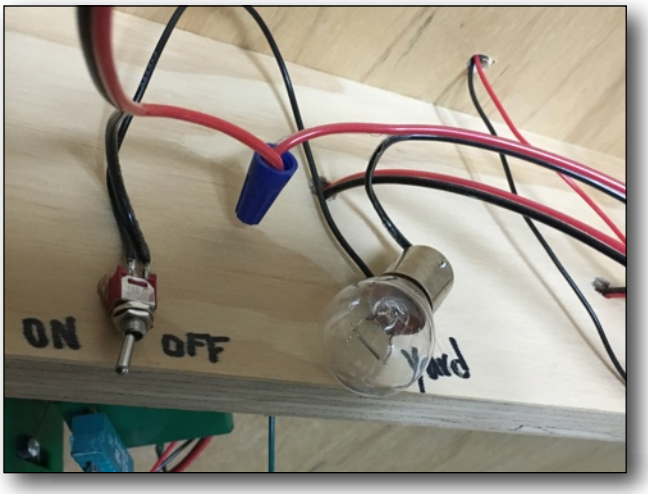
Model Railroad Engineer - Electrical SOQ
Jim Wanlass 121050

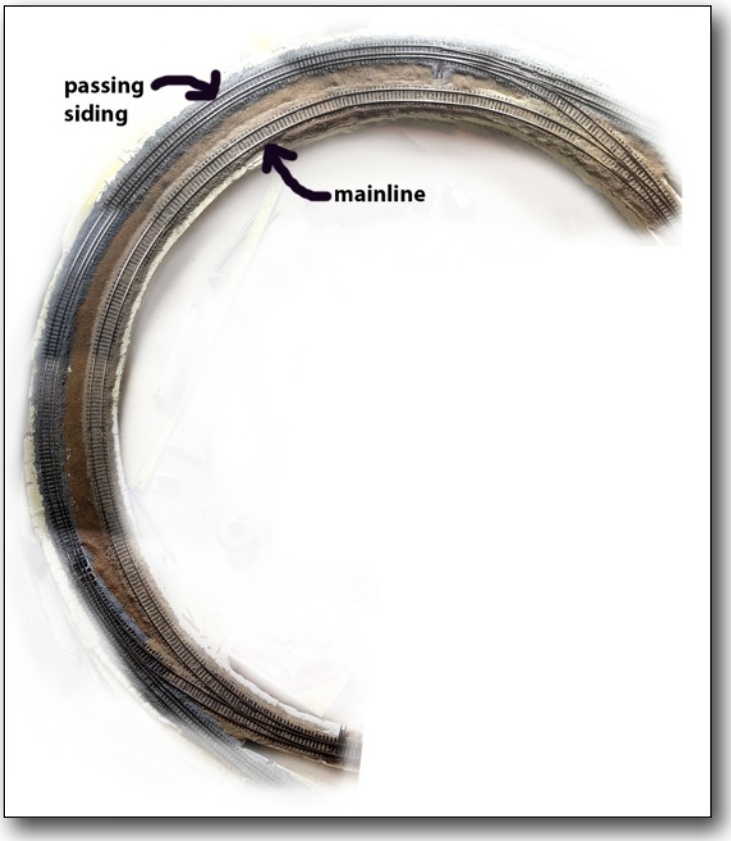
Section A

Construct and demonstrate on own or club layout, the satisfactory operation of an electrical control system on a model railroad capable of simultaneous and independent control of two mainline trains in both directions, and containing at least:

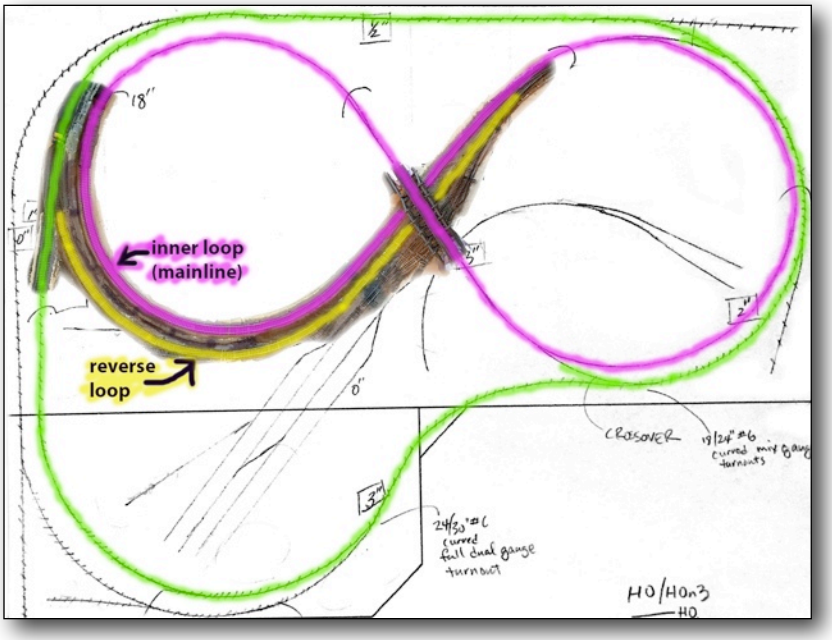
1. For conventional DC wiring (non-command-control), five electrical blocks that can be controlled independently. For command control wiring (DCC, TMCC, and others), sufficient gaps and switches to maintain polarity, phase if needed, and troubleshooting.
2. One mainline passing siding.
3. One reversing loop, wye, turntable, or transfer table.
4. One yard with a minimum of three tracks and a switching lead independent of the main line.
5. Facilities for the storing of at least two unused motive power units
6. One power supply with protective devices (short indicator or circuit breaker) to ensure safe operation.

(A1) DCC system – Digitrax Zephyr with 3 short circuit protective districts using 1156 tail light bulbs and an on/off switch. The power to each district can be turned off for troubleshooting.

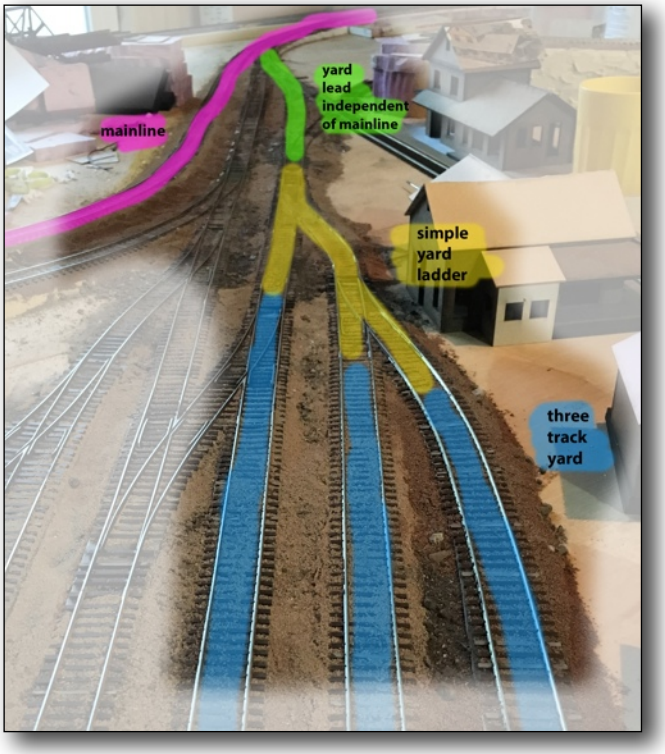




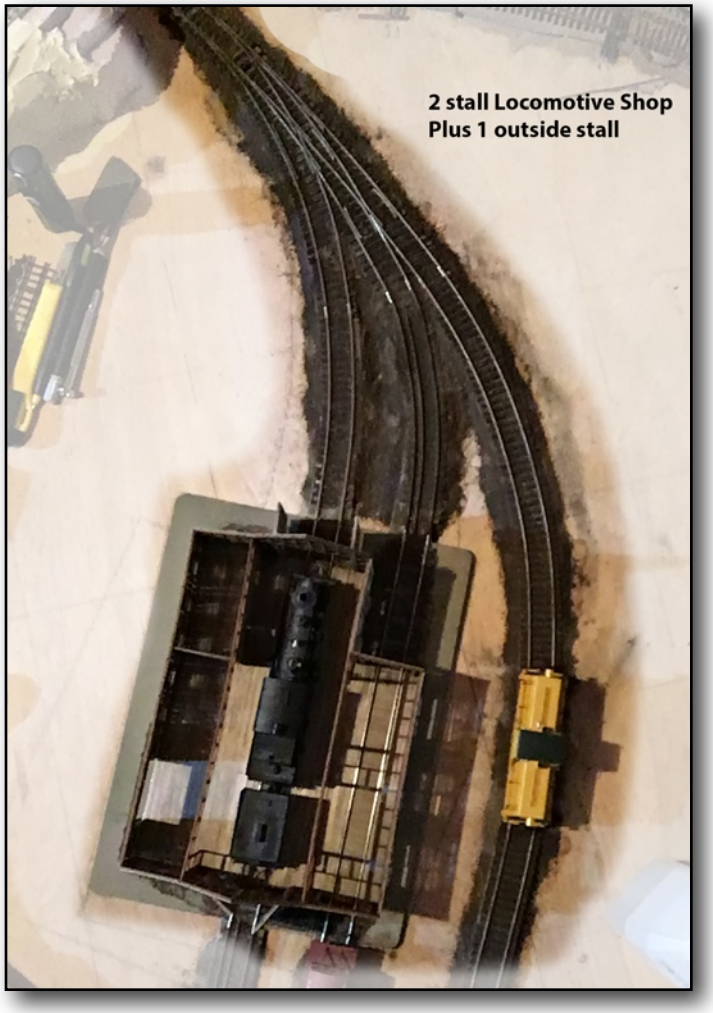
(A2) Mainline passing siding



(A3) Reversing Loop



(A4) Yard with 3 tracks



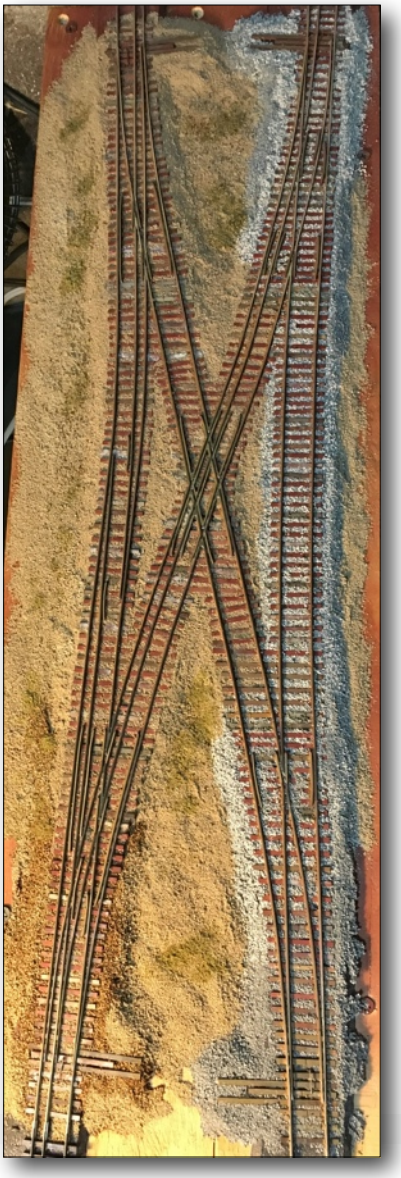
(A5) Storing at least 2 unused motive power units

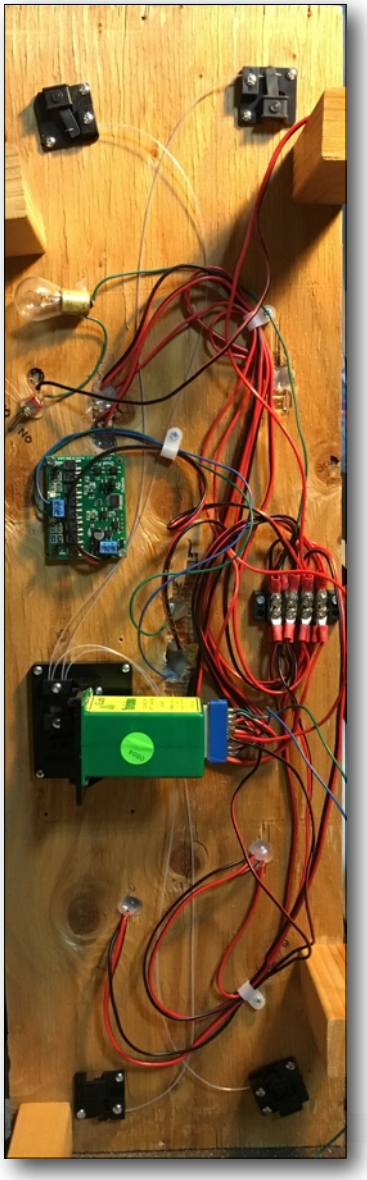
(A6) Power supply with protective device. The Digitrax Zephyr has a built-in circuit breaker protection plus each block has the 1156 tail light bulbs as shown in A1. Additionally, the power supplies are plugged into a surge protector power strip.

Section B
Wire and demonstrate the electrical operation of at least three of the following items:

1. Turnout
2. Crossing
3. Crossover
4. Double Crossover
5. Slip Switch *(single or double)*
6. Gauge Separation Turnout
7. Double Junction Turnout
8. Three Way Turnout
9. Gauntlet Turnout
10. Spring Switch
11. Operating Switch in Overhead Wire

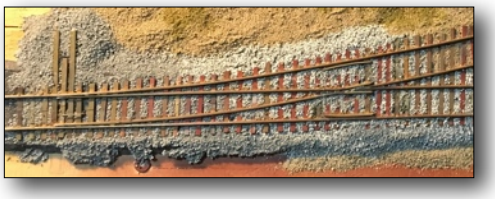
(B) Originally constructed for part of my layout that is now dismantled, it was convenient to build this track work on a board. The whole includes 4 turnouts, a crossing and a narrow gauge transition from right to left but only two turnouts and the crossing need to used for Section B. Using the remote attachments for a Tortoise Switch Machine I was able to control all four turnouts with one switch machine which also controls powering the frogs of the turnouts. I originally used a Digitrax auto-reverser for the two frogs of the crossing but just "switched it" with a Dual Frog Juicer from Tam Valley Depot. It works much better!





The schematics for the three items of track work are show in Section E.

(B1) Turnout



(B2) Crossing

(B6) Gauge Separation Turnout

(Section B description continued)
I use the tools and templates from Fast Tracks for building my track work. For the turnouts I have a dual gauge jig but for the crossing I don't. It was constructed over the paper template which I had to modify in Photoshop to include a dual gauge in one direction and standard gauge in the other. PC board ties and ME code 70 rail was cut to length and filed. Frogs for the crossing are extremely small and care must be taken to get just right. NMRA Standards gauges were used to ensure accuracy and reliability. HO and HOn3 gauges were both used. A set of HO and HOn3 trucks were also used to check for any snagging or areas that might have issues and small files were used to correct any problems.

Where PC board ties were not used I filled in the other ties with a combination of styrene and wood strips. I wanted to experiment with how the different materials would look after painting and weathering. For the most part one cannot tell the difference. I added some details from the proto87 website but the amount of time it took to add them versus the effect was not worth it. They are so small and difficult to even see. I also added non-operating switch stands. I hate seeing the throw bar "naked" and a non-operating one, in my opinion, is better than nothing at all!

The ties and rails are painted to represent weathered track work. The ties have different colors showing the effects of the weather. The sides of the rail are painted to show rust but the tops are shiny from wheels going across them. Everything was scratch built (except items already mentioned-switch stands and some NBW-like details from proto87 that is really hard to see). Strip wood and styrene was cut for ties, PC board ties for ties and electrical contact and Micro Engineering Code 70 rail cut, filed and shaped to conform to the correct shape.

Section C
Wire and demonstrate the electrical operation of at least three of the following items:

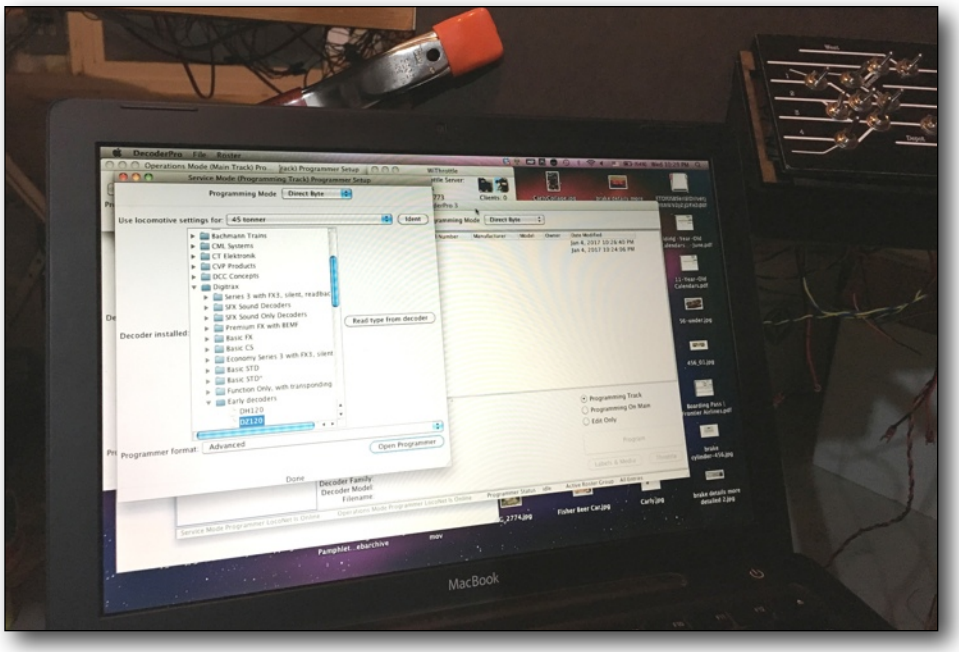
C1 (11) – Installation of an advanced electronic and/or computer control for the model railroad.
See description on page #5

C2 (14) – Installation of a command control receiver. Modifications or additions to the device's wiring are required. Installing a plug-equipped decoder into a manufactured prewired socket is not sufficient.
See description on page #6

C3 (15) – Installation of a command control throttle buss line around a layout capable of handling at least two throttles at three or more separate locations.
See description on page #7

C1 (11) – Installation of an advanced electronic and/or computer control for the model railroad.

I have my MacBook laptop connected to the railroad over LocoNet using a LocoBuffer-USB connector. It has a LocoNet RJ-12 plug on one end and a USB on the other. Using JMRI I can set preferences for my locomotives and even run them! There is a throttle built into the program. Plus I can connect my iPhone and using WiThrottle I can control my locomotives wirelessly. I have a programming track setup nearby to read and write variables to the locomotives.



Actual screenshot of my phone (not my hand though) controlling locomotive #10

Programming track

Model Railroad Engineer - Electrical SOQ

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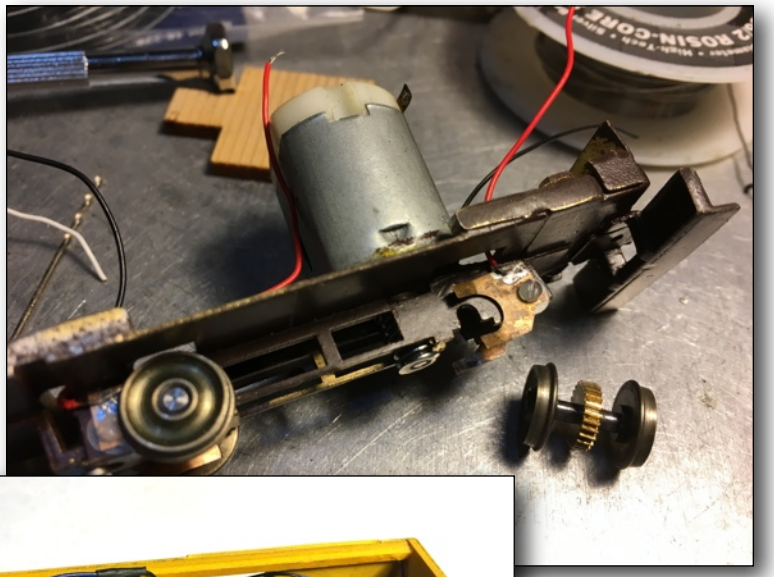
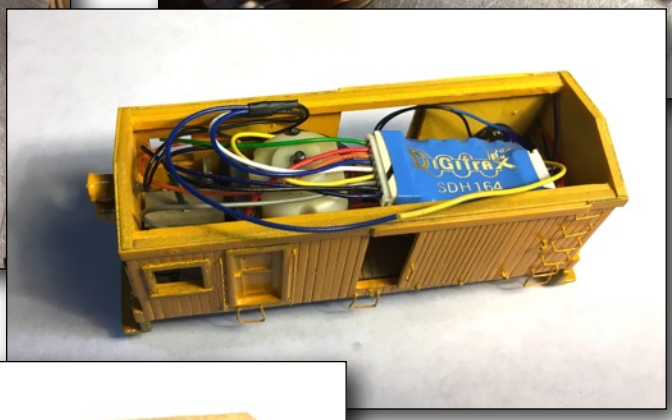
C2 (14) – Installation of a command control receiver. Modifications or additions to the device's wiring are required. Installing a plug-equipped decoder into a manufactured prewired socket is not sufficient.

The speeder is a kit that comes ready to run in DC with power pick-up on one pair of wheels only. I ordered an extra set of wipers designed for the kit. I disassembled everything and drilled the holes for the extra wipers. After painting the frame to help with the insulation, I installed wipers for all four wheels. They were installed with nylon screws and feeder wires had been soldered to each. The decoder was then wired to the pickup wires and to the motor. After testing both motion and sound the lights were then wired. The rest of the locomotive was built according to the instructions. See page #11 for the schematic of the wiring.

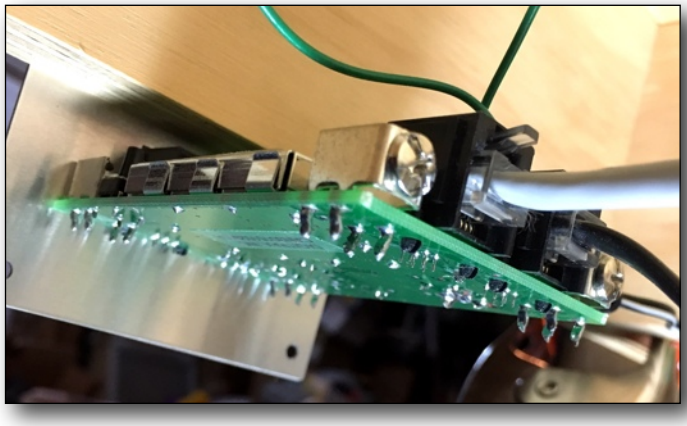


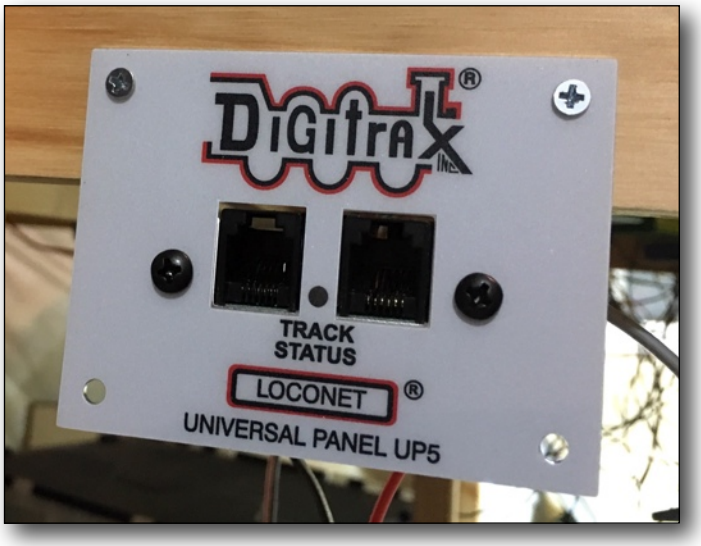


The speeder is not fully detailed in this photograph. The electrical wiring is done which is what is required for this certificate. I love seeing this little critter rumbling down the tracks.

C3 (15) – Installation of a command control throttle buss line around a layout capable of handling at least two throttles at three or more separate locations.

I used the Digitrax LocoNet standard to install the command control throttle buss line around the layout. The Digitrax UR 91 is on the front right and the Digitrax UP5 is on the front left. I made my own cables to install an additional two plugs on the backside of the layout. The schematics showing how I did it is in Section E.





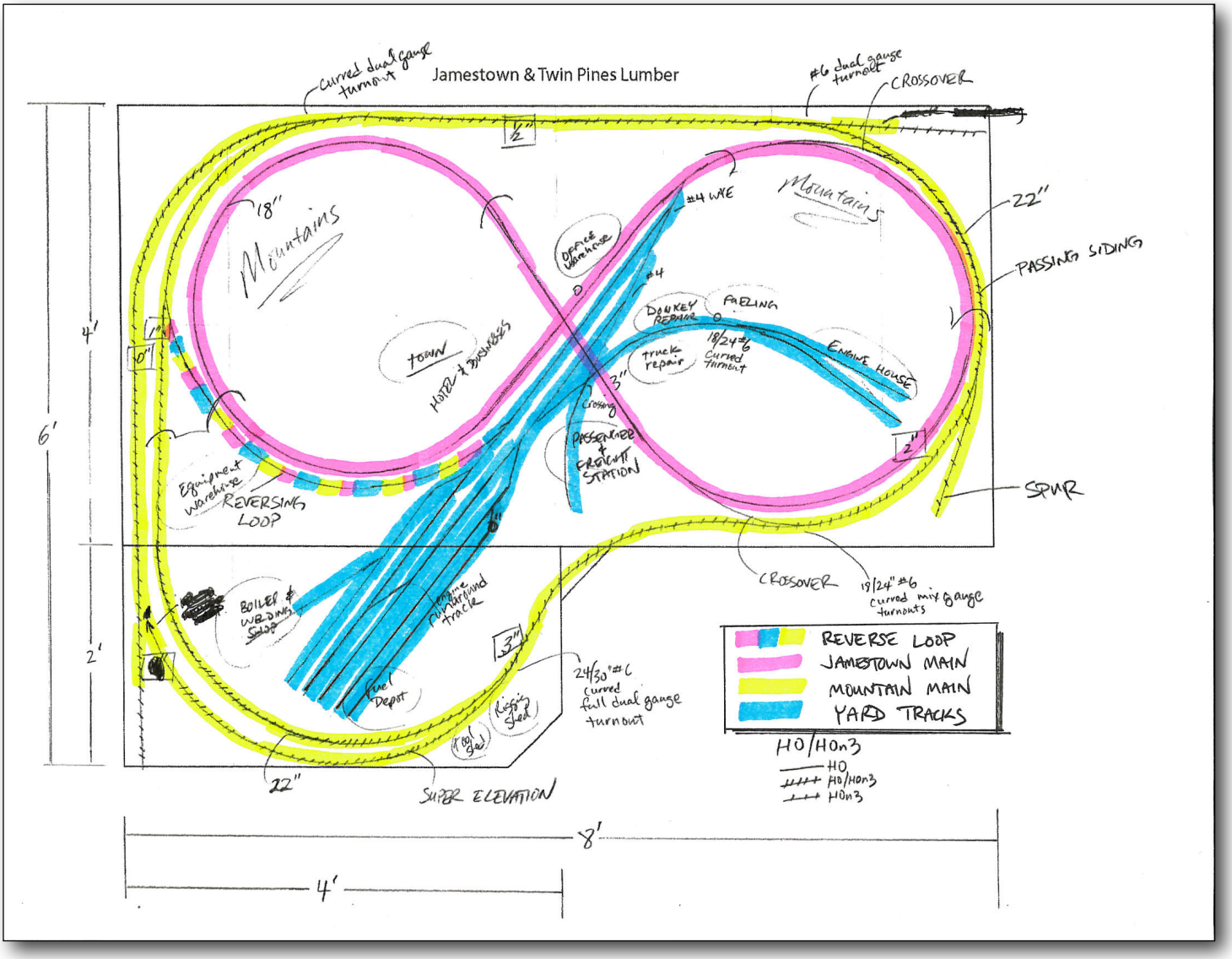
I added a short cable from the back of the UR91 so that there would be two connections on the front side.

The back of the layout didn't need anything fancy so I ran two wires from the UP5 to a generic faceplate.

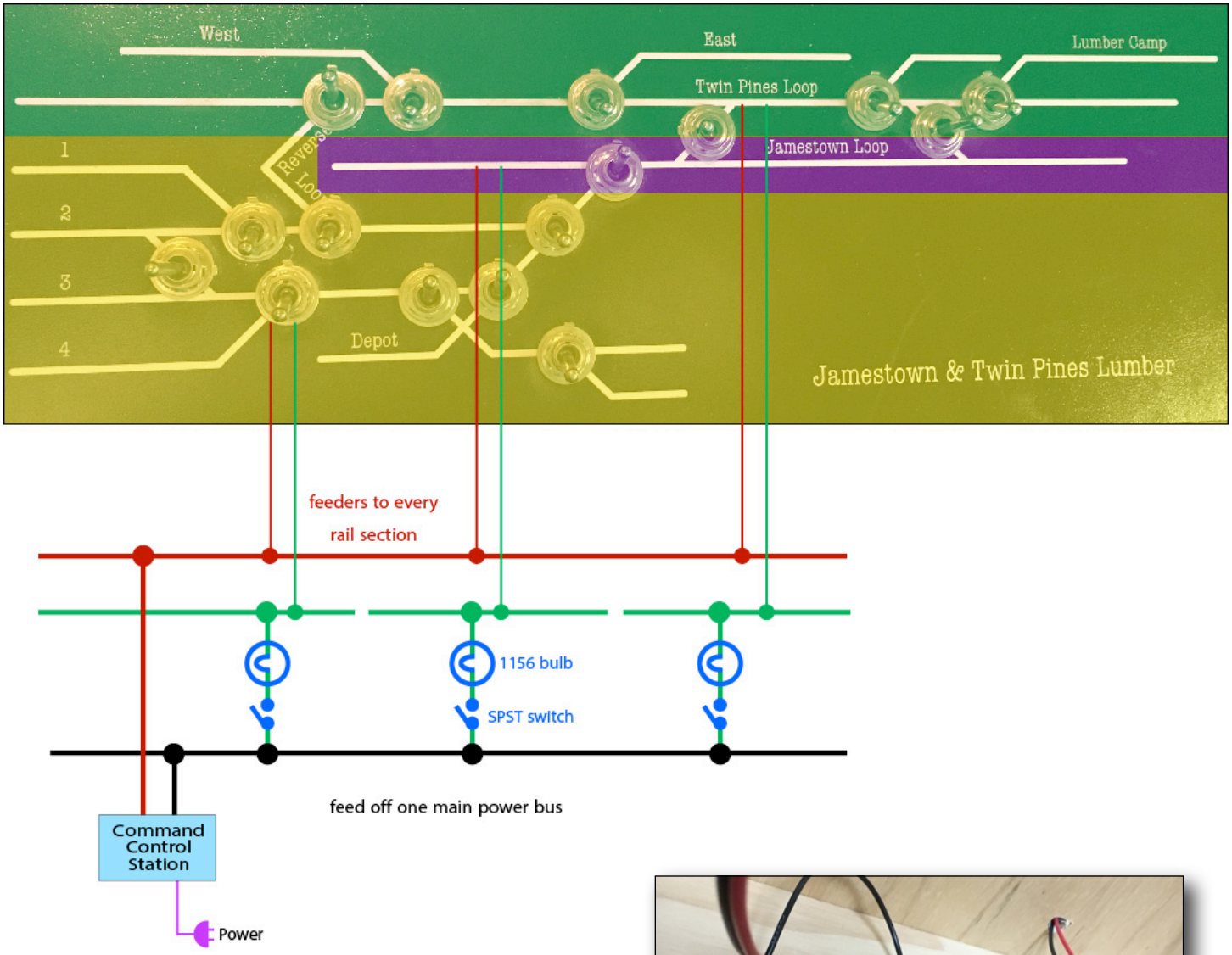
Section D

Prepare a schematic drawing of the propulsion circuitry of the model railroad in (A) showing the gaps, blocks, feeders, speed and direction control, electrical switches, and power supplies.

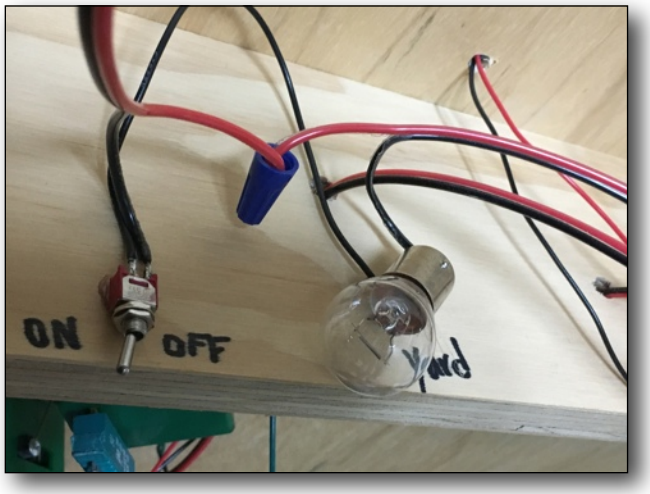
Note that this requirement includes ONLY the propulsion circuitry. It is not required to include the wiring for electrical turnout control, signal systems, building lighting, etc. You do not need to include the details for parts of the diagram which are repeated. If a number of parts are wired in the same way, it sufficient to draw one section in detail and indicate other locations with rectangles.



(D) Diagram of model railroad in (A) showing the electrical blocks. Each block is protected with 1156 tail light bulbs so if there is a short in one block the others can keep running. The entire layout is protected by the internal circuitry of the Digitrax Zephyr which is plugged into a power surge protector multi-strip outlet. Every single piece of track has feeder wires attached to a buss wire for it's block. Speed and direction control are accomplished with the Digitrax Zephyr DCC system so there are no mechanical switches for power. The reverse loop is powered with a Digitrax AR1 Auto Reverser. The frogs in the crossing are powered with a Tam Valley dual frog juicer.


West
East
Lumber Camp
Twin Pines Loop
Jamestown Loop
Reverse Loop
1
2
3
4
Depot
Jamestown & Twin Pines Lumber
feeders to every
rail section
1156 bulb
SPST switch
feed off one main power bus
Command
Control
Station
Power


FUNCTION
JUMP
MU
SWITCH
TRACK
STATUS
Digitrax
DCS
FORWARD
BRAKE
REVERSE
STOP
FULL

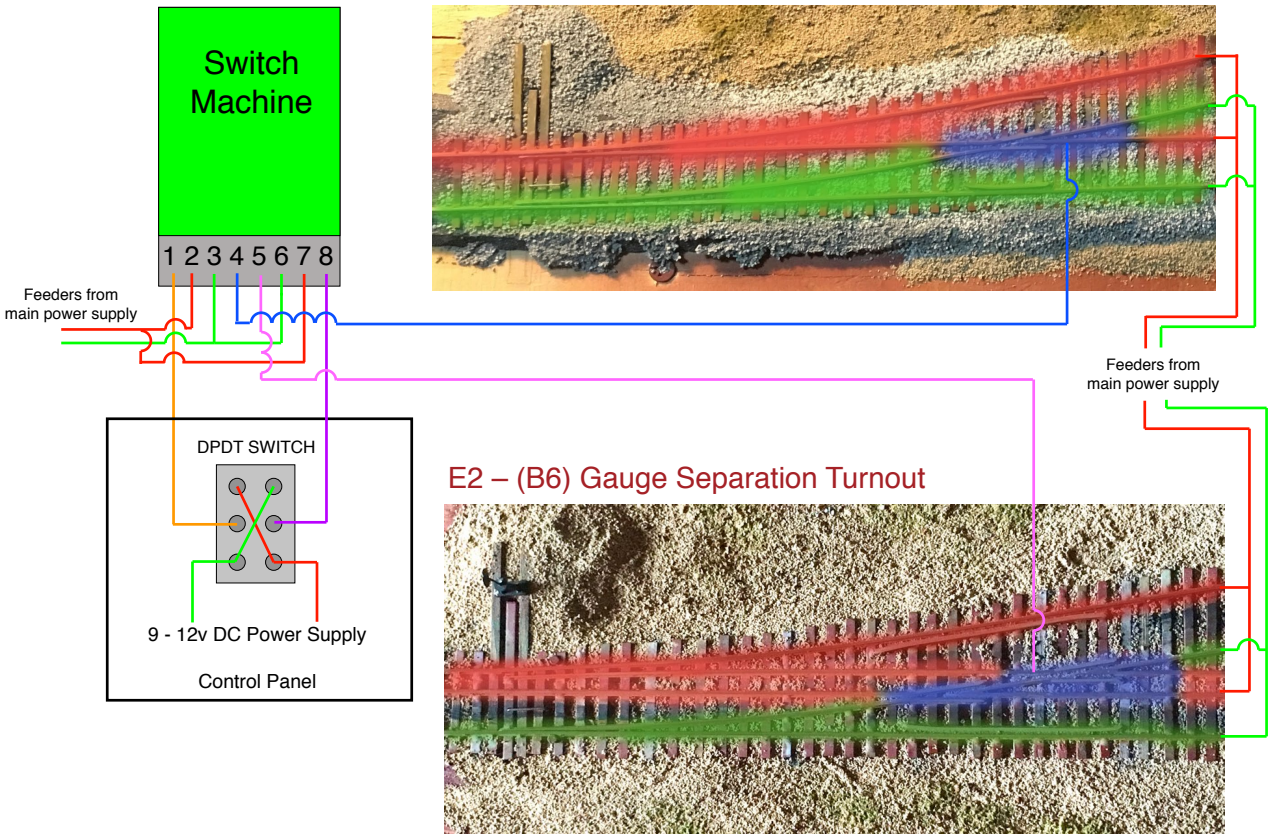

ON
OFF

Section E

Prepare schematic drawings identifying the wiring and components of the six items under (B) and (C).

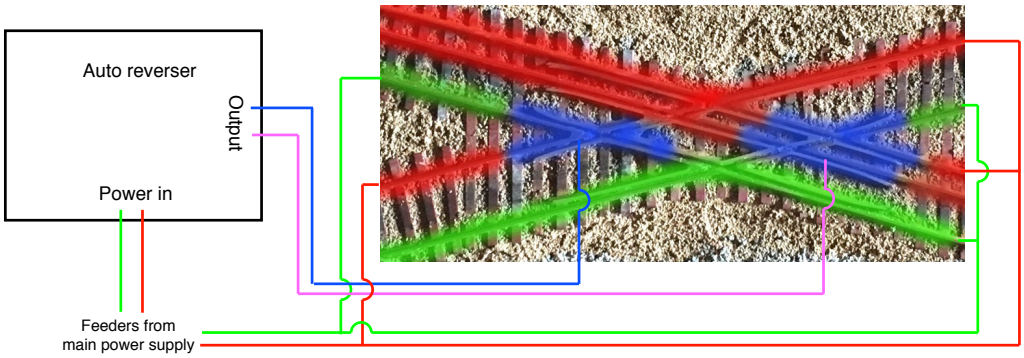
For the sake of clarity, these schematics should probably be separate from the propulsion circuitry schematic in (D) above. If you already have one over-all schematic of the layout, you might want to consider making multiple copies and going over the applicable lines with a highlighter for each feature.

E1 – (B1) Turnout



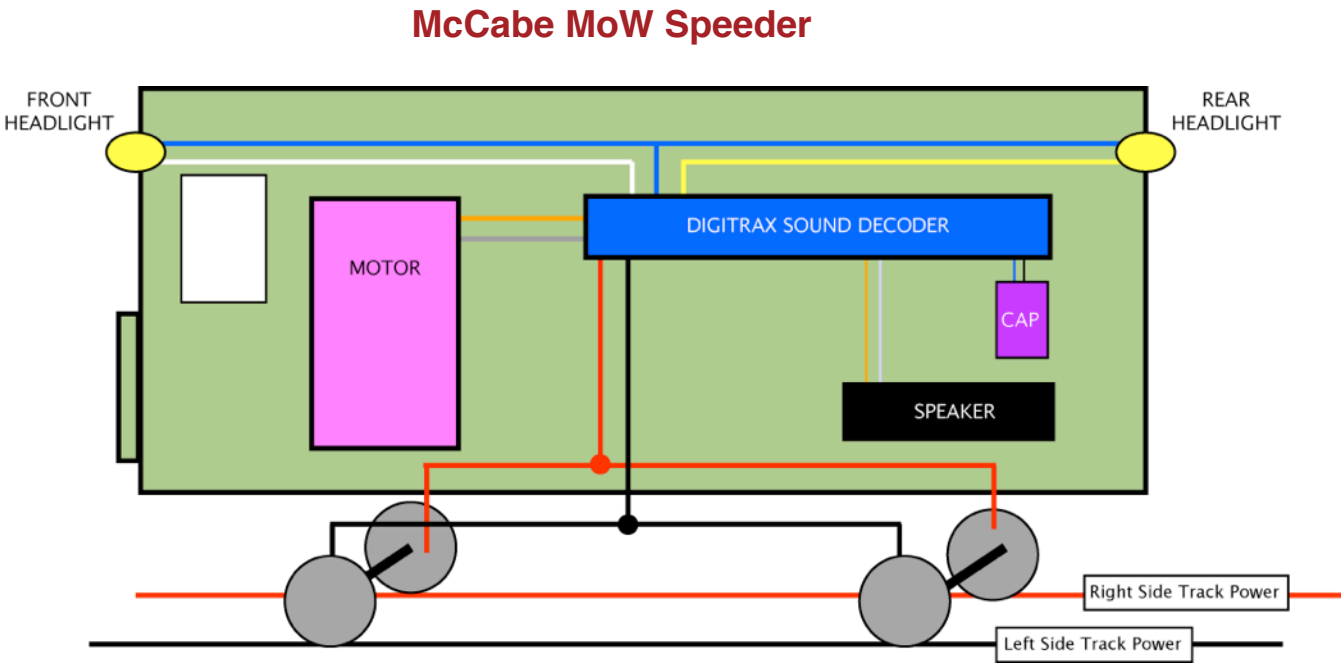
E2 – (B6) Gauge Separation Turnout

E3 – (B2) Crossing

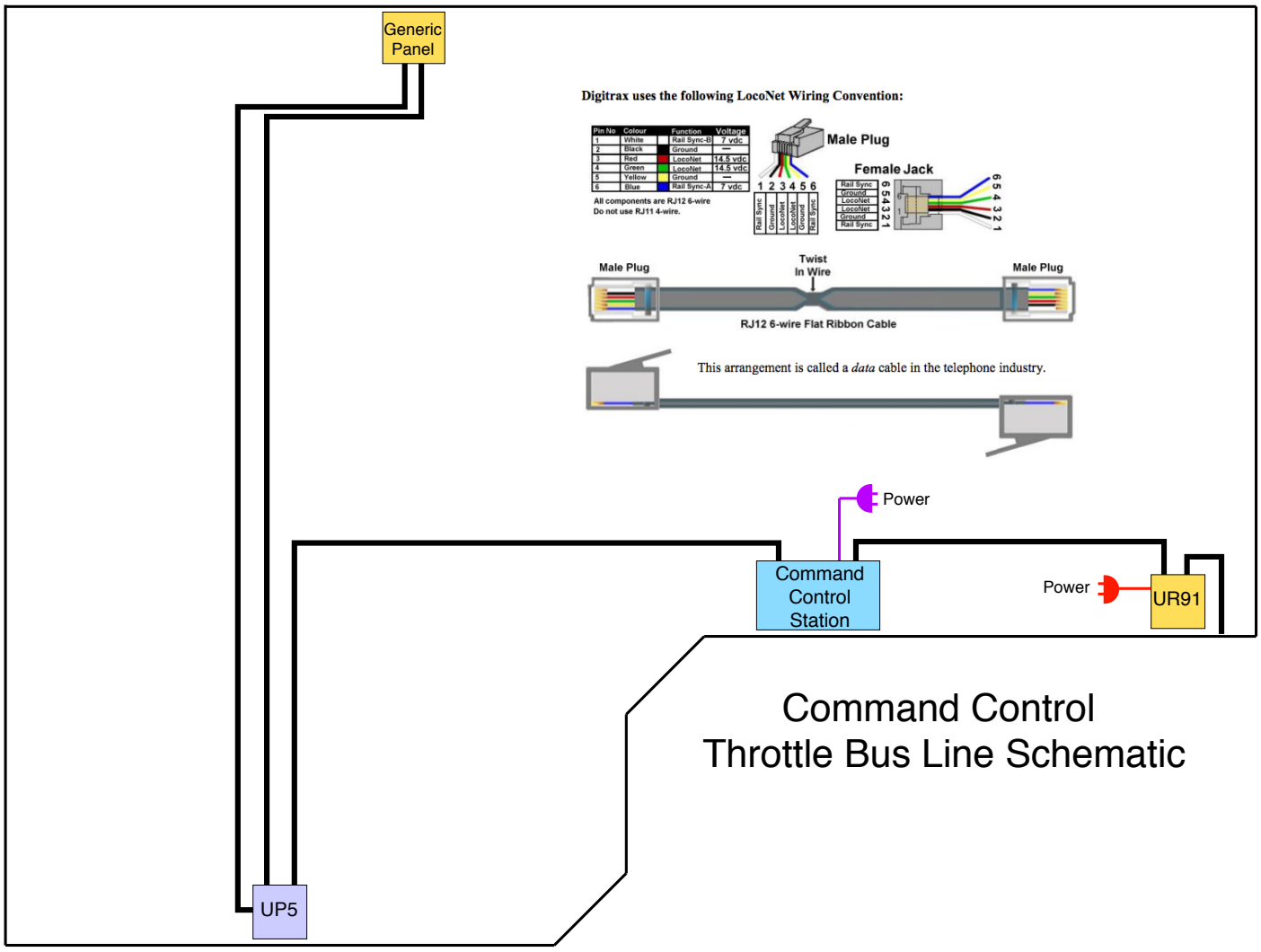


E4 – (C1) Computer control for the model railroad.

E5 – (C2) Installation of a command control receiver.



E6 – (C3) Command control throttle buss line



Section F

You must submit a Statement of Qualification (see below) which includes the following:

1. The track plan for the layout used in (A).
   See included track plan on page #7.
2. A description of each of the features used in (B) See page #3-4 and (C) See page #5-7, including:
   a. A description of the item.
   b. The methods of construction.
   c. Identification of commercial components used.
3. Schematic drawings as required in (D) See page #8-9 and (E) See page #10-12.
4. The signed Witness Certification form, showing that each of the above items are operational and meet all applicable NMRA standards.
   See attached signed SOQ.