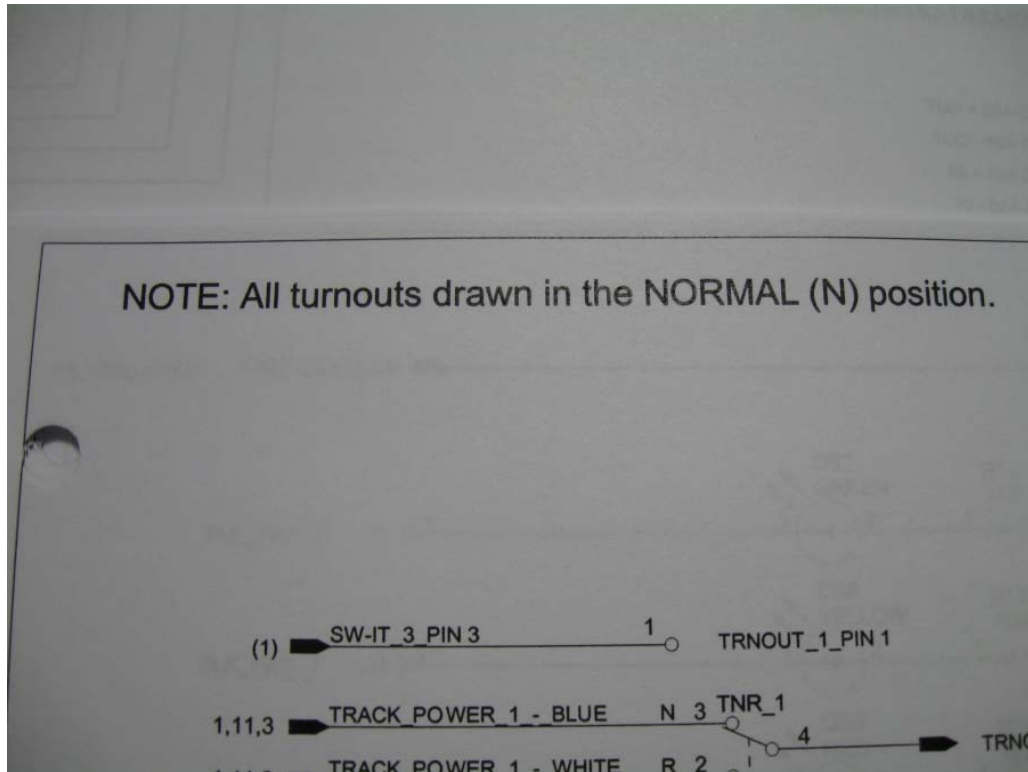
Number all components; R1, R2, C1, C2, etc.

Use arrows to show data/current flow on and off the page.

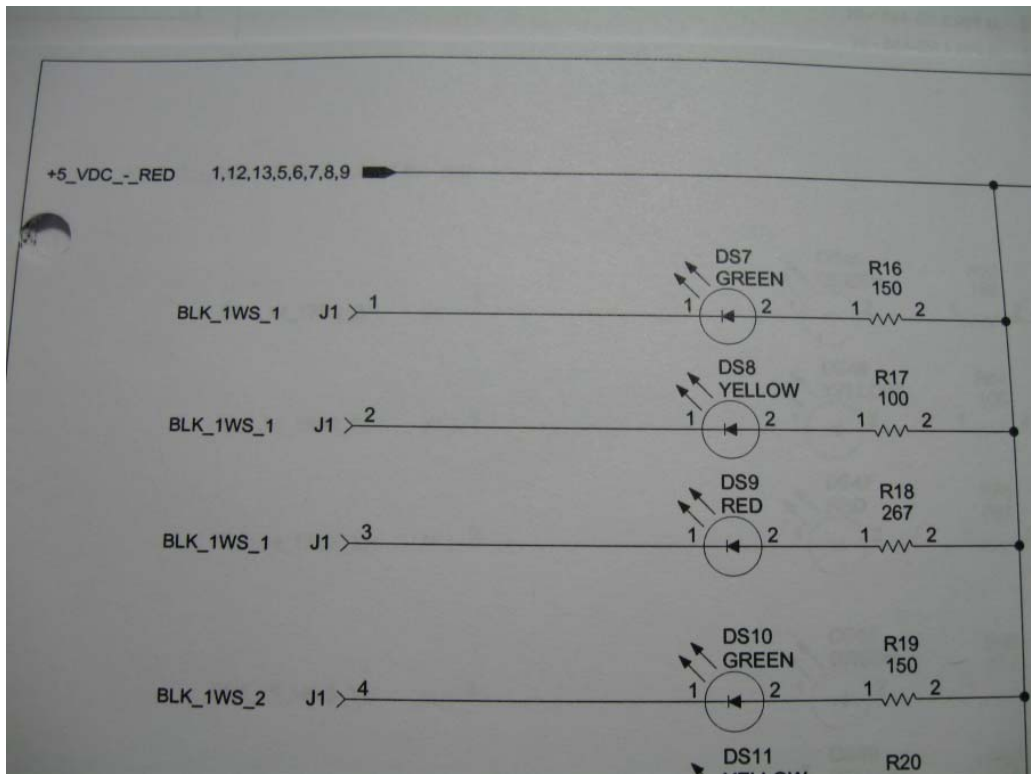
Keep it neat!



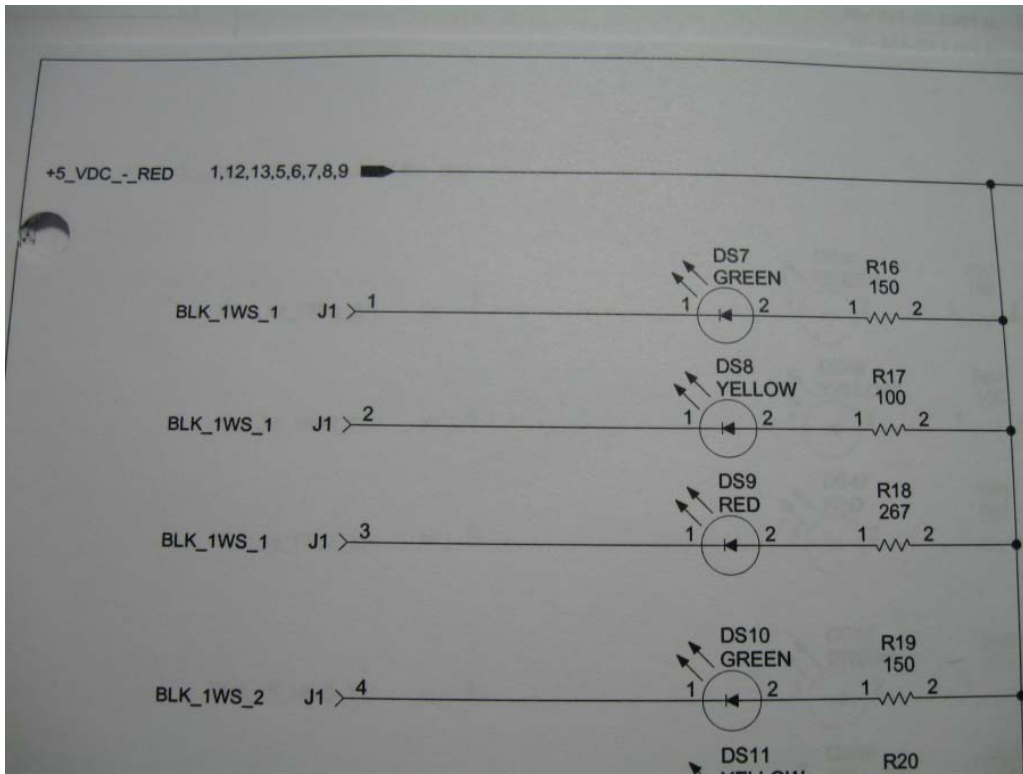
Mark your inputs and outputs



Make “NOTES” about important things



Show page numbers for all inputs and outputs



Label all bus lines