

# What the Signal Team Does

The Goal of the Signal Team is to Wire the  
Signals, Test, and make them work.

# Signal Team

1. **Background**
2. **Read As Built Notes**
3. **Intermediate Signals**
4. **Install Enclosures**
5. **Signals & Push Buttons**
6. **Wyes**
7. **Sidings**
8. **Mainline Meet Tracks**
9. **Queuing Tracks**
10. **Witcombe**
11. **System Testing**
12. **Troubleshooting**

# 1. Background - Four Signal Configurations

- There are 4 Signal configurations on Bi-Directional Track
  - **Control Point or CP Boards** in 3 programming flavors
    - **1. Entry to Bi-Directional Track -- Queuing Tracks**
      - Limits group(s) of train(s) to 140' in length
    - **2. ReEntry -- Wyes & Sidings**
      - Requires a button to be pushed to tell the system when the train is ready to leave.
    - **3. Meet -- Mainline Meet Tracks**
  - **Absolute Block Signaling or ABS Boards** (hold the LEDs in Signal Head)
    - **4. Intermediate Signals**
      - Pairs facing opposite directions placed approximately every 600' along the track
    - ABS boards have 3 configurations
      - Master - used in one of the pair of intermediate signals
      - Slave - wired to the master, used in the other intermediate signal
      - Passive - wired to CP Board for its signal heads

# 1. Background - Wiring Conventions

- Cat3 or Cat 5e Wire

Pin	Pair	Wire	Color
1	3	1	 white/green
2	3	2	 green
3	2	1	 white/orange
4	1	2	 blue
5	1	1	 white/blue
6	2	2	 orange
7	4	1	 white/brown
8	4	2	 brown

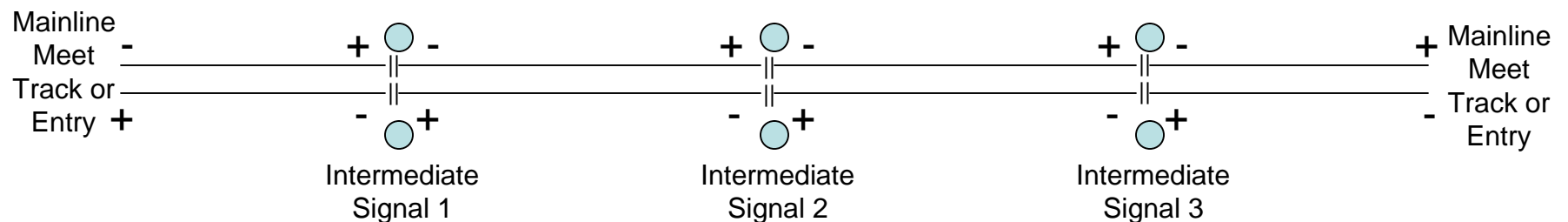
**W/G**  
**G**  
**W/O**  
**B**  
**W/B**  
**O**  
**W/N**  
**N**

**B = Blue**  
**G = Green**  
**Y = Yellow**  
**O = Orange**  
**R = Red**  
**N = brown**  
**K = black**  
**W = White**  
**Purple=Purple**  
**Pink=Pink**  
**Gray=Gray**  
**/=With**

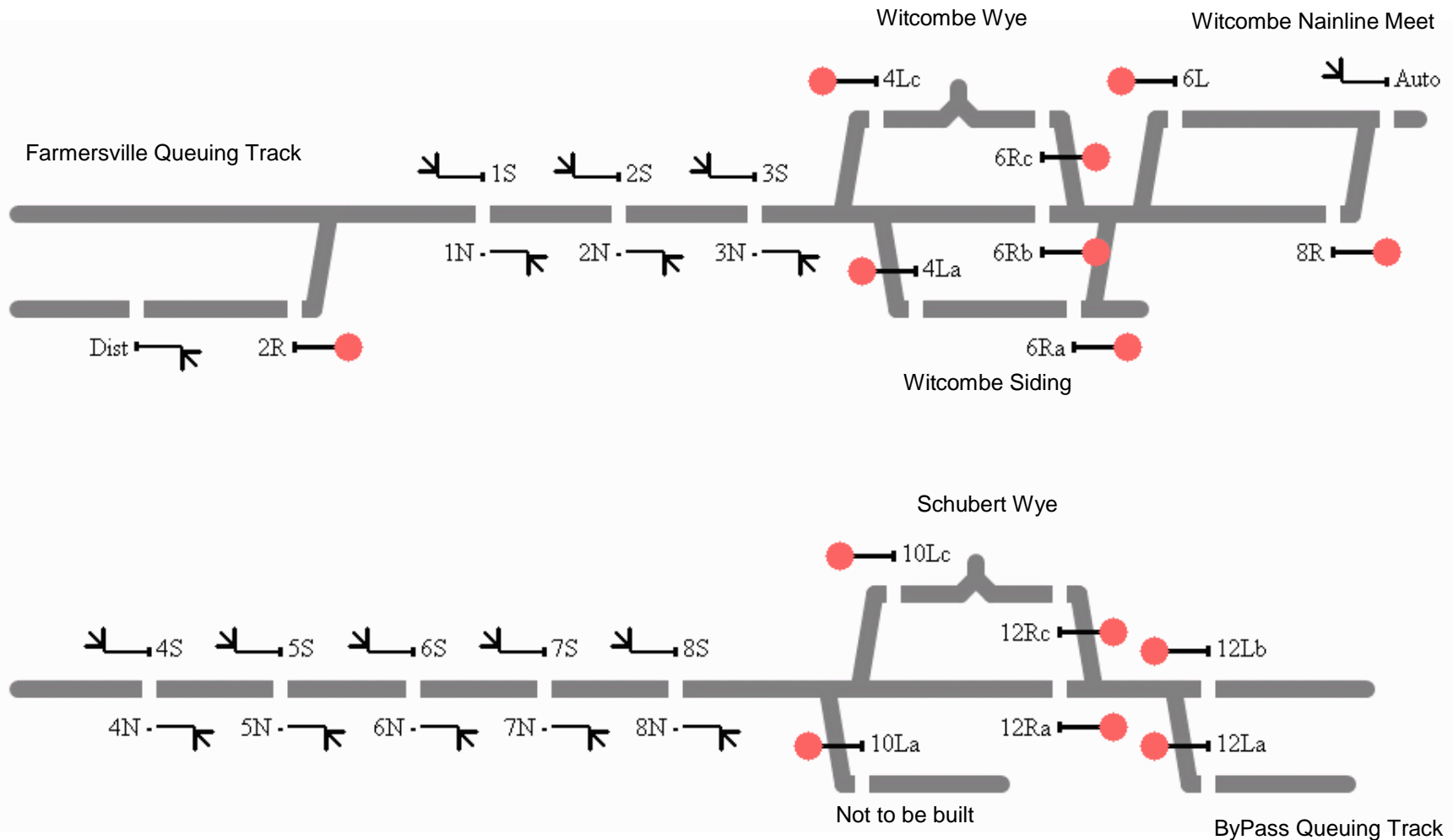
- Cat5 Cable
  - Blue = Signals
  - Black = Push Buttons & 2<sup>nd</sup> Signals
  - Other Color = Track
- Wire from Solar Panel & Battery
  - Black = Negative
  - Red = Positive
- Track Wiring 18 Gauge Stranded Wire
  - 18 GA from track box to the Track
  - 18 GA Wire Nutted to a Cat5 in Signal Heads or in 2x4 Connection Boxes
  - 18 GA Crimp ring for Screw to Track
  - Use Non Fade Colors Outside :
    - R = Red, G = Green, B = Blue

# 1. Background - Track Polarity

- As you stand looking at a signal, the right hand rail leading away from the signal is positive.
- Coded track circuit interface sends positive polarity pulses, receives negative polarity pulses (because the polarity is different at other end)
- Think of the two rails as a loop. The current always flows counter-clockwise, no matter which end is transmitting.
- When the left side is transmitting, the bottom rail is positive and top rail is negative. The right ABS detects current flowing upward only using a diode.
- When right side is transmitting, the top rail is positive and the bottom rail is negative. The left ABS detects current flowing downward only.
- The reason for opposite polarity is so that an ABS won't detect its own outgoing pulse.



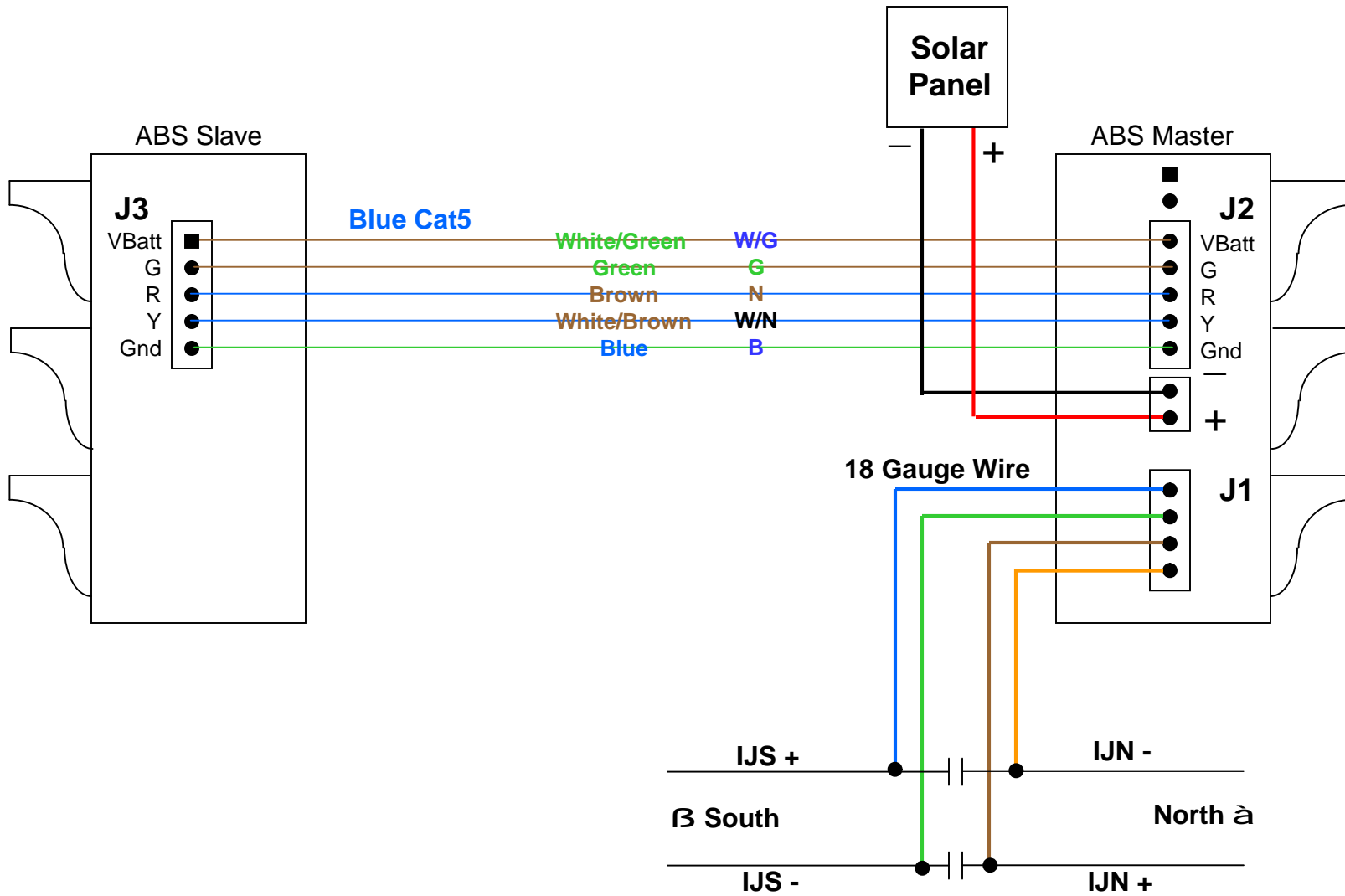
# 1. Background - Signal Names - Farmersville to ByPass



## 2. Read As Built Notes

- Read the As Built Notes to understand where the conduit goes and any unusual things. As built notes available in the Track shop and on the internet at [www.FriendsTM.org](http://www.FriendsTM.org)

# 3. Intermediate Signals



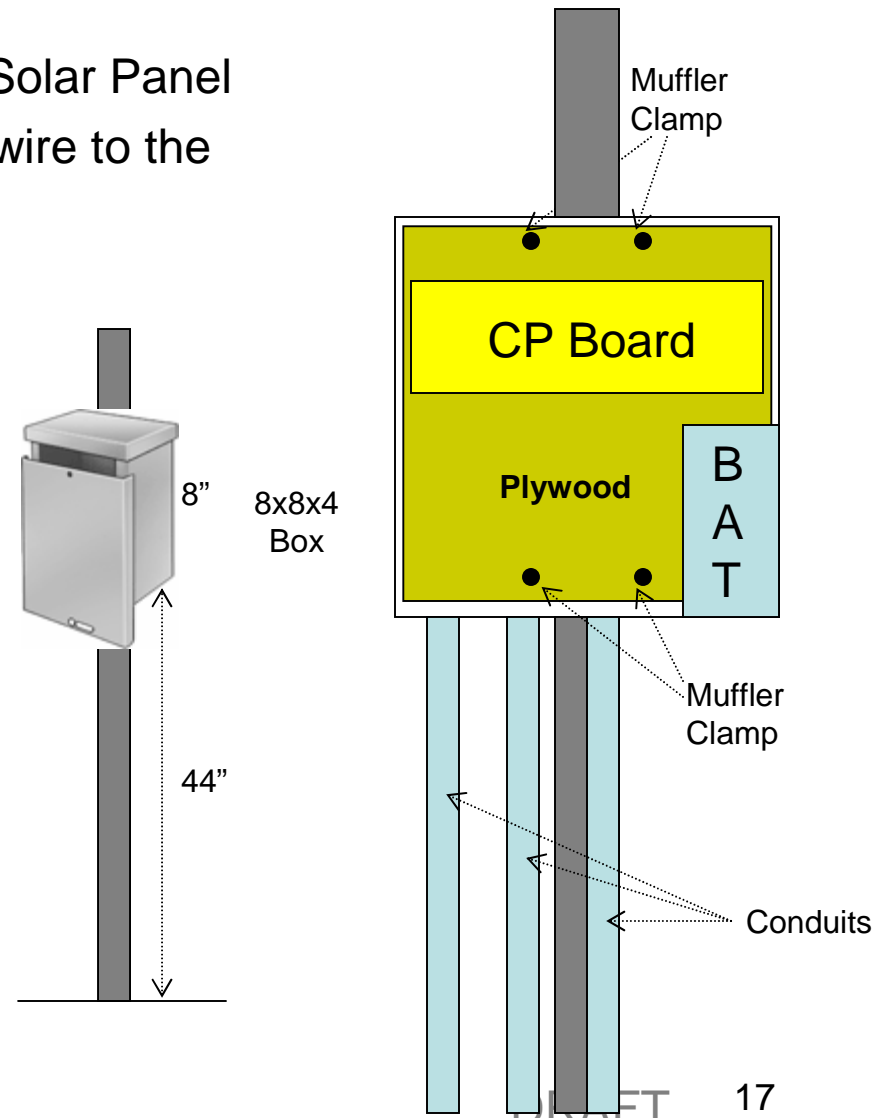


### 3. Intermediate Signals - Testing

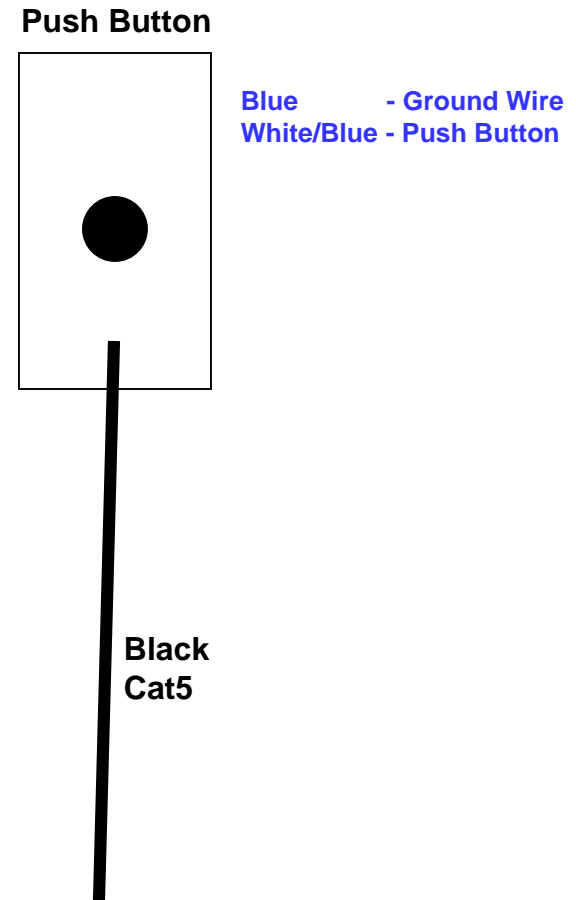
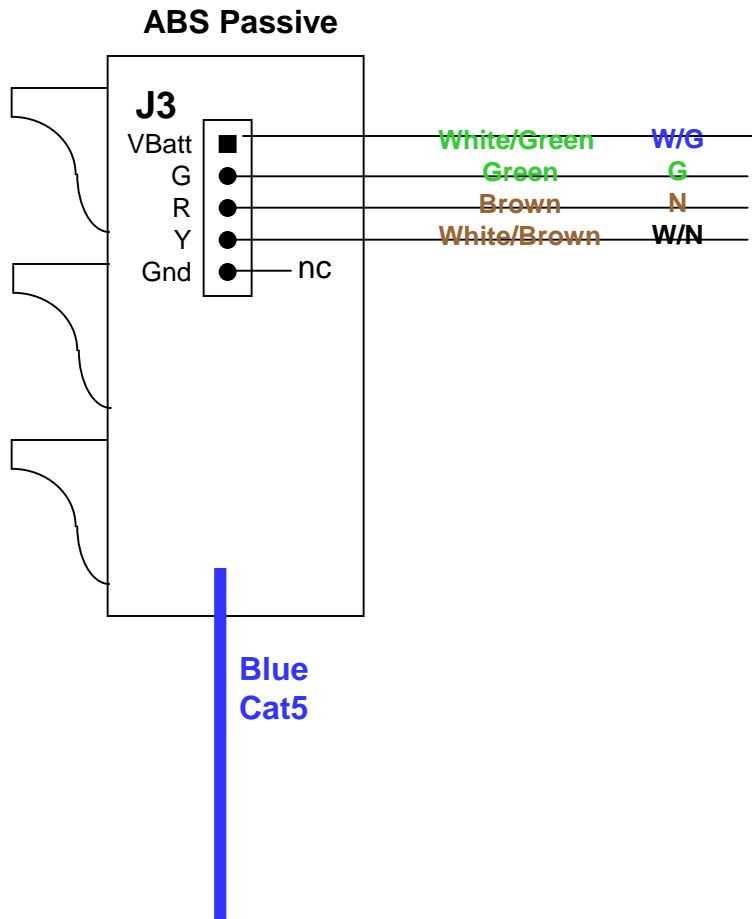
- How do we test Intermediate Signals ?
- 3.5 Volts between Screws

# 4. Install Enclosures

- Install Solar Panel
  - Post can Serve as conduit for Wire to Solar Panel
  - If Remote Solar Panel, Run 18 gauge wire to the Enclosure.
- Install CP Board
  - CP Board mounts with 1 screw
  - 2 small nails keep it from twisting
  - Newer boards allow 2 screws
- Battery Rests in Bottom of Box



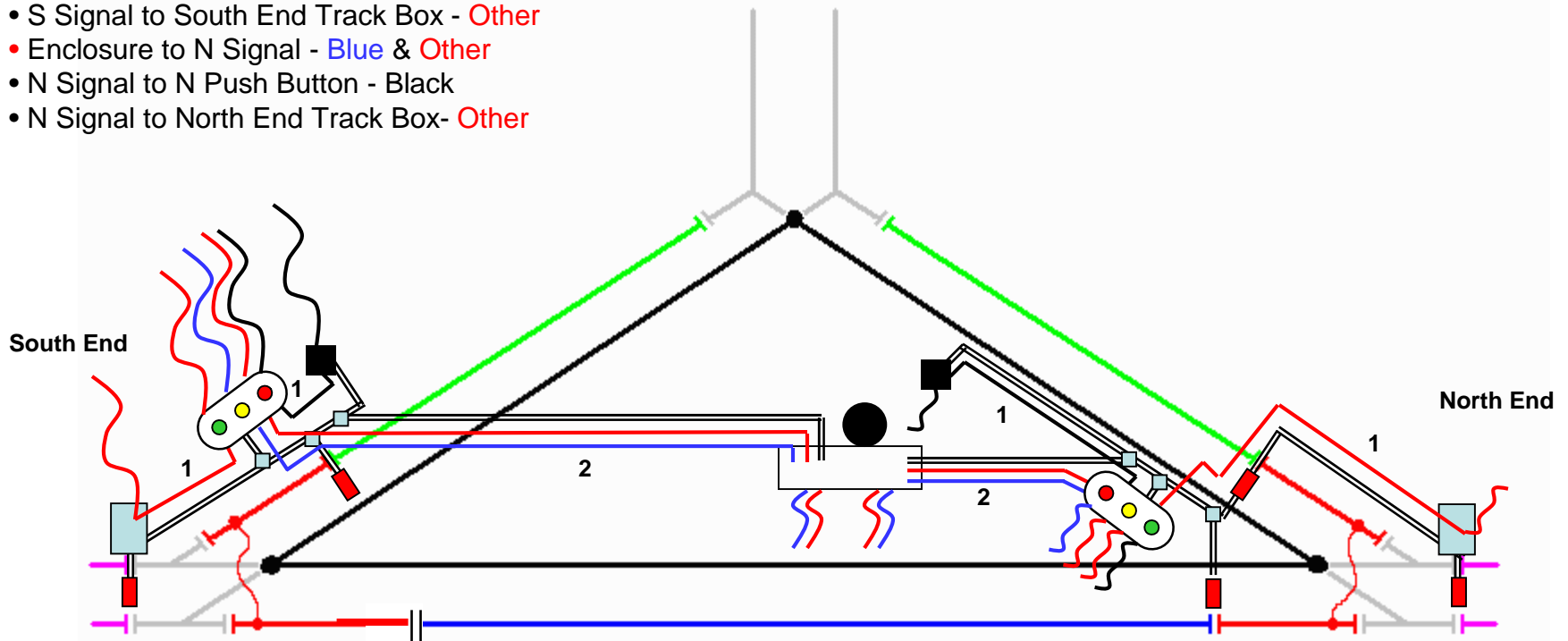
# 5. Signals & Push Buttons



# 6. Wyes - Pulled Wire & Conduit

## Cat 5 Pulls

- Enclosure to S Signal - Blue & Other
- S Signal to S Push Button - Black
- S Signal to South End Track Box - Other
- Enclosure to N Signal - Blue & Other
- N Signal to N Push Button - Black
- N Signal to North End Track Box - Other



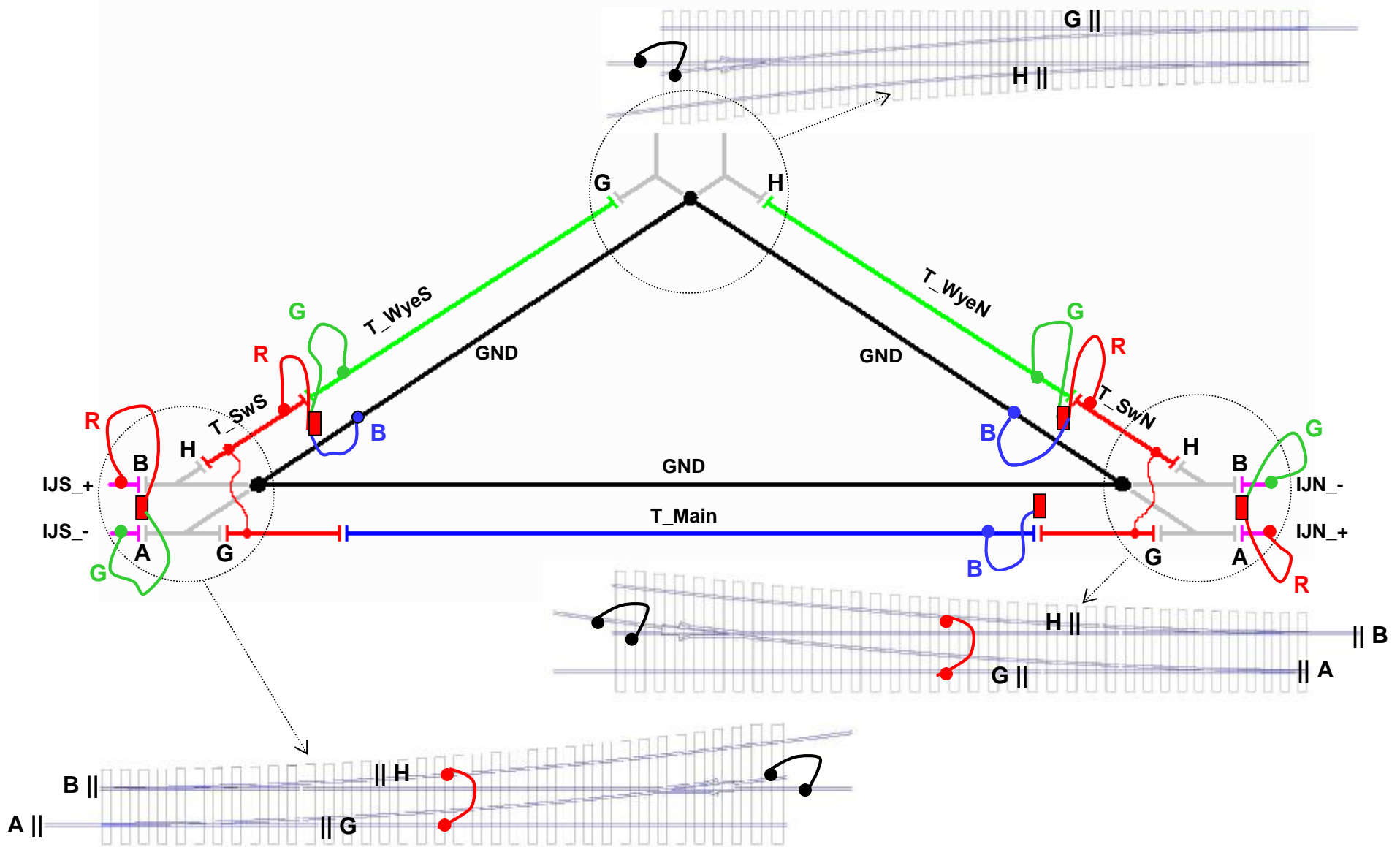
- = Push Button
- = 2x4 Connection Box
- = Type T Box
- = Type C or LB Box to let wires out between the Rails

- Blue Cat5 Wire
- Black Cat5 Wire
- Other color Cat5  
(usually Yellow, White, or Grey)

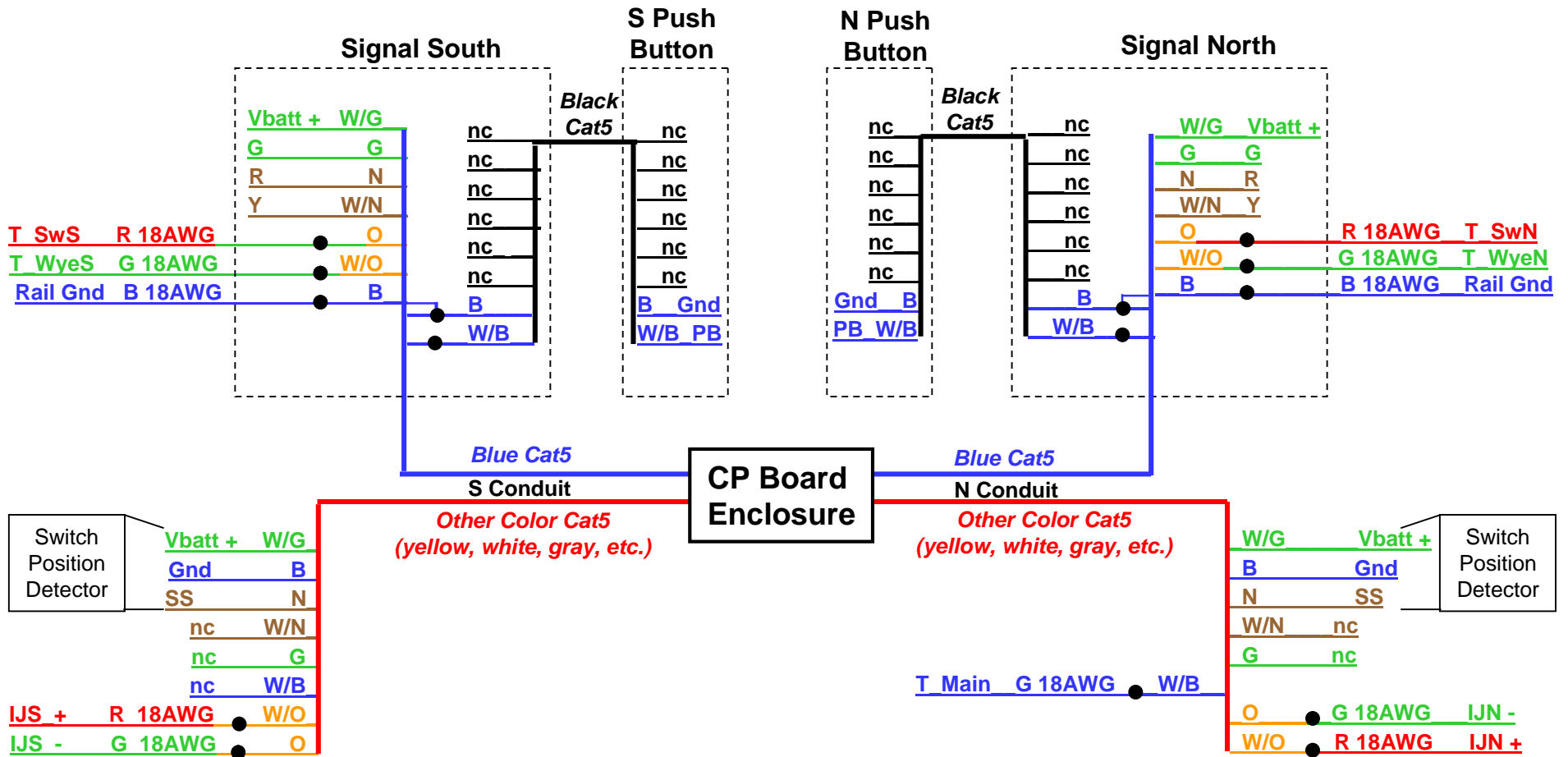
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DRAFT 19

# 6. Wyes - Bonding & Track Connections

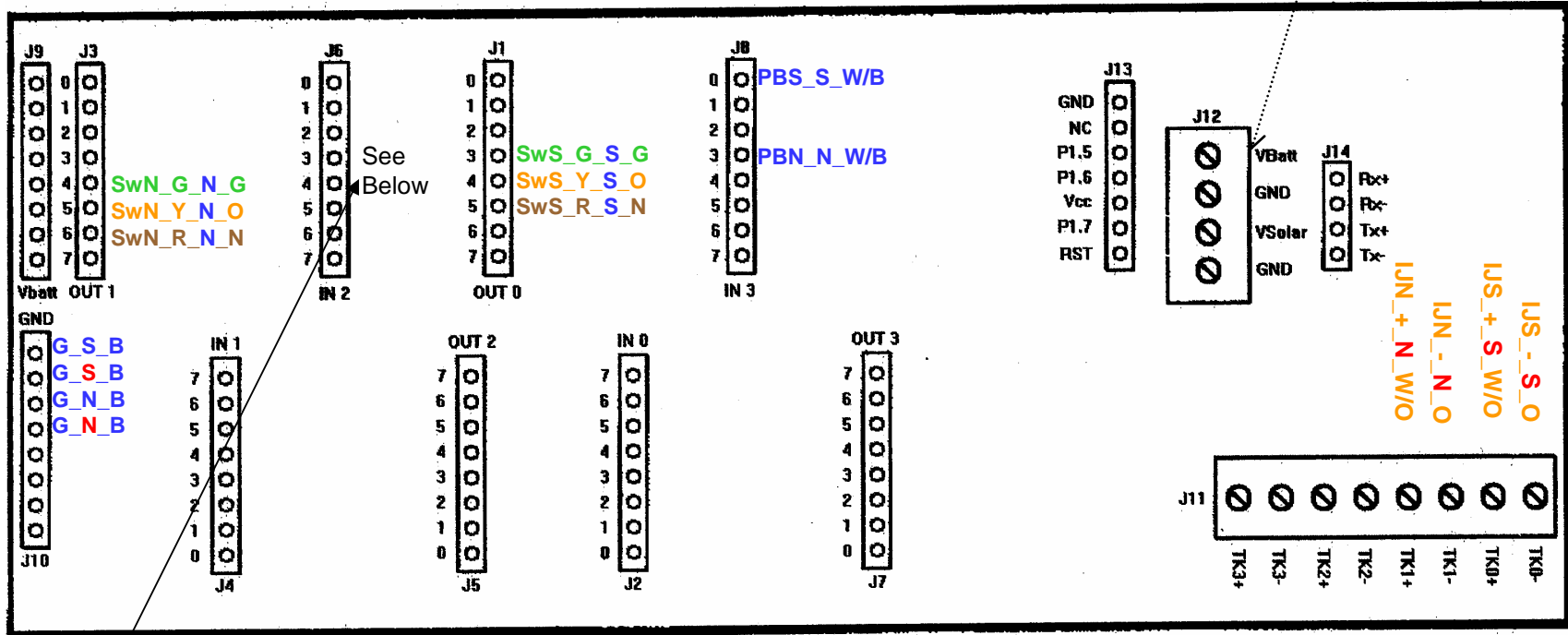


# 6. Wyes - Cabling Diagram

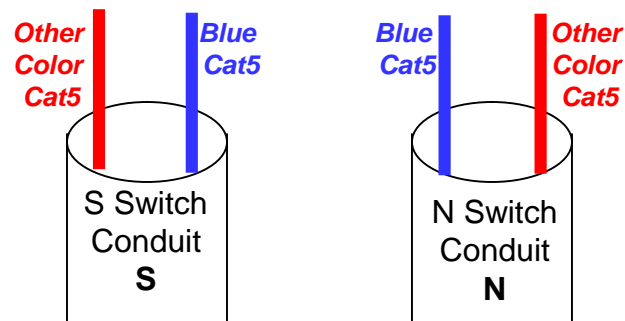


# 6. Wyes - Connect CP Board

Vbatt + S\_W/B  
 Vbatt + N\_W/B  
 Vbatt + S\_W/G  
 Vbatt + N\_W/G



Is This Wired Right ??



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## 6. Wyes - Testing

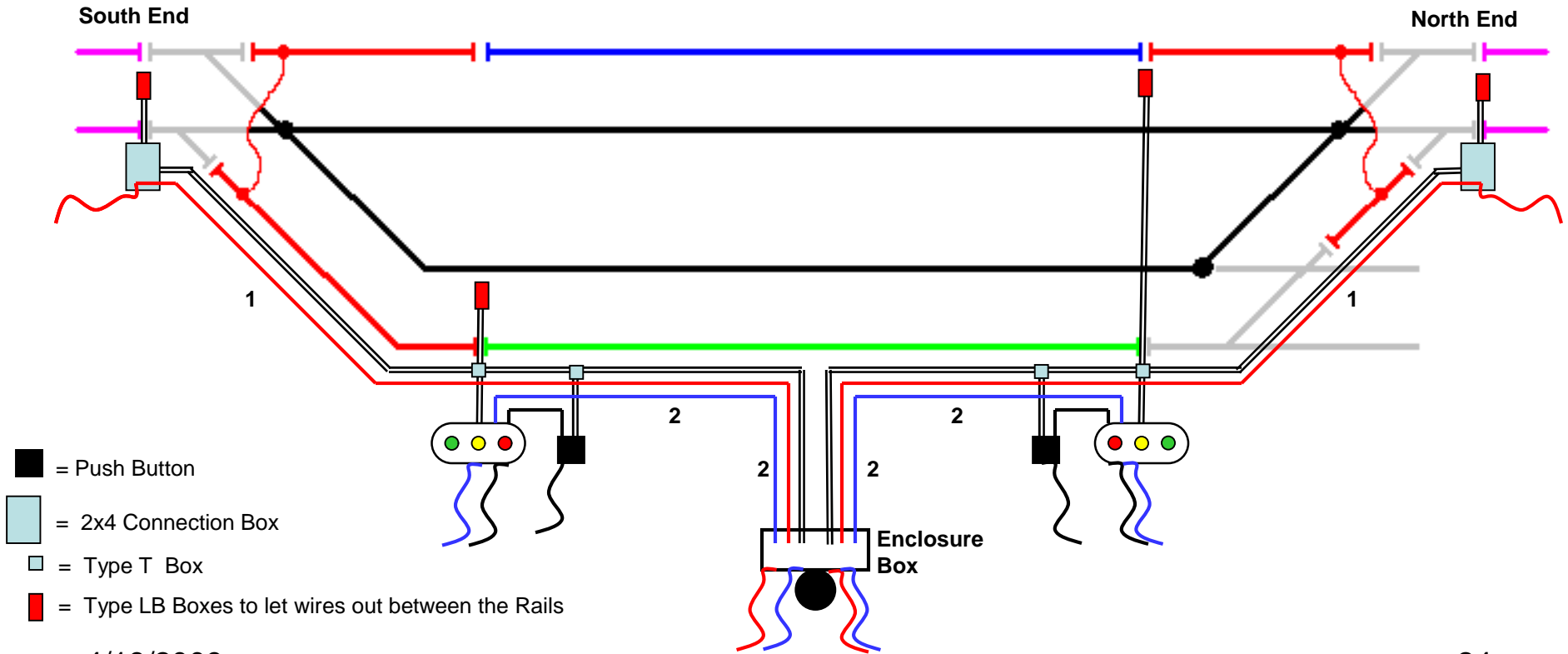


# 7. Sidings - Pulled Wire

## Cat 5 Pulls

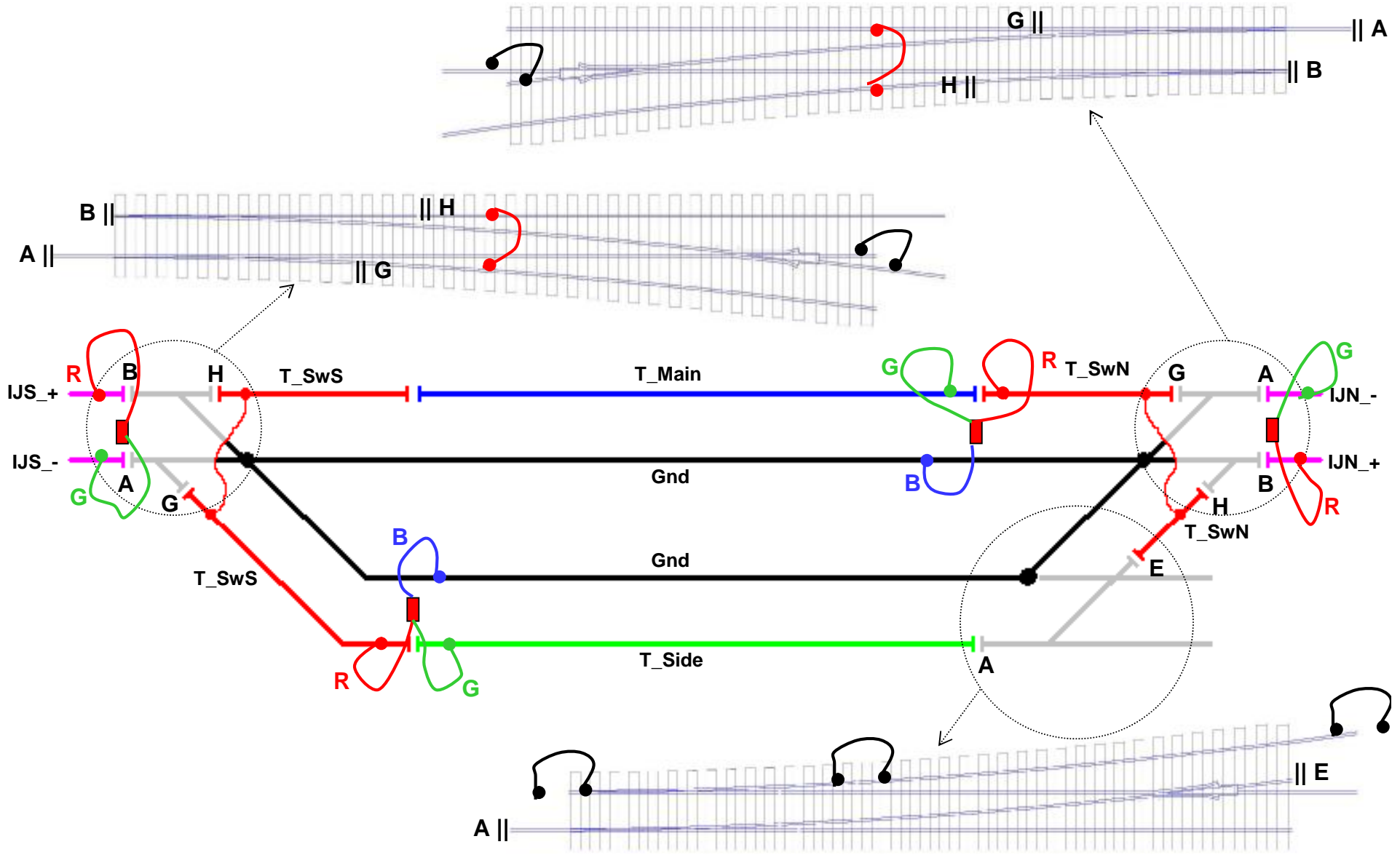
- Enclosure to S Signal - Blue & Other
- S Signal to S Push Button - Black
- S Signal to South End Track Box - Other
- Enclosure to Signal - Blue & Other
- N Signal to N Push Button - Black
- N Signal to North End Track Box - Other

- Blue Cat5 Wire
- Black Cat5 Wire
- Other color Cat5 (usually Yellow, White, or Grey)

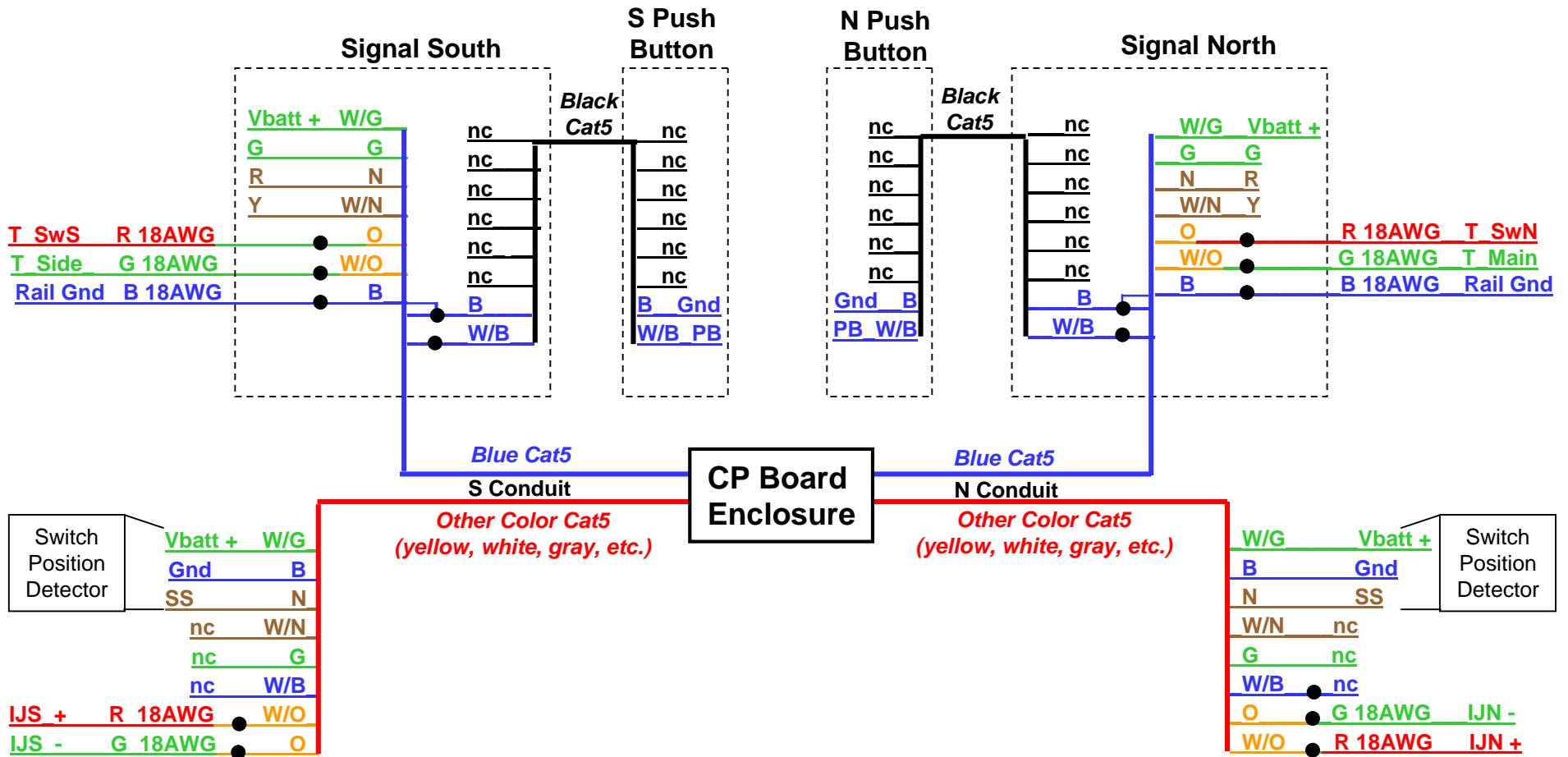


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# 7. Sidings - Bonding & Track Connections

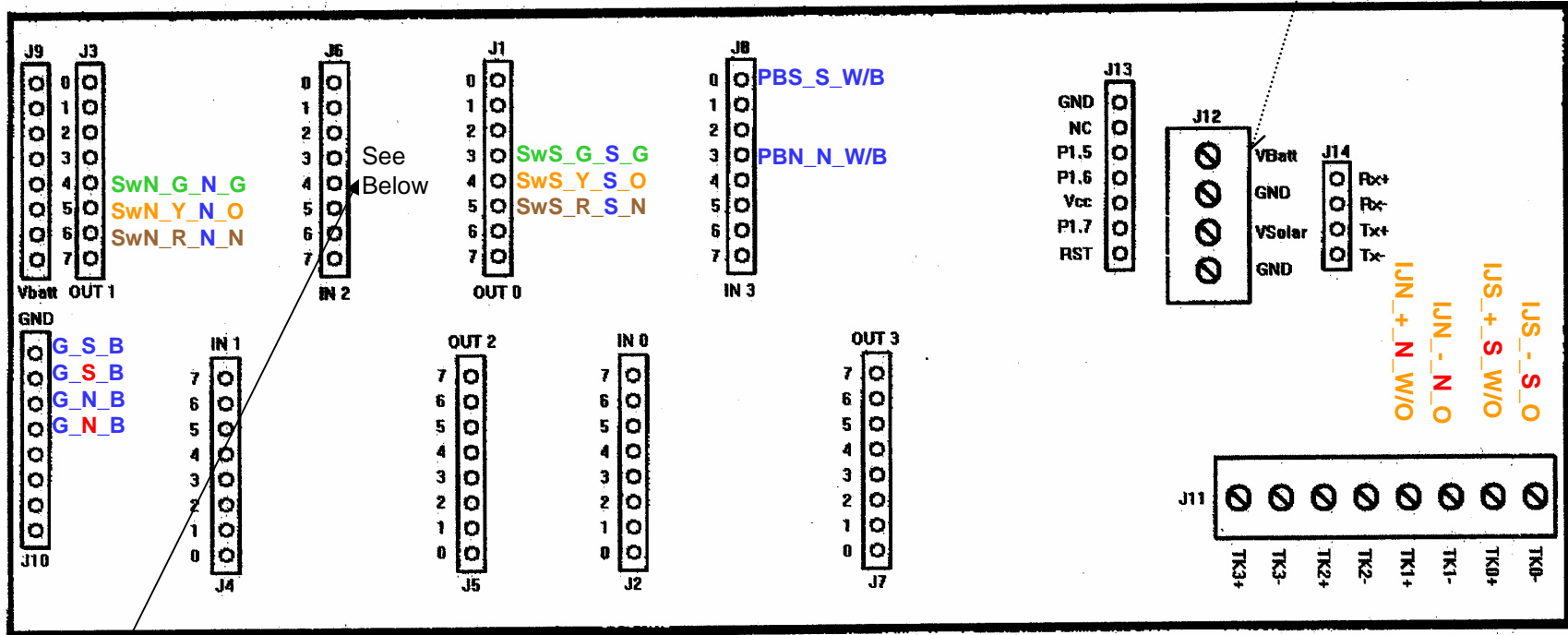


# 7. Sidings - Cabling Diagram

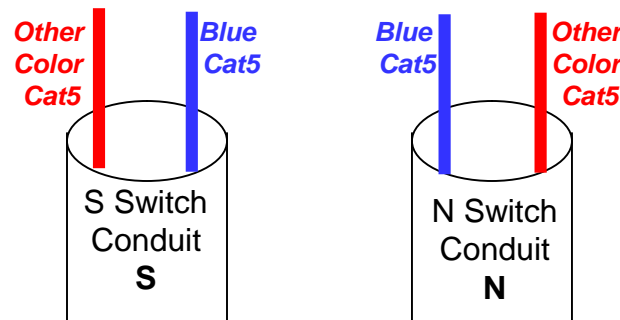


# 7. Sidings - Connect CP Board

Vbatt + S\_W/B  
 Vbatt + N\_W/B  
 Vbatt + S\_W/G  
 Vbatt + N\_W/G



Is This Wired Right ??



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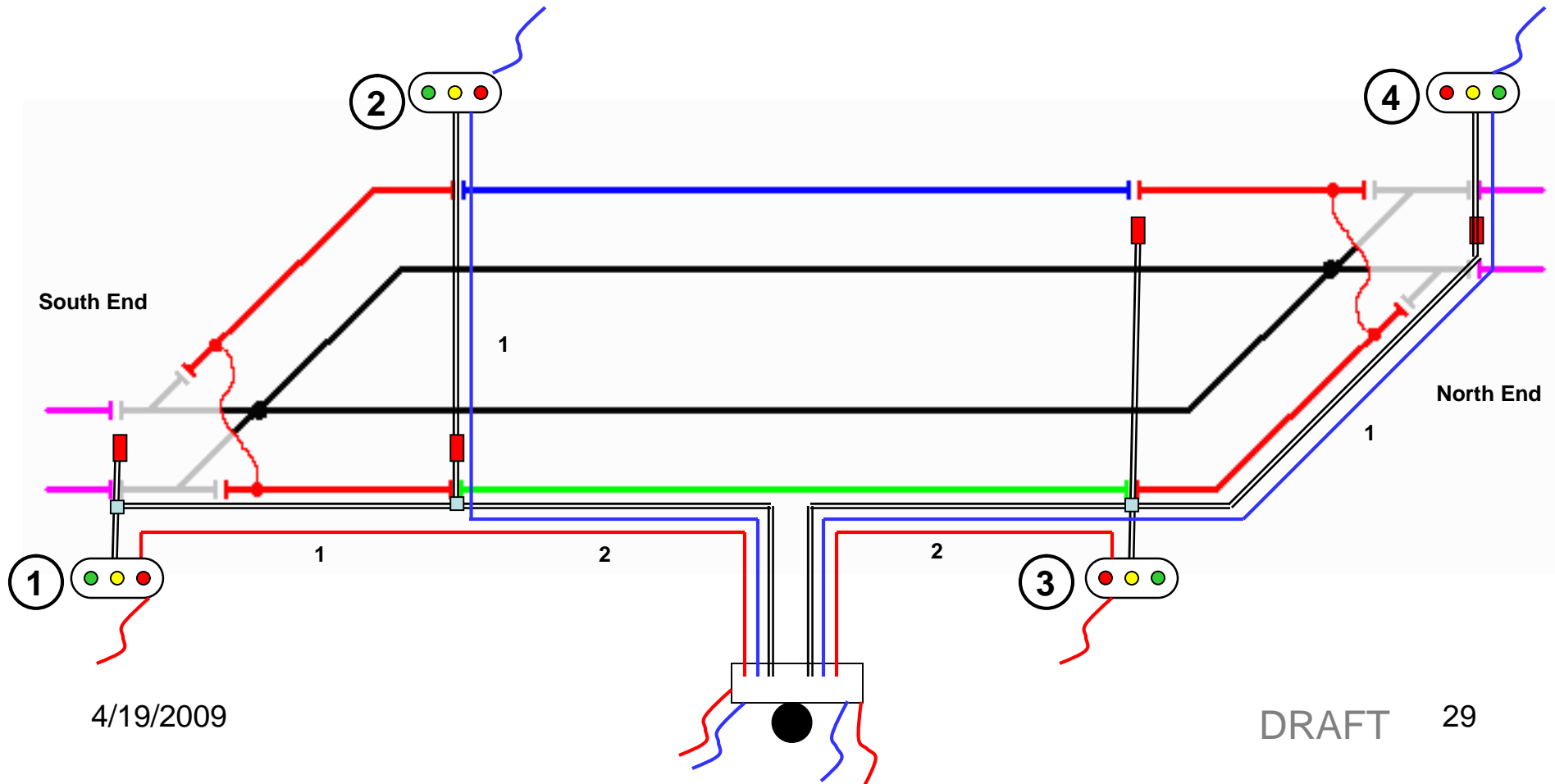
# 7. Sidings - Testing

# 8. Mainline Meet Track - Pulled Wire

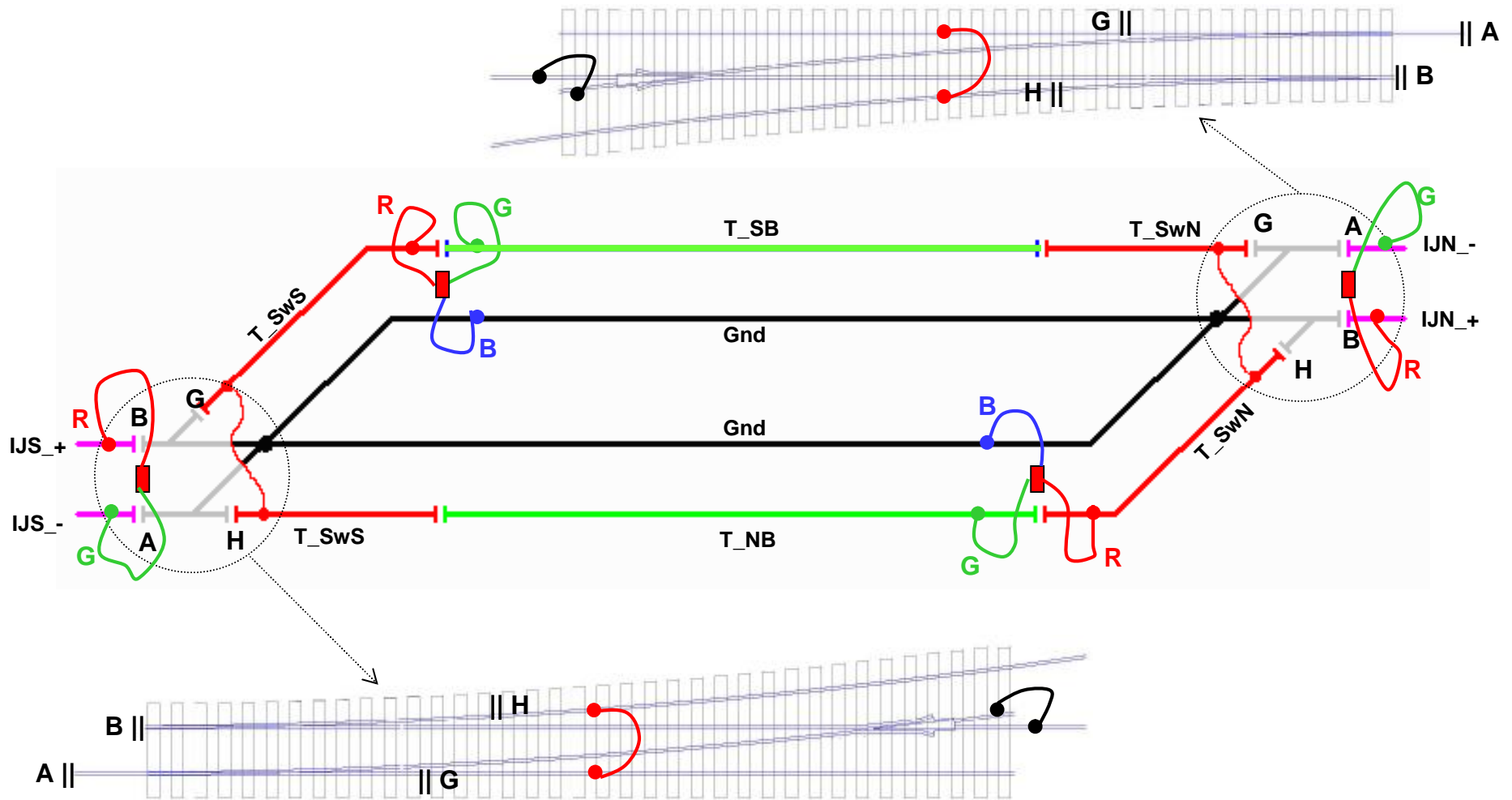
## Cat5 Pulls

- Enclosure to Signal 1 - Other
- Enclosure to Signal 2 - Blue
- Enclosure to Signal 3 - Other
- Enclosure to Signal 4 - Blue

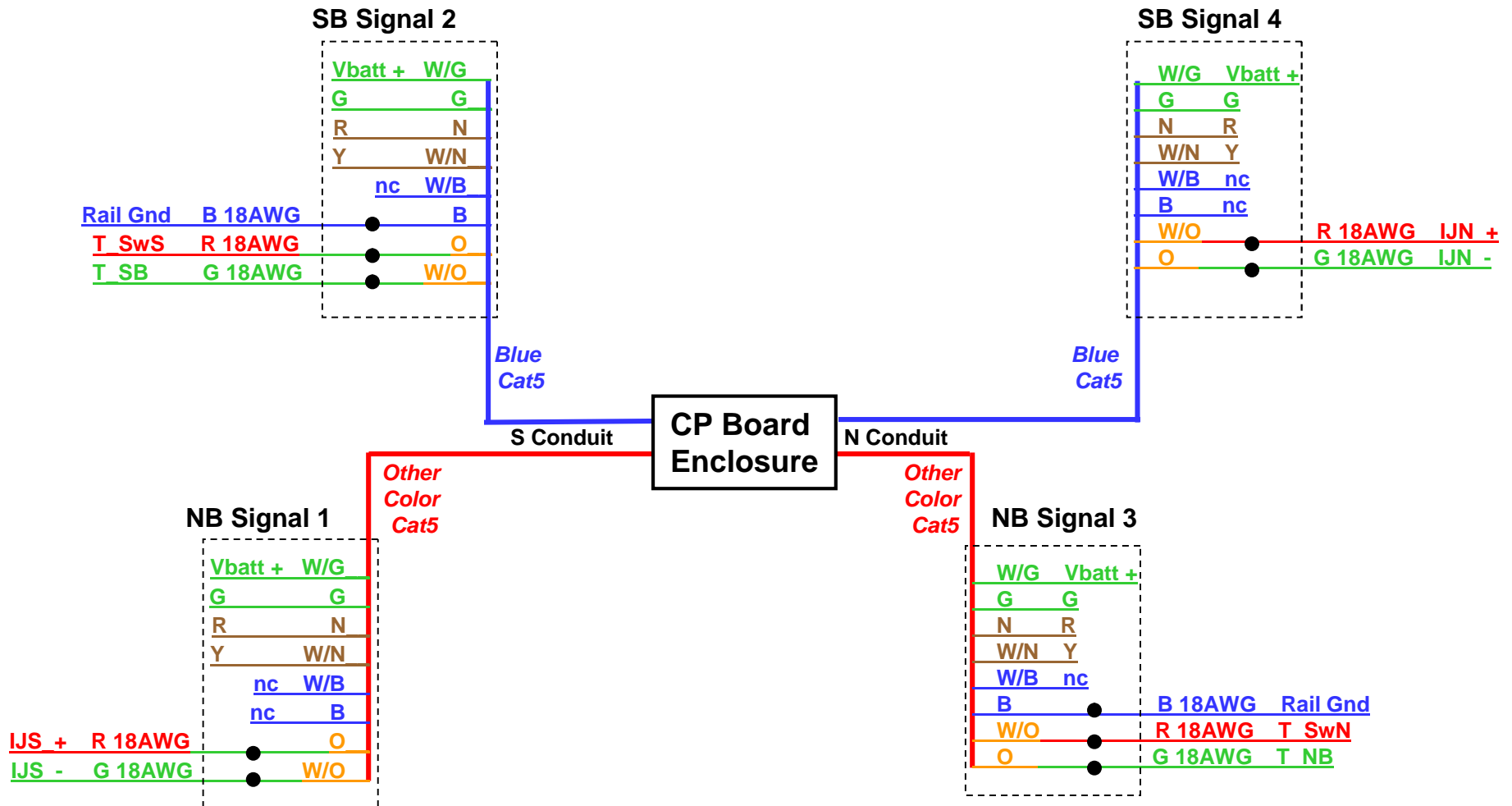
- Blue Cat5 Wire
- Black Cat5 Wire
- Other color Cat5  
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# 8. Mainline Meet Track - Bonding & Track Connections



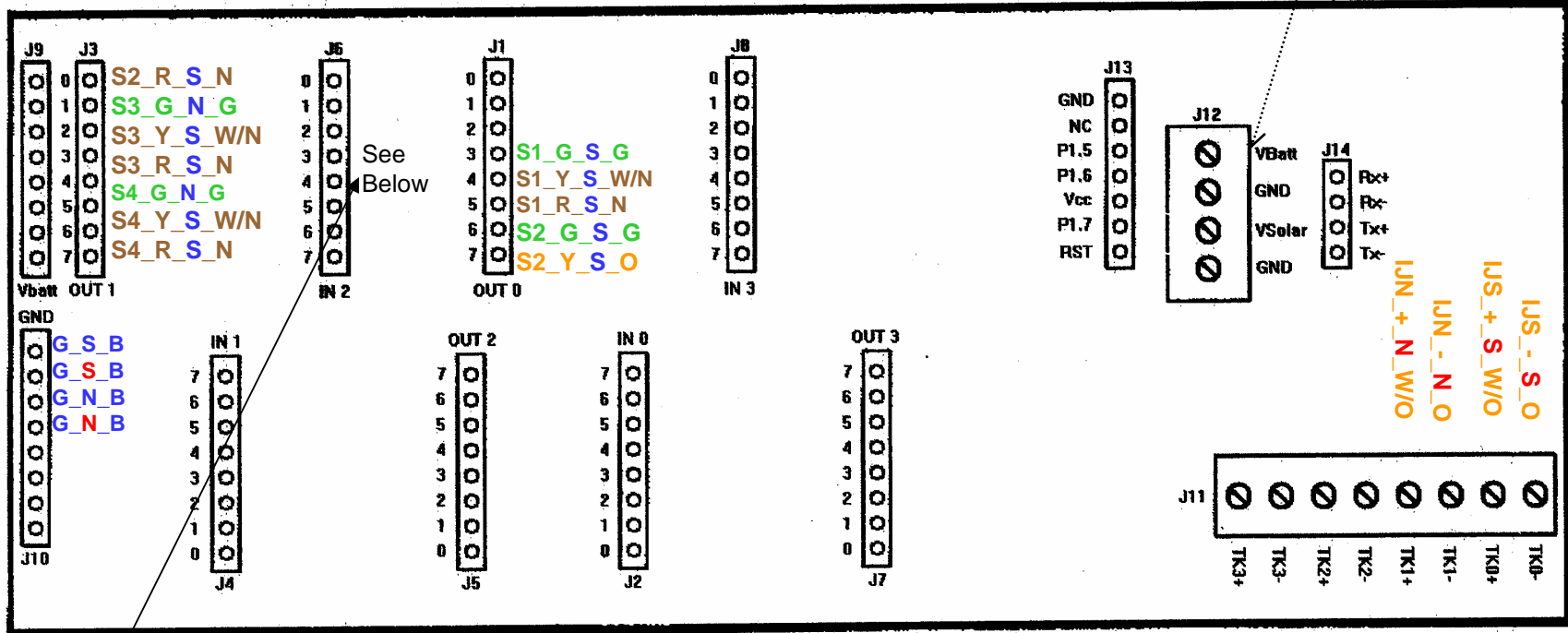
# 8. Mainline Meet Track - Cabling Diagram



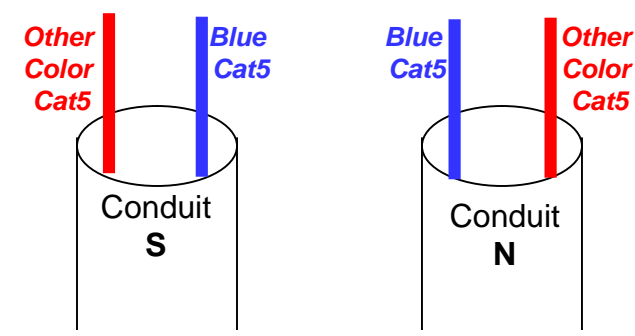
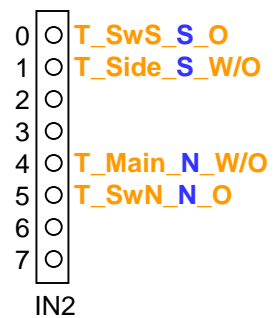


# 8. MMT - Connect CP Board

Vbatt + S\_W/G  
 Vbatt + N\_W/G  
 Vbatt + S\_W/G  
 Vbatt + N\_W/G



Is This Wired Right ??



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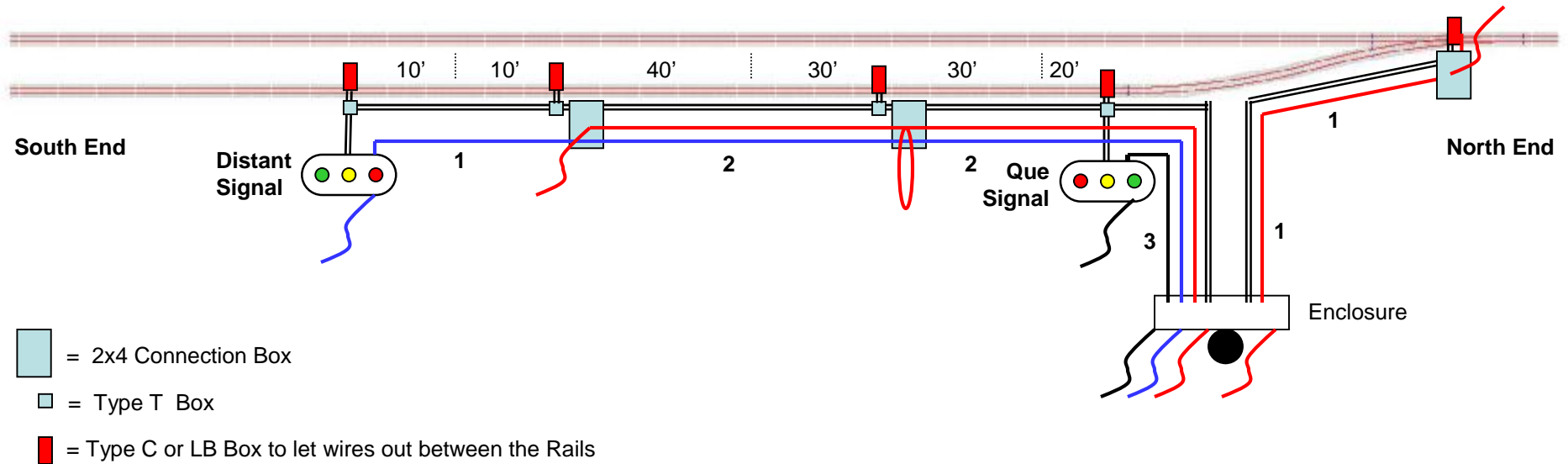
## 8. Mainline Meet Track - Testing

# 9. Queuing Track - Pulled Wire

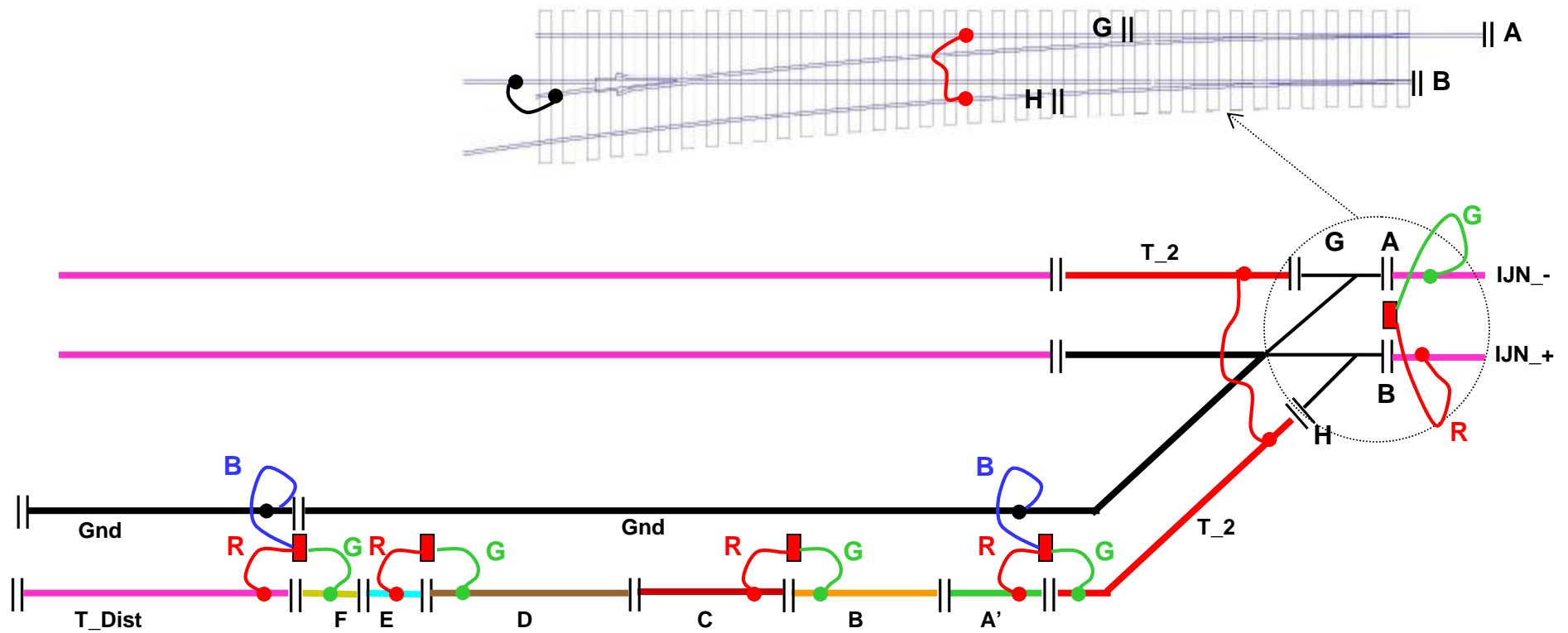
## Cat5 Pulls

- Enclosure to Signal 2 - Black
- Enclosure to N Track Box - Other
- Enclosure to S Signal 1 - Blue & Other
- 6" Loops of wire in 2 Track Connection Boxes

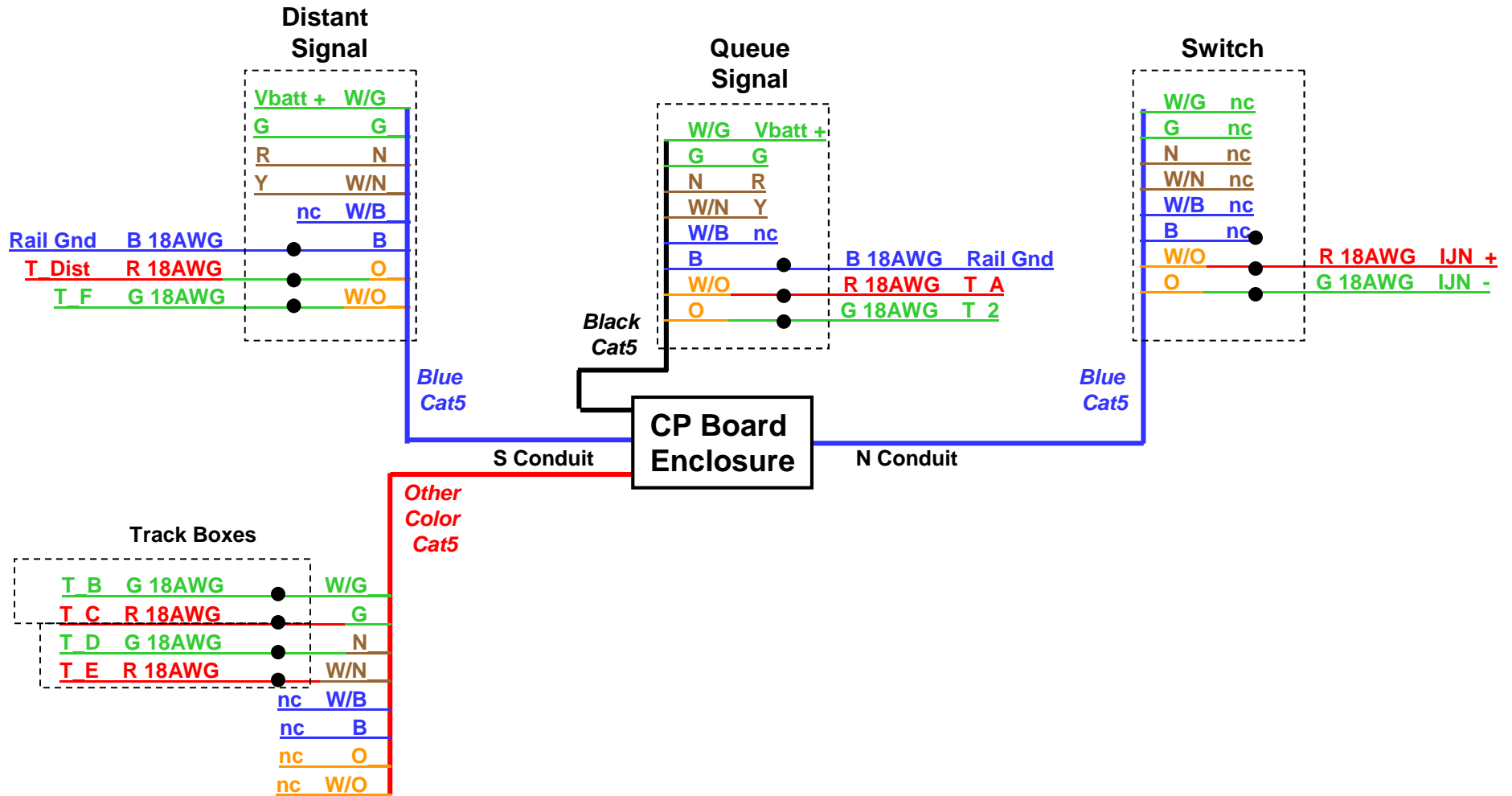
- Blue Cat5 Wire
- Black Cat5 Wire
- Other color Cat5  
(usually Yellow, White, or Grey)



# 9. Queuing Track - Bonding & Track Connections

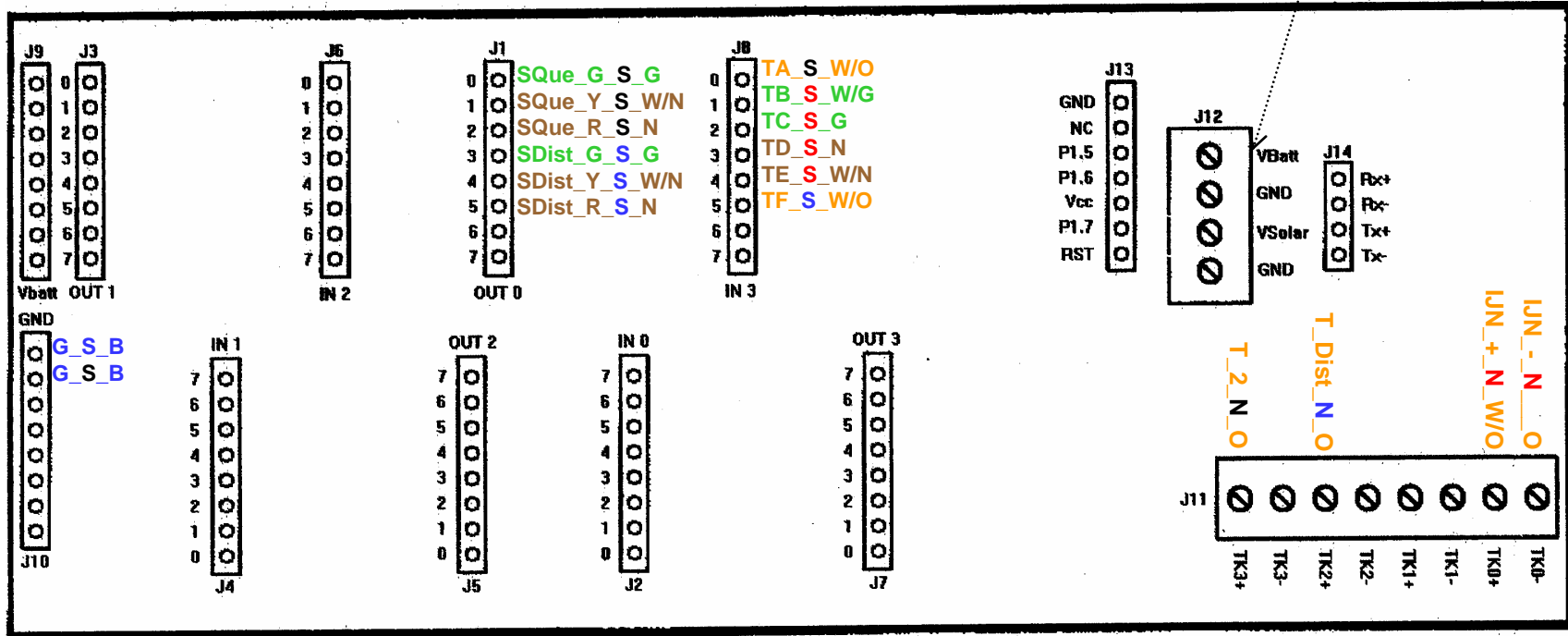


# 9. Queuing Track - Cabling Diagram

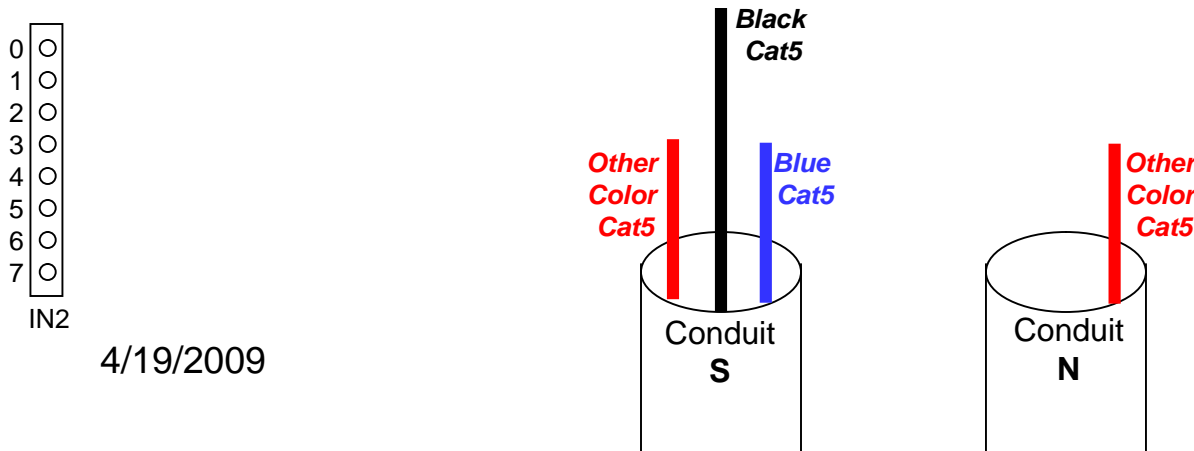


# 9. Queuing Track - Connect CP Board

Vbatt + S\_W/G  
Vbatt + S\_W/G



Is This Wired Right ??



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# 9. Queuing Track - Testing

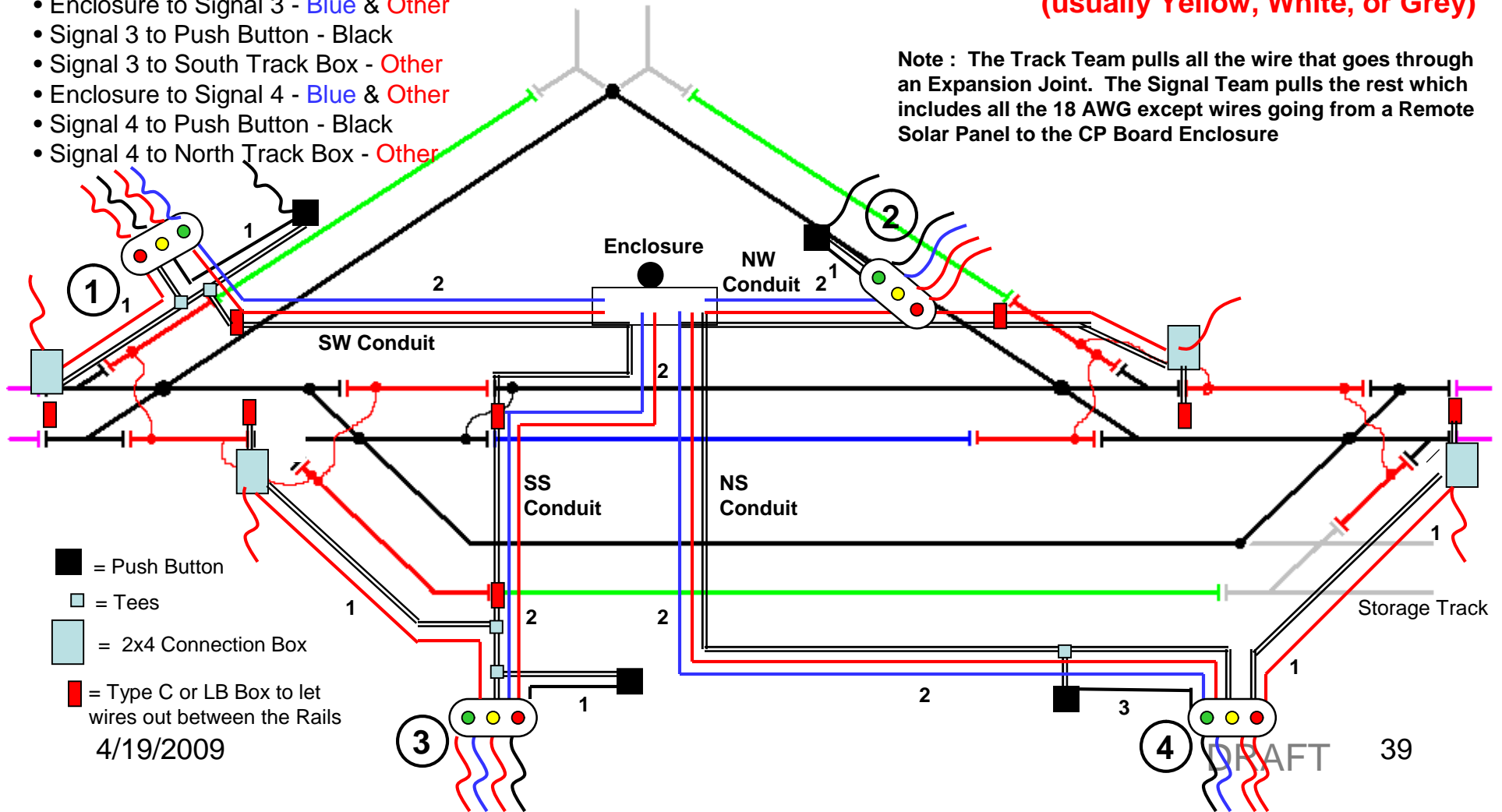
# 10. Witcombe - Pulled Wire

## Cat5 Pulls

- Enclosure to Signal 1 - Blue & Other
- Signal 1 to Push Button - Black
- Signal 1 to South Track Box - Other
- Enclosure to Signal 2 - Blue & Other
- Signal 2 to Push Button - Black
- Signal 2 to North Track Box - Other
- Enclosure to Signal 3 - Blue & Other
- Signal 3 to Push Button - Black
- Signal 3 to South Track Box - Other
- Enclosure to Signal 4 - Blue & Other
- Signal 4 to Push Button - Black
- Signal 4 to North Track Box - Other

— Blue Cat5 Wire  
— Black Cat5 Wire  
— Other color Cat5  
 (usually Yellow, White, or Grey)

Note : The Track Team pulls all the wire that goes through an Expansion Joint. The Signal Team pulls the rest which includes all the 18 AWG except wires going from a Remote Solar Panel to the CP Board Enclosure



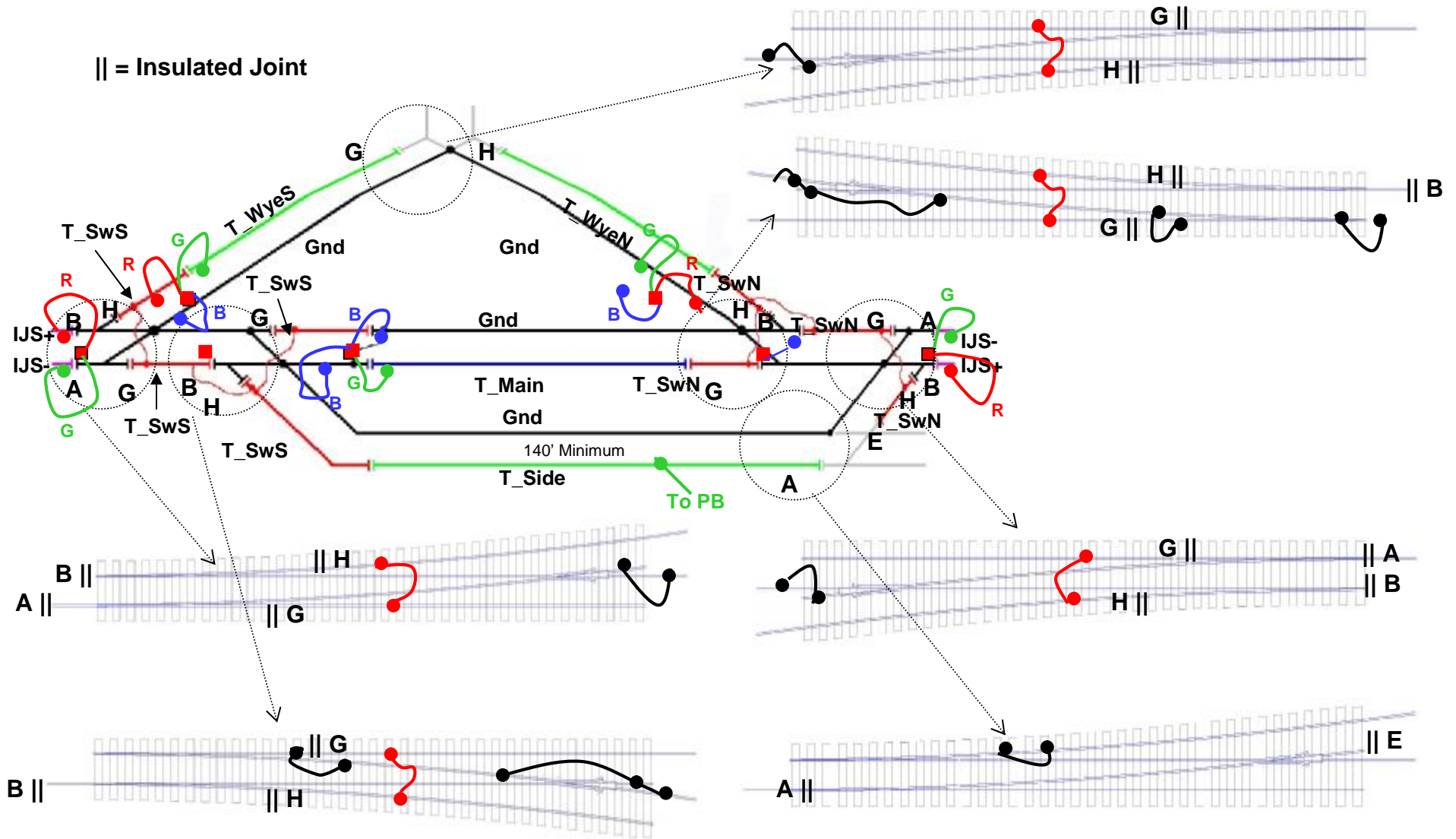
- = Push Button
- = Tees
- ▭ = 2x4 Connection Box
- ▭ = Type C or LB Box to let wires out between the Rails

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# 10. Witcombe - Bonding & Track Connections

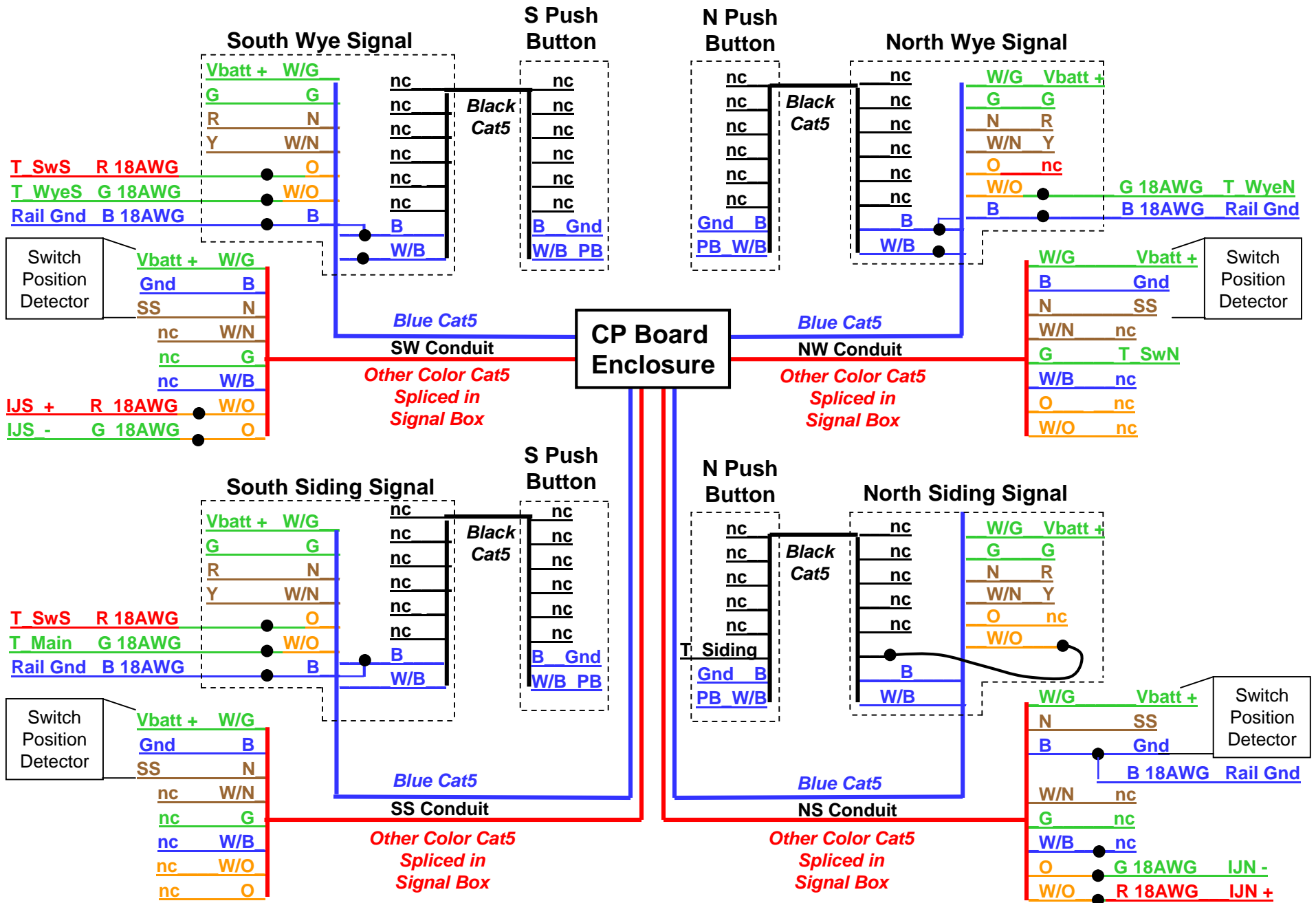


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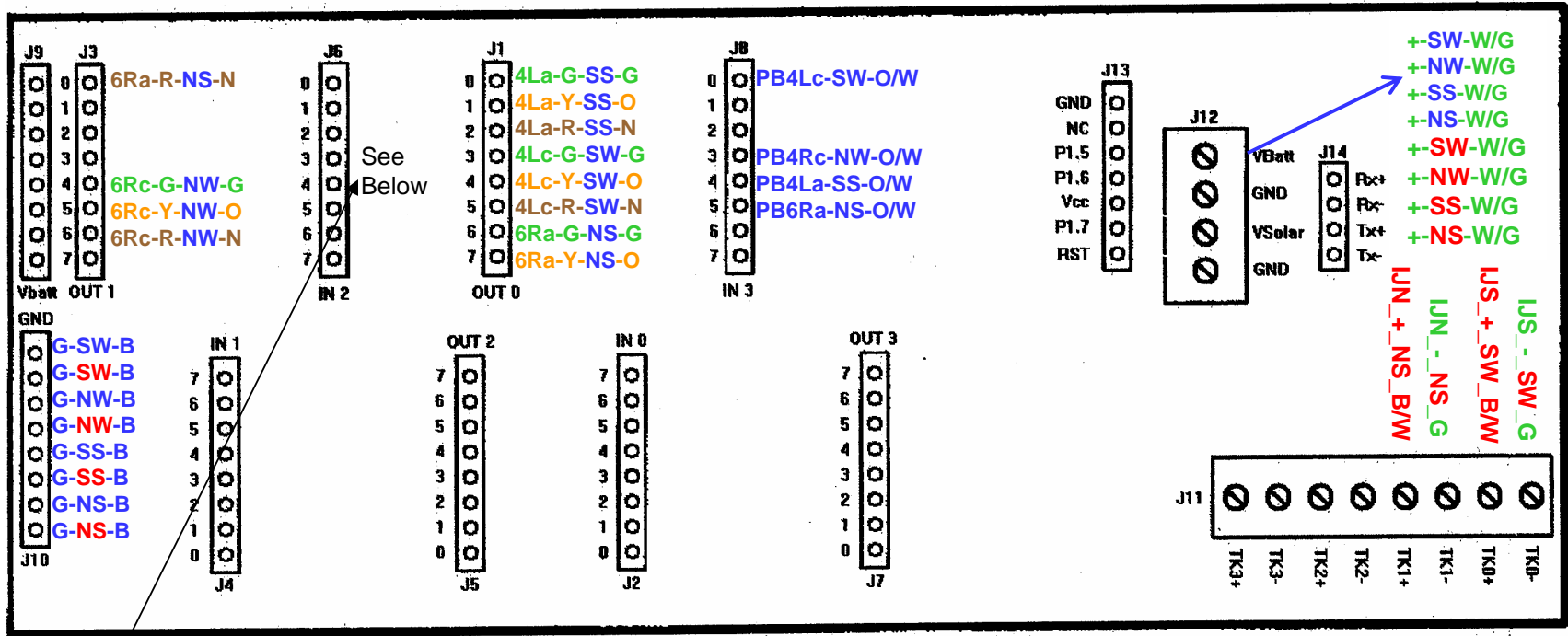
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40

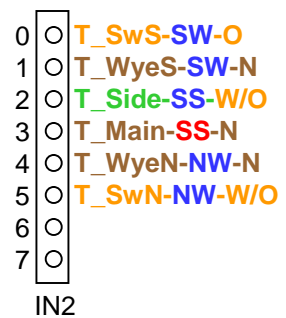
# 10. Witcombe - Cabling Diagram



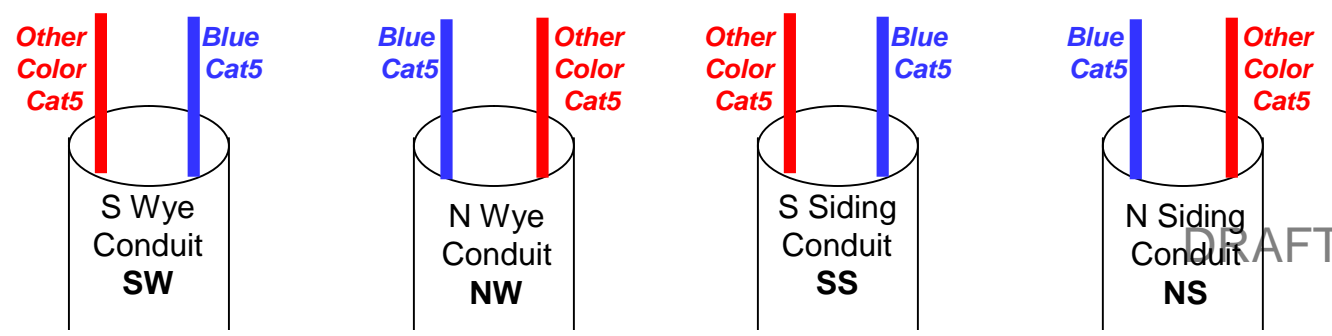
# 19. Witcombe - Connect CP Board



Is this right ?? Where does Switch Pos Sensor go ??



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# 10. Witcombe - Testing