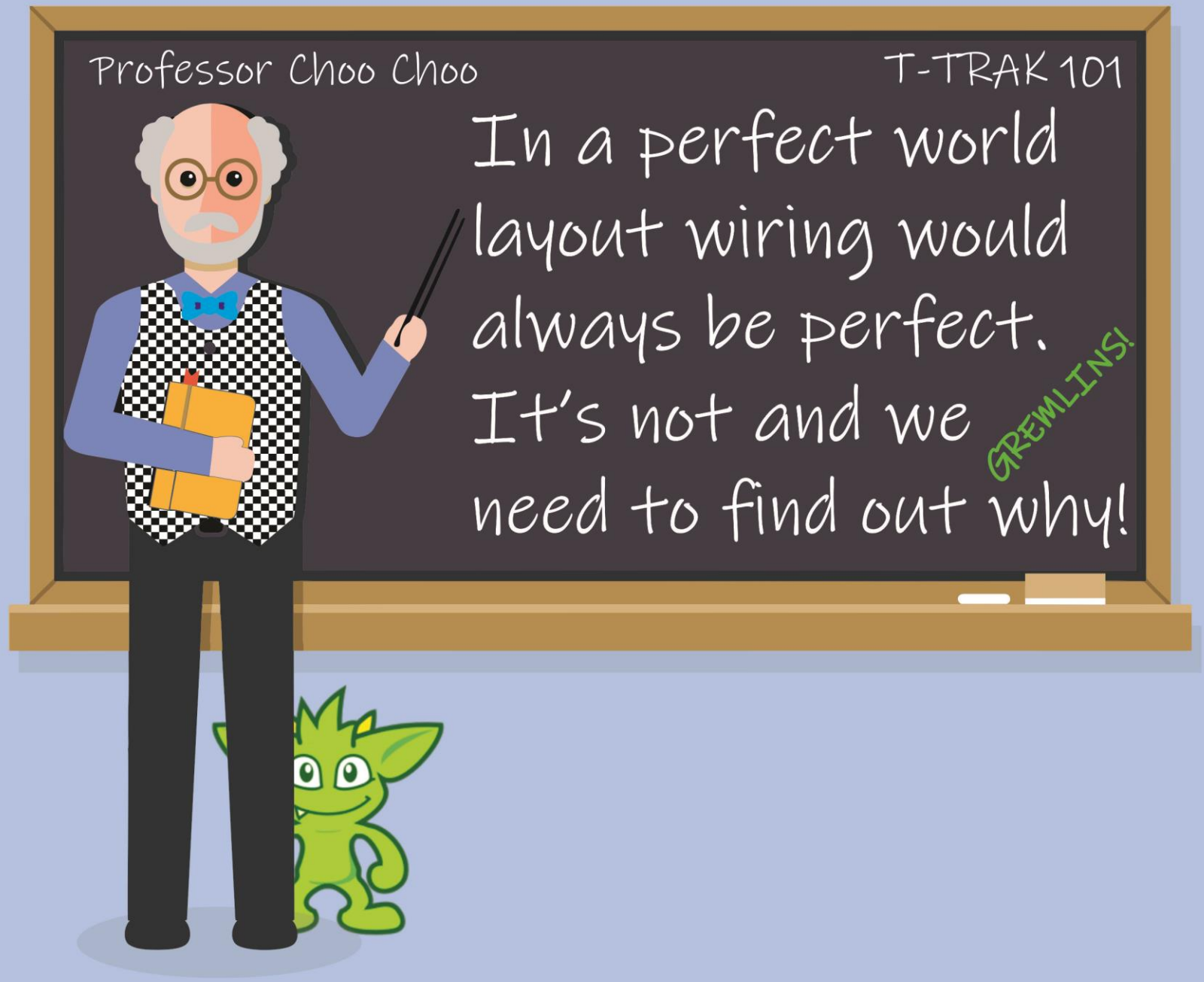
QUESTION PERIOD

TALKIN' TRAK™

Layout trouble-shooting . . .

Ways to efficiently head off layout wiring problems before the layout goes active


Professor Choo Choo
T-TRAK 101
In a perfect world layout wiring would always be perfect. It's not and we need to find out why!
GREMLINS!

Professor Choo Choo

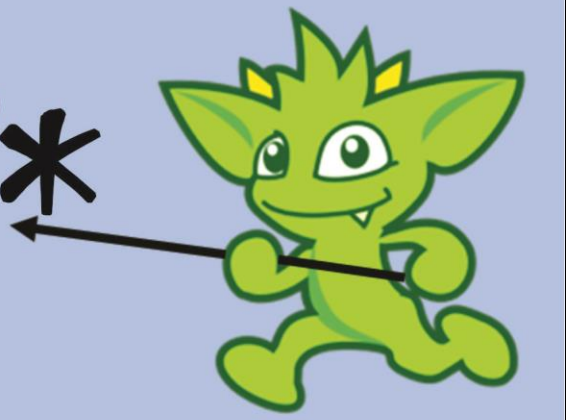
T-TRAK 101

Common Layout Wiring Problems

1 - Module wired Blue White Blue White
2 - Module leads color coded wrong
3 - Module leads connected to wrong bus
4 - White and blue track leads connected together!! (yes, it happens!!)

LAYOUT GREMLINS!

AND HEAVY BUS CABLES CAN BE BUILT WRONG



MODULE TESTERS from the past

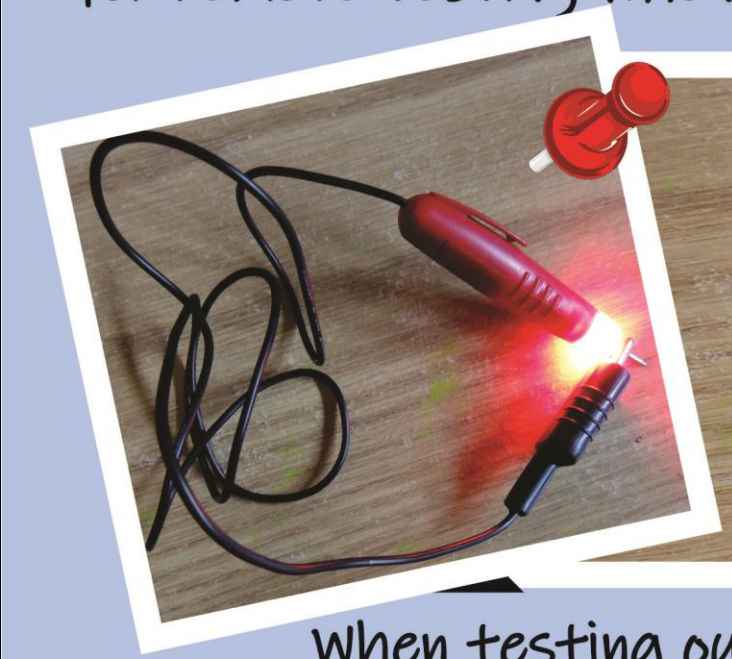
NRail has published articles about module testers in past newsletters and presented them on ZoomTRAK. Primarily intended to test individual modules they were designed to enable layout co-ordinators to test modules for standard compliance and avoid electrical problems created when non-compliant modules were added to layouts. A good idea but a daunting task when the number of modules requiring testing is in the hundreds such as the mega layout in Kansas City for the 2018 NMRA National Train Show.

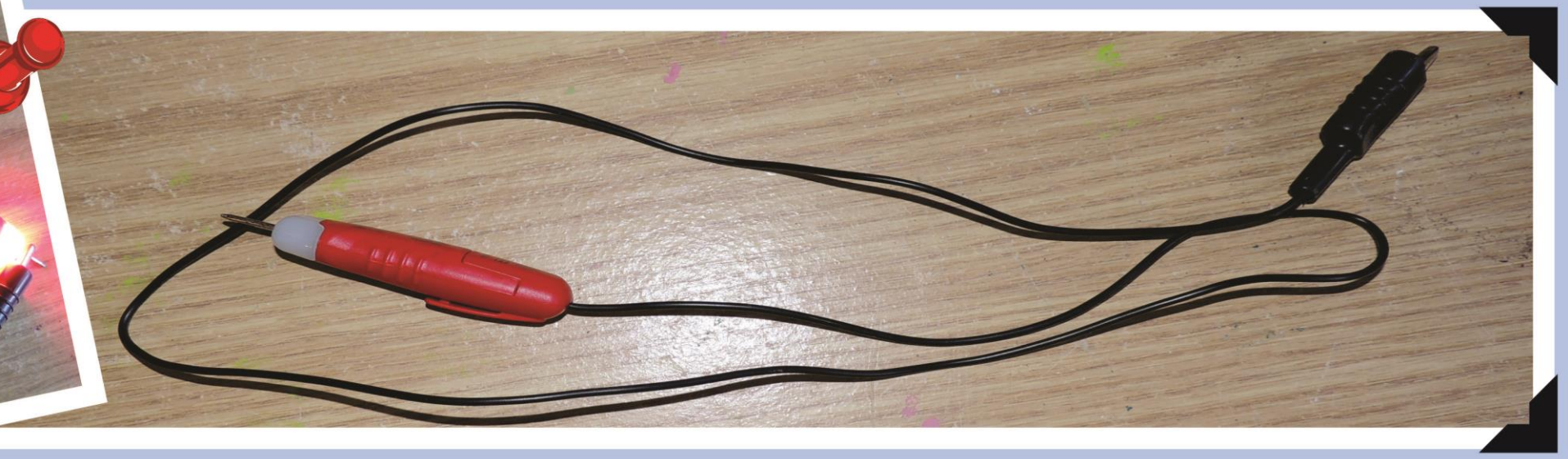
As a result layouts get built with untested modules and an electrical problem surfaces when the layout is powered up. RATS!

OK! Let's test the layout! All at once or in sections depending on it's size and configuration. But how??

a Continuity Tester ultra low tech

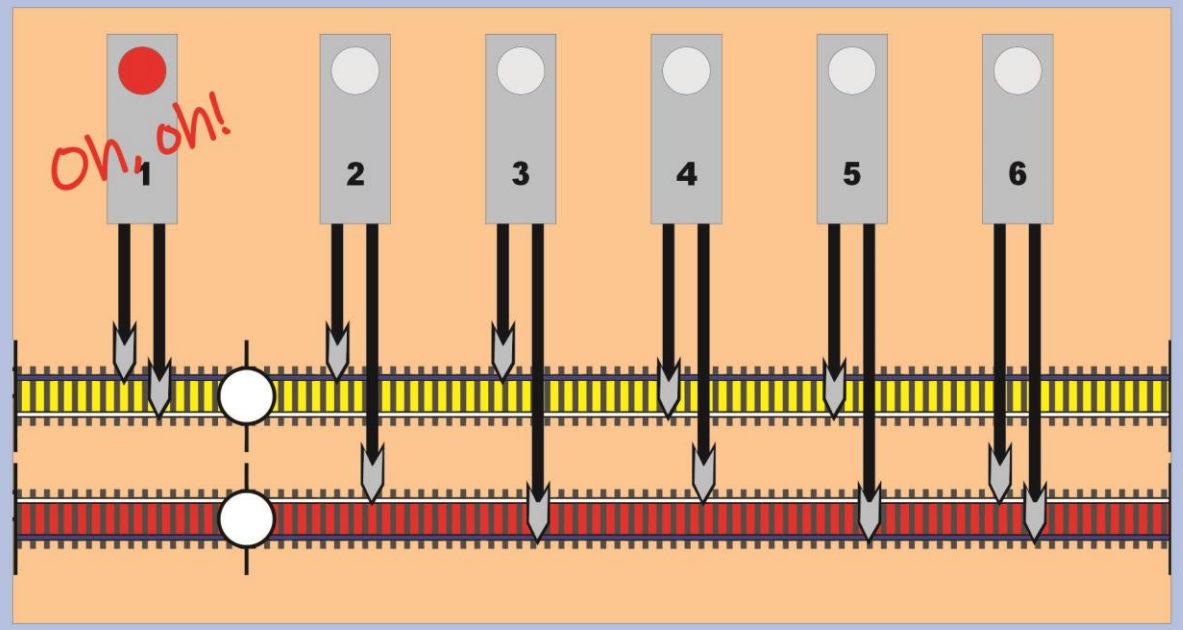
A continuity tester is simply a battery, a light bulb/LED, some wire and a couple of probes. It is used to determine if there is a continuous connection between the two points the probes are in contact with. If the light illuminates there is a continuous path between the two probes. Can't get any simpler than that. Some use a buzzer rather than a light for remote testing when the light can't be seen. And you can't burn out the bulb.





When testing our modules/layouts using independent Red and Yellow busses no two rails should ever be in contact with each other so the light should never come on. Wiring mistakes create rail to rail contact so the bright light will tell us so. Now we must find the problem. For that we will "sectionalize" . . .

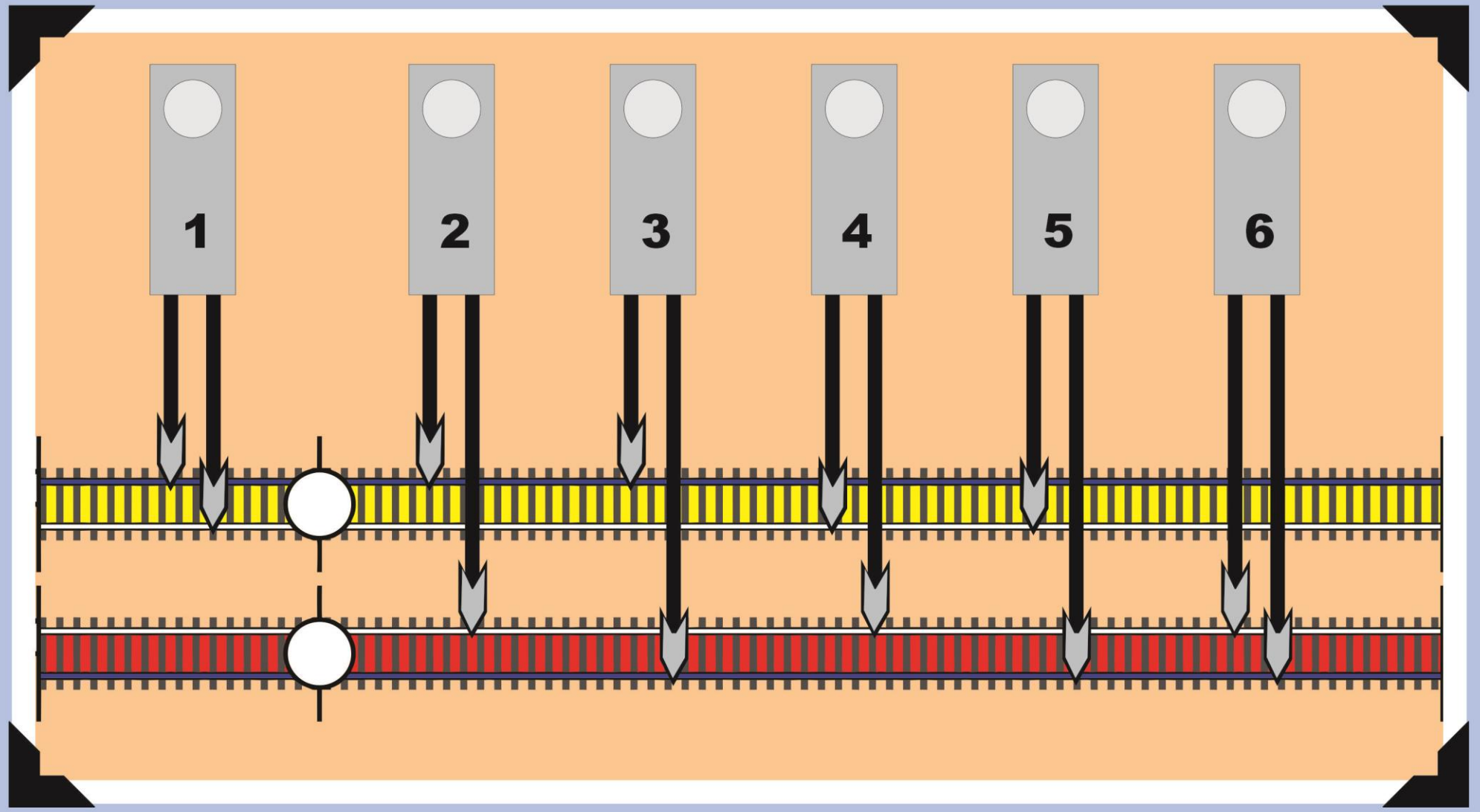
a Continuity Tester ultra low tech



This represents a module - a single module - but it's just a module connected to a bunch of other modules in a layout. It just shows how the 6 tests are performed to see if any of the 4 rails are connected together some how. They're not supposed to be so the light should never come on when doing the tests. If a light does come on, there is a problem.

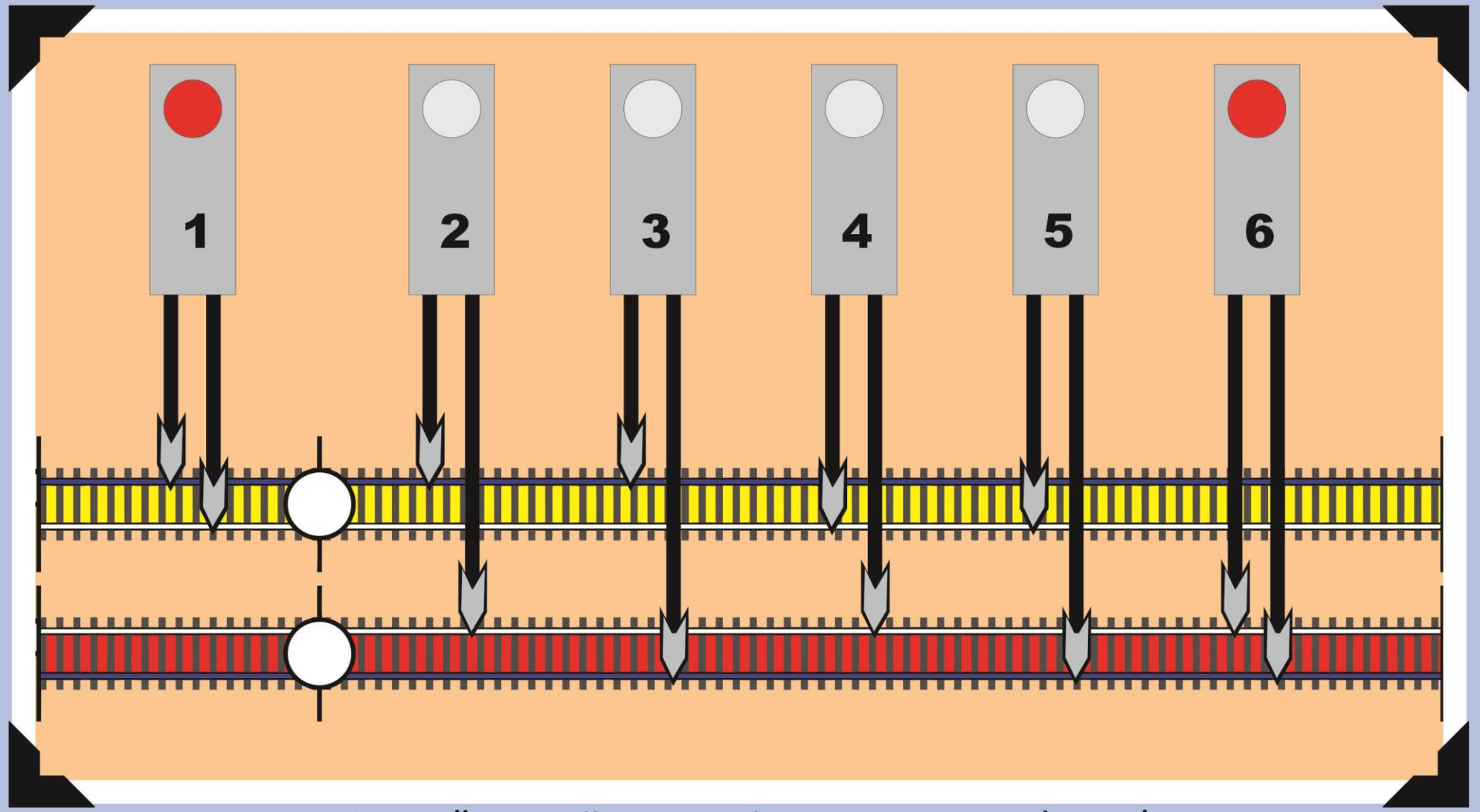
RULE #1: Disconnect all busses from the power supply!!

Connection to the power supply may give false indications and should the power supply be turned on the power would damage the continuity tester!! **ALSO**, remove all locomotives and rolling stock that are connected to track power for lights and sound effects or ??? Large layouts may be broken into sections by disconnecting modules and their red and yellow power busses at a chosen location such as branch to spine taps or mid loop.



This is a PERFECT world!!

NO lights on all 6 tests!!

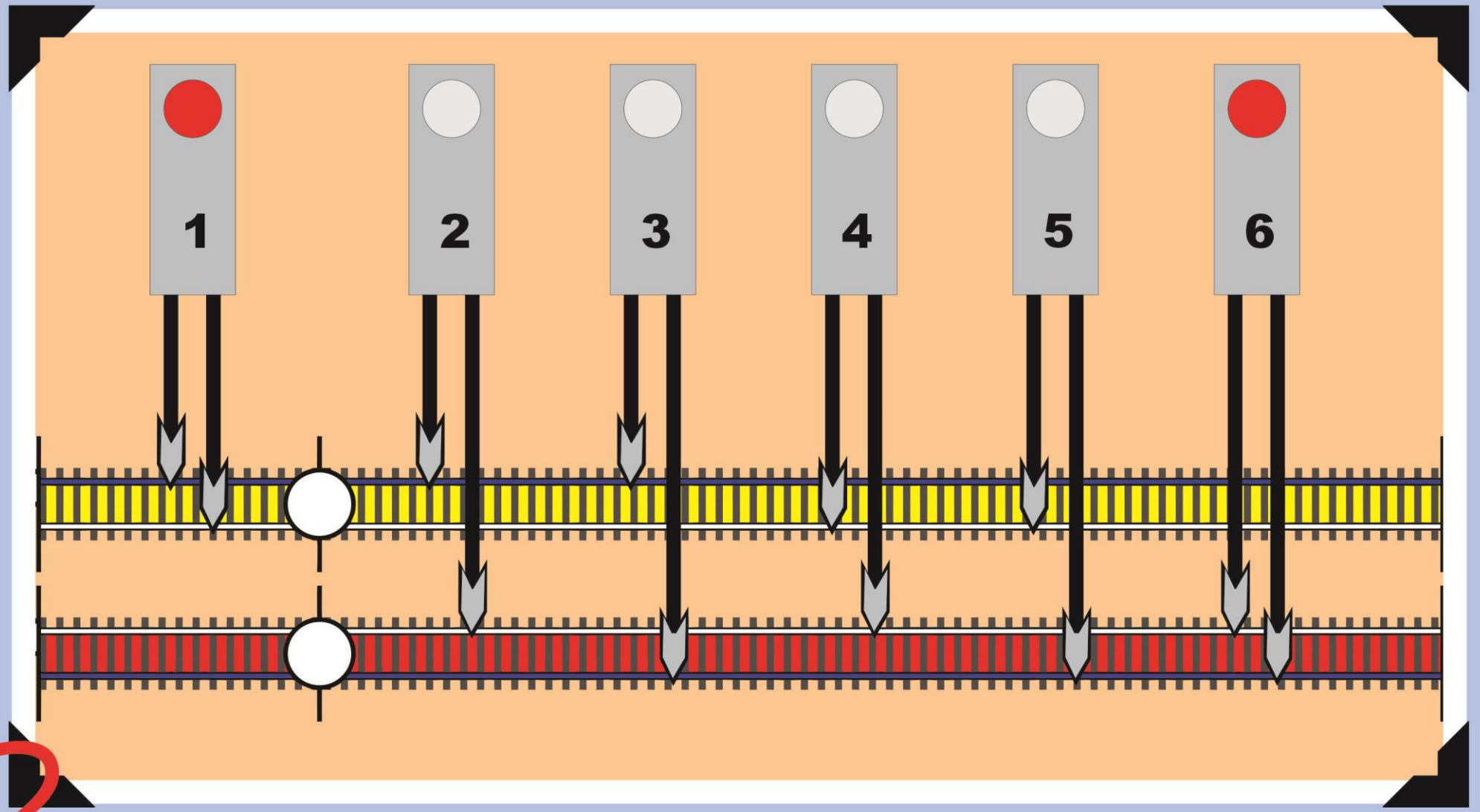


Test #1 - Yellow track B & W wires joined

Test # 6 - Red track B & W wires joined

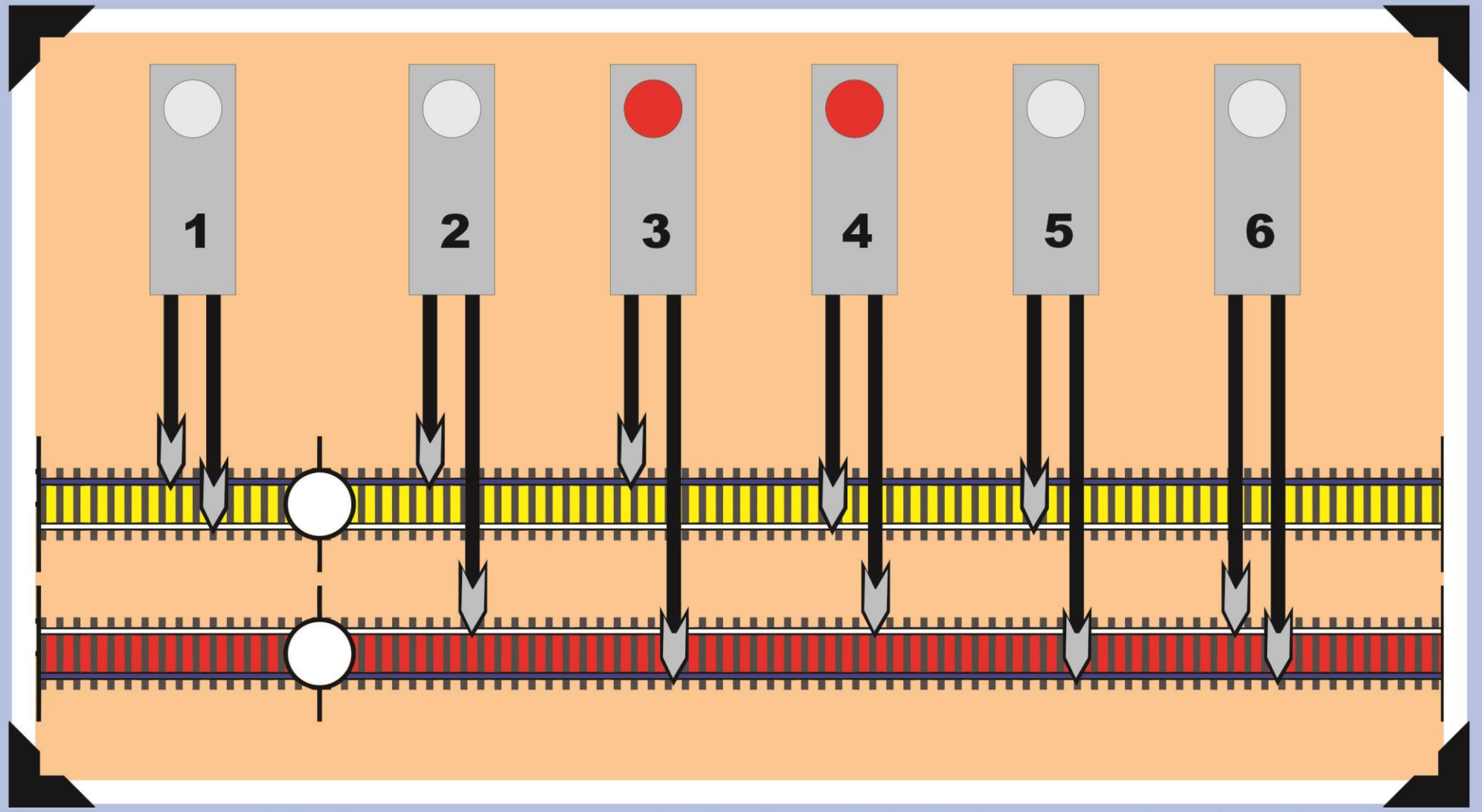
This will not clear when the offending module/s is disconnected from the busses.

The offending module/s must be removed from the layout and corrected.

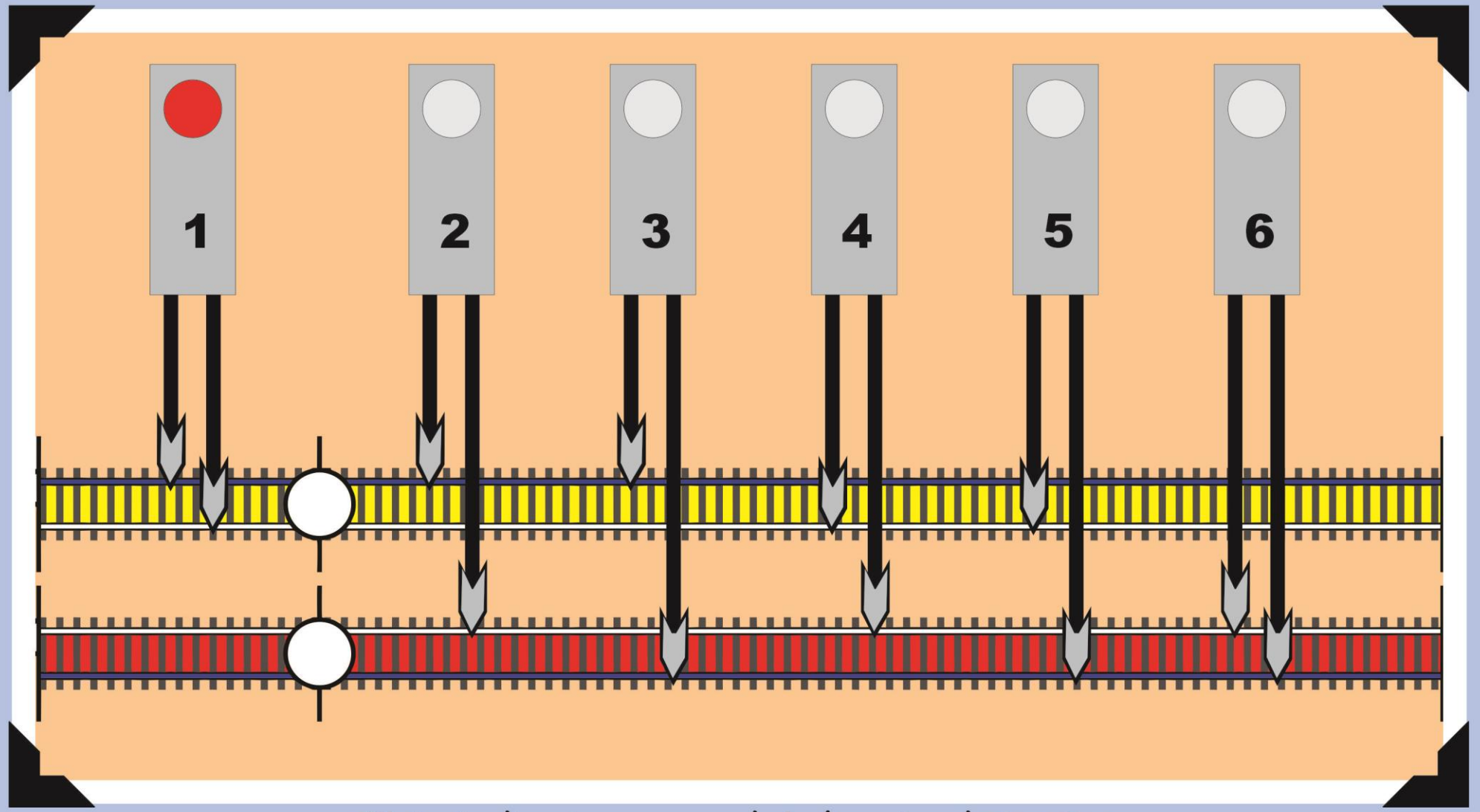


OR

This indicates the presence of a module/s wired WBBW.
This will clear when the offending module/s is disconnected from the busses.
The offending module/s may remain in the layout disconnected from the busses.



This indicates a module/s with the track feeders labeled wrong (Red=Yellow/Yellow=Red)
OR a module/s simply mistakenly connected to the wrong busses.
This will clear when the offending module/s is disconnected from the busses.
The offending module/s may remain in the layout disconnected from the busses.

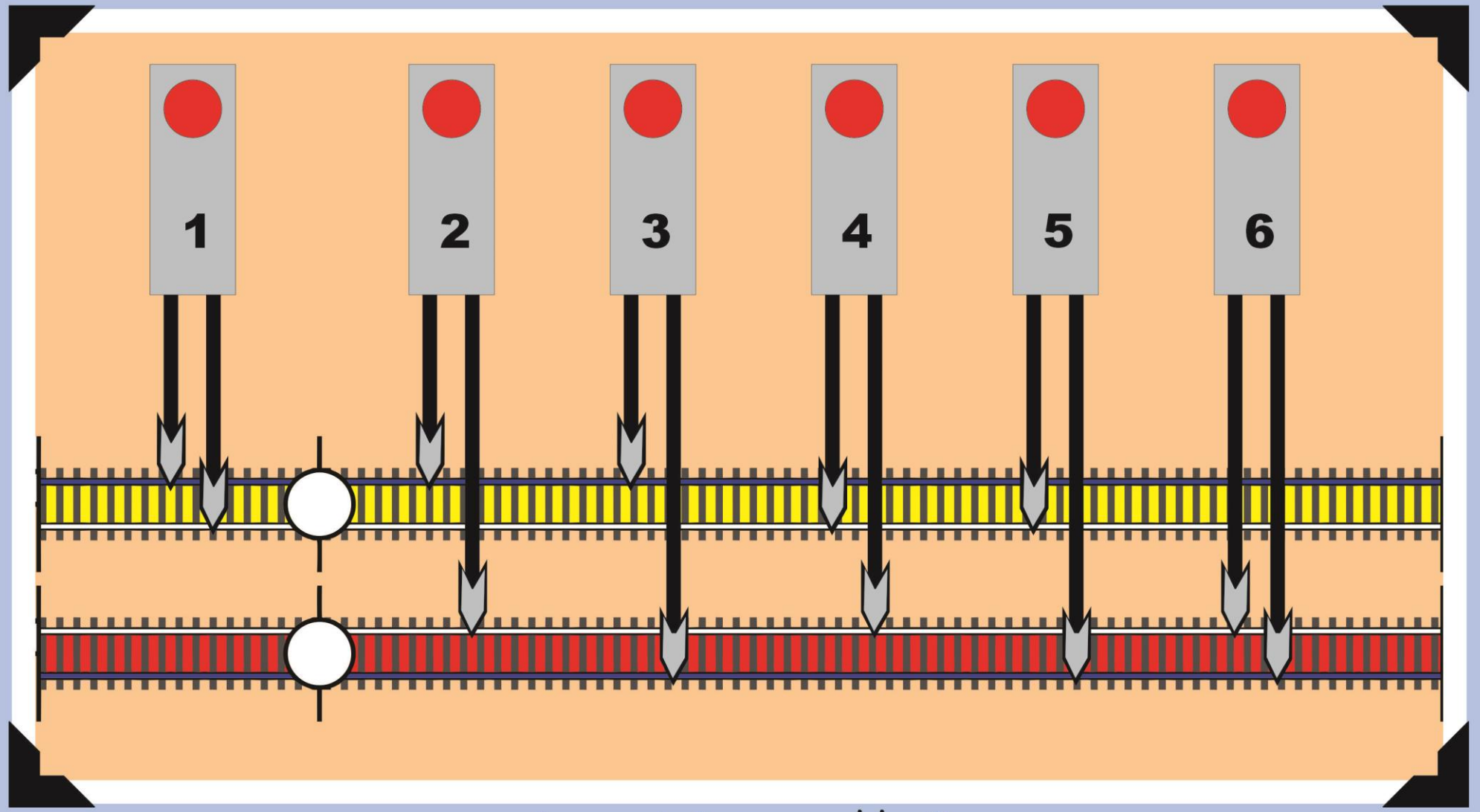


This indicates a module/s wired BWBW.

This will clear when the offending module/s is disconnected from the Yellow bus.

The offending module/s may remain in the layout disconnected from the Yellow bus.

When sectionalizing modules need only be disconnected from the Yellow bus. (The Red bus is not involved)

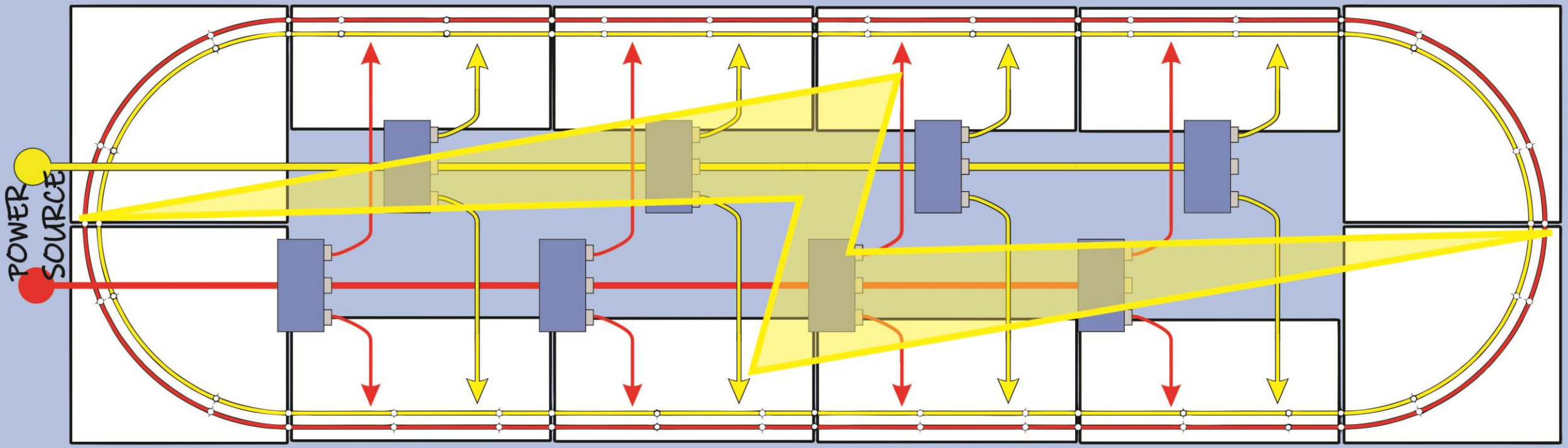


Layout Armageddon!!

This indicates a module wired BWBW and a module with reversed color Red/Yellow code.

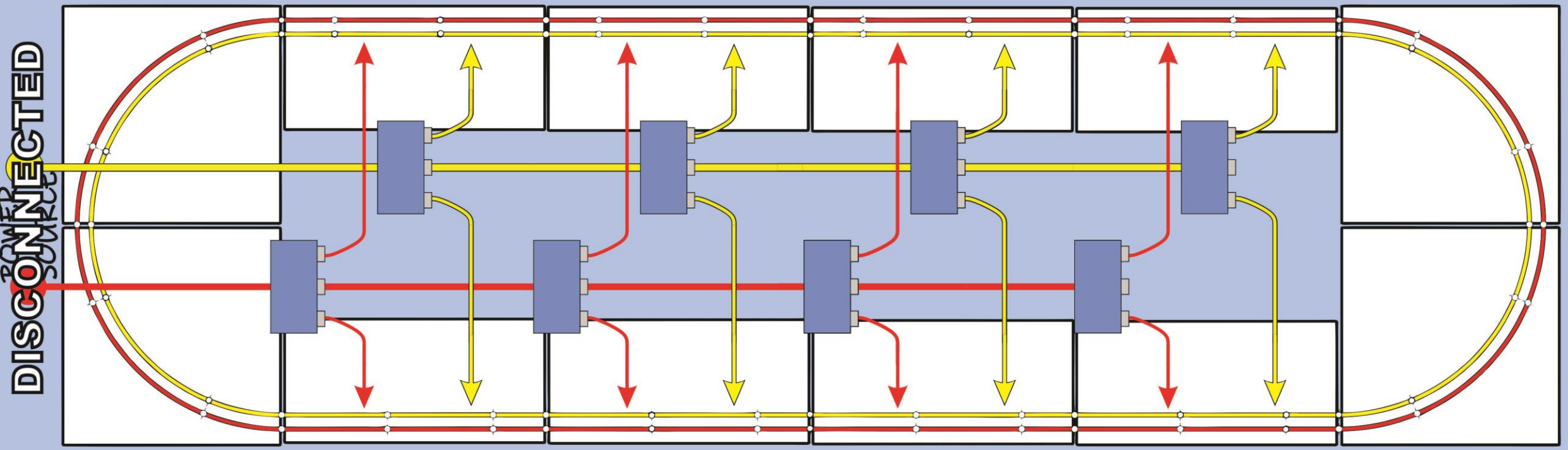
This will clear when the offending modules are disconnected from the busses.

The offending modules may remain in the layout disconnected from the busses.



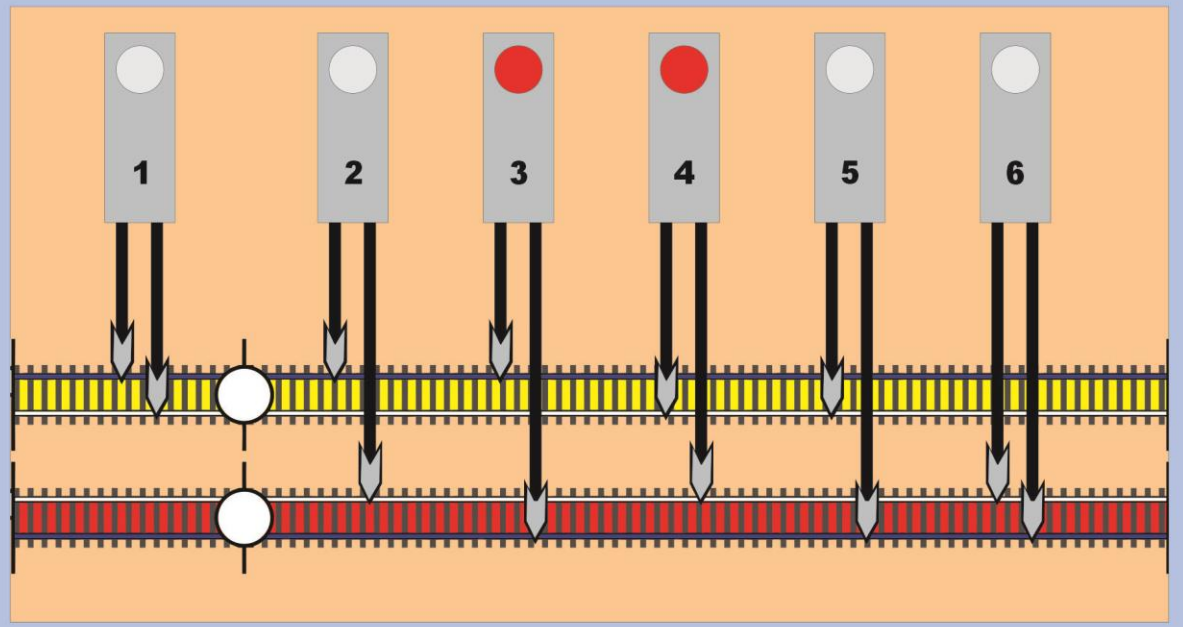
For this presentation this small loop layout on four 6 ft. tables (2 tables wide by 12 ft. long) is our problem. Once the layout was energized the power supply/s were shorted - there is an electrical fault of some kind in the wiring of the modules. The layout has independent red and yellow loops with their own busses and standard BWWB module wiring. Both loops are DC with separate busses to allow future Red bus supply change to DCC later during the show. Somewhere the two busses are joined, but where?

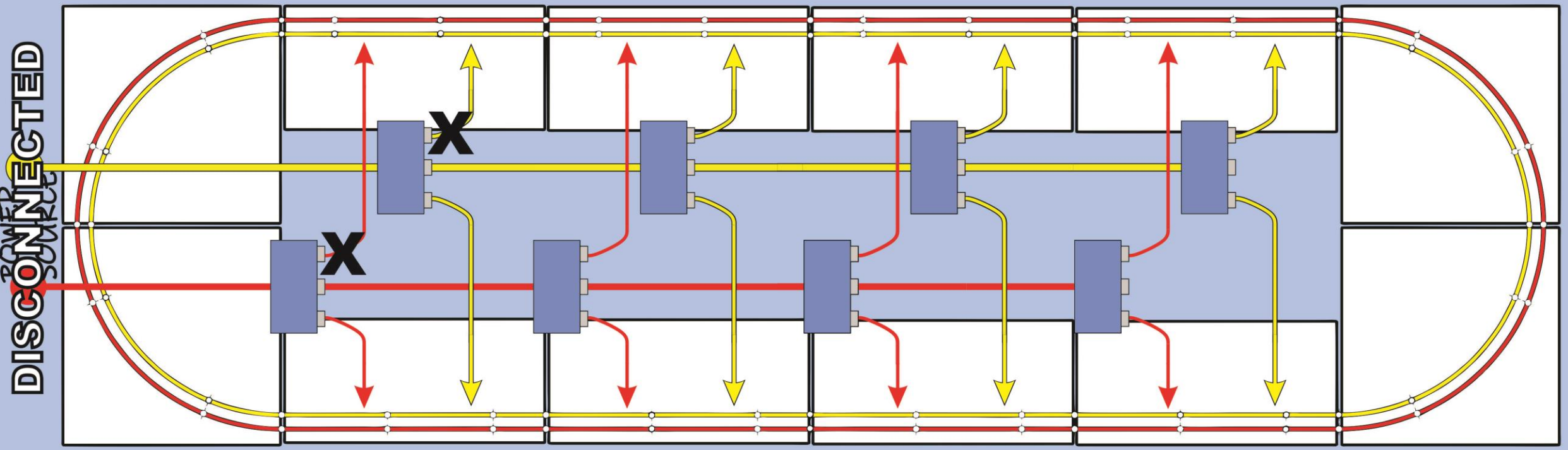
We need to find out. NOW! The show starts in minutes!!



with the power supply/s disconnected from the layout and all locomotives and rolling stock that use track power (lights, sound effects, ??) removed from the layout 6 tests are performed with the continuity tester across all 6 rail combinations: 1 - YB/YW; 2 - YB/RW; 3 - YB/RB; 4 - YW/RW; 5 - YW/RB; 6 - RW/RB.

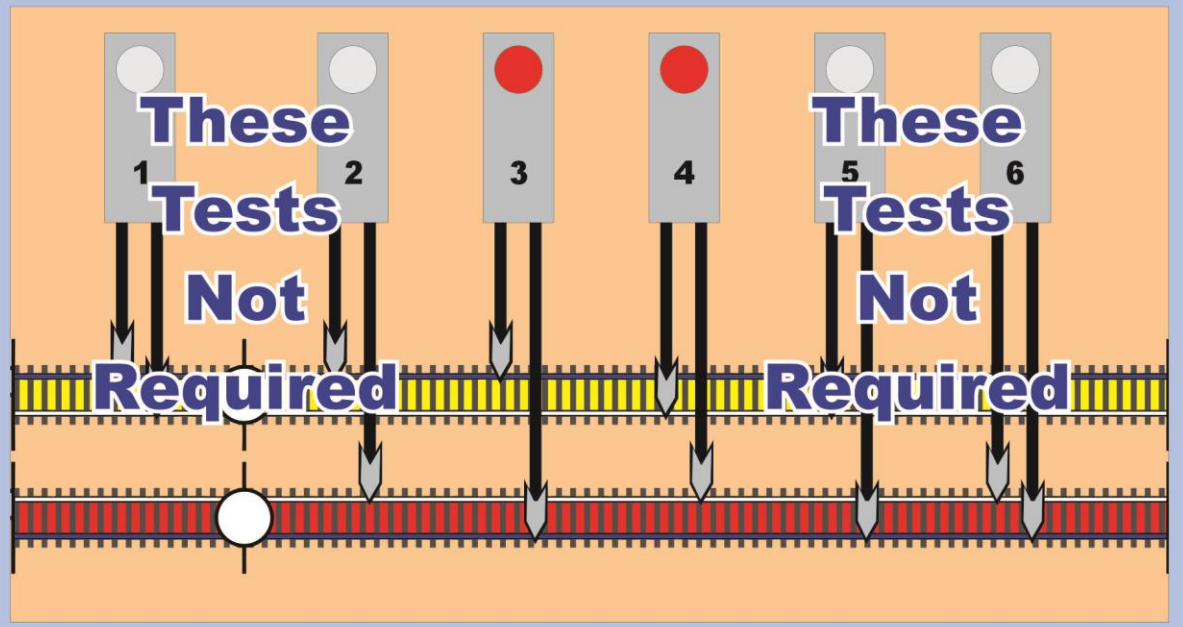
Where: YB=Yellow Blue rail; YW=Yellow White rail; RB=Red Blue rail; RW=Red White rail.

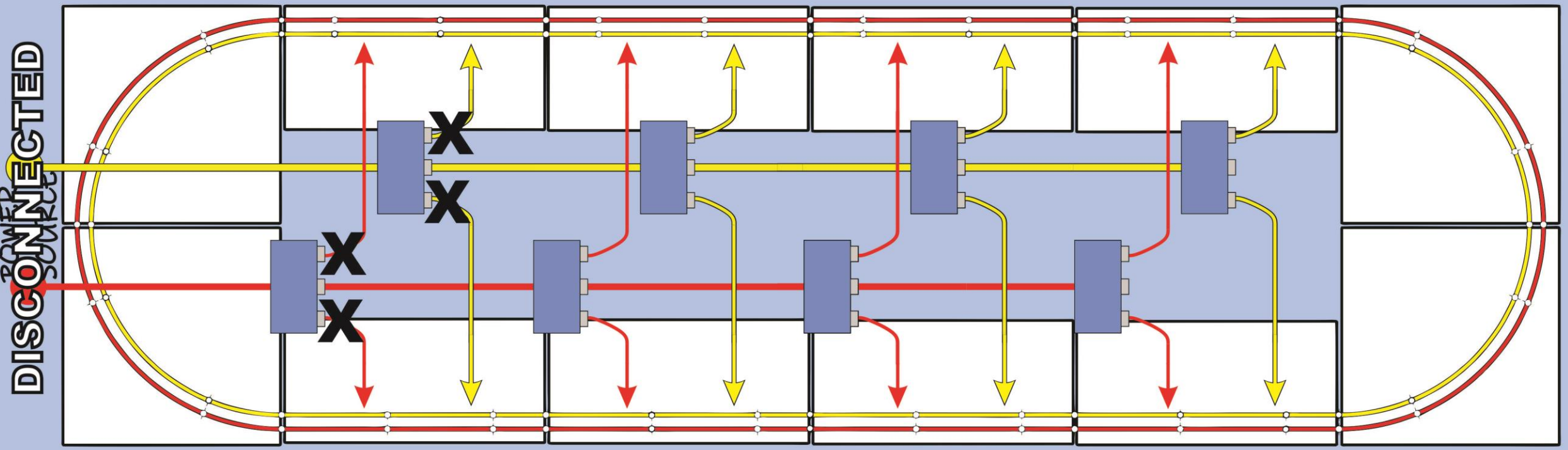




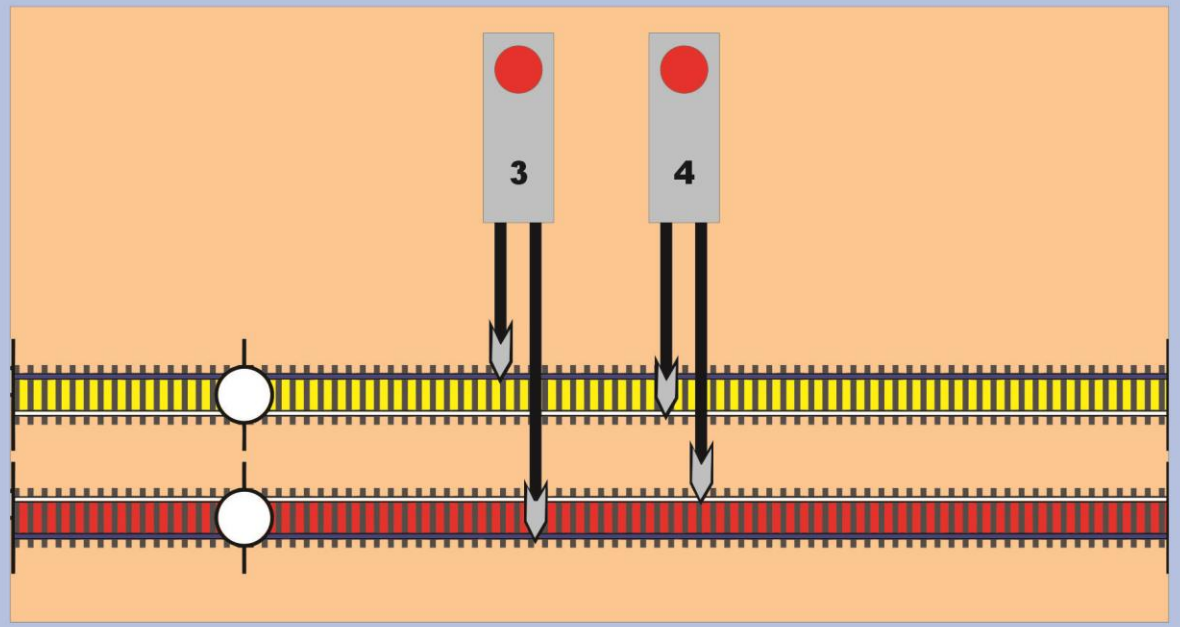
Since we know that only tests #3 and #4 show results we do not need to repeat tests #1, 2,5, or 6 as we sectionalize this layout. Disconnecting the first module from the Red and Yellow busses did not solve the electrical problem.

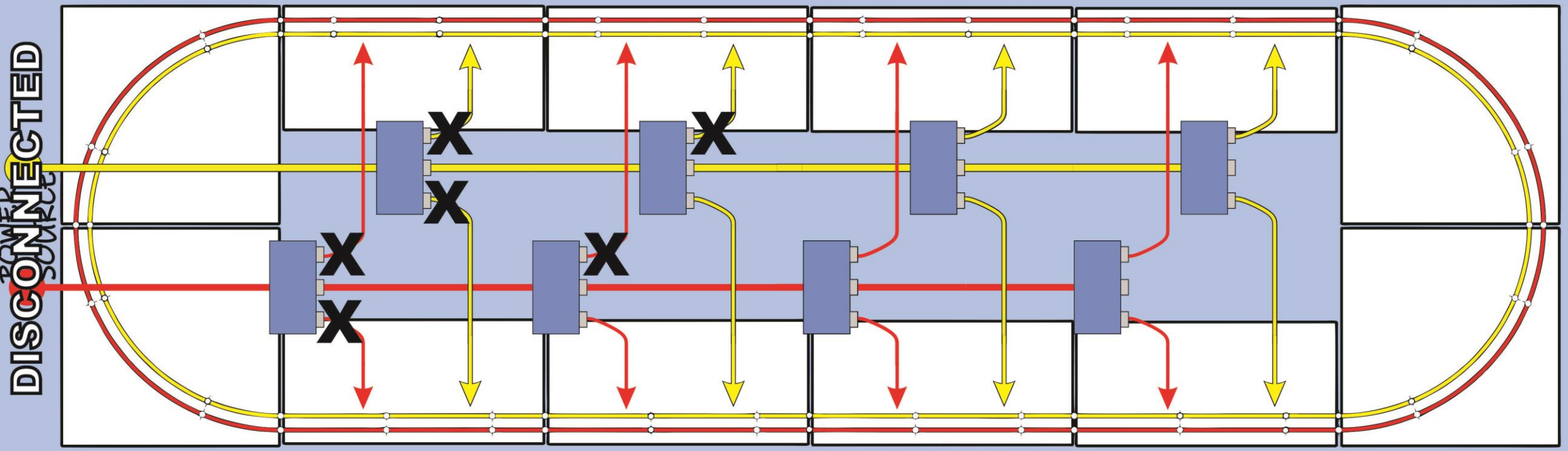
So, we will continue . . .



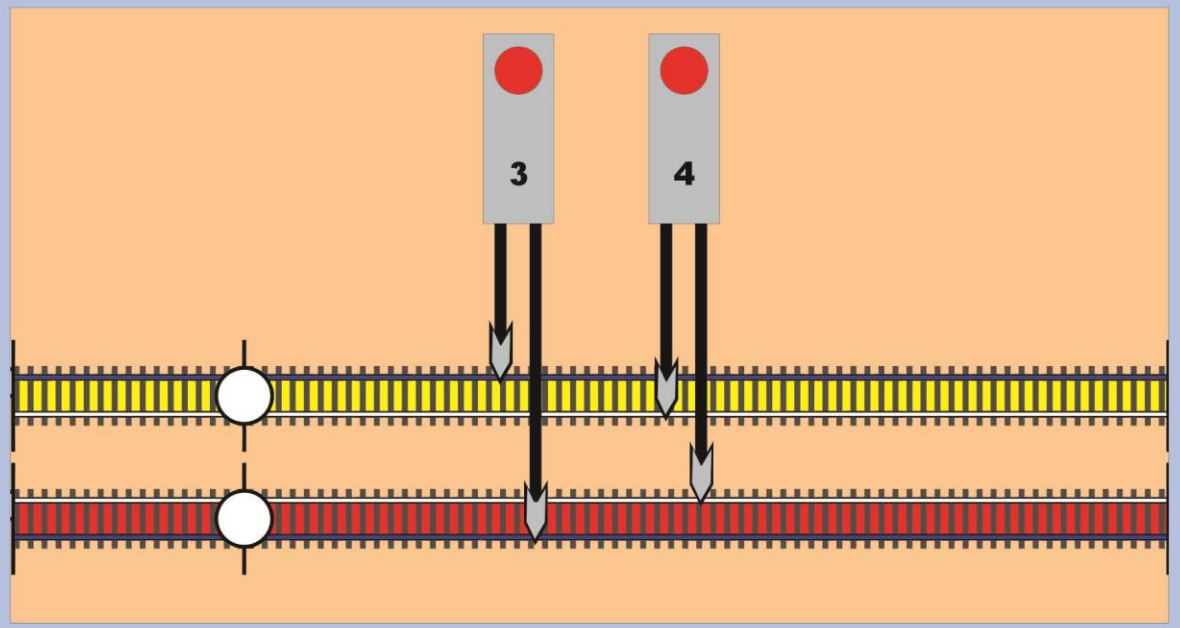


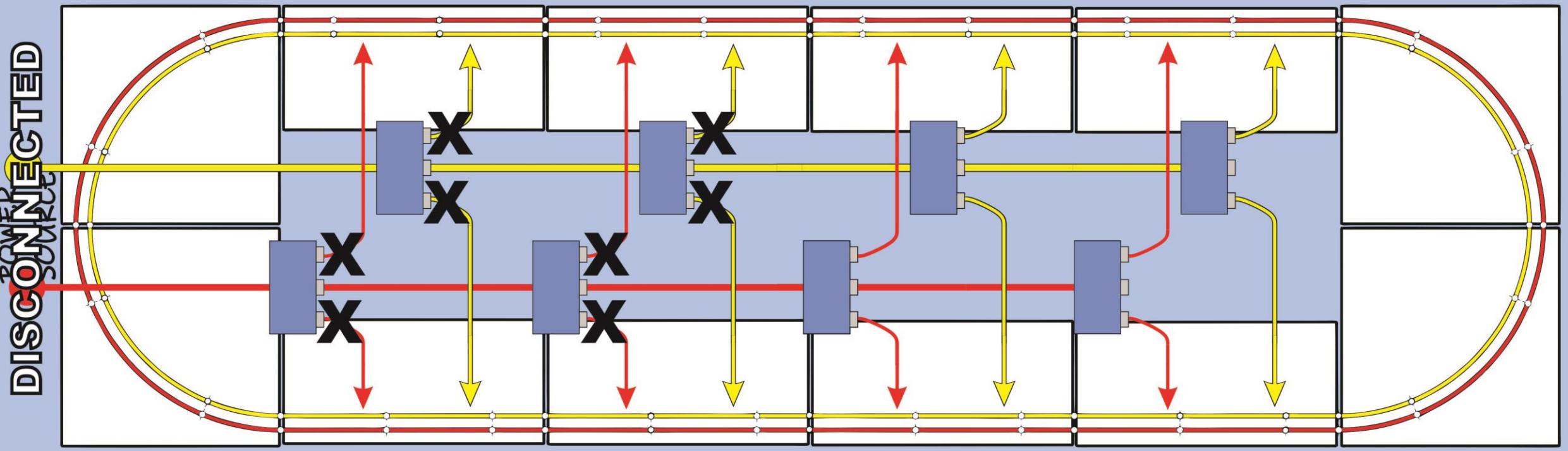
Disconnecting the second module didn't either . . .



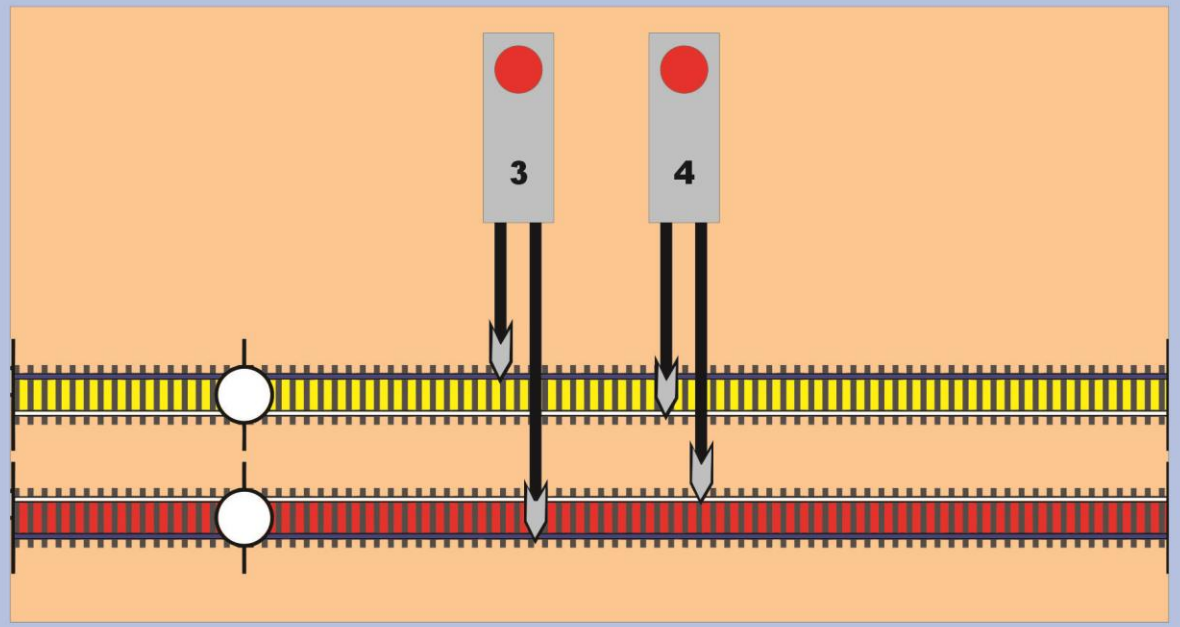


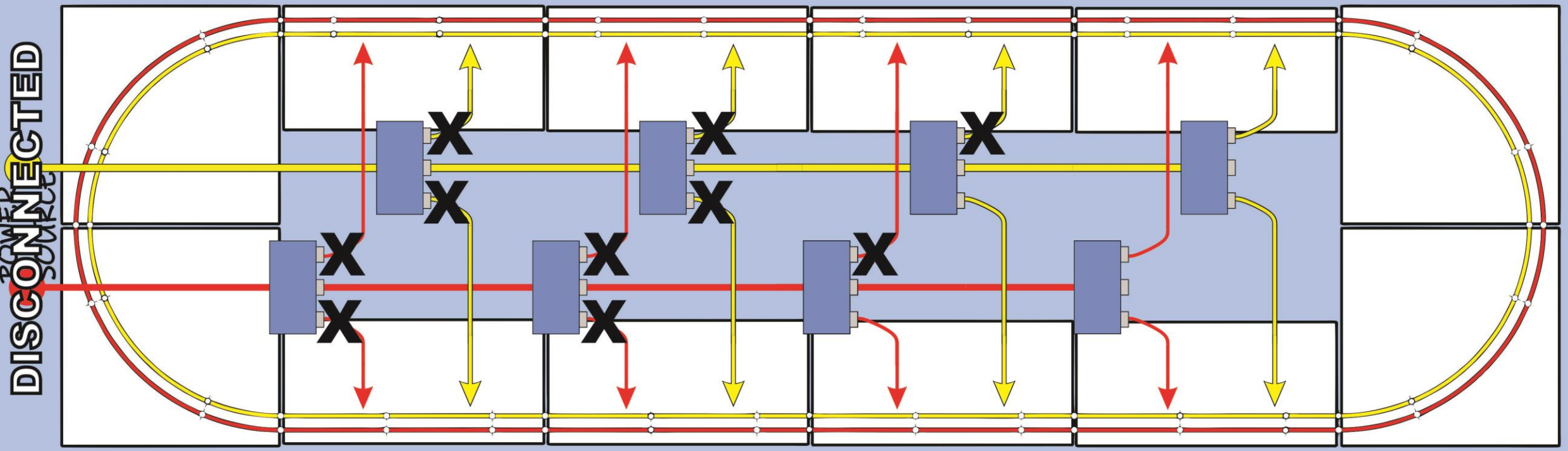
Nor the third . . .





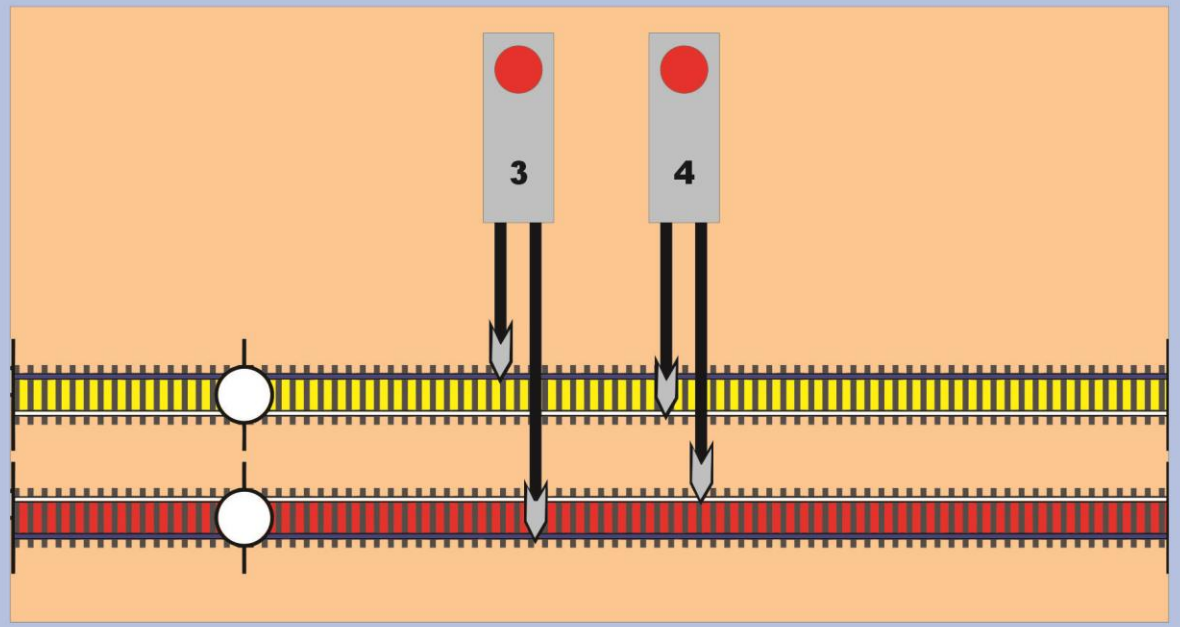
Nor the fourth . . .





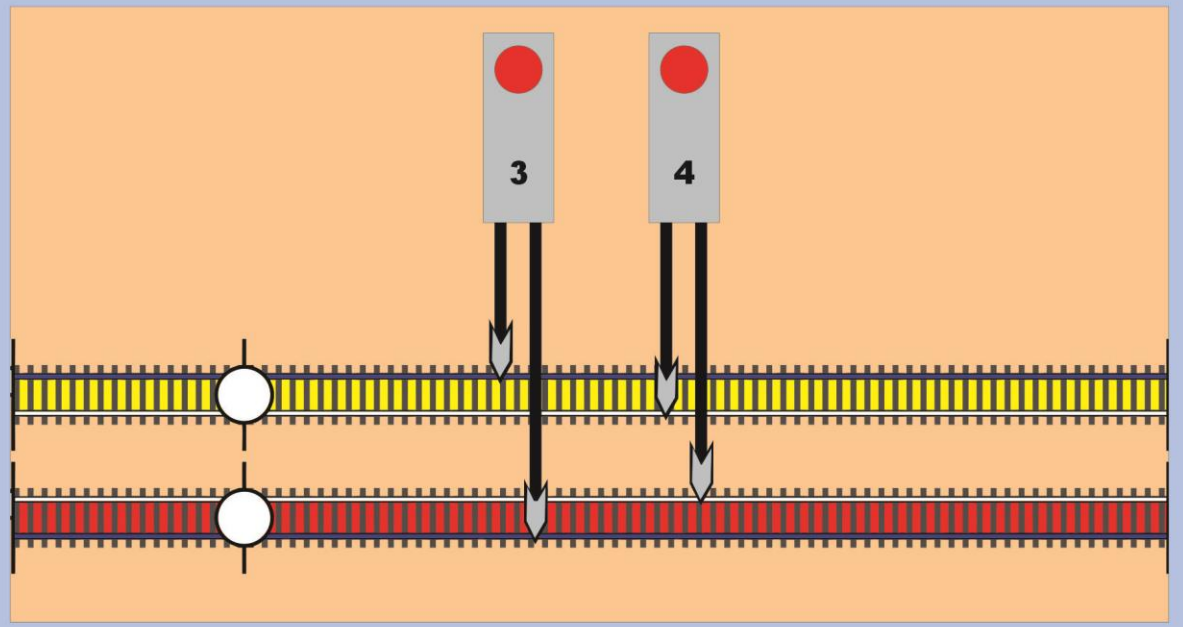
Nor the fifth! . . .

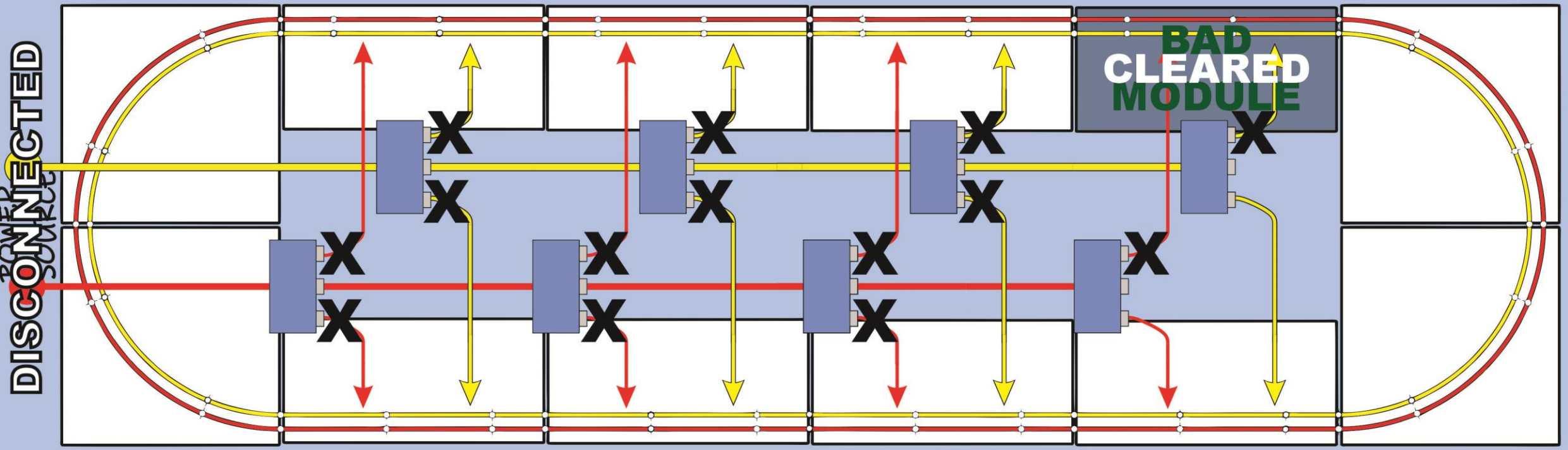
(I'm glad there's not 40 modules in this thing!!)



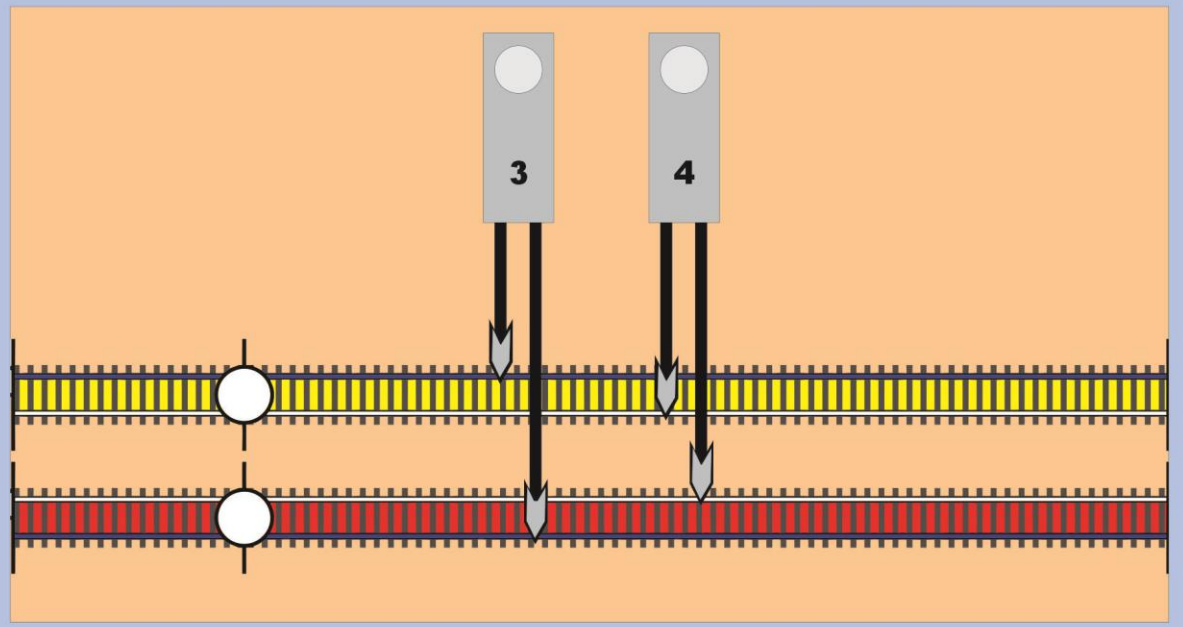
DISCONNECTED POWER SOURCE

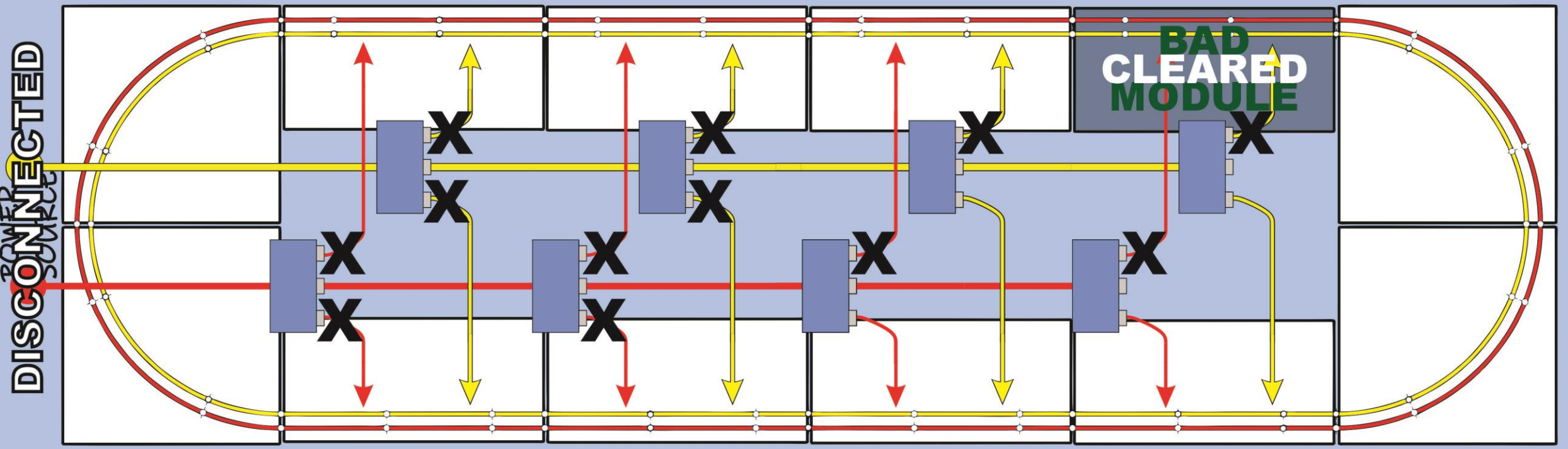
Nor the sixth . . .





In this case once the seventh module is disconnected from the layout busses the fault is removed. This identifies this module as being the cause of the problem. Since the fault is now cleared none of the remaining connected modules are suspect. BUT, is it the only problem module? What about those modules that are already disconnected??

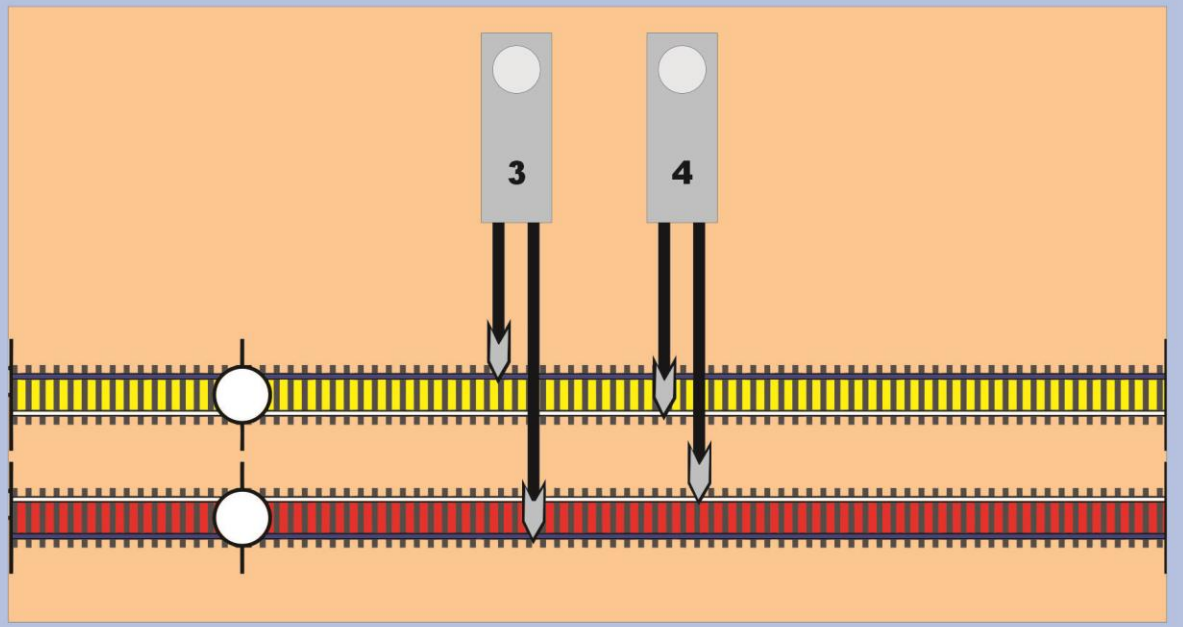


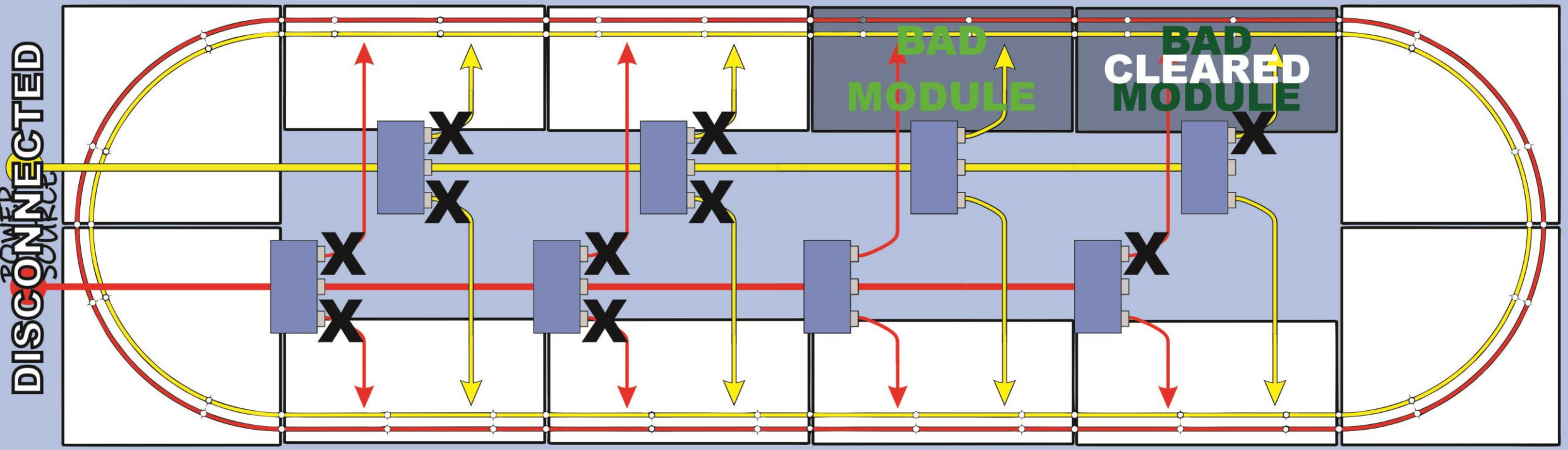


Since the last module was found to be the cause of the fault no further sectionalizing is required so modules removed from the busses may now be added one at a time in any order desired but testing must continue.

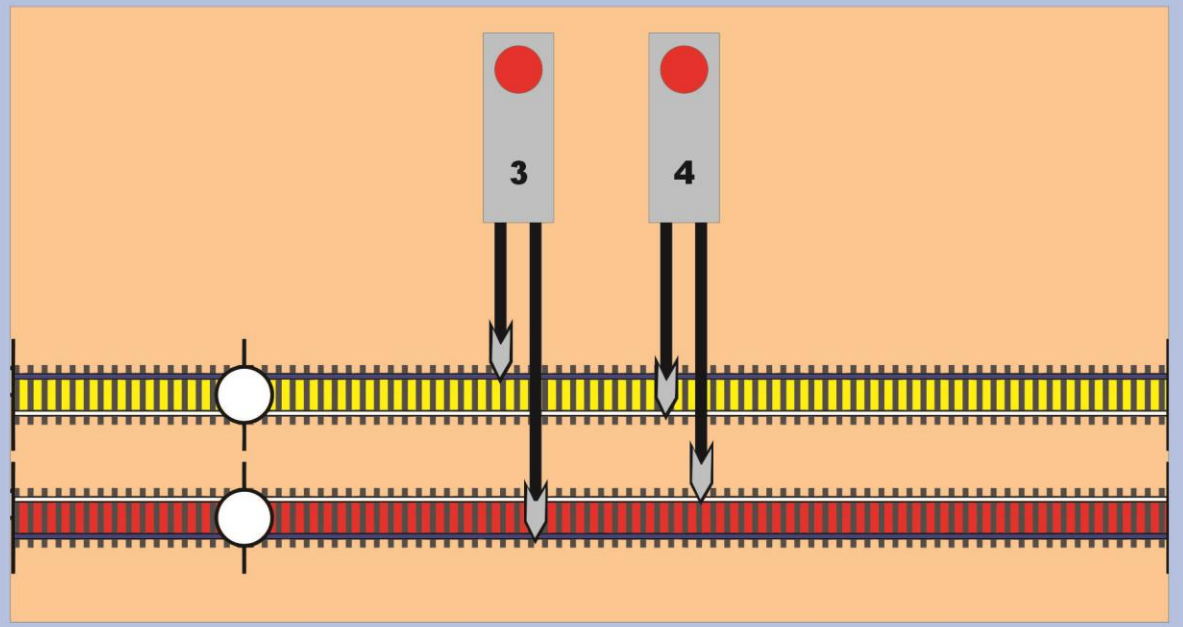
Why??

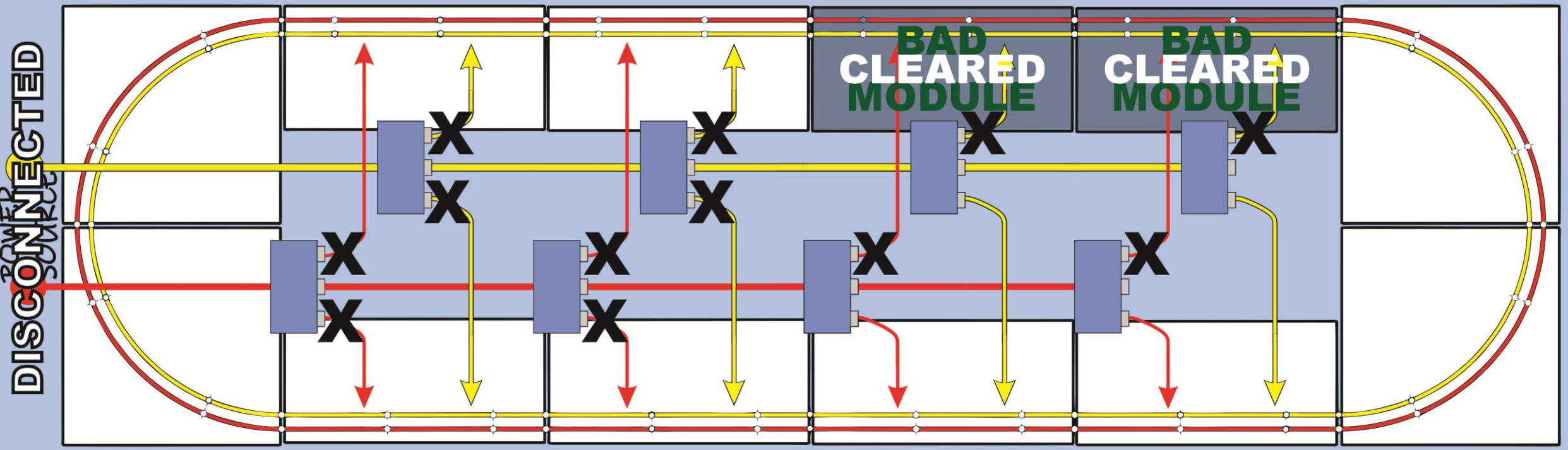
Because there may be other similar modules!



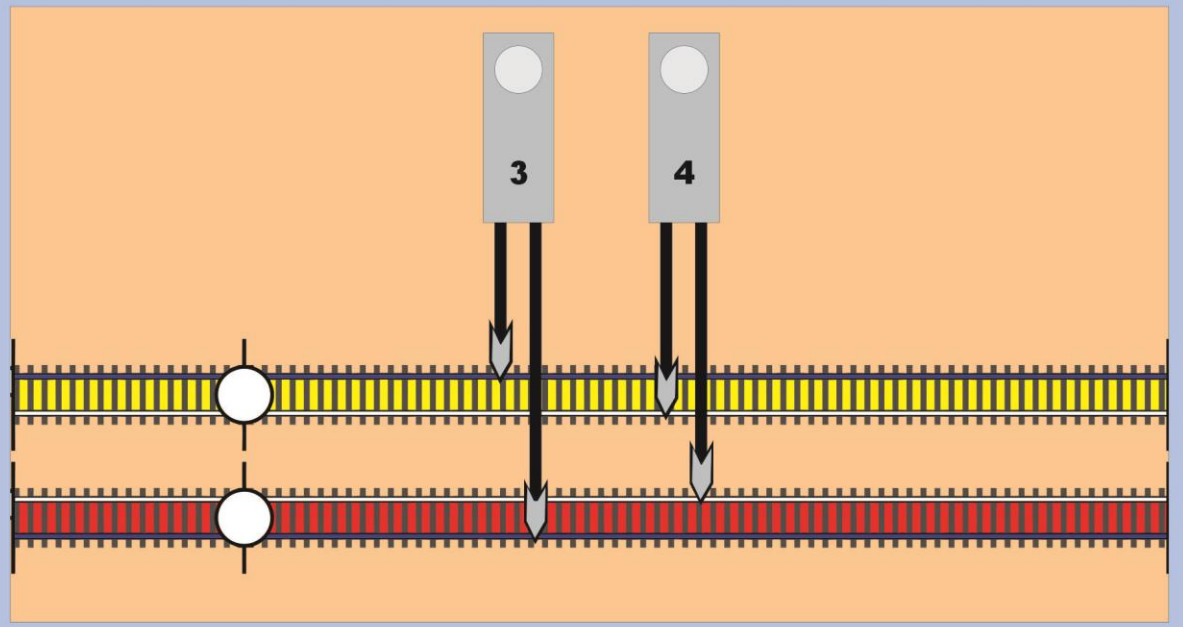


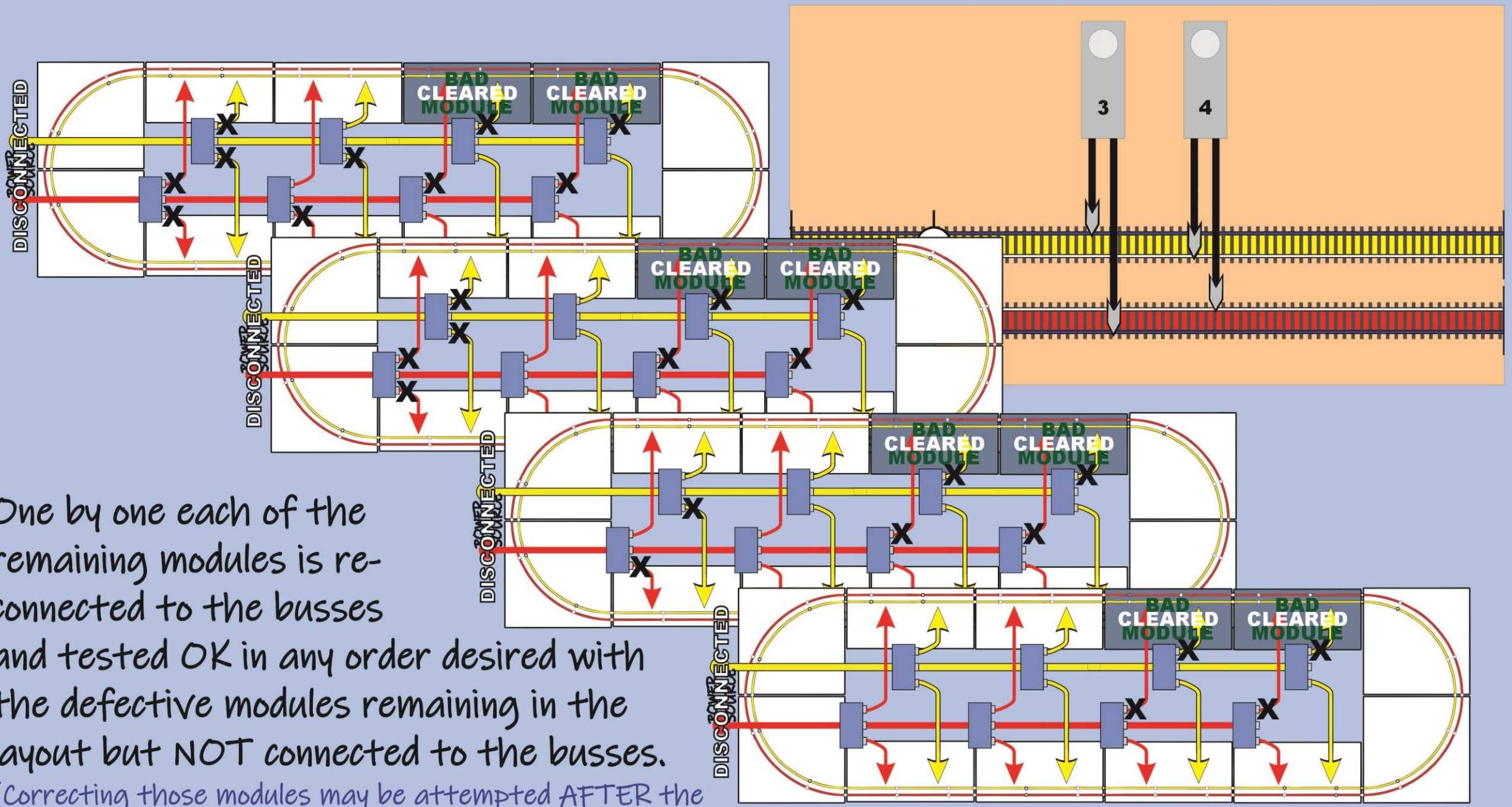
As modules continue to be added to the layout busses the fault returns after the second module is reconnected indicating that it is also defective. It's presence in the layout was hidden by the other defective module. Any number of defective modules may be hidden until the last one is removed and are only discovered as they are reconnected.





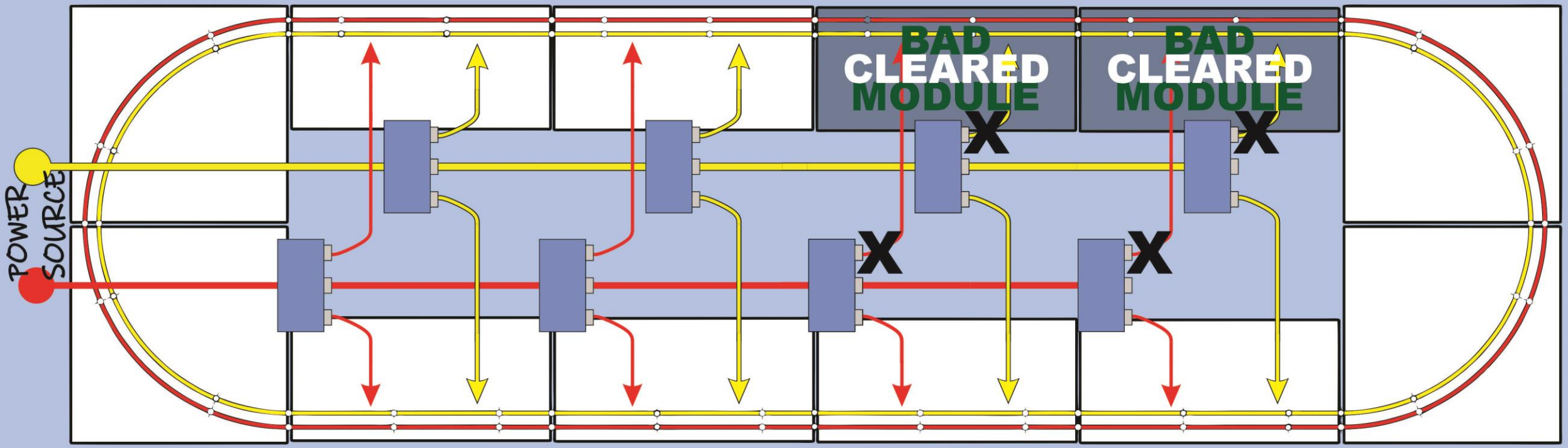
Once that module is again disconnected from the layout busses and the test indicates that the fault is cleared that module is identified as being faulty. It can remain in the layout BUT MUST remain disconnected from the busses.





One by one each of the remaining modules is re-connected to the busses and tested OK in any order desired with the defective modules remaining in the layout but NOT connected to the busses.

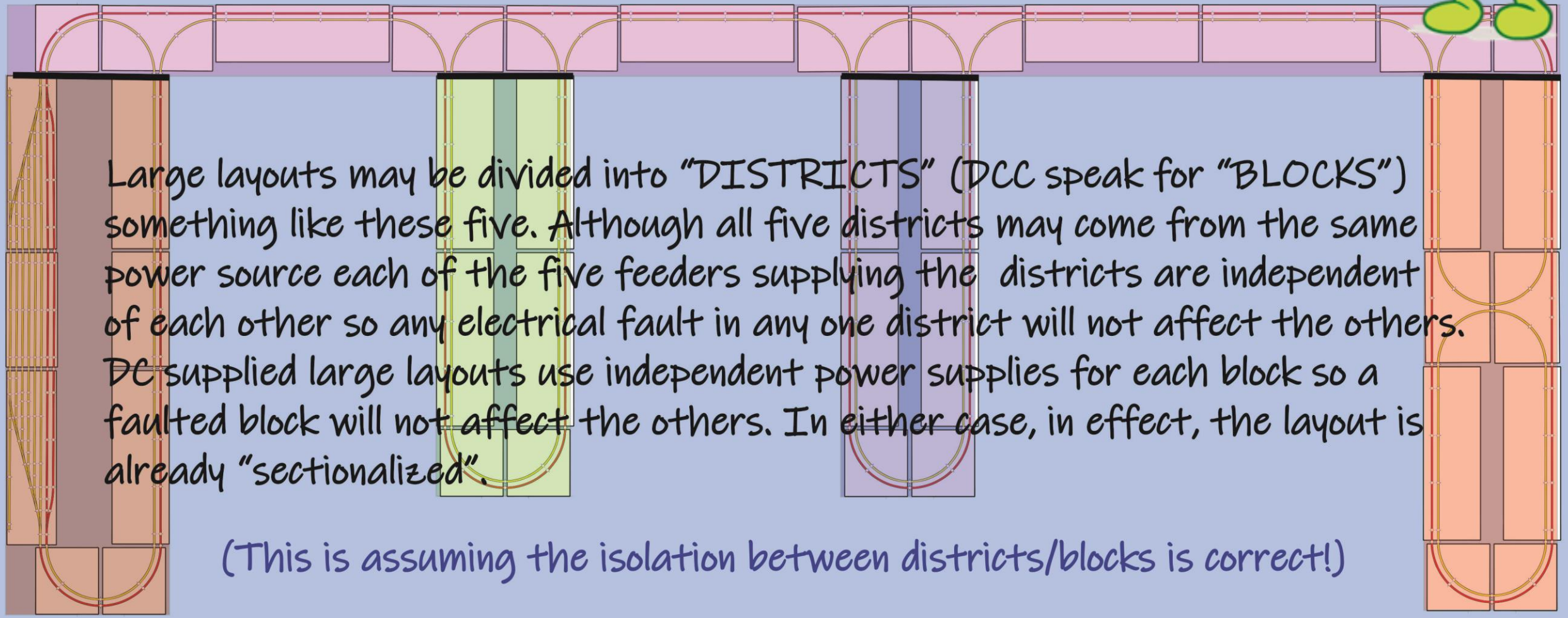
(Correcting those modules may be attempted AFTER the layout is in operation IF attempting to do so DOES NOT prevent the operation of the layout - It's all about the show!)



With the defective modules removed from the busses, but still in the layout, and all the other modules confirmed OK the power source/s is reconnected and we are

RUNNING TRAINS!!

Ifs, ANDs or BUTs



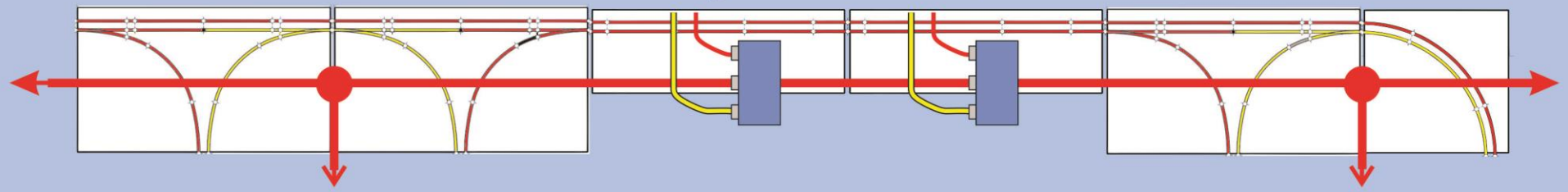
Large layouts may be divided into "DISTRICTS" (DCC speak for "BLOCKS") something like these five. Although all five districts may come from the same power source each of the five feeders supplying the districts are independent of each other so any electrical fault in any one district will not affect the others. DC supplied large layouts use independent power supplies for each block so a faulted block will not affect the others. In either case, in effect, the layout is already "sectionalized".

(This is assuming the isolation between districts/blocks is correct!)

MORE Ifs, ANDs or BUTs

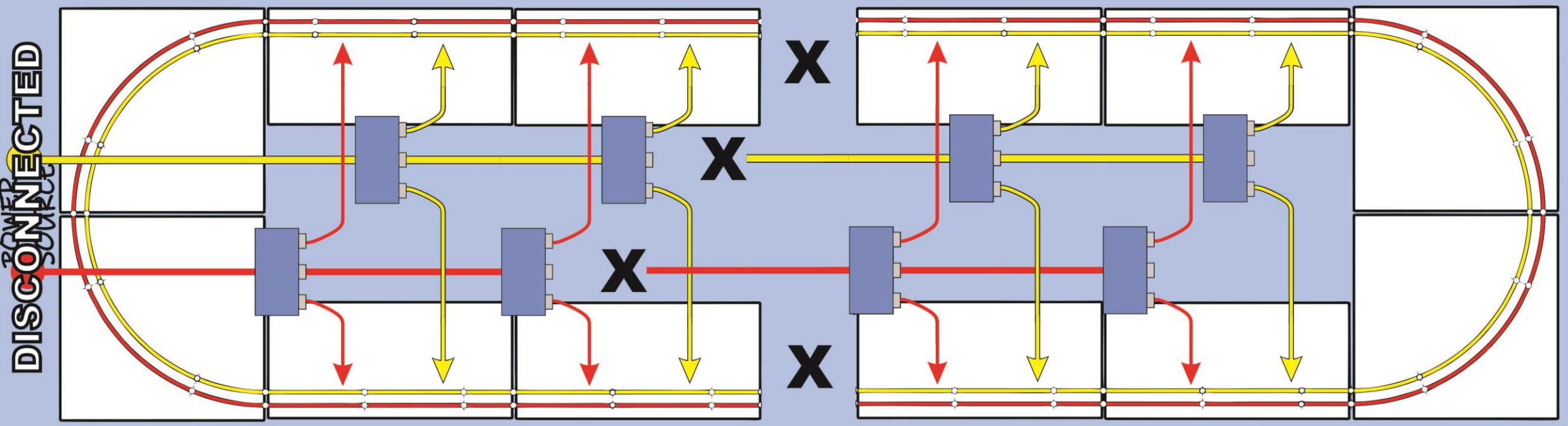
So far all I've talked about is the testing of simple standard loop layouts, those that have two loops of track each supplied by their own bus, and problems that might be encountered. As I mentioned in my Yellow Bus Talkin' T-TRAK presentation a separate Yellow bus may not be required. In such cases both the Red track and Yellow track can be supplied from a single bus. That changes things. And both tracks of a layout

Single module row spine



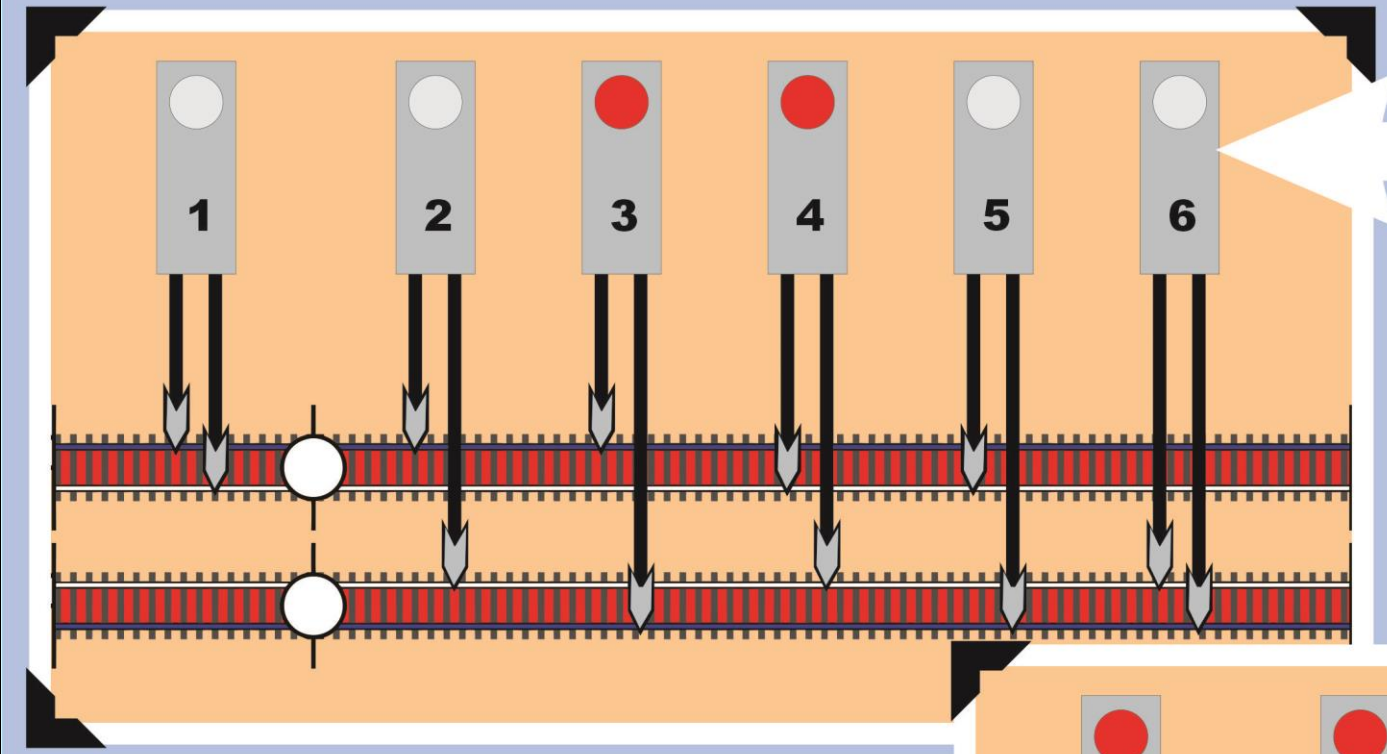
spine single row of modules is supplied by the same bus. All of this applies to DC or DCC layouts.

But, if you have a larger layout and use different wiring schemes . . .

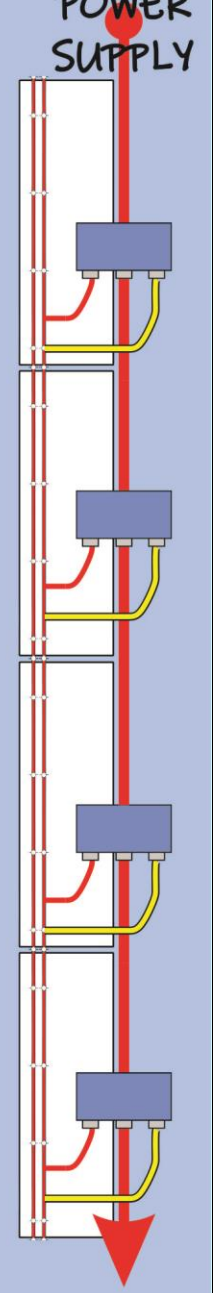


IF the faulted layout or district/block is large break it into 2 sections by separating modules and disconnecting the bus section and determine which of the sections is faulted.

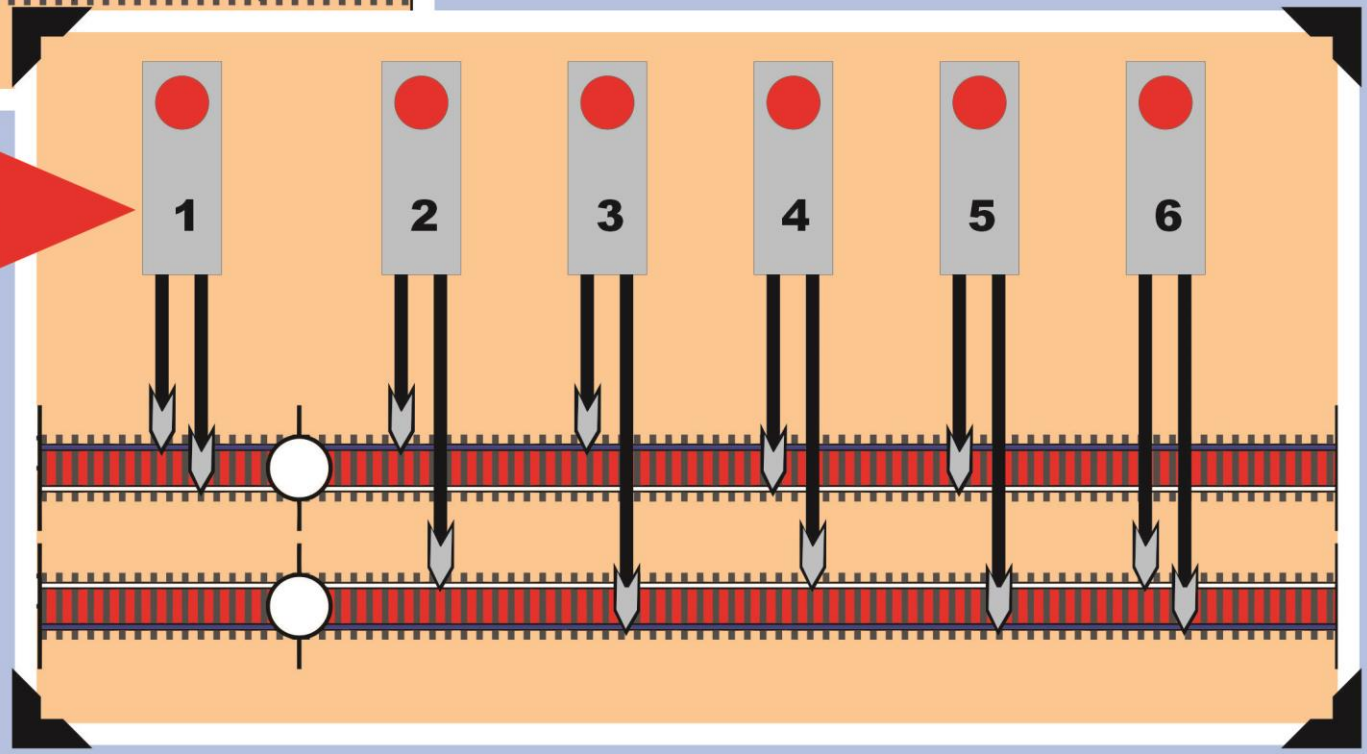
IF that faulted section is also large break it into two sections too, and so on, and only the faulted section will require testing. After the faulted module/s is dealt with reassemble the layout. (the worst part is connecting a large block of modules back together!!)

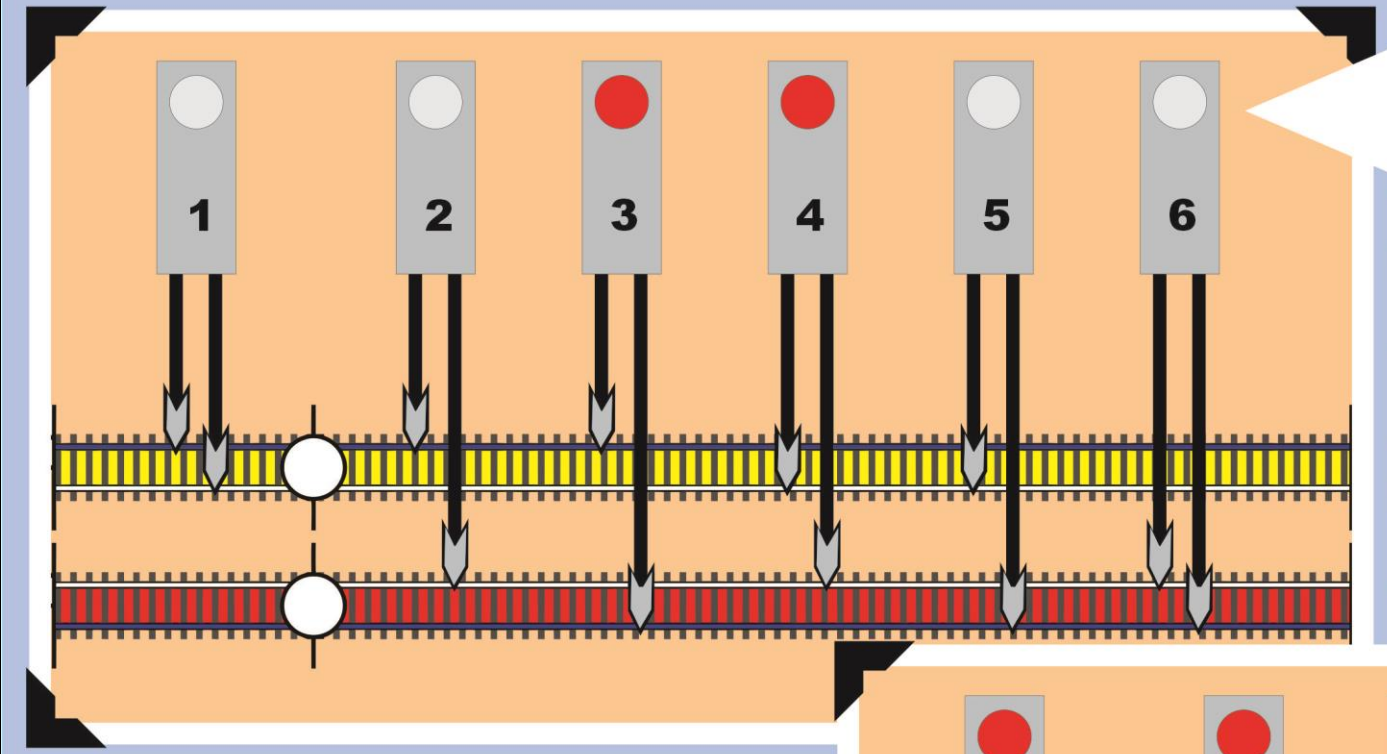


IF both the Red and Yellow tracks are supplied by the same bus as in this single row spine this is a correct indication that the Blue rails of both tracks are connected together and both White rails are also connected together.

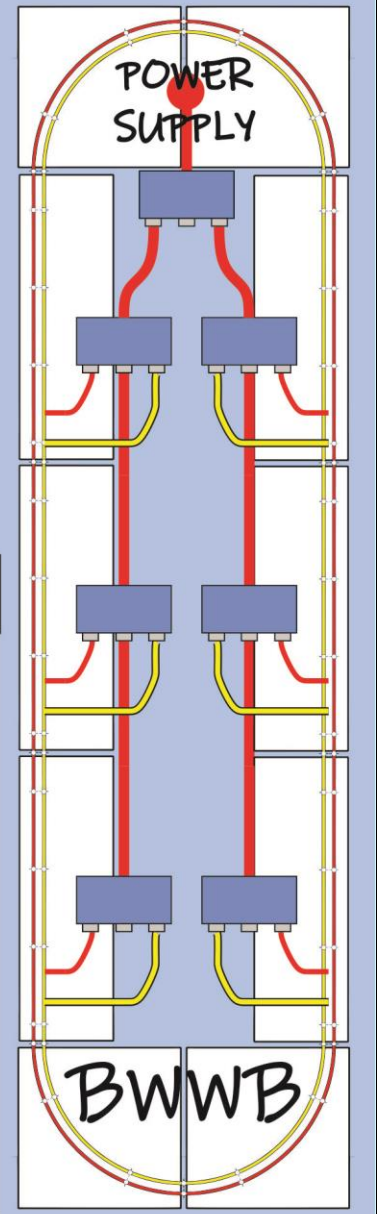


But if an incorrectly wired module (such as a BWBW module) is included in the spine this is the visual test result since all rails are connected together. Any Red loops connected to the spine will also show a test #1 or #6 fault.

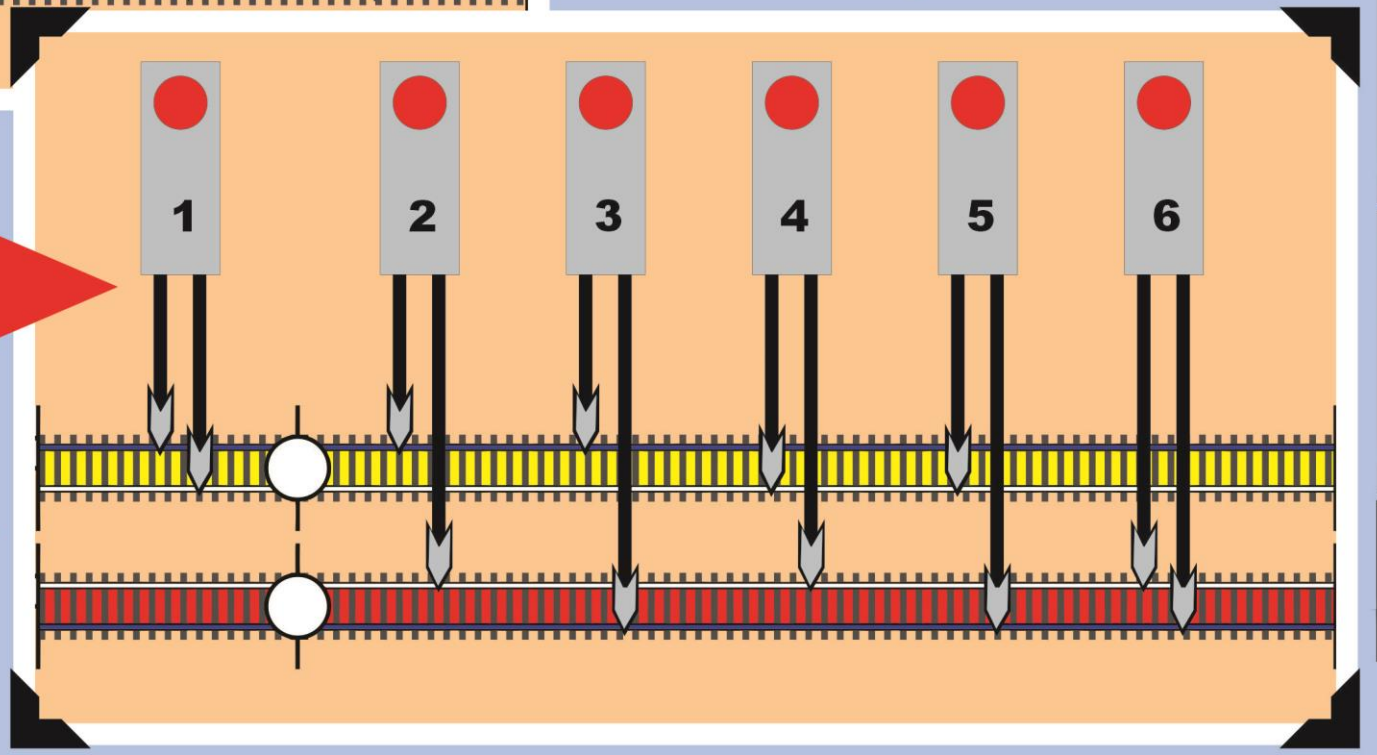


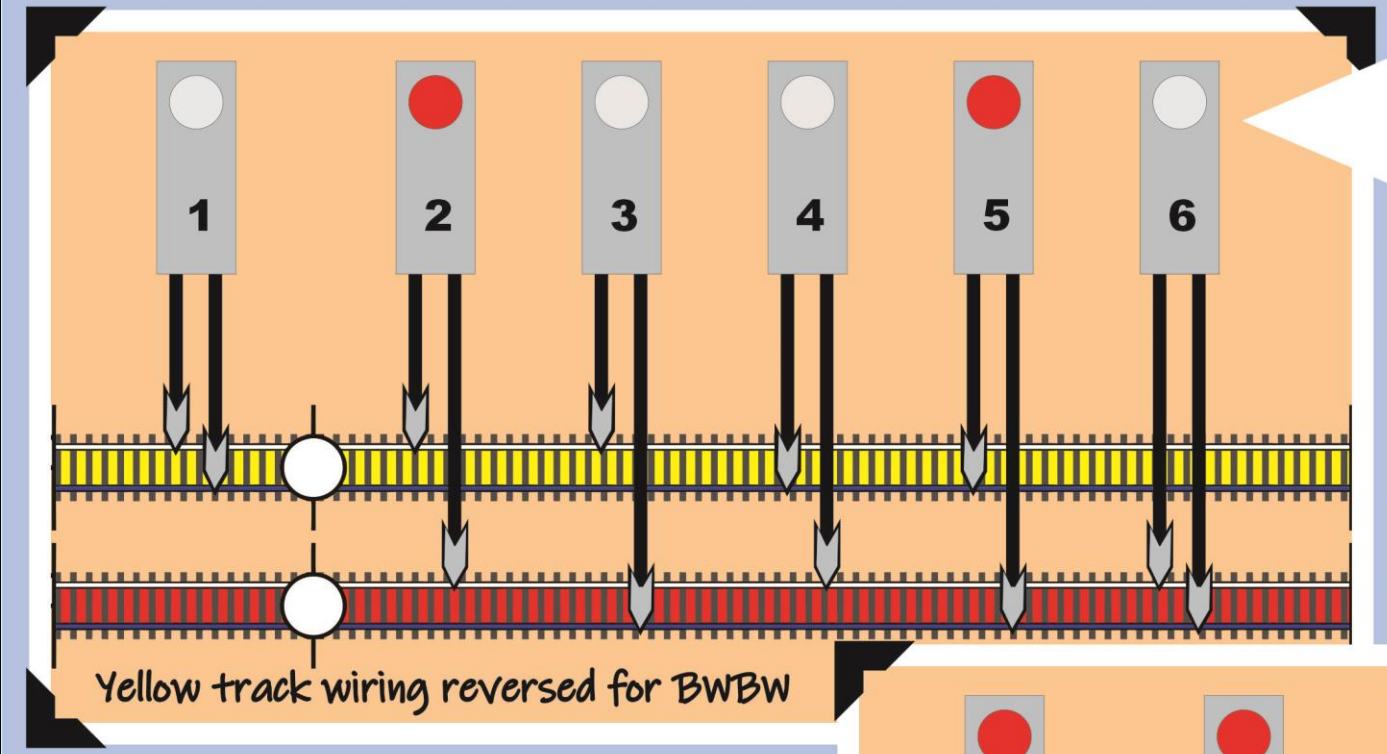


IF both the Red and Yellow tracks are supplied by the same bus as in this loop this is a correct indication that the Blue rails of both tracks are connected together and both White rails are also connected together.

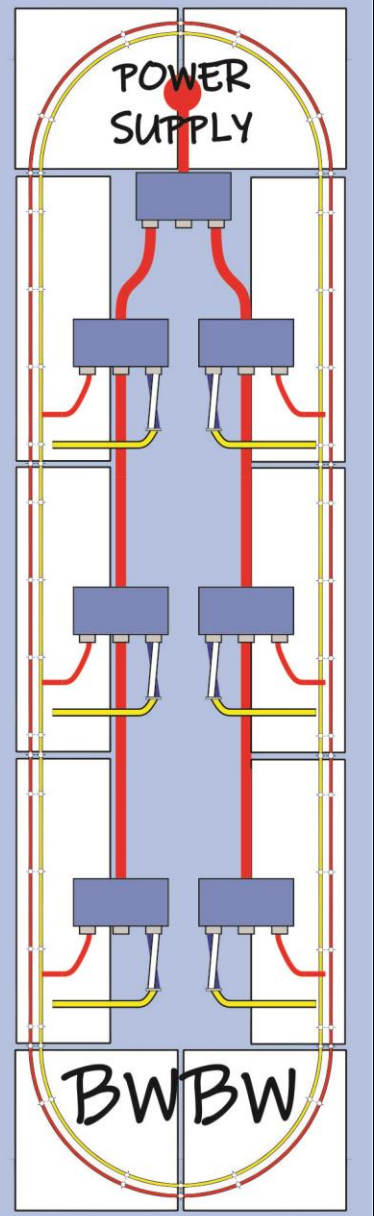


But if an incorrectly wired module (such as a BWBW module or a module with reversed R/y color code) is included in the loop this is the visual test result since all rails are connected together.





IF both the Red and Yellow tracks are supplied by the same bus as in this small loop that uses reverser cables to create a pseudo BWBW condition this is a correct indication that the Blue rails of both tracks are connected together and both White rails are also connected together.



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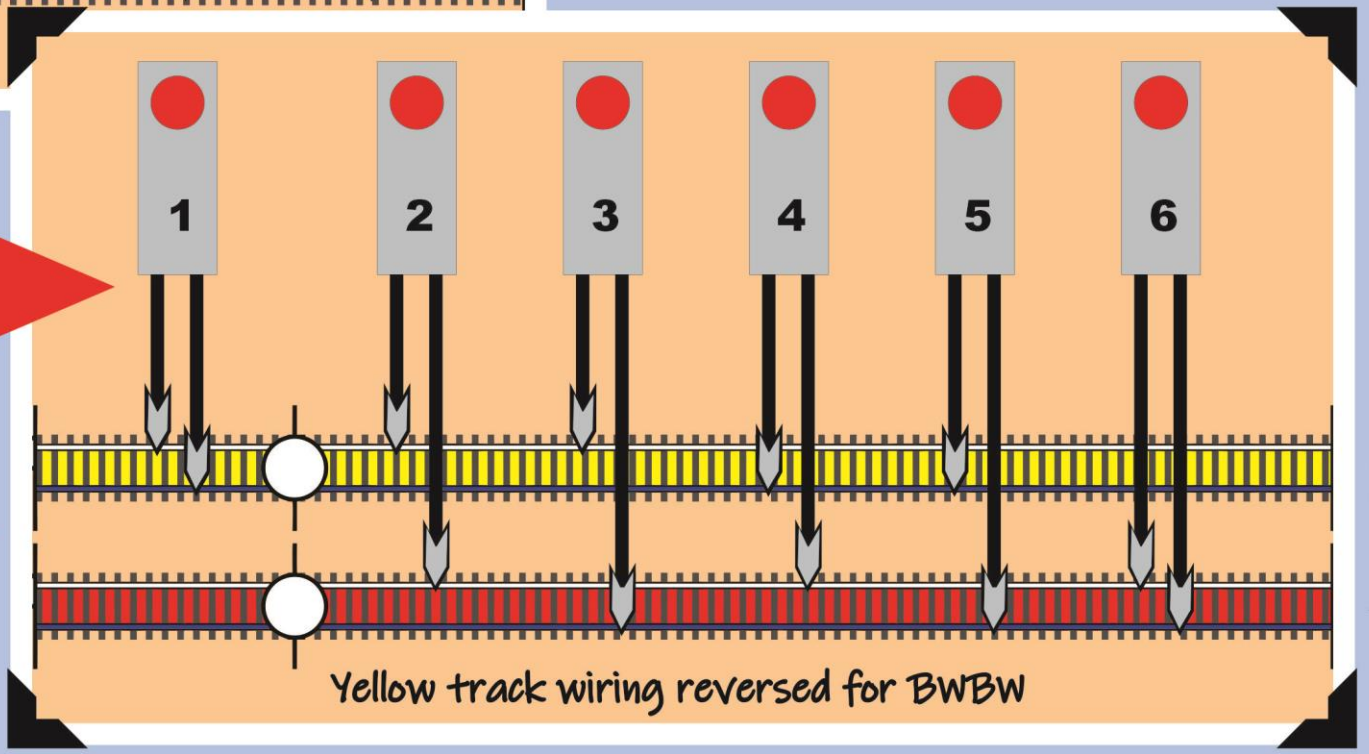

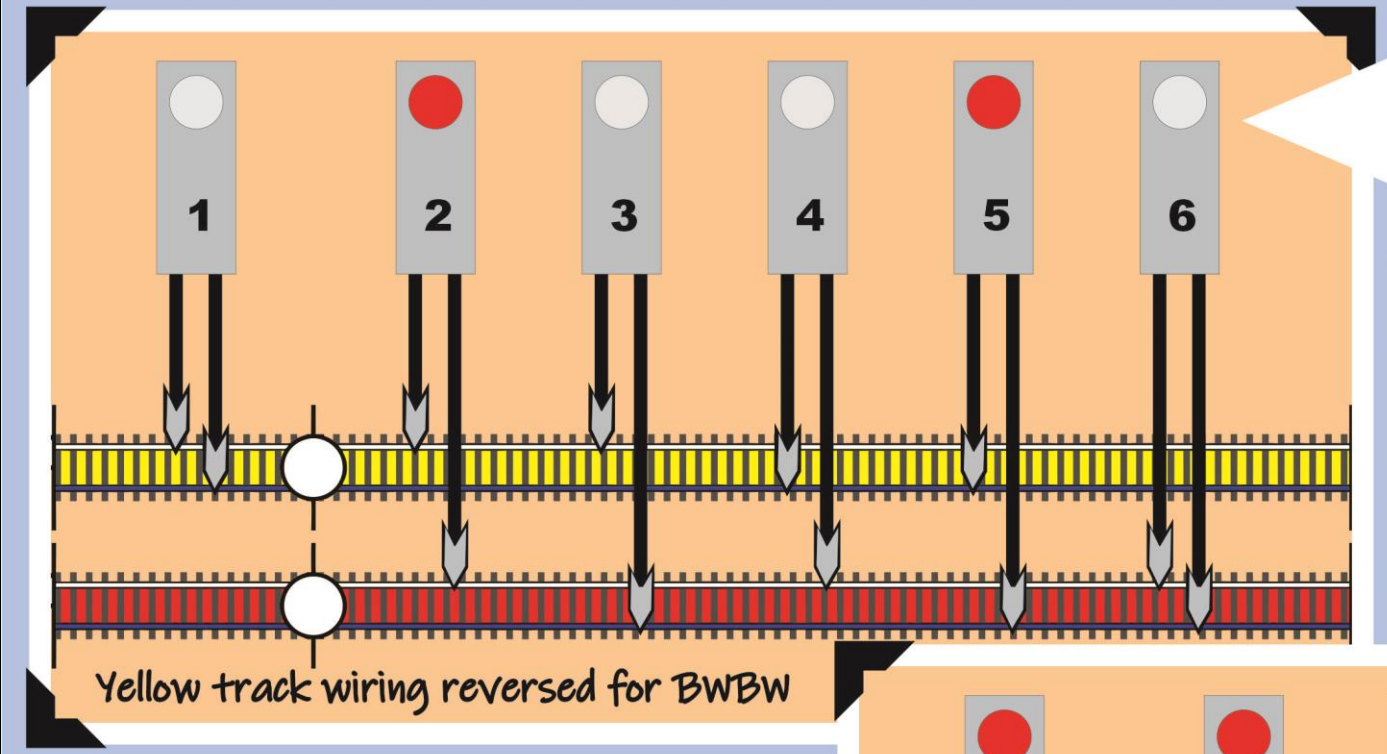

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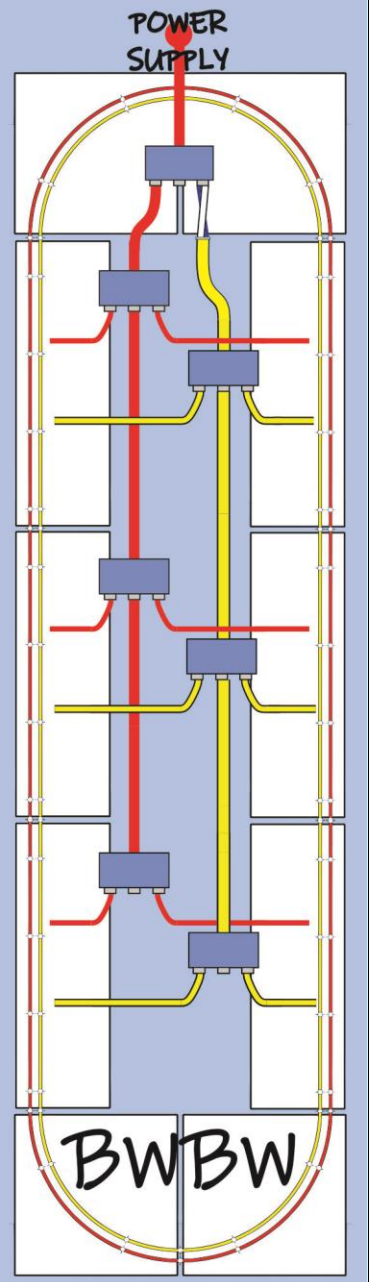

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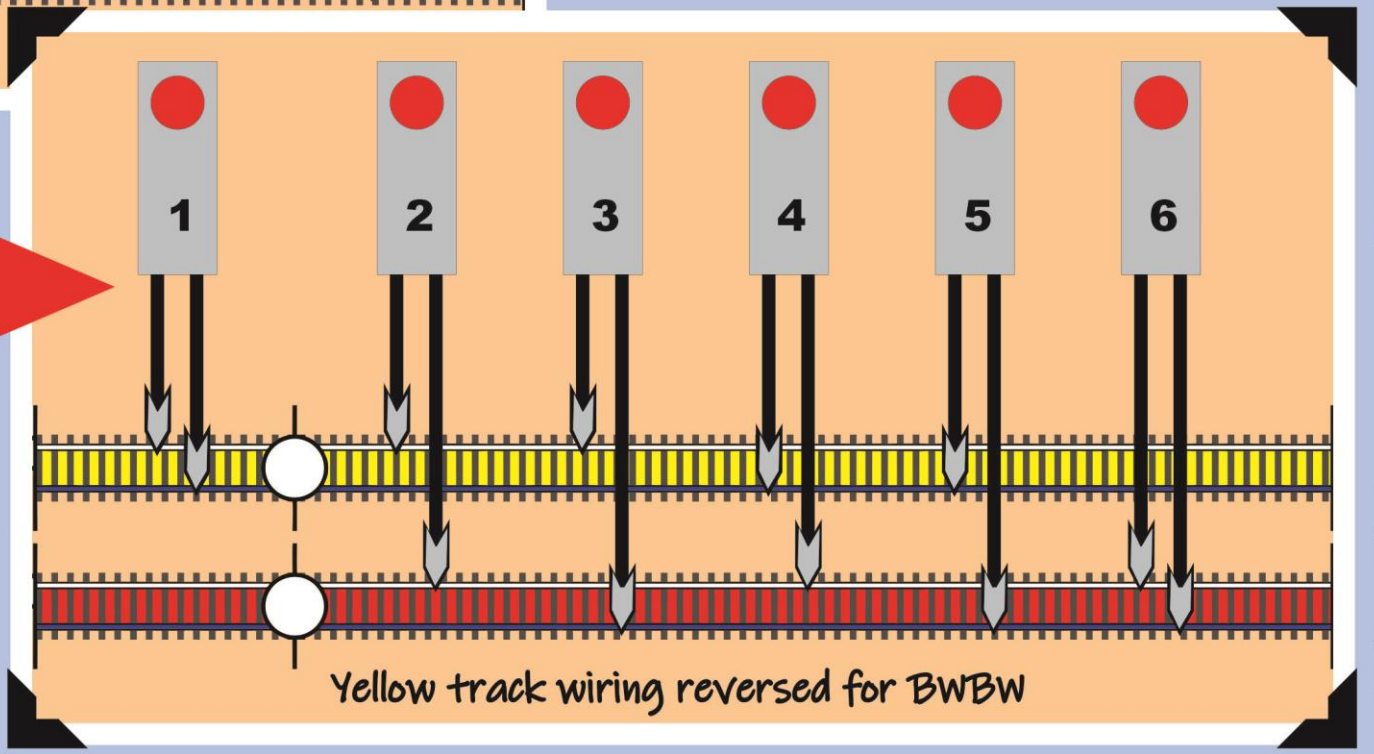

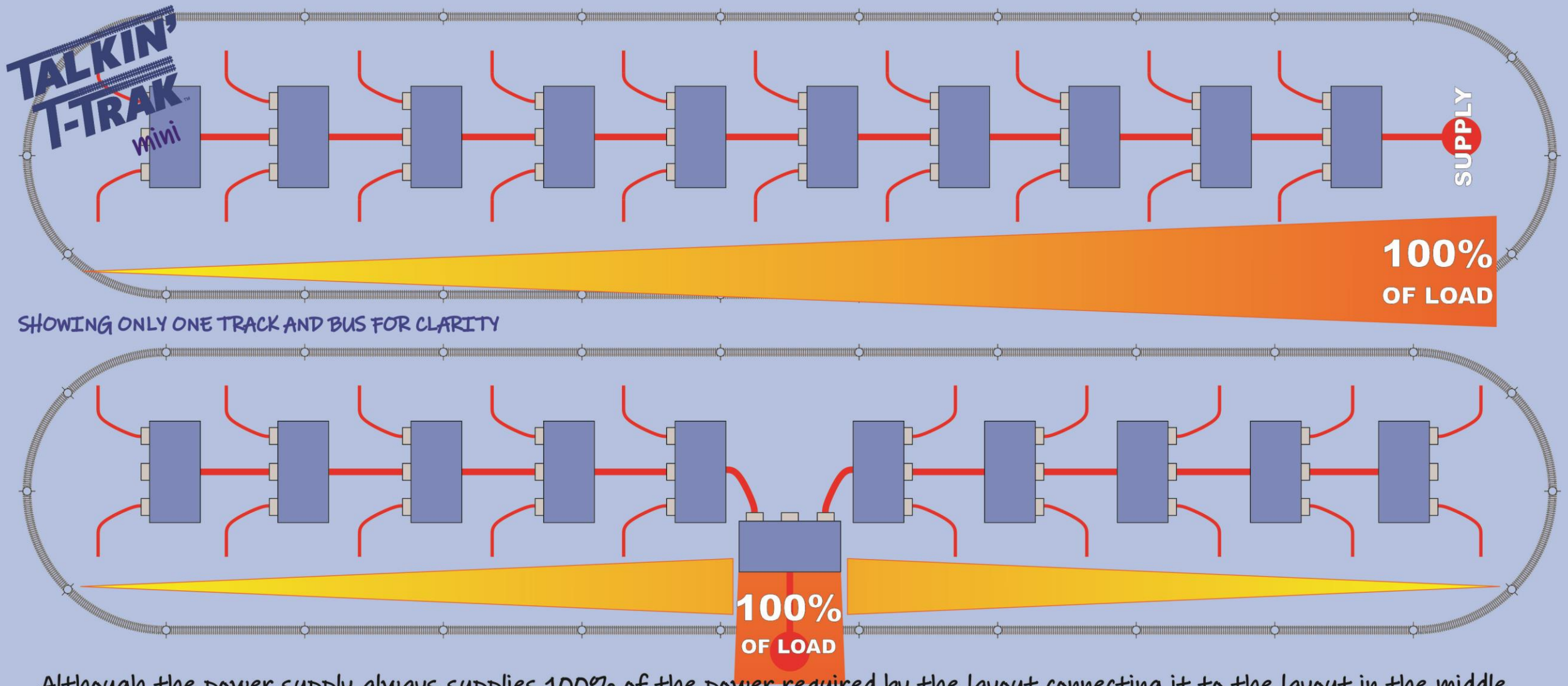

Although the power supply always supplies 100% of the power required by the layout connecting it to the layout in the middle minimizes the voltage drop at the end of the bus by shortening the bus length and minimizing the electrical load on any bus section. The track rails also act as a parallel power bus. Rail joiners are the most restrictive element to electrical power flow - reduce the effect by maximizing the number of connected bus feeders. Power loading at any given location around the layout depends on the location of trains. Even though a layout may be divided into blocks/districts overloads can occur when trains collect in any one place due to blocked movements or several sound equipped and/or track power lit passenger trains accumulate in a yard.

THANKS
For Watching

A ZoomTRAK presentation by True North Rail