User Manual

Pattern Automation System (PAS)

LIMNTECH SCIENTIFIC, INC.

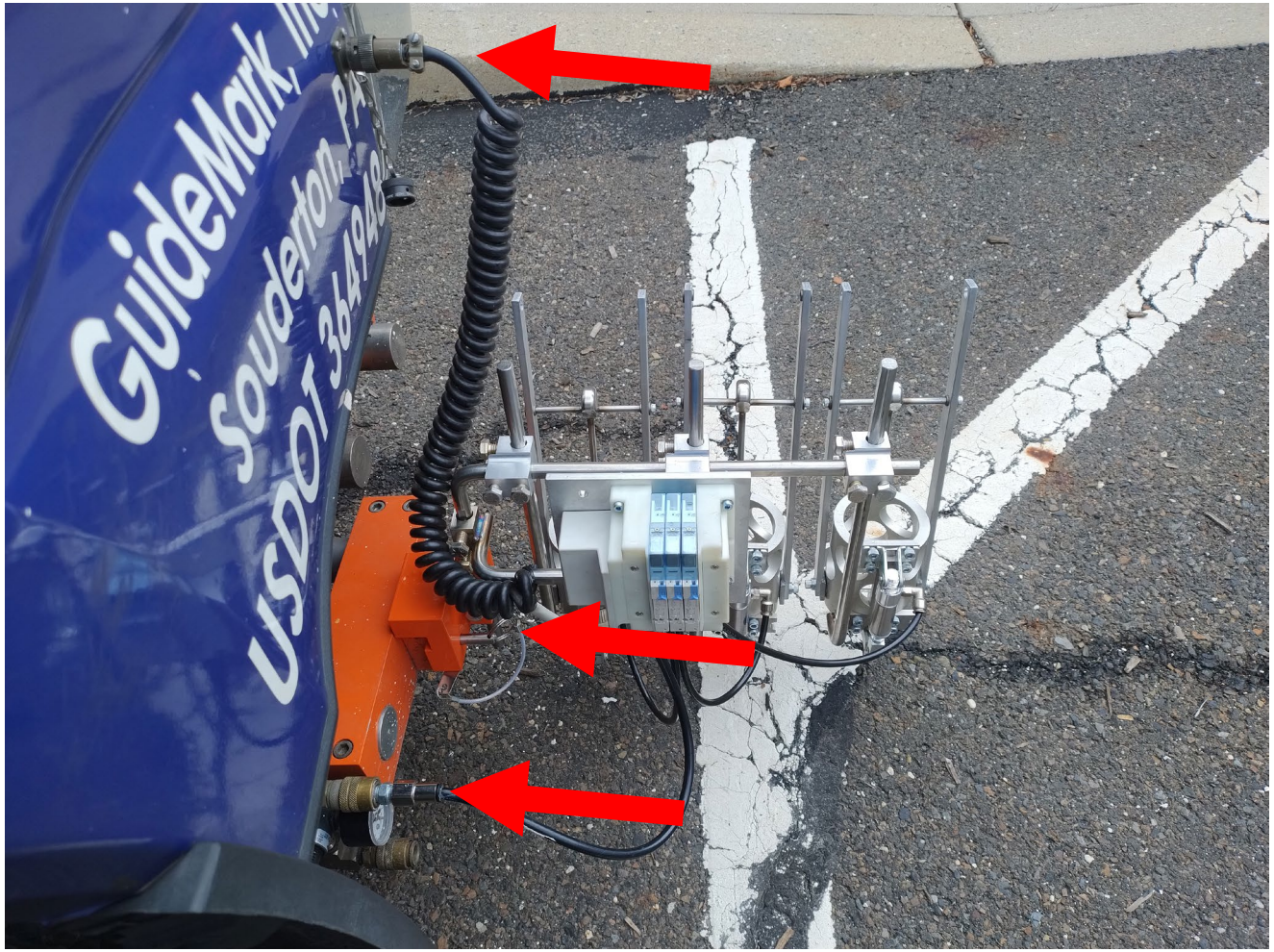
Table of Contents

Section One

Hardware Setup

Attach PAS Assembly

- Attach the carriage assembly to the truck at the three points shown on the image to the right.



Select the Rattlecans

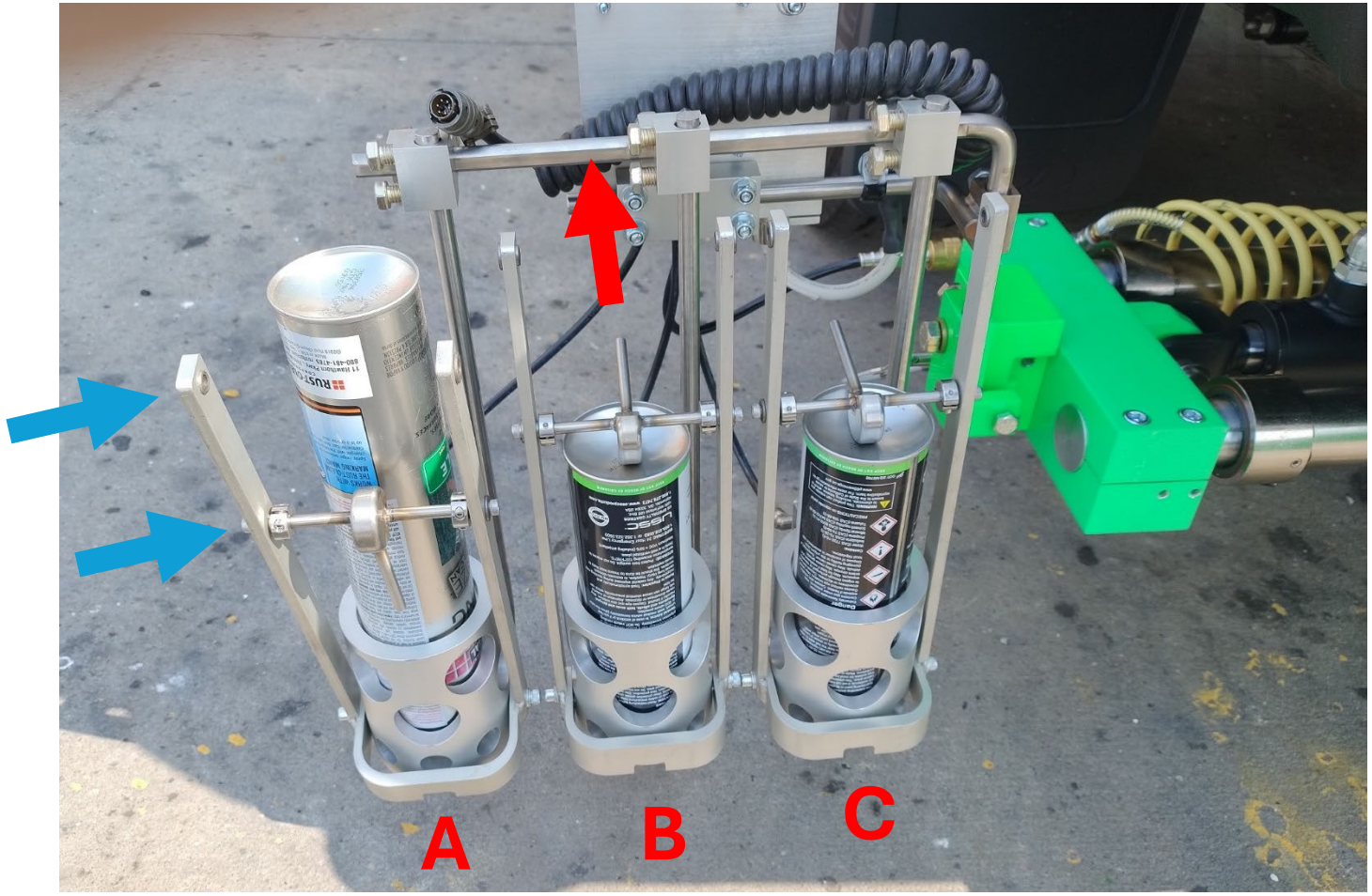
- The PAS supports two sizes of rattlecan. The standard size is 20 cm (7 3/4") in height from the top of the aluminum to the bottom. The tall size is 30 cm (11 3/4") in height.

Prepare the Rattlecans

1. Grab a rattlecan with a plastic tip as seen in **A**.
2. Remove the original plastic tip as seen in **B**.
3. Install the provided metal tip as seen in **C**. The provided tip requires a pressure fit, so it's not uncommon for a little paint to spray out when seating it.

Install the Rattlecans

- Place three rattlecans in their holders and secure them by pushing the locking rod forward in the direction of the red arrow, as seen in **B** and **C**.
- When using a tall rattlecan as in **A**, remove the locking rod and move it to the upper position as shown with the blue arrows.



Enable Air to the PAS Assembly

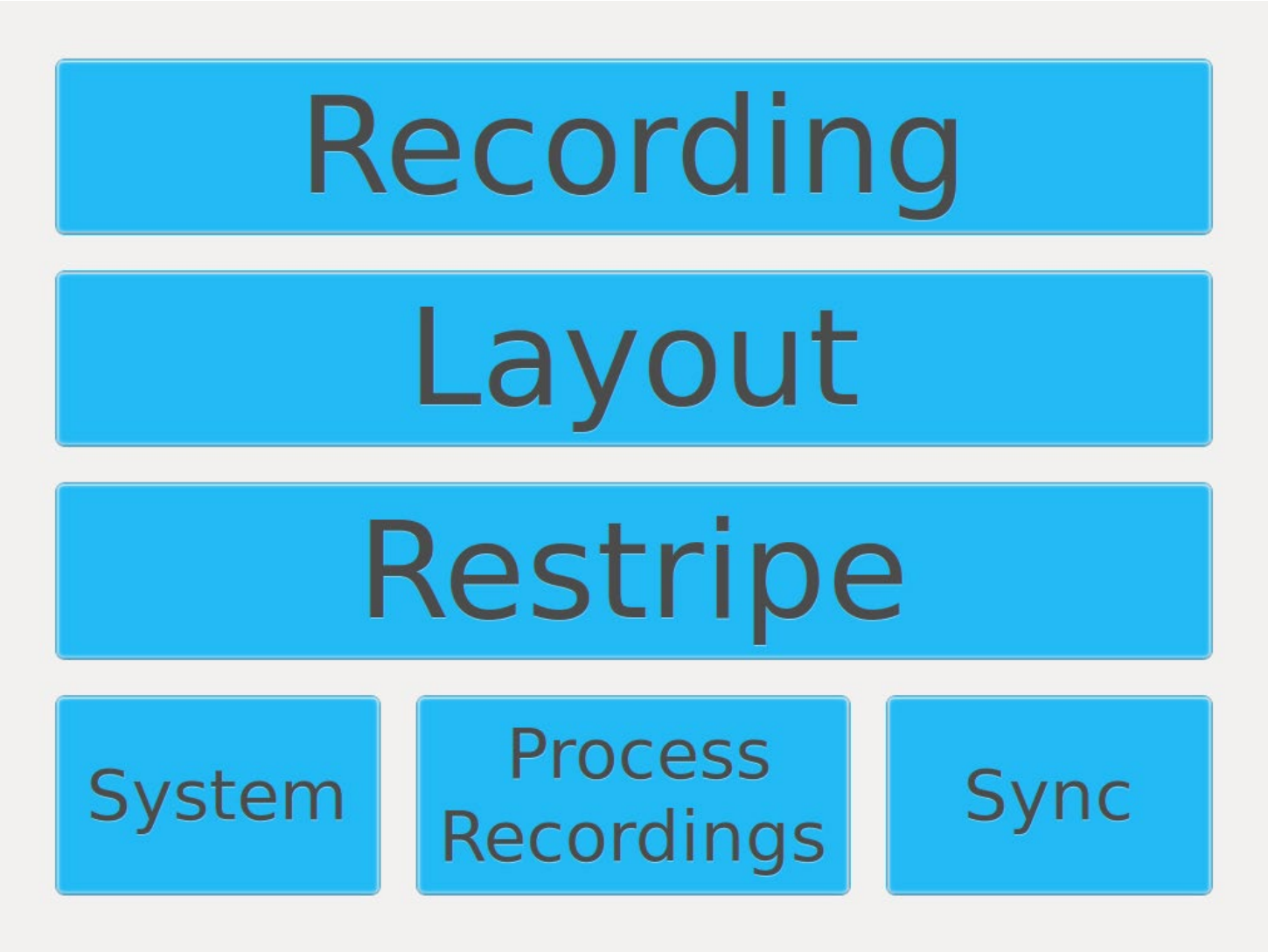
- In the cab of the truck, switch on the air compressor. Depending on the build, this switch is located either overhead or below the center console.
- If a Skip-Line or Epic skip timing unit is included in the vehicle build, power it on and perform the following to enable the flow of air to the PAS assembly:
  1. For driver's side layout, set "Gun 1" to solid.
  2. For passenger side layout, set "Gun 4" (Skip-Line) or "Gun 2" (Epic) to solid.
  3. Flip the Start/Stop switch to the Start position.

Section Two

User Interface

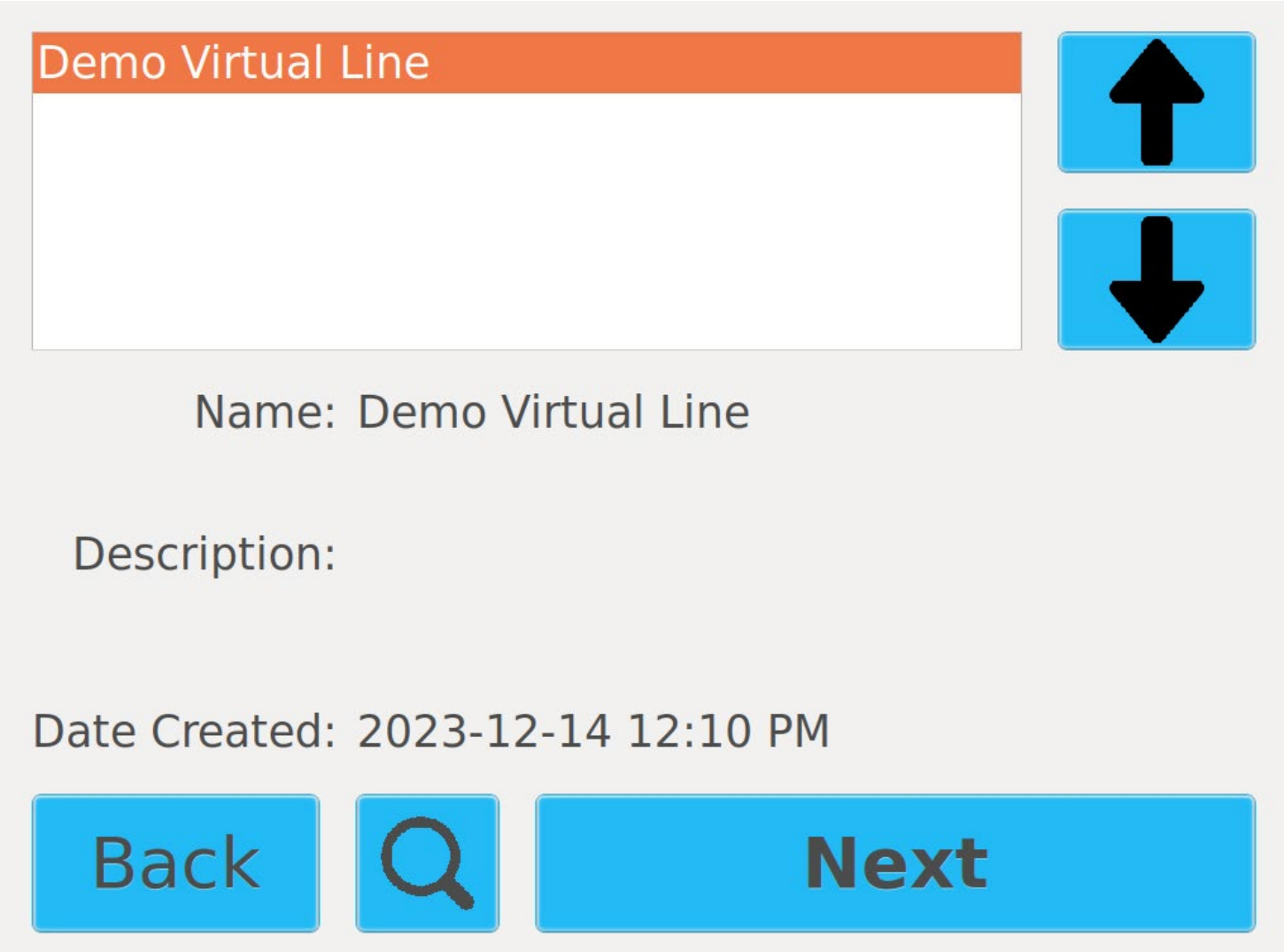
Main Menu

- Select the **Layout** button to begin.
- Note: The **Restripe** button will only be present in LifeMark®-400 systems.



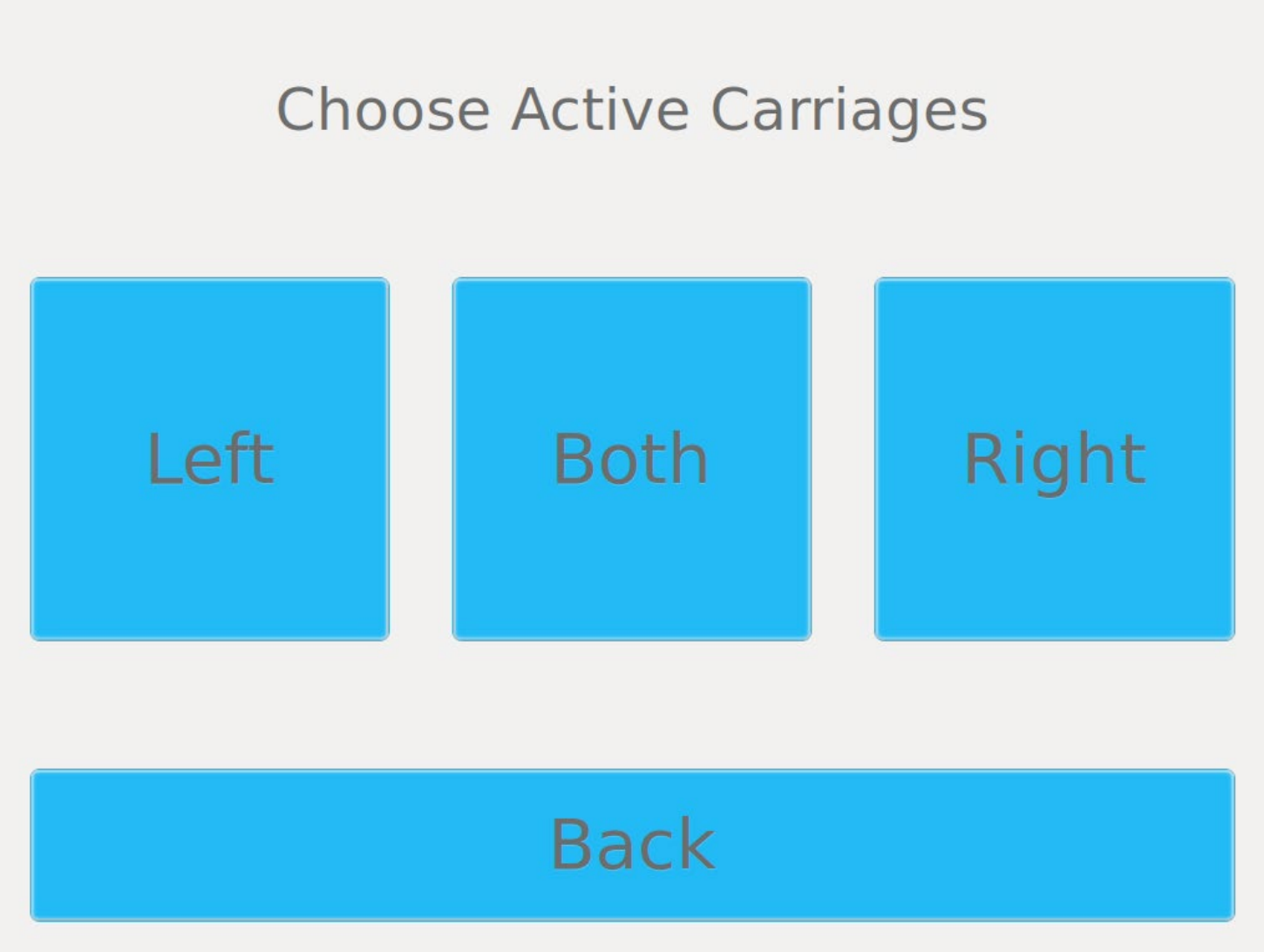
Path List Selection

- This screen lists all of the available Layout paths.
- Select the path you want to lay out and hit **Next**.



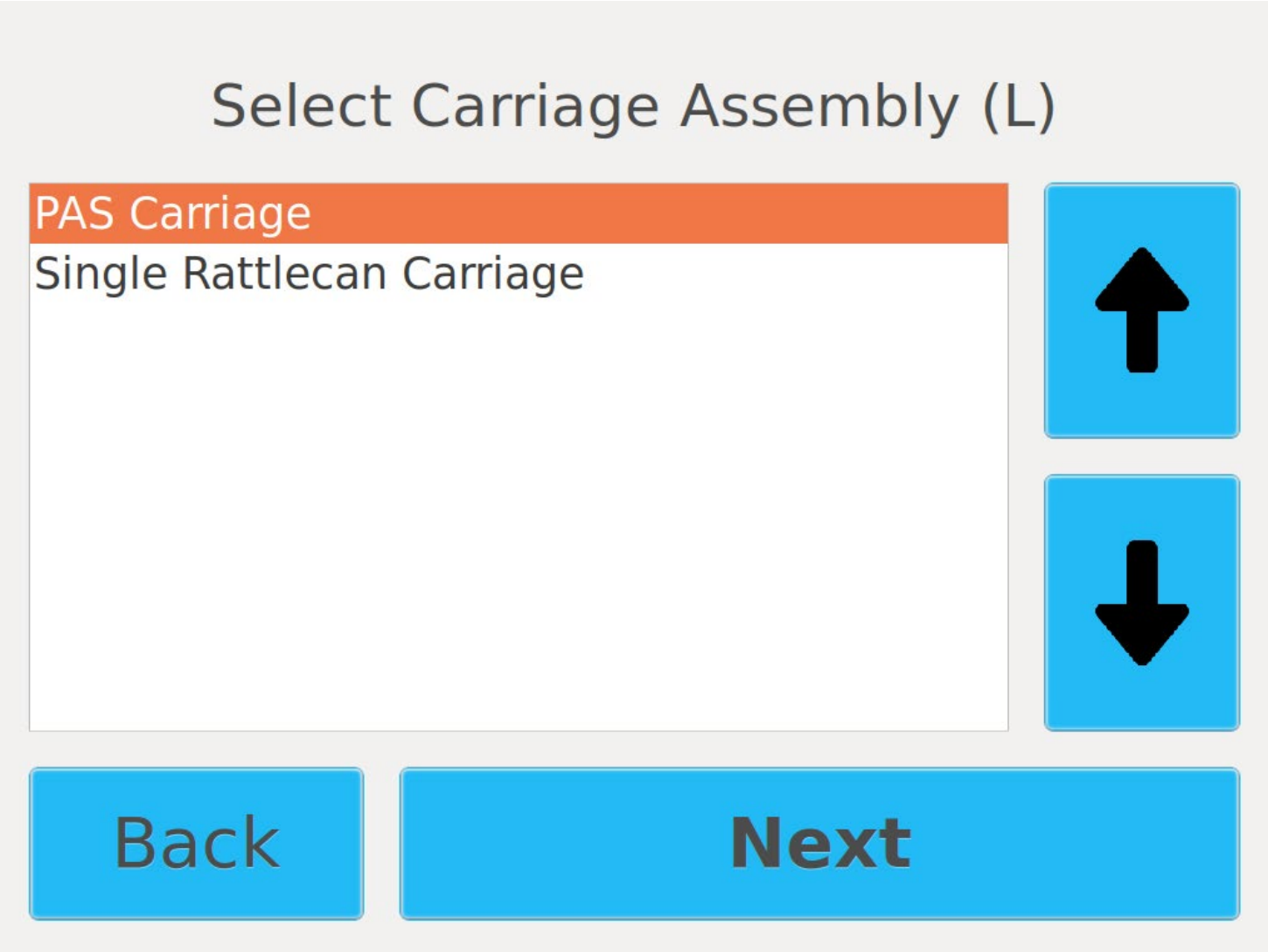
Carriage Selection

- Select which carriages you would like to use for Layout.
- The following slides demonstrate the screens for a **Left** active carriage.



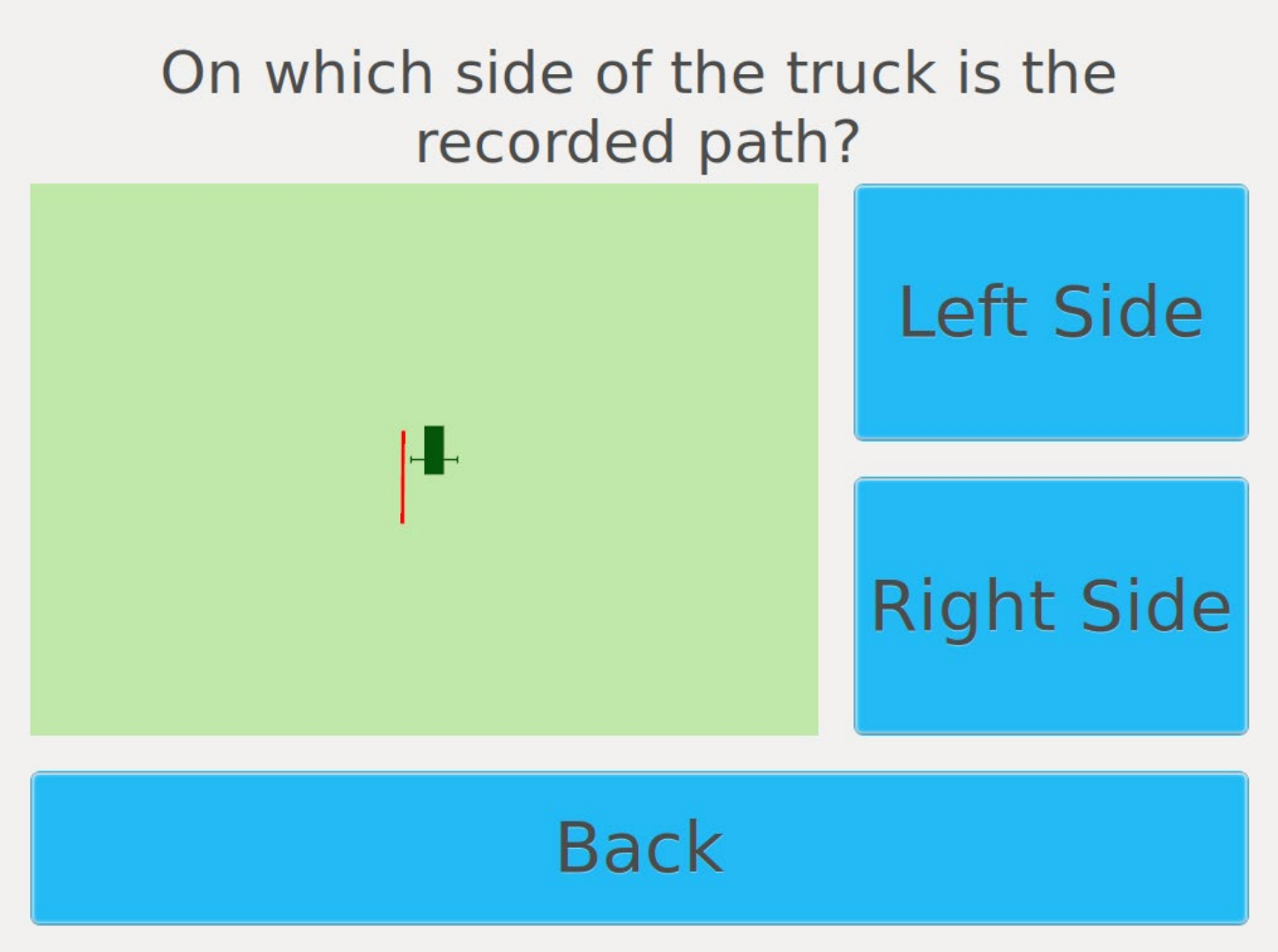
Carriage Assembly Selection

- PAS equipped systems have two carriage assembly options.
- This screen asks the user to specify which attachment is being used for layout.
- The "PAS Carriage" has been selected for this tutorial.



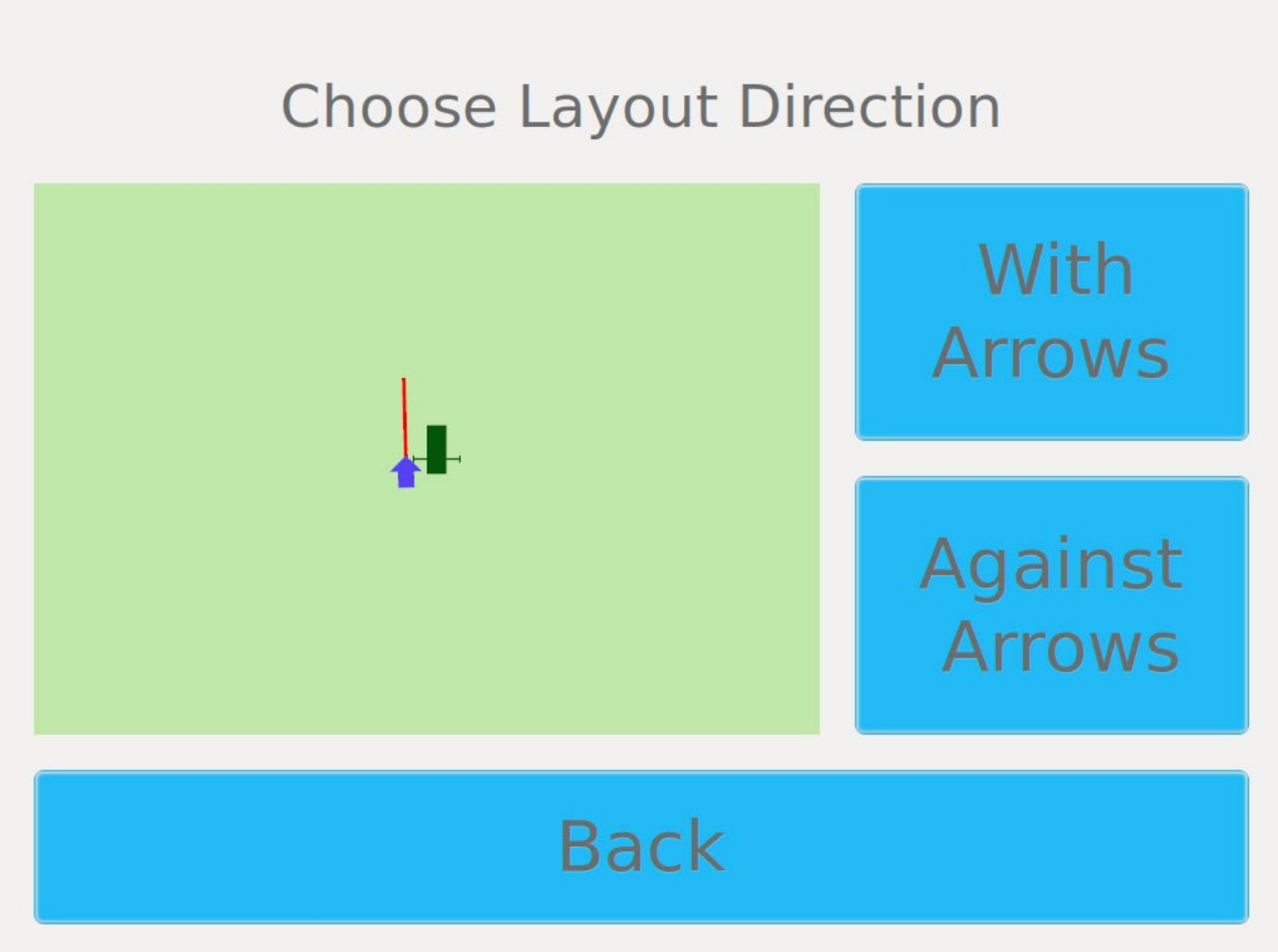
Side Selection

- Select whether the red virtual line appears to the left or right of the truck.



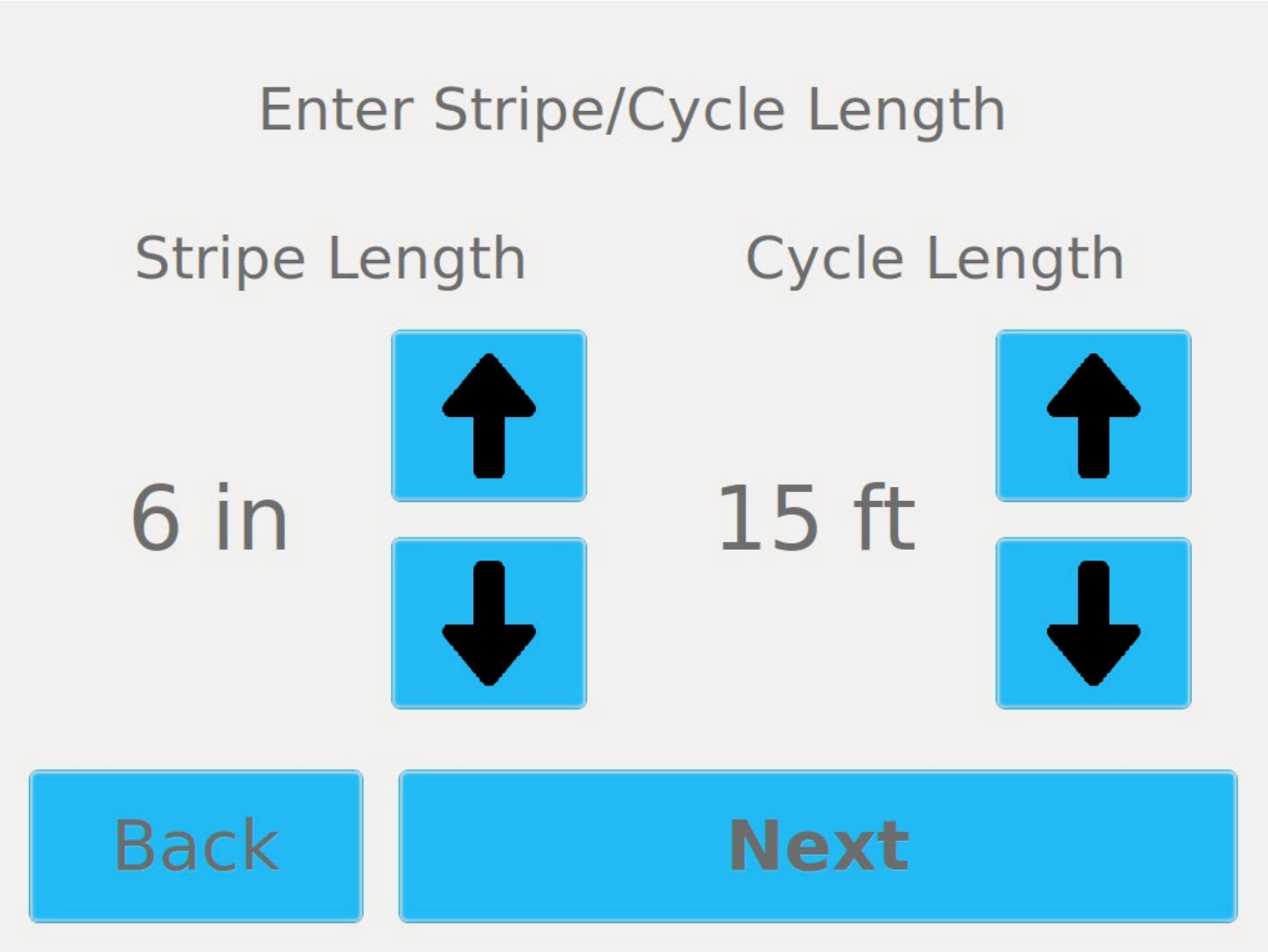
Direction Selection

- Select whether Layout is going to occur in the same or opposite direction of the arrows displayed on the screen.



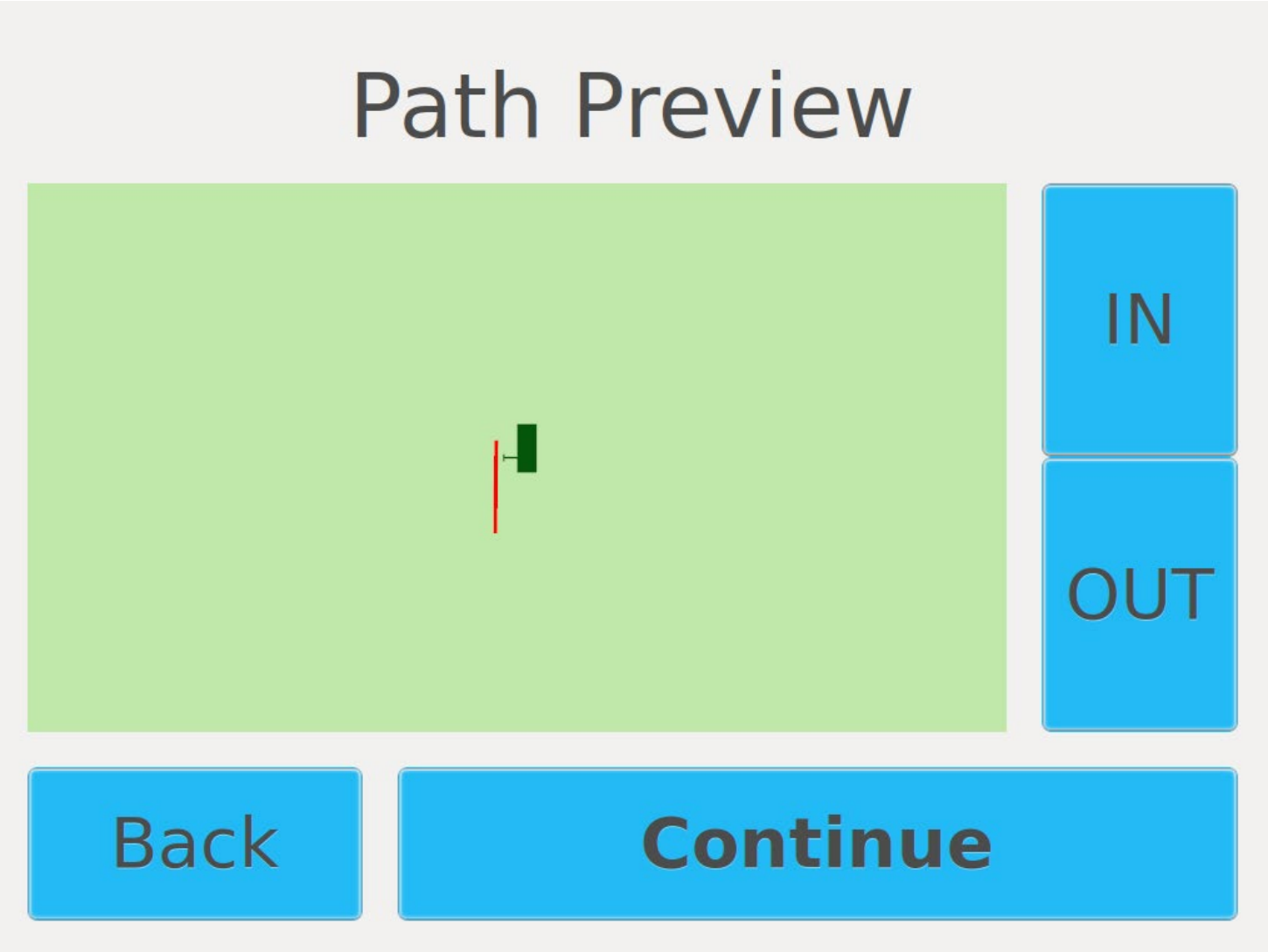
Stripe Cycle Selection

- The PAS software controls the stripe/cycle of the middle rattlecan.
- This screen allows for the user to set their desired stripe/cycle.



Path Preview

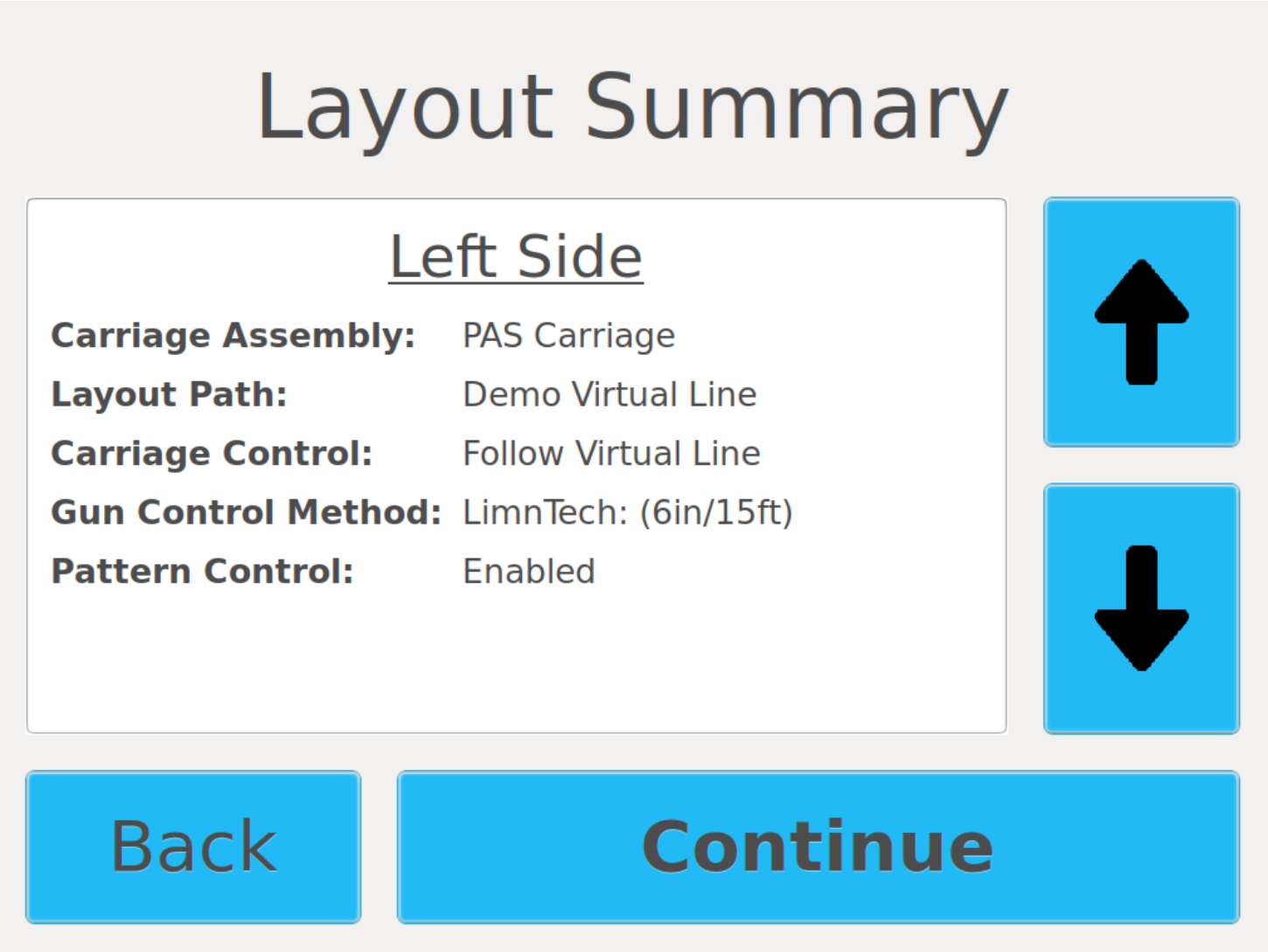
- This screen allows the user to locate the virtual line they wish to layout.
- Pressing continue will allow the user to advance to the next screen.



Layout Summary

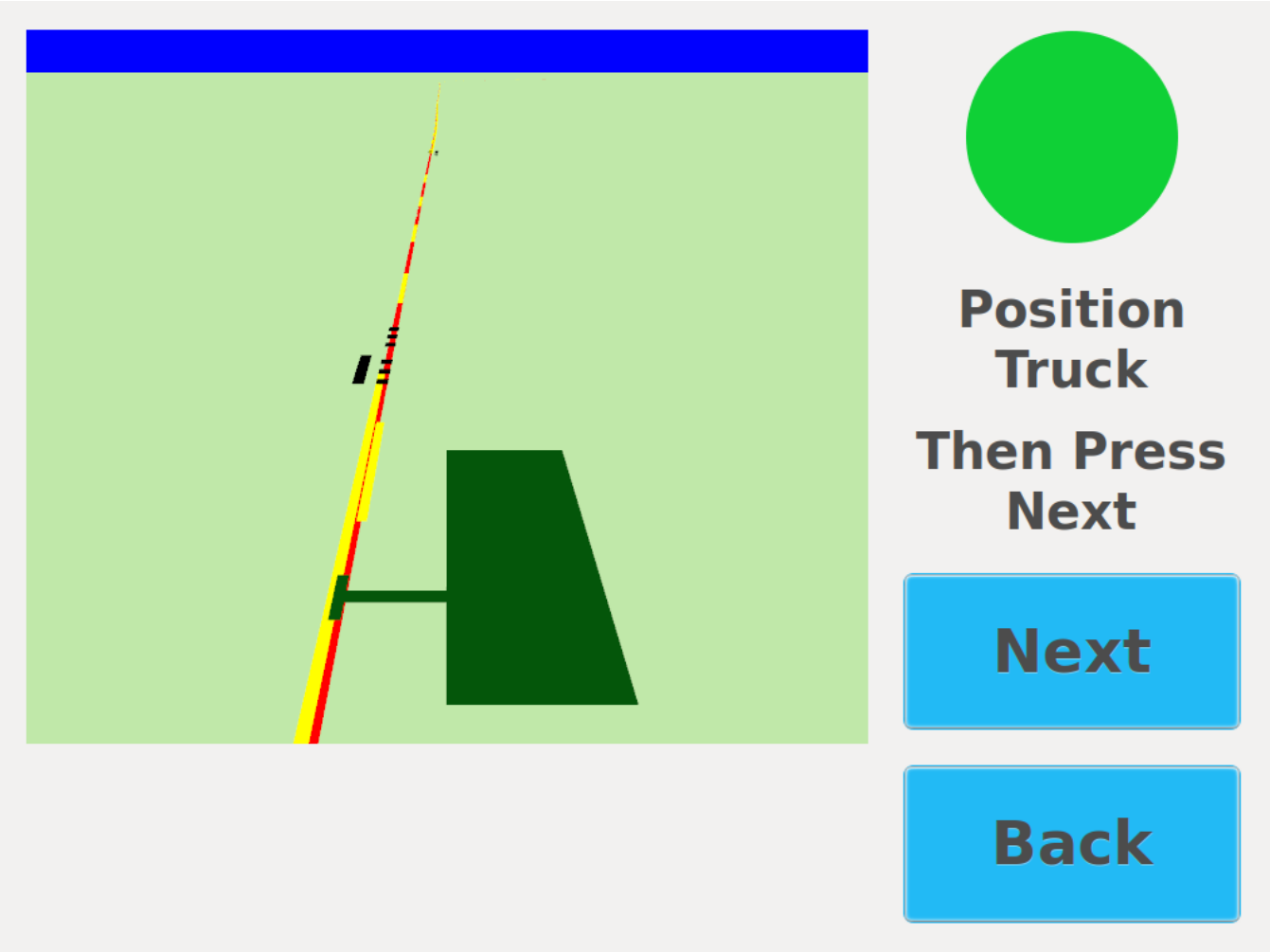
- This screen allows the user to review how they set up their layout job to make sure all of their user input is correct.

- **Carriage Assembly:** This shows the user which carriage attachment is selected for layout. This could be single rattlecan or PAS.
- **Layout Path:** This is the name of the selected virtual line.
- **Carriage Control:** This shows how the carriage will follow the line. It will either follow the line directly or at a constant offset.
- **Gun Control Method:** This tells the user if the layout dots will be controlled by the LimnTech system or a separate paint control box.
- **Pattern Control:** This shows whether PAS is enabled or disabled for this layout job.



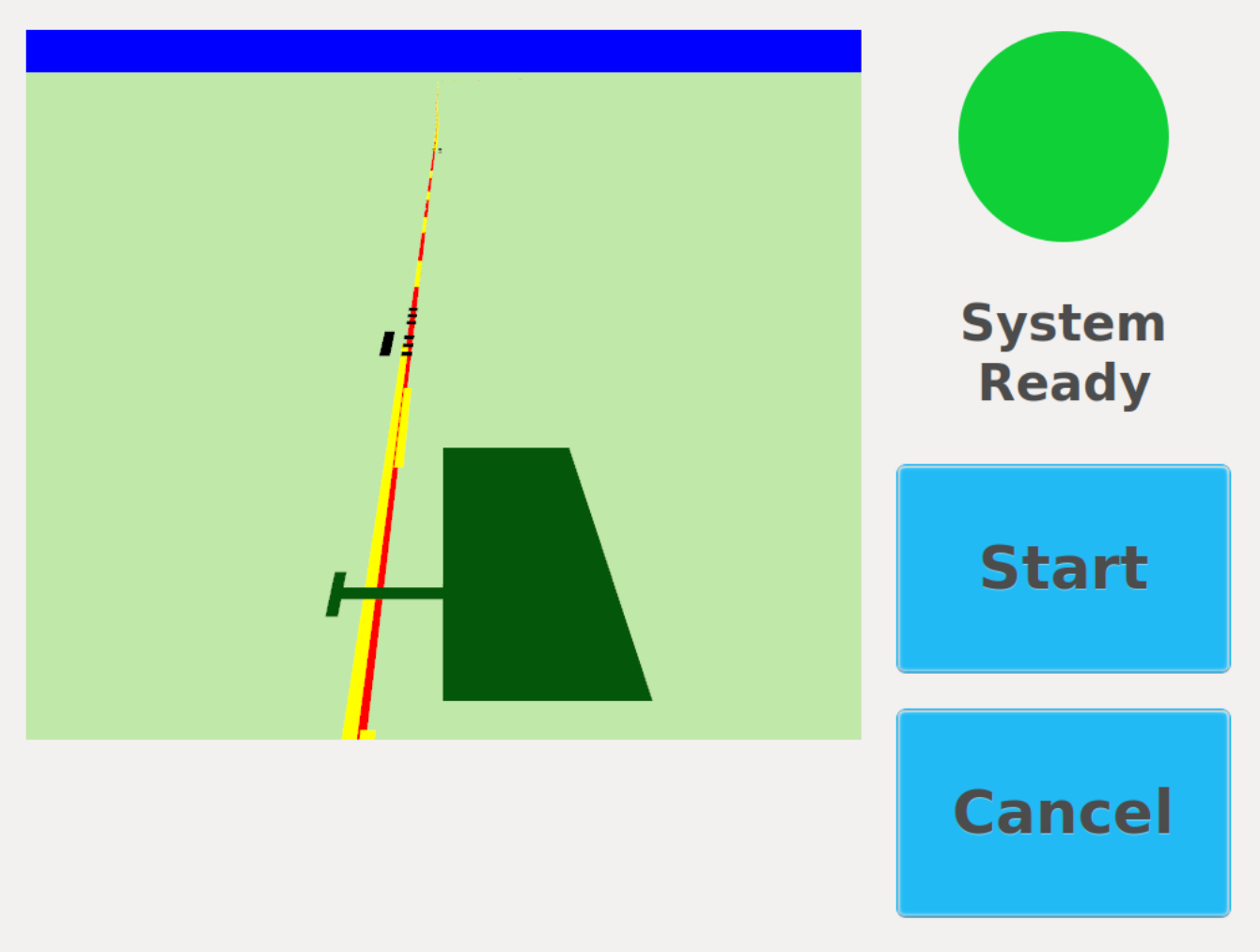
Position Truck

- This screen allows the user to locate the virtual line they wish to layout.
- If your truck build requires PTO or a pony motor to be started for layout, make sure they are started now.
- Make sure air is being fed to the carriage assembly.
- Since P.A.S. is enabled, the pattern will be overlaid on top of the virtual line. The pattern transitions are also drawn on the screen which are represented in black.



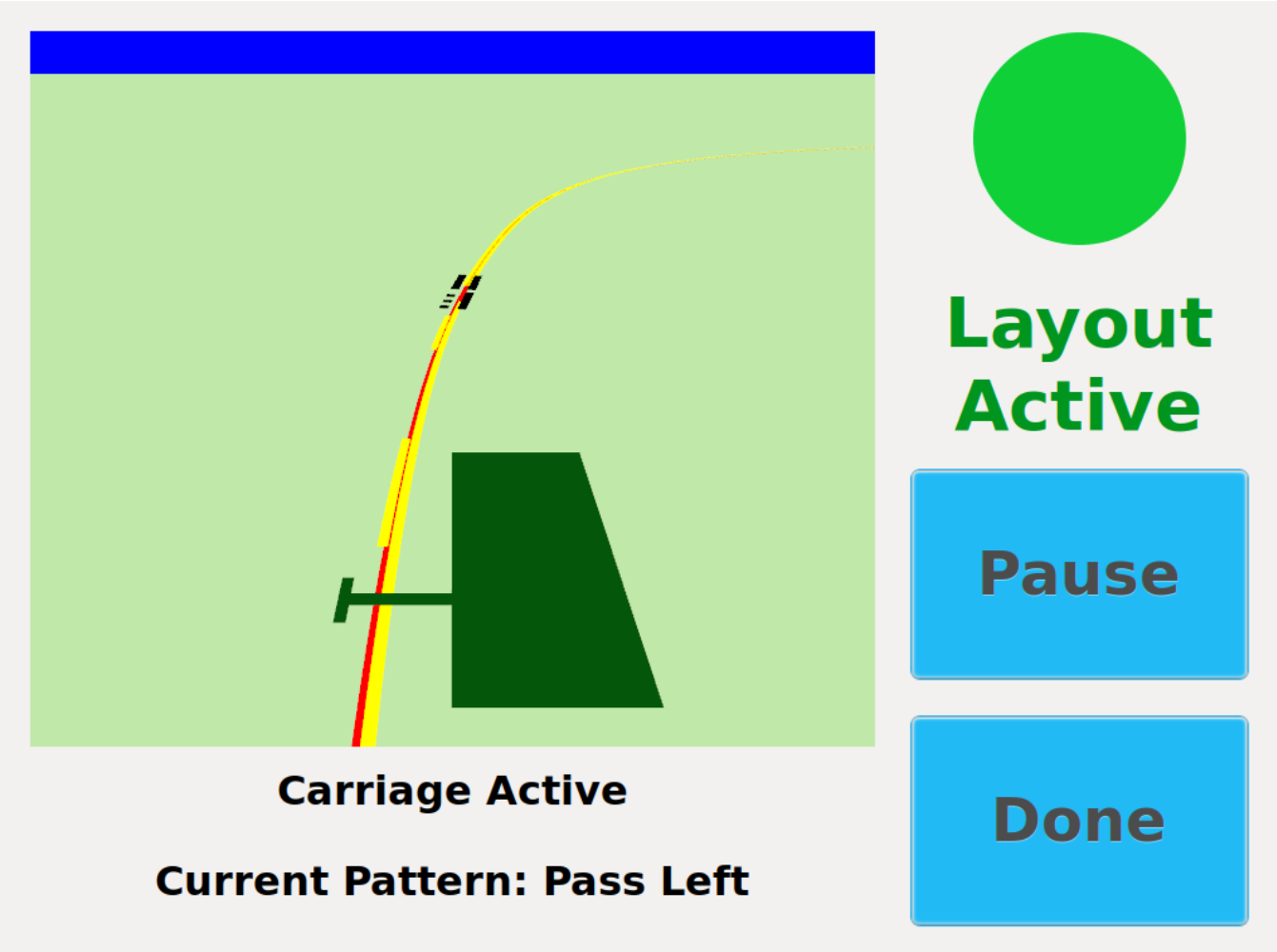
Layout Idle

- Press start to have the system automatically move the carriage over the virtual line.



Layout Active

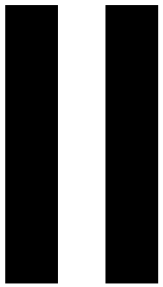
- As the carriage is following the line, the current pattern will be displayed at the bottom of the screen.
- The inside and outside paint guns will fire to signify a change in pattern.
- The middle gun will align with the virtual line and place the layout dots.
- Press **Pause** to stop painting and retract the carriage.
- Press **Done** to exit the Layout job.



Pattern Transitions

- During layout, pattern transitions will be marked in the following format:
    1. Previous Pattern
    2. Gap (No markings are painted)
    3. Next Pattern
- The LimnTech system will recognize and have encodings for 8 distinct patterns. These encodings can be found on the next slide.

Pattern Transition Types



Double Line

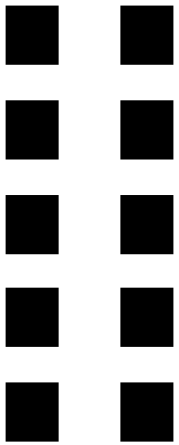
Single Line

Pass Left

Pass Right

Pass Both Ways

Single Mini Skip



Double Mini Skip

No Line

P.A.S. Tips

1. The rattlecans must fire rapidly in order to paint the pass lane and mini skip transitions. If the vehicle is driving too quickly while painting these transitions, some of the short skip marks may be missed. For best performance, limit the vehicle speed to 10-15 mph during PAS layout.
2. The PAS transition markings will be laid out within a foot or two of the original pattern transitions.

Section Three

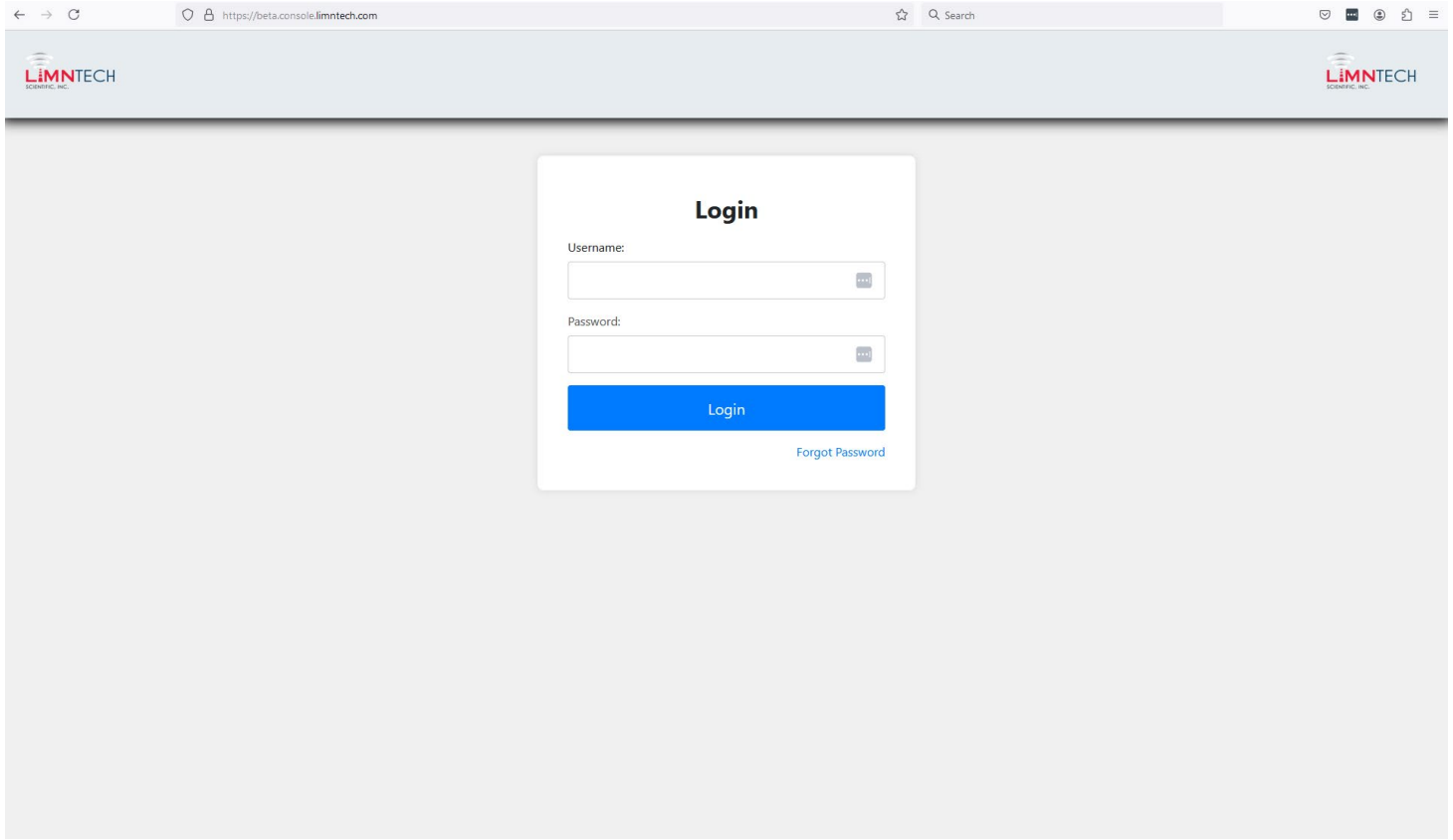
Web Integration – Editing Transitions

Editing PAS Detected Transitions

- While the LimnTech team is constantly improving its line detection algorithms, no AI powered system is perfect. There may be falsely detected transitions during the recording process. Some situations that may cause mistakes are:
    1. Worn Lines
    2. Shadows
    3. Poorly restriped lines
    4. Lines going out of view of the camera
- With this in mind, the LimnTech website allows users to inspect and, if desired, edit the detected PAS transitions before Layout.
- The following section of this document will outline this process.

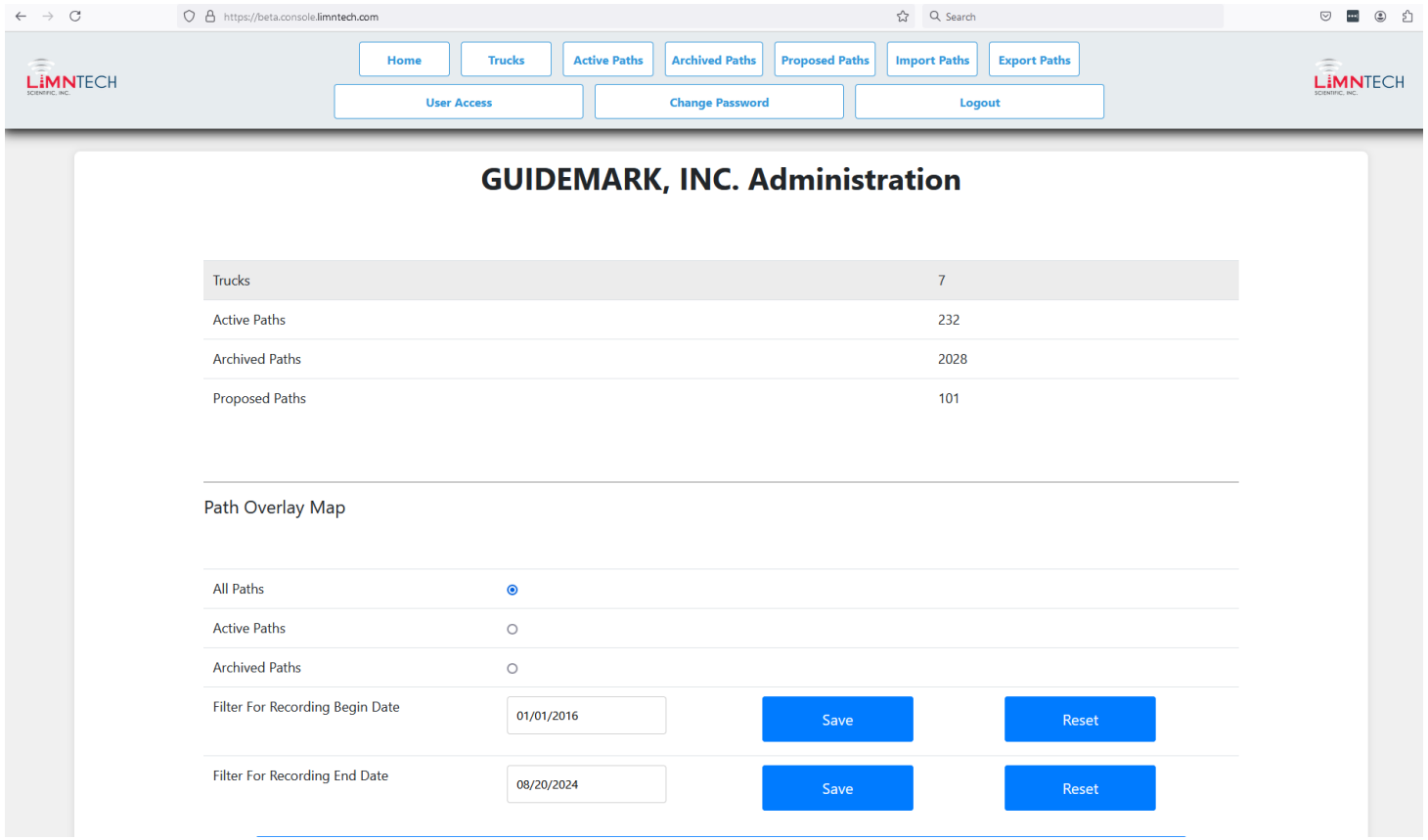
Navigate To Webpage

- On any browser navigate to the following website: https://console.limntech.com
- If you do not have login credentials for the website, please contact your company's LimnTech web admin to help set up your account.
- If you forgot your password, click the "Forgot Password" link and follow the prompts.



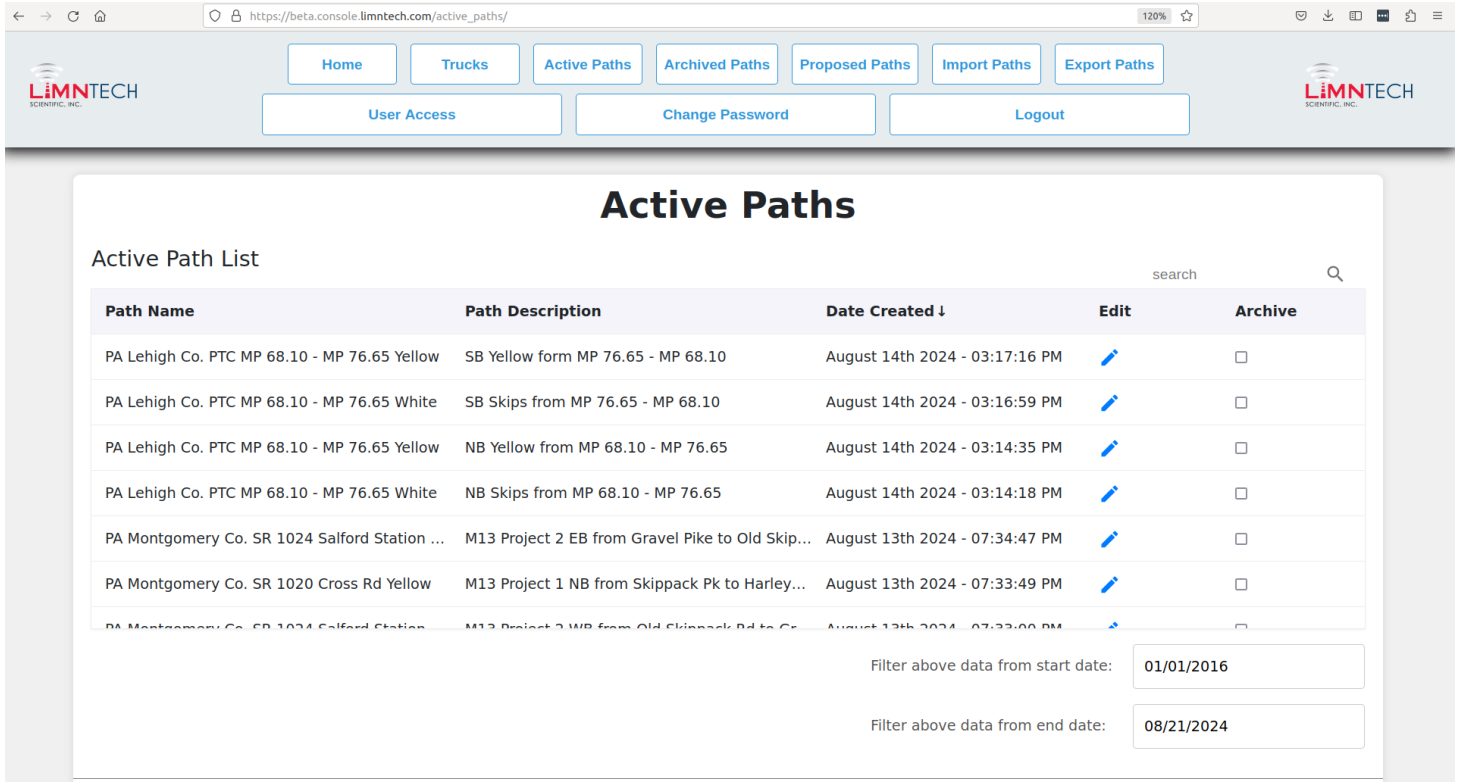
Navigate To Active Path List

- Make sure that the buttons on the banner of your web page are the same as the buttons shown on the banner of the image to the right.
- If "User Access", "Import Paths" and "Export Paths" are missing, your user account has read-only permissions. This will allow only for the viewing of the transitions on the map but does not include the ability to edit the transitions.
- If you see these buttons, your account has "Administrator" permissions. Please click the button "Active Paths" at the top of the webpage to view your active recordings.
- If you suspect you have the wrong account permissions, please contact your company's administrator.



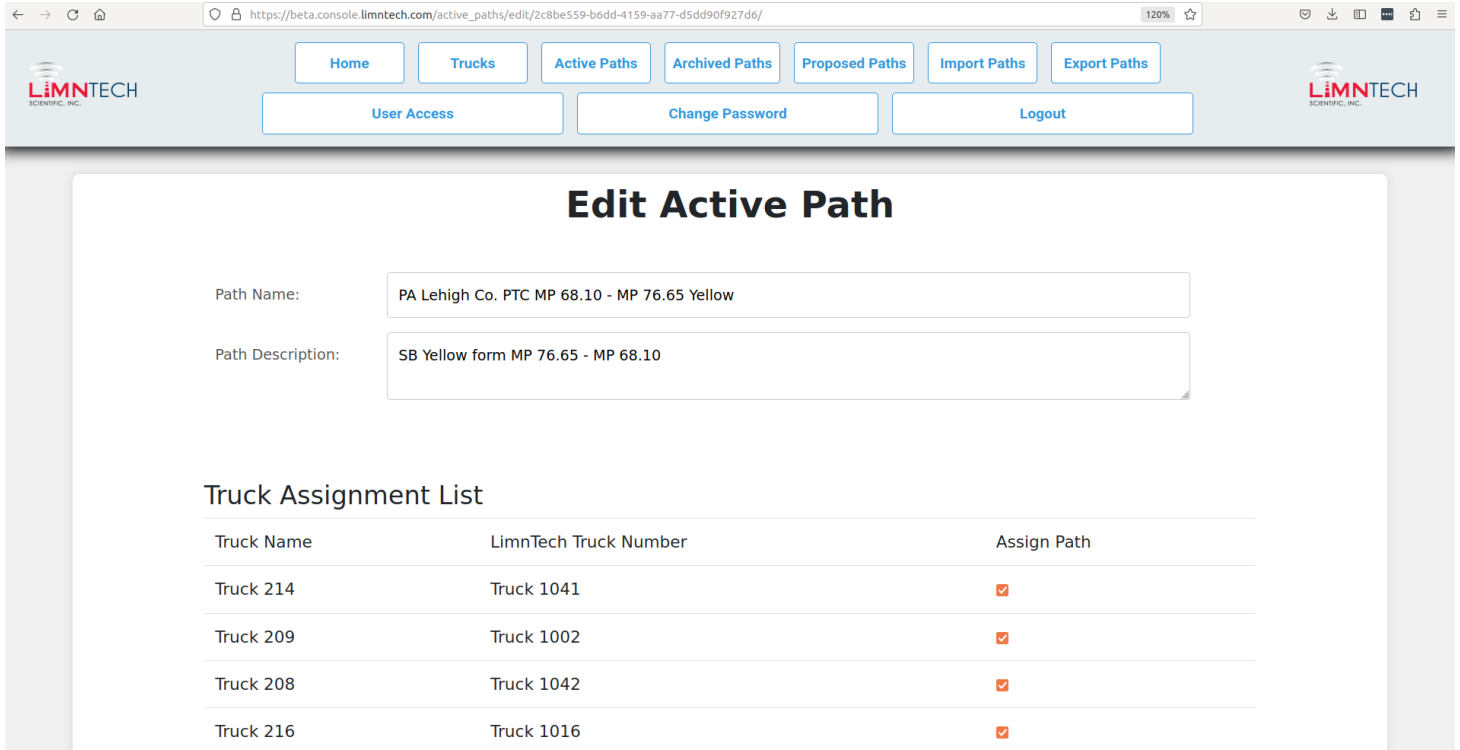
Select The Desired Path

- This webpage shows a list of all "Active“ recordings. "Active" recordings can be downloaded by the company's fleet of trucks.
- Selecting the "Edit" icon for a specific path will bring up more detailed information about the selected path. If your user is read-only this button will be called "Info".
- Among the detailed information shown, a user can use the "Edit" page to view and edit the detected PAS transitions.



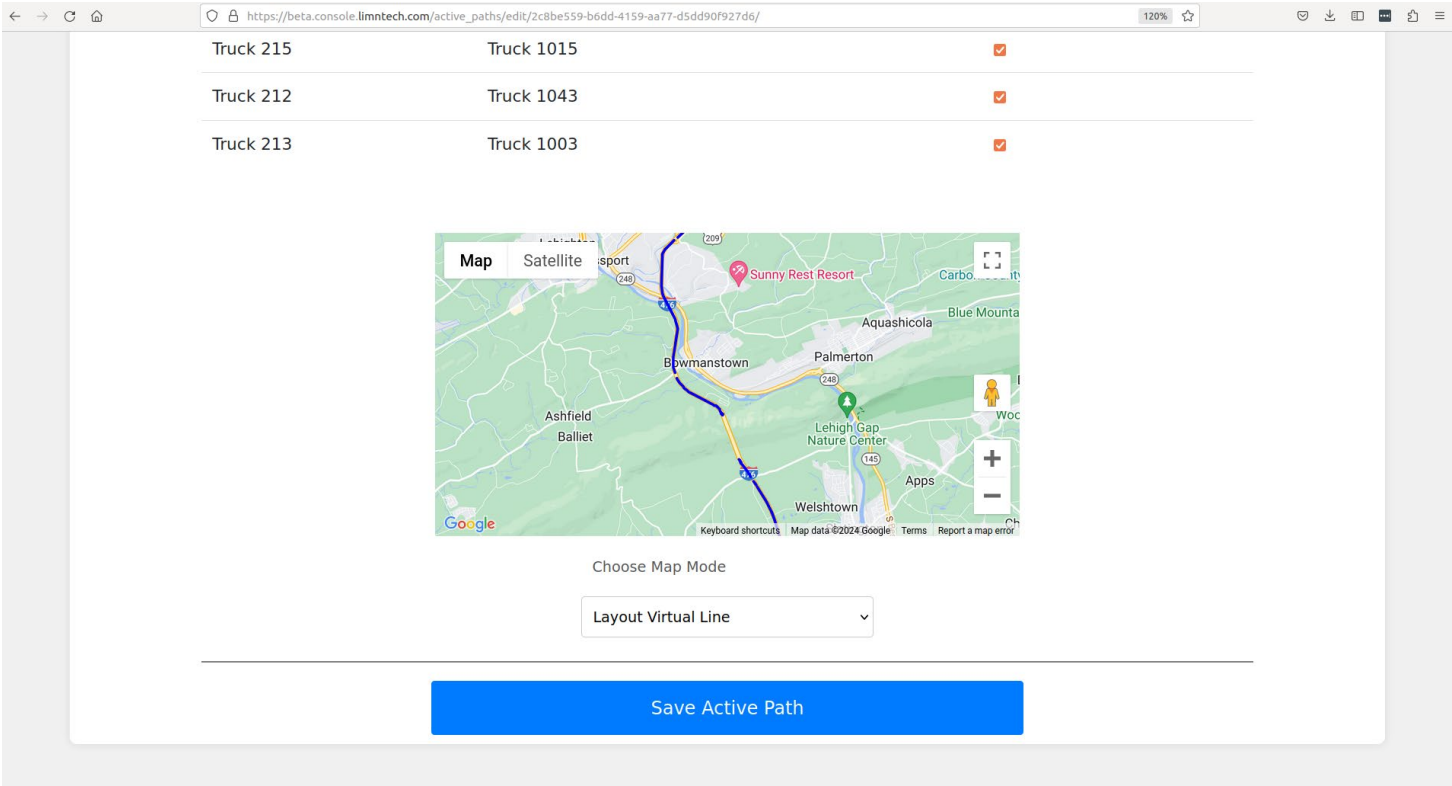
Active Path Edit

- This page allows a user to view details about the performed recording. Below are the following actions a user can take from this page:
    1. Edit the path name
    2. Edit the path description
    3. Assign the path to specific trucks in a company's fleet
    4. View the virtual line over a Google Map
    5. View the P.A.S. transitions over a Google Map
    6. Edit / Delete PAS transitions before layout is performed
- **A truck must be synchronized to receive any changes made through the website.**



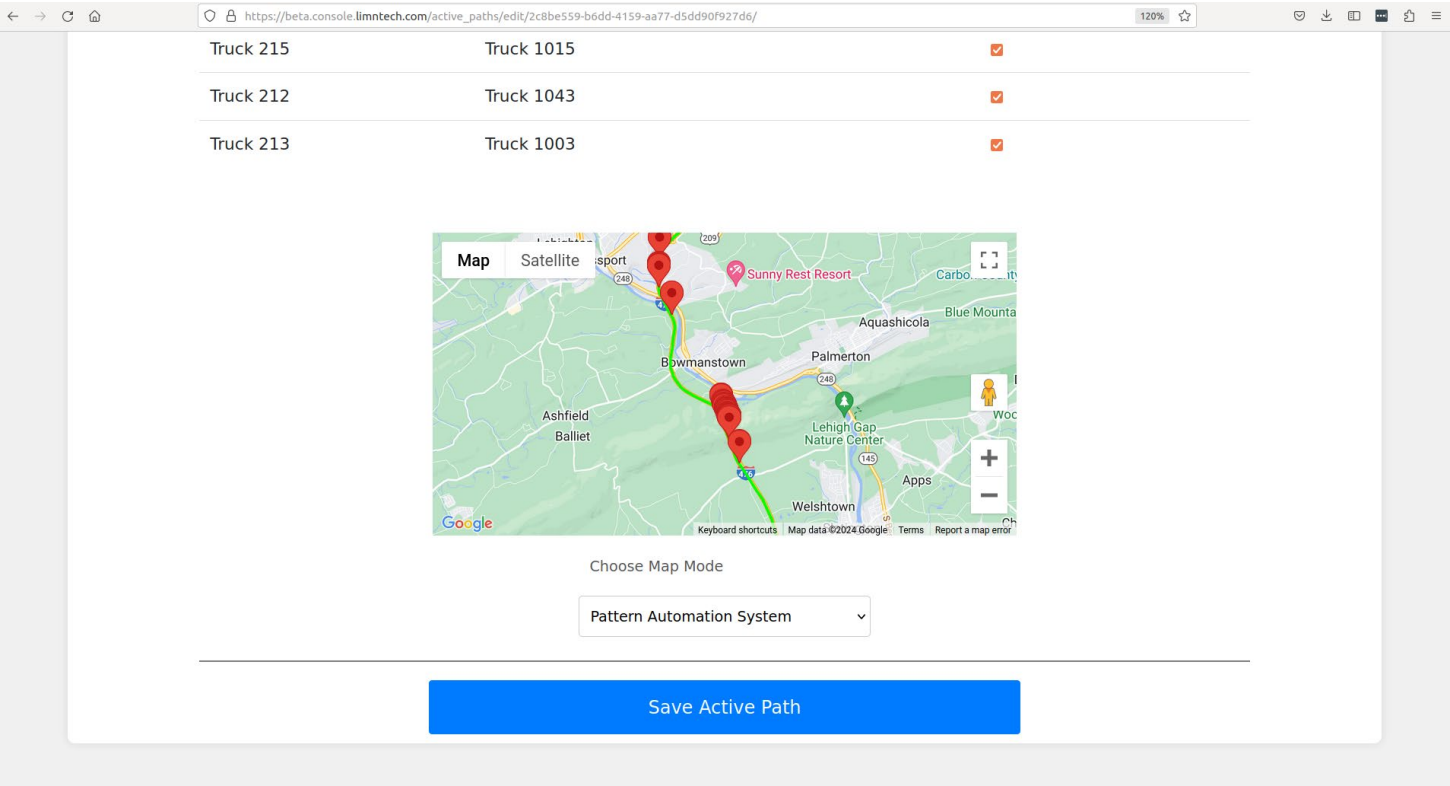
View The Virtual Line

- Scrolling down to the bottom of the "Edit" page will show the virtual line overlaid on a Google Map.
- If PAS was enabled for the selected recording, a dropdown "Choose Map Mode" will be available as shown in the image to the right.
- This dropdown box will let the user dynamically toggle between viewing the virtual line and the PAS transitions.



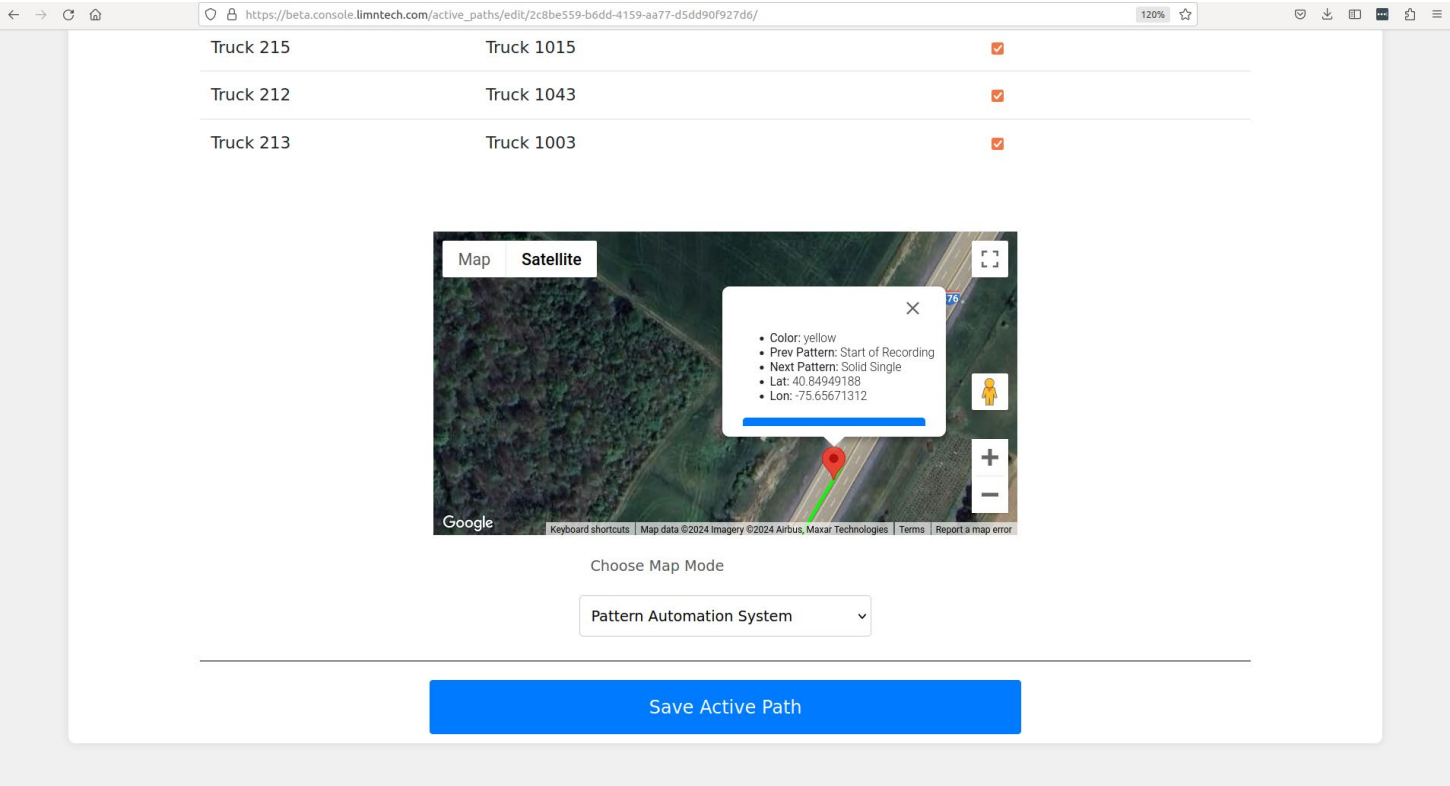
View PAS Detected Transitions

- Selecting "Pattern Automation System" on the "Choose Map Mode" dropdown will show the PAS detected transitions on the map.
- The pins on the map represent a detected pattern change. Clicking on one of these pins will show detailed information about the transition. The following slides will give more information on this.
- Previous / Next patterns are with respect to the direction of recording. There will be a pin placed at the location where the recording is started and where the recording is stopped. Clicking on these pins will show the text "Start of Recording" or "End of Recording". This can be used to determine the recording direction if this is forgotten.
- The green line represents where the truck travelled during the Recording. **This is not the Layout virtual line,** since the PAS will work even when there is a red dot during Recording.



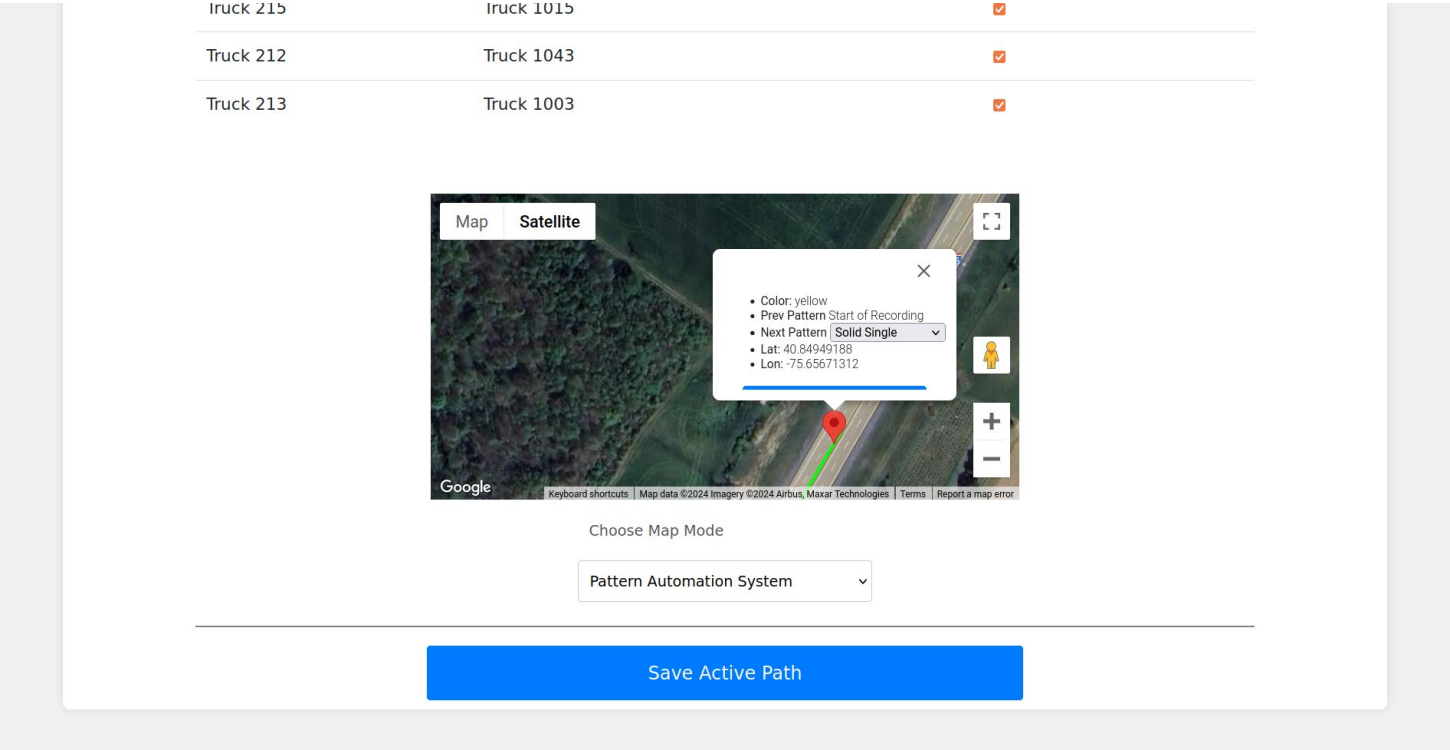
Transition Detail

- Each pin on the map is clickable and will display the following information
  1. Line color
  2. Pattern Transition (previous pattern and next pattern along the recording direction)
  3. Transition Location (Latitude / Longitude)
  4. Edit Button
  5. Delete Button
- Pressing the button entitled "Edit" will allow the user to change the detected transition to any of the eight PAS supported transition types.
- The button entitled "Delete" will appear for every marker except the markers indicating the start and stop of the recording. Pressing this "Delete" button will remove the transition from the recording.



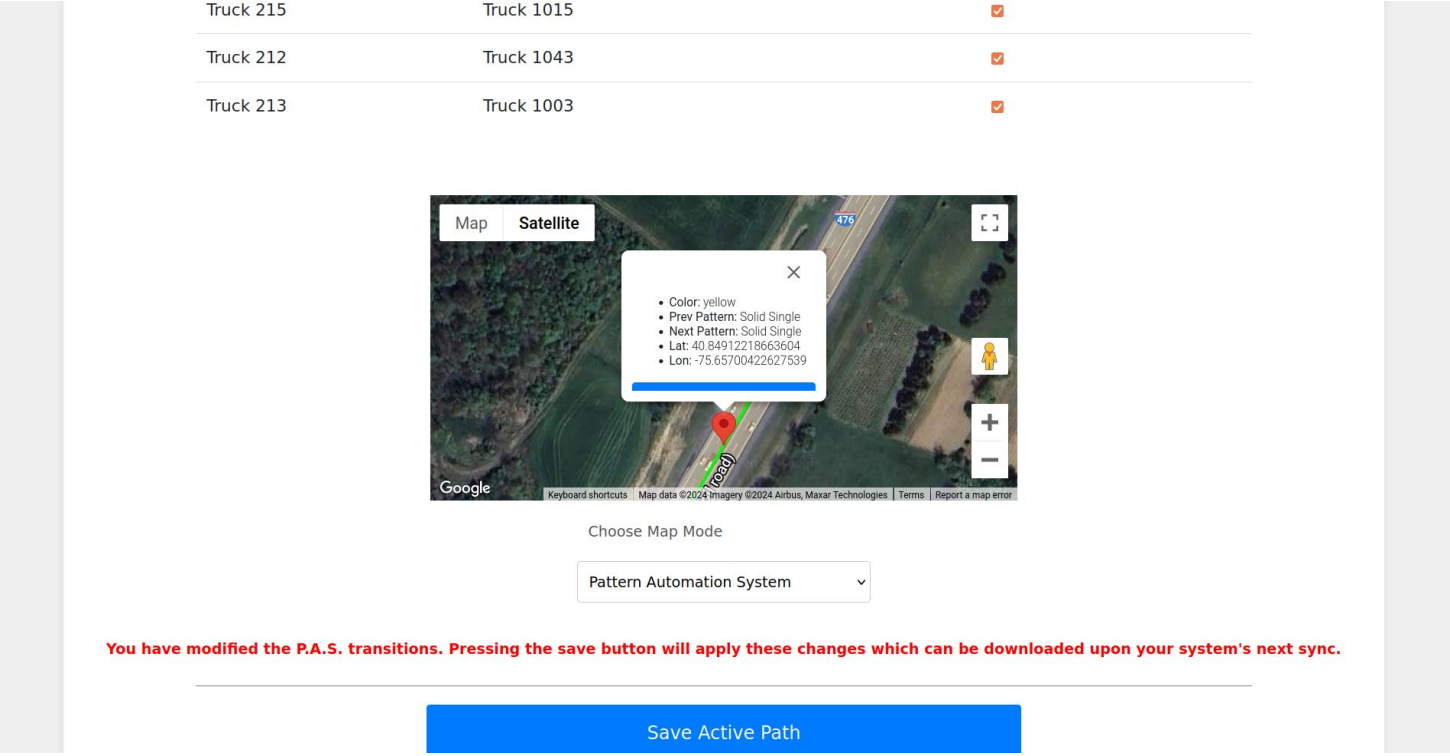
Edit Detected Pattern

- When editing a transition, the user will be presented with a dropdown selection of supported PAS transitions.
- When the user is satisfied with their changes, they can press the button named "Apply" in the pop-up window.
- Once every edit is made, the user must press "Save Active Path" at the bottom of the website for all their changes to be saved.
- Once the user pressed "Save Active Path", any vehicle wishing to perform Layout with the changes must synchronize.



Create New Transition

- Clicking anywhere on the green line will create a new pin on the map
- By default, the previous and next transitions will both correspond to whichever pattern is currently assigned to the line before the user created the transition.
- In the example to the right, the user clicked the green line where "Solid Single" was the current transition.
- The user may now use the "Edit" button to modify this transition.
- Any transitions where the previous pattern and the next pattern are the same will be ignored by the server when "Save Active Path" is pressed.



Delete Transition

- There may be false positive transitions detected by the PAS system.
- If the user wishes to completely remove a detected transition, they may press the button labeled "Delete" that is shown in the pop-up window when clicking on a transition.
- Note: the first and last transitions cannot be deleted since they represent the start and stop of the recording. All other transitions may be deleted.