Randall Train Layout Manual

By Raphaël, v3, updated 2018-08-30

The purpose of this document is a manual for the operation of the Randall Train layout.

The manual is composed of the following sections:

Section 1	**Automation Overview / Detailed Staff Usage Manual**. This contains background information on the various components of the Automation. It also details steps that the Museum Staff or anyone running on Saturday should be aware of.
Section 2	**Saturday Operators Days**. Instructions for operators running their trains on Saturdays. Includes a checklist of operations to do before and after running.
Section 3	**Troubleshooting**. Some common issues for Museum Staff and for Saturday Operators.
Section 4	**Known Issues**. A list of known track issues, updated as needed.

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Section 1
Staff Usage Manual

The purpose of this section is to explain how to use the train automation in the train room at the Randall Museum. This is targeted towards the Museum Staff. This document tries to be as non technical as possible.

Note: If the automation does not start or has stopped, please consult Section 3 “Troubleshooting”.

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1.1- Automation Overview

We have two trains which both operate from the “main station” (properly named hereafter Stockton Station).

The train composition may vary over time. The picture above may not be representative of the currently running configuration.

The two trains are typically:

1. An **Amtrak train** (gray engine and gray coach cars) or a yellow UP engine.
2. A **single-car train**: RDC (silver car) or Doodlebug (green).

Both trains travel on the same route. They alternate. Each time the green activation button next to the station is pushed, one train leave. When it comes back, the other train leaves at the next activation.
When an activation button is pressed, the train moves up the route till another specific point where it stops and reverse course towards the starting point. This is a simple point-to-point back-and-forth travel.

The automation is designed with two routes: a “Branchline” route and the main “Passenger” route.

At this time, only the “Passenger” route is working. The branchline needs more work and is currently deactivated.

Each route has a specific "automation toggle" switch which controls whether the automations can start.

- When the train is in motion, toggling the automation off triggers the train to return to its starting point. This is the intended way to "shut down" the automation.
- **These on/off toggles are not emergency stops**! Turning them off is used to run the train back to its “storage” position.

Each route has a large green activation button.

- When the train is stopped at the starting point, it starts the travel automation.
- When the train is in motion, the button does nothing.

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A main computer, located next to the DCC command station, controls the whole automation for both routes.

Two tablets display the state of the automated routes and the location of the trains.
The tablets do have an “**Emergency Stop**” button which can be used to stop both trains when a problem occurs.

1.2- Train Placement

In case the trains are removed from the layout, they must be repositioned in a specific location and order for the automation to run again.

Please make sure automation is off before you place the trains on the track.
This will prevent accidental activations of the trains and departure while you are trying to set them up.

<u>The Amtrak Train or yellow UP Train</u>
Train order, from left to right, must be:

- Amtrak engine #506.
- Amfleet coach labelled “LEFT” (see blue sticker under the car).
- Amfleet "café" car (with the middle section without windows) in the middle.
  There is a sticker under the car which indicates the LEFT side.
- Amfleet coach labelled “RIGHT” (see blue sticker under the car).
- Amtrak engine #516 in reverse.

Train placement:

- Train must be located on **the third track**, in front of the Stockton Station.
- Align the front engine with the left-most side of the turnout on mainline track #1.

Double check this tricky points, as they are known issues which can be easily missed:

- Double check that all wheels are properly set on the rails.
- Double check that all couplers are properly attached, especially between coaches.

The single-car RDC (silver) or Dooglebug (green)

Train order:

- The RDC has a front and back although it may be easy to discern for the non-initiated. To help identifying the front, look under the engine for a blue sticker “FRONT”.
- The engine must be placed on the track with the FRONT towards the LEFT.

Train Placement:

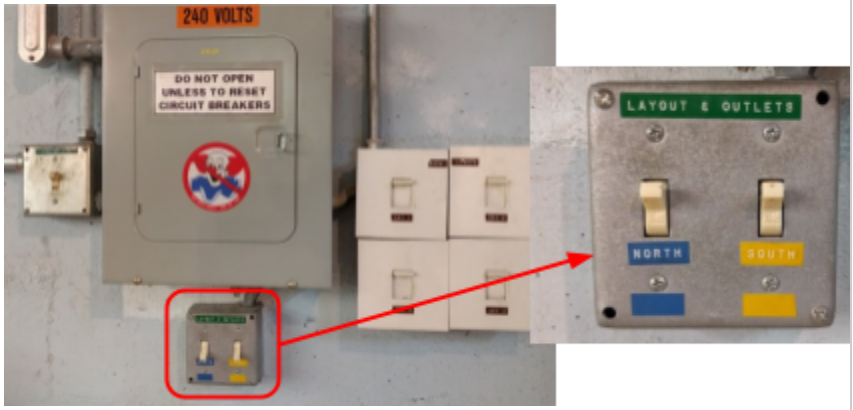
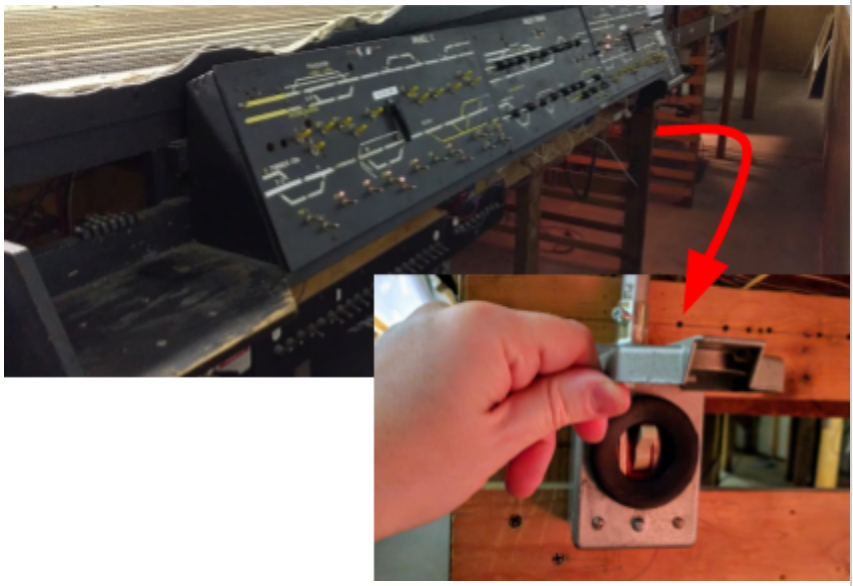
- Engine rain must be located on **the second track**, in front of the Stockton Station (this is Mainline Track #2).
- Engine must be lined up with the left-most side of the turnout on mainline track #1.

Double check:

- Make sure wheels are properly set on the rails.
- Double check that the FRONT is located towards the LEFT.

1.3- Turning the Layout & Automation On and Off

1.3.1- Procedure to turn Automation ON

1- Turn on the "Layout & Outlet" power next to the sliding door. Flip both up.	
2- Turn the main DCC power switch on. It is located under the layout in a gray protective box. Flip it up.	

3- Verify that little lights come up on the Valley Panel.
⇒ If they do not, you need to reset the gray box power supply under the layout.

Then proceed to step 4 on the next page.

4- Wait a minute for the computer to start and display a map of the layout.	
5- Make sure the "Passenger Automation ON / OFF" toggle is up on the "Valley" panel. Note: The "Branchline Automation" on the central "Mountain" panel is not currently used.	

IMPORTANT : Train Activation will NOT start unless BOTH trains are present at their expected starting point next to the station.

1.3.2- Procedure to turn Automation OFF

1- Turn off (down) the Automation ON / OFF toggle.

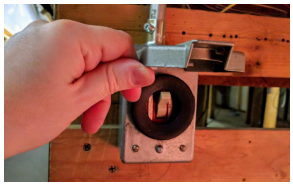
Note: Turning this toggle OFF does NOT stop the trains.
It brings them back to the station if they are not there already, and prevents further departure.

⇒ **This step is optional if both trains are ALREADY idle at the station** and no one is pushing the green buttons.

IMPORTANT :
Do NOT proceed to next step till all trains are IDLE in their respective station.
Automation will NOT restart properly if trains are not at the expected location in front of the station.

2- Turn off the main DCC switch next to the computer.

⇒ Do NOT touch the computer. It will automatically and safely shut off by itself.



3- Turn off the "Layout & Outlet" power next to the sliding door. Flip both down.

1.3.3- Check the Tablets

There are two tablets: one by the Valley Tower panel, and one by the Mountain Tower panel. They are “always on” even when the layout is not powered -- the tablets simply fall into a deep sleep mode.

In normal operation, there should not be any need to turn them on. The should automatically wake up within 5 minutes of having power and when the automation computer is running.

If for some reason the tablets are fully turned off (e.g. if the battery gets depleted overnight), do the following to turn them on:

- Press the power button once and release it. The display should come up after a few second, it will display the ChuWi logo, then a white screen with a countdown timer and then eventually it will display a large battery filling up.
- Press the power button a second time and this time hold it for 4 seconds. Upon releasing it, the tablet will display the ChuWi logo, then a white screen with a countdown timer and this time it will boot into Android. At that point the tablets are programmed to start the software and connect to the main computer automatically.

<TODO picture: 2 tablets location / which one is the power button>

Once the tablets are up and running, they should display the state of the automation as such:

<TODO picture screenshot tablet landscape + portrait in start position>

1.3.4- Check the Layout Panels & Track

Before turning on the automation or even *using* the layout, please do the following checks:

- Make sure there are lights on both the Valley Tower and the Mountain Tower panels.
    - There should be one little white/yellow light on for each block.
    - ⇒ If the panels show no lights at all, see the troubleshooting section below.

If the Passenger Automation is going to be used, some turnouts must be in very specific positions:

- Valley Tower Panel: T03 must be Normal.
- Stockton Yard Panel: The two yellow lead tracks must be turned on.
- Passenger Panel: T503 must be Normal. Blocks B503A and B503B must be turned on.
- Any short in the Stockton Yard has a direct influence on the Amtrak train when it is in the Passenger Station.

1.3.5- Turn on the Automated Routes

Each automated route as its own “automation toggle” which indicates whether it can be activated or not.

Passenger Automation:

Branchline Automation:

These toggles have two purposes:

- When turned on, they allow the large green “activation buttons” to start and move the trains. They also configure the mainline turnouts in a very specific way.
- When turned off, they bring back the trains to their startup position.
- **They are not Emergency STOPs for the automation** ⇒ Toggling them off will NOT stop trains which are actually running.

UPDATE 2018-08:

- The Passenger Automation toggle has been moved to the Valley Panel 1.
- The Branchline Automation is currently not used. The toggle can stay off.

1.3.6- Warning about Power-Cycling the DCC

To make my position clear: **I do not recommend power-cycling the DCC**.

Rationale against it: Most of the time, people power-cycle equipment when they do not understand what is going on. It always pays better to take time to analyze the situation and see if there's a better alternative. There are cases where it is the thing to do, especially given the haphazard nature of the NCE command station, but I want to emphasize this should only be done as a *last recourse*, not a first one.

Anyhow, since I know sooner or later someone is prone to think that's the "right" thing to do or be instructed to do so, I want to clearly explain the procedure so that it be at least done correctly.

To power cycle the DCC command station, perform the following steps:

1. **Please please please** consider 4 times why you are doing this. Were you told to do it, or do you think it will magically solve some random unrelated problem? ⇒ If that's the case, check "Section 3 - Troubleshooting" in the manual **before** proceeding.
2. **Important**: If the trains were running, **wait for the trains to come back** to their starting position! ⇒ Do not proceed to next step if the trains are not at their starting point.
3. **Turn the automation toggles off**.
4. Turn off the DCC power.
5. **Important: Wait for the computer to turn off**. This takes exactly one minute.
6. **Once the computer has been clearly turned off**, turn on the DCC power.
7. It is extremely likely that one of the power supplies will trip. ⇒ Check whether all the panels lights properly turned off. Consult the "Critical Power Supplies" chapter in "Section 3 - Troubleshooting".
8. **Wait for the computer to finish booting and displays the map**.
9. Turn the automation toggles on.

1.3.7- Turning off the Automation and the Layout

To turn off the layout at the end of the day, simply reverse most of all previous steps:

10. Optional: turn the automation toggles off. Doing so instructs the trains to go back to the station if they are not there, and it prevents further activation. This steps is optional if both trains are already at the station and no visitor is pressing the buttons.
11. **Important**: If the trains were running, **wait for the trains to come back** to their starting position!
12. **Turn off the DCC power**.
13. **Important: Wait for the computer to turn off**. This takes exactly one minute.
14. **Turn off the Layout power** using the North & South switches at the entrance.
15. **Turn off the lights**.

1.4- Computer and Tablets

The automation is driven by a computer that is located next to the DCC Command Station under the layout. This section covers how to install and remove them.

1.4.1- Computer

The computer is located next to the command station on a specific little board:

The computer is locked in a dock which provides power and USB connections. The dock itself is secured by a cable lock.

During normal operation (either Automation or Saturday Operation), the computer should always be on and in its normal state would display a live map of the layout, showing clearly which blocks are occupied.

Important

Once it is running, **do not try to use the computer**.

The program is not serviceable by the Museum Staff.
Saturday Operators are not authorized to make any changes to the computer or the software.

If you see “things moving on the screen”, that’s probably Raphaël remotely accessing the computer. In that case please do not interfere, do not use the keyboard or trackpad, and in that particular check with Raphaël before turning off the DCC and/or the computer.

Laptop Startup Sequence

The following sequence should happen when the computer starts:

1. A black screen with 3 lines of text, which goes away after a few seconds.
2. Some kind of logo replaces that on a blue/gray background.
3. A log-in box appears for 10 seconds. Do not touch it as it auto-logs in automatically.
4. Some black windows (named “Terminals”) with text in them appear. This part lasts a minute or two.
5. Finally the screen is filled by the train map on a green background.

It’s possible for the computer to get stuck at step 1 with a black screen with 3 lines of text and a “TPM error”. In that case, a simple fix is to hold down the power button till the computer turns off. Then release the button and press it again once briefly to restart the computer.

Storing the Computer Away

The computer is installed in a “dock” which is locked by a key and screwed in place. In case it is necessary to store the computer away, please follow these procedures.

To remove the computer, do these steps:

- Make sure DCC power has been turned off and if necessary give the laptop one minute to turn off.
- Unlock the dock using the key found in the cabinet.
- Press the large button next to the blue tape to “eject” the computer.
- Put both the computer and the dock key in the rear cabinet.

To install the computer:

- Make sure DCC power is turned off (to prevent the computer from starting right away).
- Take it from the rear cabinet.
- Take the key to the dock.
- Make sure the dock is not locked by pressing the button next to the blue tape.
- Place it on the dock by aligning the top left corner then pressing firmly down. It will “click” once in place.
- Use the key on the left side of the dock and lock the dock.
- Put the key back in the cabinet.
- DCC power can now be turned on.

1.4.2- Tablet #1 (Valley)

The Valley Tower table is located here:

It is held in place by a simple wood retainer.
There is a power plug just under it.
Place the AC adapter in the power plug, and use the specific USB C cable to power the tablet.

<TODO picture of power button + USB C cable>

Note that the ChuWi tablets are quite finicky -- make sure to not lose either the provided USB C cable nor the AC adapter.

Turning on the tablet is a bit of an exercise in frustration. It goes like this:

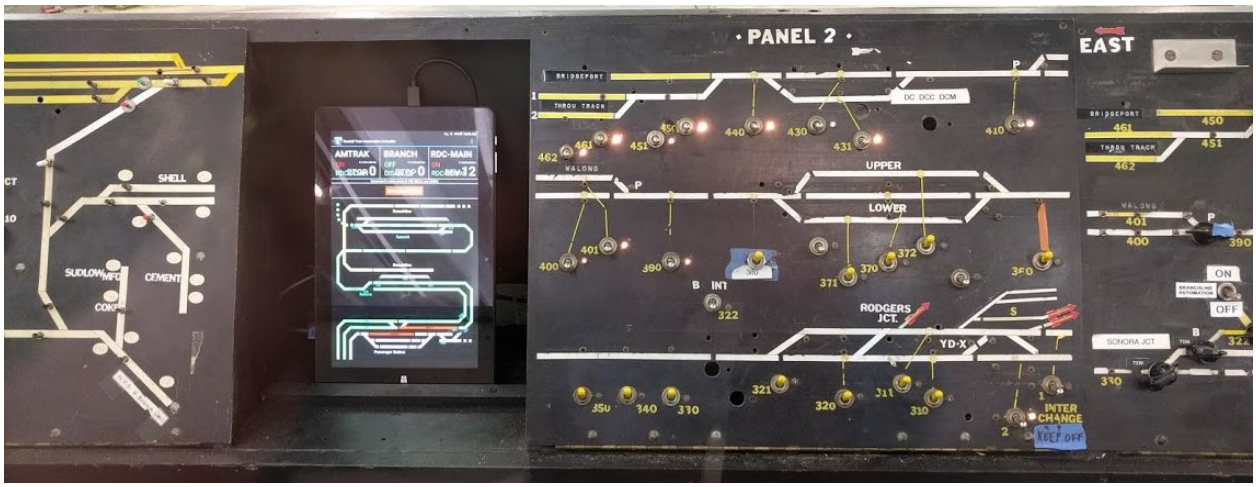
- Press the power button once and release it.
    - The display should come up after a few second, it will display the ChuWi logo.
    - then a white screen with a countdown timer.
    - and then eventually it will display a large battery filling up.
- At that point, press the power button a second time and this time hold it for 4 seconds.
    - Upon releasing it, the tablet will display the ChuWi logo (again),
    - then a white screen with a countdown timer (again),
    - and this time it will boot into Android.
- At that point the tablets are programmed to start the software and connect to the main computer automatically.

Turning off the tablet is easier:

- Press the power button for a second or two.
- A menu appears that has a “Power Off” option at the top. Press it.
- ⇒ Make extra sure to not select any of the other options.
- The tablet will start its shutdown sequence.
- At some point the display will turn off to turn on almost right away and display a logo, then actually turn off.

1.4.3- Tablet #2 (Mountain)

Same instructions as for the first tablet, except the location is this one:



There’s a small power strip tucket behind the tablet to plug the AC adapter.

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1.5- When Automation Doesn't Work

The train equipment and specific parts of the layout are delicate, and many things can go wrong, resulting in the automation not starting as expected.

1- Read chapter "Critical Checks" in Section 3. It contains a checklist describing various *known* issues and offers some remediation steps. Go through that check list in order.

⇒ There are many delicate parts on the layout.
⇒ Do not touch equipment unless indicated in the troubleshooting section.
⇒ If you are not sure of what to do, then **do nothing.**
Instead TURN POWER OFF and contact us.

2- Read chapter "The 3 Critical Power Supplies" in Section 3. It details what to do in case of sections of the layout not being powered appropriately. This is referenced by the checklist.

⇒ If you are not sure of what to do, then **do nothing.**
Instead TURN POWER OFF and contact us.

3- Take notes of what you do or the state your observe. If you can, snap a picture of whatever state you observe and think is relevant.

4- Contact either Jim or Raphaël. Reception desk has our contact information.
⇒ If you are unsure on what to do when things do not work, please contact us immediately and we'll try to help.
⇒ Even if you fixed a problem using the troubleshooting steps, please let us know. If you can document whatever you saw with a picture. This helps in updating the troubleshooting section later.

5- IMPORTANT: If the automation does not work, TURN OFF POWER TO THE LAYOUT by using the "North / South" wall toggles by the entrance door.

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Section 2
Saturday Operators Days

The purpose of this document is a manual for the operation of the Randall Train layout by individual Operators on Saturdays.

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2.1- Operator Rules

The train layout is under the jurisdiction of the museum. The train layout does not operate like a traditional train club. As for right now, there is no notion of membership and fees. The following rules describe the situation as it is now, and may evolve later as needed.

The train layout is under the leadership of Jim Evans and Raphael Moll (the “coordinators”), as a direct result of us having worked towards restoring the relationship with the museum after the GGMRC donated the layout to the museum and having provided the means to automate it as wanted by the museum.

The structure that we established can be summarized as follows:

- Train automation is the main purpose of the train layout as a museum exhibit.
- “Operators” refers to individuals who are allowed to run their personal trains on the layout for public display, as long as the rules specified here are followed.
- Jim Evans is the lead coordinator for Operators.
- Raphael Moll is the lead coordinator for Automation.

Operators are museum volunteers and must abide by the museum rules for volunteers, as well as the rules we have defined for operating on the train layout.

The main purpose of Operators is to run trains for the enjoyment of the public and enhance interest in model railroading.

Rules follow below.

2.1.1- Who can run

Only approved Coordinators as well as approved Operators can run on the layout.

Operators can only run *after* they have gone through the fingerprinting and orientation process, as explained in the next chapters.

Although it might seem to be a friendly gesture to allow young people or others to operate your train running on the Randall layout, being in a public setting, this can encourage others to request the same privilege. Therefore this practice is discouraged.

Age recommendation:

- Below 16, young operators can only run with *active* adult supervision required at all times from a parent or guardian. Both the younger and the adult operators must first have completed the fingerprinting and orientation process.
- At 16 or +, no adult supervision is required. Operators need to complete fingerprinting and orientation like adults.

2.1.2- Fingerprinting

Operators must have been fingerprinted using the process defined by the museum and have the process completed *before* operating:

“The Randall Museum requires that all model railroad volunteers get screened by SF Recreation and Park Department for liability reasons. Please contact Nathan Robinson, Randall Museum Friends Executive Director at 415-554-9681 to get scheduled for screening.”

2.1.3- Orientation

Operators must follow a short orientation from the coordinators, either Jim Evans or Raphael Moll.

The Randall layout can be somewhat tricky and the control panels can be finicky to operate. An operator can easily render a large portion of the layout unusable. To prevent this, we are having some basic mandatory orientation covering these rules as well as what is permitted and not permitted on the layout.

The orientation is not a training. It is expected that operators have already basic proficiency and are able to run their own trains. The layout uses NCE Pro Cab controllers which are easy to use even for young operators.

We reserve the right to refuse operation to individuals who do not follow the rules, or do not exhibit the proficiency to run properly, or do not respect other individuals or the public. This list is not exhaustive.

2.1.4- Public Utility, Safe Operation

The main purpose of Operators is to run trains for the enjoyment of one-self and of the public.

At the time being, Operators are expected to:

- Only run on Saturdays.
- Only run on the mainline, in a clockwise direction.
- Only run equipment which is known to work reliably.
- Comply with the automated operation of the layout.
- Comply with the rules set here.
- Comply with the requests from the coordinators.

Saturday Operators Days is not a class.
This is not an experimentation place. Do not run trains which are too long (trains should always fit in the main yard or passing sidings), may be prone to derailments, or are not able to cope with the grades on the layout.

Running trains on the historic Randall Model Railroad should be an enjoyable experience and this can be achieved by good teamwork by the operators through the adherence to the common sense rules above.

Repeated violations will result in corrective actions.

2.1.5- Respect

Operators are expected to show respect, share with other individuals who want to run on the layout, and respect the public.

Common sense rules:

- Do not block the mainline.
  This is never the right place to park a train or spot a set of unattended cars.
- Do not block interchange tracks.
  This is never the right place to park a train or spot a set of unattended cars.
- Do not pass signals at danger, that is do not pass a red signal.
  The layout does not have many signals. The only few signals present indicate that turnouts are not aligned properly. They must be respected.
- Always watch your train.
  Check your train speed and be aware of the train in front. It may have stopped for technical reasons, and ramming it will only make a situation worse.
- Always communicate with others operating on your track both in front and behind your train.

2.1.6- Participation

Operators are expected to participate in some function in the maintenance of the layout.

The layout needs work: track work repairs, turnout repairs, scenery. A list of known issues is clearly posted on the main yard. It is available in section 5 of this manual.

Main coordinator for repairs is Raphael. Please coordinate any proposed repair work with Raphael.

In the past, some questionable choices have been made on the layout, with sub-par work. To avoid repeating this, we ask that Operators evaluate their own proficiency and do not attempt repairs that may cause more problems than they fix. Please discuss and specifically document the repairs you are going to be attempted *before starting* and after having completed the work in an effort to keep track of the state of the layout.

2.2- Checklist START of the Day

- Turn main layout power on then turn DCC on, per procedure listed in manual.
    - ⇒ See Section 2 in the manual.
- Set Automation toggles to OFF.
- Double check all DCC Yellow block toggles are Up, and that all Silver ones are Down.
    - Check to be done on Mountain Panel 1, Mountain Panel 2, Valley Panel 1, Valley Panel 2.
- Double check turnouts panels. Turnouts to check:
    - On the Stockton Yard Panel: T210, T11, T212, T240, T124, T220 all Normal.
    - On the Valley Panel: T03, T04, ~~T05~~ (currently out of service), T06, T10 all set to Normal.
    - On the Valley Panel: Set T20 to Thrown/Reverse (eg. align towards B21).

The Coordinator in charge will decide if the Operation Day will cohabit with the Automation or without it. Suggestion mode of operation:

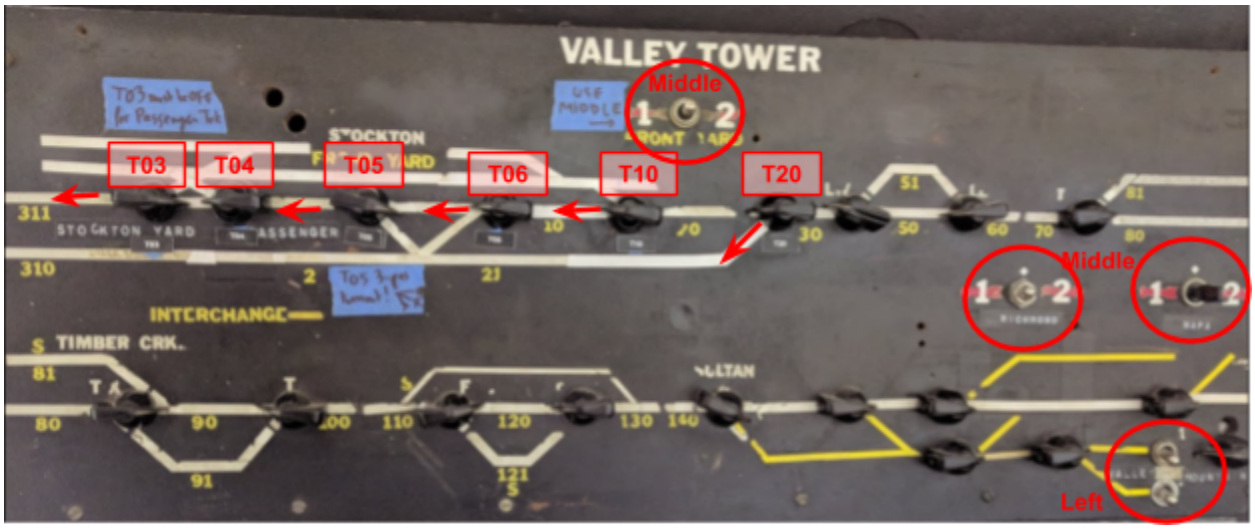
- If only one Coordinator is present, cohabiting with the Automation is easy.
- If one or more Operators are present, run with Automation disabled.

In both cases, Operators must be conscient of the automated changes done to the Sonora turnout and must coordinate their trains accordingly (see chapter 5).

See pictures next page.

Stockton Yard panel in desired state, with relevant toggles highlighted:
<CURRENT PICTURE IS A PLACEHOLDER>

Valley Panel panel in desired state, with relevant toggles highlighted:
<CURRENT PICTURE IS A PLACEHOLDER>



2.3- Checklist END of the Day

Basics:

- **It is mandatory that the automation be left in a known WORKING state at the end of the day**.
  It is the responsibility of the Coordinator present to ensure the automation is working. "Working" means it has been tried successfully once for each automated train.
- The museum officially closes at 5 PM. Sometimes visitors linger around. This is fine.
- Operators are not required to stay till 5 PM.
- However if they leave early, they are still expected to cleanup the room and leave the automation in working order.
- Be considerate. Do not leave your trains on interchange tracks or lead tracks for the yards ladders. If a spot is "convenient" for you, it's likely to be convenient for others too.

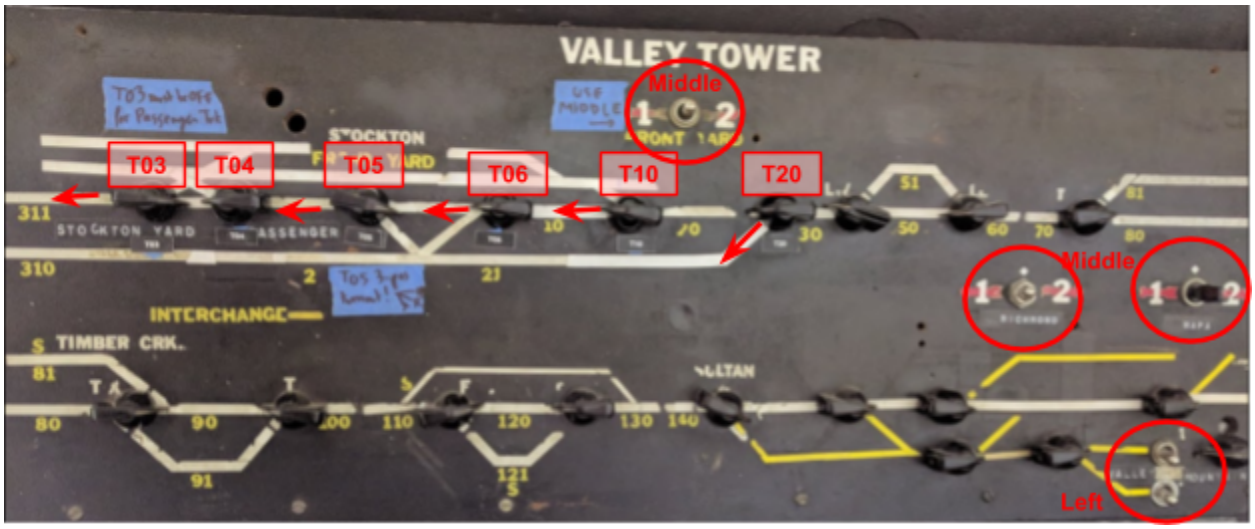
Mandatory steps before returning to automation:

- Remove all trains from the mainline that are not in used by the automation.
- All the mainline and the first interchange track in Stockton Yard must be free.
  - ⇒ This is needed in case engines miss their stop at the station. They should be "rolling" free without crashing in other trains.
  - Block B02 (the inside mainline track) *must* be free, *including* in Stockton Yard.
  - Stockton Yard Interchange track #1 (the "3rd track" in front of the yard) *must* be free.
- All turnouts for the above mentioned mainline and interchange track must be left in Normal (closed) position.
  - Exhaustive list of turnouts to check:
  - On the Stockton Yard Panel: T210, T211, T212, T240, T124, T220 all Normal.
  - On the Valley Panel: T03, T04, T05, T06, T10 all set to Normal.
  - On the Valley Panel: Set T20 to Thrown/Reverse (eg. align towards B21).
- Power:
  - On Stockton Yard Panel, Yellow toggles for power on both interchange track must be up.
  - On Stockton Yard Panel, remove power to storage tracks 1 through 8 (white toggles down).
  - On Stockton Yard Panel, both interchange track power selectors must be in the middle "Y" position.
  - On the Valley Panel, the top-center "1 2" toggle, the Richmond one, and the Napa one must be in the middle position.
  - On the Valley Panel, the "Valley Mountain" toggles at the lower right must be on the left position.

See pictures next page.

Stockton Yard panel in desired state, with relevant toggles highlighted:
<CURRENT PICTURE IS A PLACEHOLDER>

Valley Panel panel in desired state, with relevant toggles highlighted:
<CURRENT PICTURE IS A PLACEHOLDER>



2.4- Completion Sheet Before Leaving

Steps to perform before leaving the layout.
It is *your* responsibility to allocate enough time to perform the steps before leaving.

☐ **"End of Day Checklist":** Perform all steps (see other page).

☐ **Enable and Try the Automation:** Run each train once using the activation button.
It is of crucial importance that the automation be left in a working state.

☐ **Access Door Keys**: Placed on the nail by Stockton Yard labeled "Glass + Door Key".

☐ L**ight off in the Rear Room**. It does not turn off with the rest of the layout.

☐ **Side Access Doors**: Closed and locked.

☐ **Leave the room in a clean state**.
Movable kids benches must be moved to the central area.

☐ If it after 5 PM and the front desk people have already turned off the rest of the museum, you are in charge of turning it off too:

- Power off DCC ⇒ See Section 2 for details.
- Power off layout power.
- Power off all lights.

Special Notes / Issues:

Name:	Date:

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2.5- Running with Automation ON

Once the automated routes are turned on, it is extremely important to *not* run any train manually on the automated routes on the Branchline and the parts of the Mainline monitored by the automation.

The automation relies on block occupancy. If another train is located on the blocks, it will utterly confuse the state of the automation in a manner which cannot be predicted.

On the mainline, care is to be taken between blocks B310/B311 and up to block B370. If you are not familiar with the block numbers, that means anything from the Stockton Station up to the Summit.

Important:

Never try to “outsmart” the passenger automation by trying to sneak an automated train on the mainline between the passenger station and the Summit when the Passenger Automation is turned on.

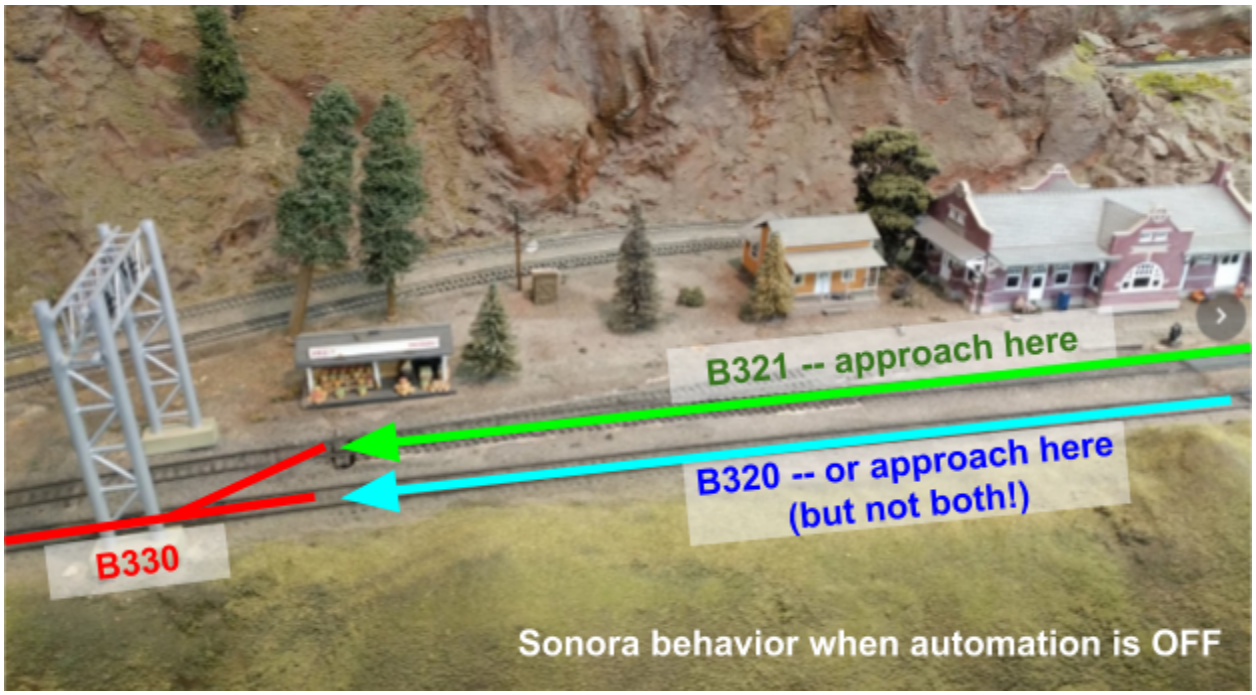
<TODO add picture explaining “blocks B310 up to 370”>

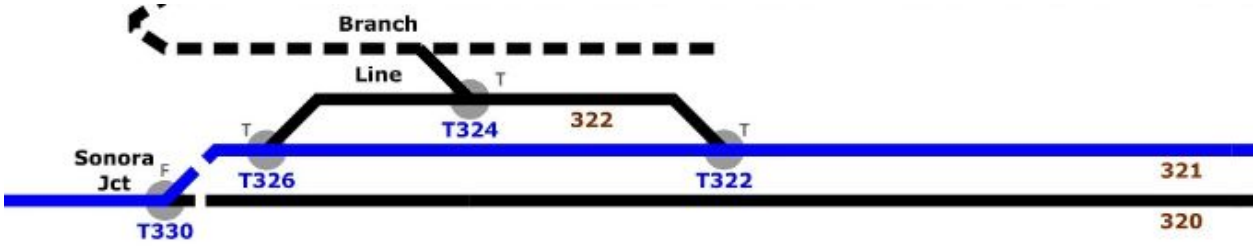
That being said, a procedure has been developed to allow people to run on the mainline when the automation is ON. It's a fairly simple procedure and if you follow the rules here, it should all work seamlessly:

- The train must run in the "normal" travel direction e.g. from Stockton station towards Summit.
- Bring you train on block B320, the outside mainline track #1 before Sonora.
    - Note that at this point Sonora is thrown and you have a RED light.
      Do not foul the Sonora turnout.
- If an automated train is travelling, you must wait for it to return to the station.
- Once the automated train is stopped at the station, the computer does a few things:
    - Both automated trains will blow their horn.
    - The Sonora turnout is closed in Normal.
    - This means the computer gave you track usage. The automation will NOT work till the train as cleared the Summit.
    - You now have a green light on block B320 traveling towards B330.
- Bring your train up to the Summit.
- Once block B370 (the Summit) has been occupied *and* then freed, the computer will regain control of the Sonora turnout and will enable further activation of the automated trains.

2.6- Running with Automation OFF

The Sonora Turnout (T330) Automation.





Historically, the Sonora turnout (labeled T330 on the new map) has always been a great source of confusion for *any* operator I have seen using the layout, including me. People constantly forget to throw the turnout and run their train against the turnout, shorting the mountain division!

To remedy that, the Sonora Signal Bridge has been fixed. The side going up that has the turnout thrown properly is clearly signaled green and the side against is clearly red.

I know for a fact this is not enough. Very often operators ignore signals, even when they are red!

To compensate for that, the computer runs a secondary automation *only* when the Passenger Automation is turned off:

- If a train enters block B320 and *both* B321 and B330 are empty, the turnout T330 is set to Normal.
- If a train enters block B321 and *both* B320 and B330 are empty, the turnout T330 is set to Reverse.

In other words:

- **If the block after Sonora is free,**
- **And if there is ONLY ONE TRAIN on both sides of the mainline going to Sonora,**
- **Then the turnout is aligned for that train.**

This means that when the Passenger Automation is turned off, the Sonora turnout is automatically thrown towards a train going up. This should avoid 95% of the issues I noticed with this turnout.

There are four important caveats:

- This does *not* work when the passenger automation is turned on. However in this case the manually running train should *not* even be on these blocks to begin with!
- This logic does *not* work if a train is parked on the mainline on blocks B320, B321 or B330. However trains should *not* be parked there to begin with!
- The logic does *not* work if there are 2 trains going up on blocks B320 and B321 (or even just sitting there). In that case, the computer does not know which side to choose and thus does not choose any side.
- Remember that the block detection only detects engines and light cars that draw current from the track. This logic will fail to detect non-powered cars that are still crossing the Sonora layout. This could happen if an operator is running a train long enough that its head engines have left block B330 but the tailing cars are still on the Sonora turnout.

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Section 3
Troubleshooting Guide

The purpose of this document is a *quick* Troubleshooting Guide for the Randall Layout. This document tries to be as non technical as possible.

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3.1 - Most Typical Staff / Operators Issues

“***Nothing* is working**”.

- This is not an issue, it's just an overstatement and it's fairly useless. Reporting this does not help as it provides no valuable information. Please don’t say that.
- This statement is false. It is not even a paradox. Entropy theory currently teaches us that *something* has be working *somewhere*.
- If you ever say this to me in a tone of indignation or utter despair, I will simply not help.
- Solution ⇒ Take time to understand what is not working and then restate the problem with a narrower scope. *Help me help you*.

“**Green Activation button is not doing anything**”.
That is still quite vague but a bit better than issue #1. Things to look for, in that order:

- Passenger and Branchline automation switch are on.
- All the “critical checks” in the next section.

“**My non-automated train running somewhere else stopped for no apparent reason**”.

- “**It must because of the automation**”.
    - ⇒ It most likely is not. Let's not blame the automation until all other culprits have been eliminated.
- Is the train stopped in front or on a turnout?
    - ⇒ **Check the turnout is aligned correctly**.
    - Do NOT randomly start toggling turnouts unless you know it's the one where your train is. Take the time to figure which turnout it is and which toggle matches it using the map that I have posted next to the Valley Tower.
- Is one of the circuit-breakers activated?
    - ⇒ Check the corresponding layout section for derailed or shorting engine.
- Is one train or engine emitting the typical "sizzling" noise of a short?
    - ⇒ **Check *all* the wheels of your train** for one that is derailed.
    - ⇒ Is any part of the train on a turnout? Is the turnout properly thrown?
- Is the DCC block turned off?
    - ⇒ **Check the panels for the yellow DCC block toggles, which must be up**.
    - Do NOT randomly start toggling DCC blocks on/off unless you are sure it's the one where your train is. Take the time to figure on which block your train is located and which toggle matches it.

“**The Yard is not working**”

- Is one of the circuit-breakers activated?
    - ⇒ Check the corresponding layout section for a derailed or shorting vehicle.

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3.2- Critical Checks

There are many things that can trick an operator on this layout. The list is quite long so I'll try to simplify it as a checklist, from most simple checks to more complex. When "something" is not working, check this list first before doing anything else.

For the museum staff: In case of trouble, please go through this checklist. If unsure, however, please do nothing rather than do the wrong thing. In all cases, **if the automation is not working,** it is vital to **TURN THE POWER OFF** for the whole layout and **CONTACT US**.

1	**Power to layout is on?** -- do NOT power-cycle it, just check it is on! ⇒ Look at the North & South switches next to the entrance. They should be up.
2	**DCC power is on?** -- do NOT power-cycle it, just check it is on! ⇒ Check the DCC switch next to the command station. It should be up.
3	**DCC power is on but Automation "doesn't do anything"** ⇒ Check that trains are all located in their start position (station) and that the corresponding automation toggles are up. ⇒ Check trains are not derailed (e.g. all wheels look to be on the rails). ⇒ Check that the Laptop is turned on (see check #4 below)
4	**Is the Laptop turned on and and stuck on "TPM error"** Laptop should normally display the layout map and reflect used block and the automation switches' states. A few times we have noticed the laptop not starting correctly. This manifests by the laptop screen showing 3 lines of text with the top one indicating a "TPM error" for a long time (more than 30 seconds). ⇒ Press the round black button with a little green light (labeled "POWER") in the middle under the screen and HOLD down it till the computer turns off. Then press it again to turn on the computer.

Continued on next page.

5	**Is the Laptop turned on and displaying the layout map?** Laptop should normally display the layout map and reflect used block and the automation switches' states. If power is off: ⇒ Check the DCC switch next to the command station. It should be up. If power is on: ⇒ A few times we have noticed the laptop not starting correctly. This manifests by the laptop screen showing 3 lines of text with the top one indicating a "TPM error". ⇒ follow the procedure to power-cycle the DCC.
6	**Check** whether **Passenger and Branchline Automation Toggles** are on or off, depending on whether you want the automated routes to work or not (e.g. Saturday Operating Days).
7	**Check *ALL* the yellow toggles for the DCC**. ● **⇒ YELLOW toggles go UP. SILVER toggles go DOWN**. On the Valley Tower panel. ● ⇒ Very often people turns some off by mistake just by walking next to the panel. On the Mountain Tower panel. ● ⇒ Do NOT try to sit in this confined area. It's guaranteed you will toggle some switches randomly without realizing it! Each block has a 2 toggles, one yellow on one panel and another silver on the other panel ⇒ They MUST not be both up at the same time.
8	**Are the little lights** (one per block) turned on on both the Valley **Tower panel** and the **Mountain Tower** panel? ⇒ If they are off, that means the "critical power supply" (see below) is tripped and is turned off.
9	**DCC is working but "normal" turnouts do not throw** ⇒ You need to check the "Non-DCC Turnouts power supply" (see below).

Continued on next page.

10	**DCC-controlled turnouts** do not throw ⇒ You need to check the “DCC Turnouts power supply” (see below). There’s also a hardware bug with the NCE Switch-8 that controls the DCC turnouts. Sometimes the board simply doesn’t communicate properly when powered on. It happens fairly rarely. *TBD: I will add a concealed push button to reset it*.

Others TBD… to be added as we become aware of them. ⇒ This list is not exhaustive. If we find new problems, we will figure them out and add them to this list.

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3.3- Issues with the DCC-controlled Turnouts on the Mountain Panel

This currently affects turnouts T311 through T330 on the Mountain Panel, specifically the ones that have a black turnout label number on them.

Issue 1: **The DCC-controlled turnouts may not match the position indicated by the panel** rotary switches.

Reason: When a DCC-controlled turnout is activated by the computer or a ProCab in accessory mode, the change is NOT reflected in the mechanical rotary switches. These older panels lack visual confirmation of the turnout alignments.
(Note that the plan is for this to be eventually solved by a different electronic module, which has not been completed and installed yet.)

To try to compensate, there are 2 mechanisms in place:

- First when the layout is powered up, all DCC-controlled turnouts are realigned in the direction of the their panel rotary toggle.
- When the automation is deactivated using the master automation switch, the passenger turnouts are realigned to their normal direction (i.e. mainline is green).

To “synchronize” a DCC-controlled rotary switch, you need to toggle it two times, one in either direction.

Issue 2: **The DCC-controlled turnouts may become unresponsive.**

Reason: The NCE Switch-It 8 and the NCE Button Board used to wire the DCC-controlled turnouts seems a tad buggy (like most of NCE’s stuff actually) and sometimes the serial link between both boards just fails to respond.

To fix this:

- At the top center of the Mountain Turnout Panel, there’s a red push button.
- Important: Do NOT continue this procedure if the Automation is currently enabled and running. Disable the automation using the Automation Toggles and wait for trains to reach their station before continuing.
- Push the red button *briefly* to cut power to the NCE turnout controller. This will reset it.
- Wait 1 minute while the turnout controller resets all 8 turnouts to match the position of all the turnout toggles.
- Re-enable the automation if you disabled it in the previous step.

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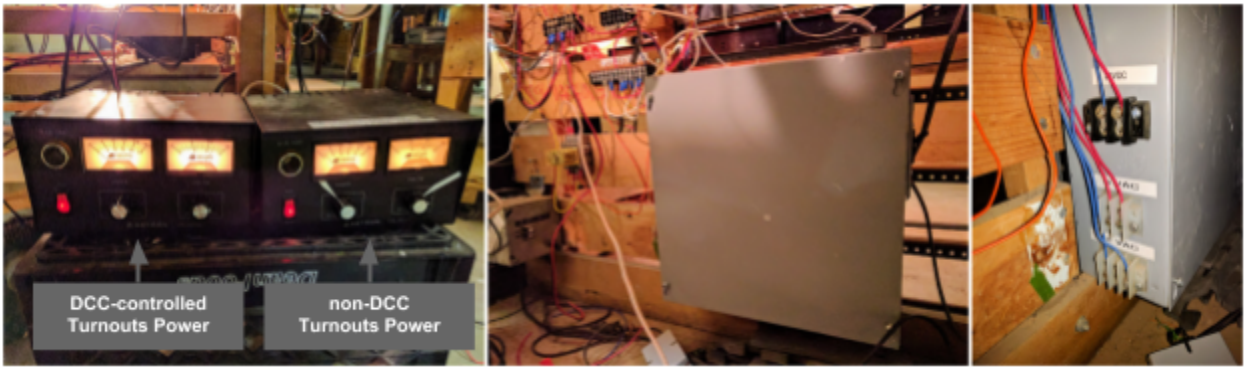
3.4- The 3 Critical Power Supplies

There are 3 power supplies behind the command station:

- 2 on the side, almost identical to each other. They control the turnouts.
- There's one large gray box behind the command station, on the other side of the support wall. This one is a AC/DC power supply for the DCC relays and the lights.



The gray power supply is known to trip once in a while. When it does, it is very easy to notice:

- There is no DCC, even though the DCC is turned on.
- There are no blocks lights on the Valley Tower and the Mountain Tower panels.

To reset it, reach the front of the power supply and turn the black lever back on.

The turnout power supplies have a red power button in front. Please avoid touching them! They must be properly positioned for the current and voltage. Follow the marks on the power supply and make sure the knobs are properly positioned.

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3.5- Automation Troubleshooting

The part here covers only troubleshooting that is specific to the automation.
For general layout troubleshooting, e.g. on Saturday Running Days, please consult the separate document “Randall Layout - Troubleshooting Guide”.

3.5.1- Warning about Power-Cycling the DCC

To make my position clear: **I do not recommend power-cycling the DCC unless necessary**.

Rationale against it: Most of the time, people power-cycle equipment when they do not understand what is going on. It always pays better to take time to analyze the situation and see if there’s a better alternative. There are cases where it is the thing to do, especially given the haphazard nature of the NCE command station, but I want to emphasize this should only be done as a *last recourse*, not a first one.

Anyhow, since I know sooner or later someone is prone to think that’s the “right” thing to do or be instructed to do so, I want to clearly explain the procedure so that it be at least done correctly.

To power cycle the DCC command station, perform the following steps:

1. **Please please please** consider 4 times why you are doing this. Were you told to do it, or do you think it will magically solve some random unrelated problem?
   ⇒ If that’s the case, check chapter 2 “Critical Checks” in the manual **before** proceeding.
2. **Important**: If the trains were running, **wait for the trains to come back** to their starting position!
   ⇒ Do not proceed to next step if the trains are not at their starting point.
3. **Turn the automation toggles off**.
4. Turn off the DCC power.
5. **Important: Wait for the computer to turn off**. This takes exactly one minute.
6. **Once the computer has been clearly turned off**, turn on the DCC power.
7. It is extremely likely that one of the power supplies will trip.
   ⇒ Check whether all the panels lights properly turned off.
   Consult the “Critical Power Supplies” chapter in “Section 4 - Troubleshooting”.
8. **Wait for the computer to finish booting and displays the map**.
9. Turn the automation toggles on.

3.5.2- DCC Addresses Reserved for the Automation

Do not operate trains with the following DCC addresses when the automation is enabled:

- Long-address 204 (when the Rapido Amtrak F40PH are running).
- Long-address 506 (when the Atlas Amtrak GE are running)..
- Long-address 010 (shown as "`010*`" on the NCE ProCab, for the RDC).
- Long-address 045 (shown as "`045*`" on the NCE ProCab, for the Doodlebug).

Note that controlling a train using short-address 10 or 45 (no leading zero) is always OK.

3.5.3- Do not try run on the section controlled by the Automation

“**I tried to sneak up behind the automated train and now my train derailed**”.

- Your train should NOT be on an automated route if the automation is enabled and you do not have right of way.
- **When the automation starts, it will realign the turnouts** for the passenger and the branchline routes. Same when the train reverses course and comes back to its starting point. If you have a train on these turnouts, it will derail when the automation realigns them.
- **The automation relies on block occupancy**. Trying to use an automated route when it is activated will confuse the automation and place it in an unpredictable state.

The only time an operator can run a train on the automated route is when going up the mountain after the computer released the right of way to the operator.

3.5.4- Automated trains were running and suddenly stop

What to do next:

- Stop the automation using the tablets as described in the next chapter.
- Move the trains to their starting point.
- Reset the automation using the tablets as described in the next chapter.

If the automation still does not work after the reset operation, please consult chapter 2 “Critical Checks” and performs the various checks.

3.5.5- Emergency Stop & Automation Reset

In case an automated train derails or stops to respond, it is necessary to reset the automation.

Simply moving backs trains to their starting location does not reset the state of the automation. **The automation will not start if the trains are not located at their expected starting point.**

Please remember that the **Automation ON/OFF Toggles do not stop the trains**!

To turn off the automation if a train has a drastic problem, use the “Emergency Stop” option provided by the tablets as explained here:

<TODO insert tablet screen shot here>

1. Press the “Emergency Stop” red button on the tablet.
2. On the confirmation screen, press “STOP”.
3. All automated trains will stop instantly, wherever they are.
4. Move the train back to their expected starting location.
   You can do this using a variety of techniques: simply physically move the engines and cars, or use an NCE ProCab controller and drive the trains. This is up to you.
5. Double check the trains are properly installed, in the proper direction.
6. Once both trains are properly setup, follow the steps as indicated on the tablet:
   a. Toggle both automations to OFF.
   b. Use the “RESET” button on the tablet.
   c. Confirm the RESET action. This re-enables the automation.

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Section 4
Known Trackwork Issues

Updated: 2018-06-12

- **[P1] Short on Stockton Yard track #6.**
- **[P1] Short on Stockton Yard track #8.**
- **[P2] Occasional dead spot on T161.**
- **[P2] Occasional stop&go on T70.**
- **[P2] Remove Mountain Programming Track.**
- **[P2] Check all boosters output voltage/current. Adjust for constant level.**
- **Dip between turnout T370 and Summit's bridge.** Understand worth fixing?
- **Turnouts with known issues**:
    - **T01** (left side of cross-over in front of Stockton Passenger Station).
    - **T02** (right top at cross-over in front of Stockton Passenger). Broken point.
    - **T06** (main to siding in front of Stockton yard): Sticky throw bar
    - **T110** (from station at block 120 back to main, in front of Lodi): Broken.
    - **T111** / **T112**: Lodi. Broken points (spiked on T112).
    - **T150** (main to siding just before Sultan).
    - **T151** (from Napa to main, before Sultan): Dead track.
    - **T373** or **T380** before Shed (issue not seen in a while).
    - **When entering the A loop on Napa**: Broken point.
- **Label Bridgeport and Sultan Turnout Numbers on fascia + Mountain panel**.
- **Find places names in documentation and labels geo areas**.
- **Catalog all building lights**.
    - Figure out which ones have lights which are not working.
    - Figure out which ones do not have lights but could be easily added.
- **Industrial City is not powered**.
    - Fix turnouts on the Industrial City.
    - Fix power to blocks in Industrial City.
    - T130 (main to Industrial City): Frog hardwired for Normal.

Procedure for fixing layout issues:
Before any fix is being done, a proposal must be made that clearly documents: block and turnout numbers affected, picture of existing wiring, what is the current issue and how it is going to be fixed.
Proposal must be sent to Raphael for review via email or Google Docs.
Document should be updated after the fix with updated picture and wiring change.
⇒ The layout needs to be properly documented, starting with all fixes that are done.

Sidings to clean:

- B371 (upper summit siding).
- B431 (tehachapi loop siding).
- B51 (return tunnel siding) -- done 2018-06, should be good.
- Bridgeport balloon track -- done once 2018-06, needs usage/repeat
- Bridgeport yard tracks.
- Napa balloon track.
- Napa yard tracks (on top of workbench).

Completed:

- [Moved] Moved booster junction from T80 (behind McDo) to T70 (by tunnel).
    - T70 cleaned frog. Still shows stop&go at booster junction on some trains.
- [Fixed] T50/51 turnout toggle was loose and screwed in reverse direction.
- [Fixed] T05 toggle was loose; replaced broken Fulgurex spring on B01/B02 frog inverter.
- [Fixed] T130 (main to Industrial City) ⇒ Frog hardwired for normal.
- [Fixed] Turnout T322 sticky throw bar (from main to branchline).
- [Completed] Reinstall programming track onto workbench.
- [Completed] Create consistent numbering scheme for mainline vs yards.
- [Completed] Labels panels and layouts on valley side.
- [Completed] Labels panels and layouts on mountain side.
- [Completed] "Recipe" for Bridgeport Balloon Track usage, printed on the panel.
- [Completed] "Recipe" for Napa Balloon Track usage, printed on the panel.
- [Completed] Label Branchline Automation Toggle.
- [Completed] Label Passenger Automation Toggle.