**1. Hook up and install**

A first time user would only need to copy the project folder containing all the files onto a computer if they wished to adapt the code. If they want to run the simulation, they should copy the executable file from the release or debug folder (accessed from the bin folder).

**2. Compile and link**

If the user if running the simulator from Visual Studios, they should rebuild the solution after making modifications and then run using “Start without debugging”.

**3. Initialize**

Once the project or executable is downloaded, there should be nothing to initialize.

**4. Use**:

1. Run the program.
2. On the opening screen, the user can decide to create a brand new track, or they can open an existing track they created. Tracks are saved as text files.
   1. If the user selects “open” it will prompt them to open an existing track file. They then will be brought to the create form with their selected track drawn on the panel.
   2. If the user selects “new” it, it brings the user to the create form with an empty panel.
3. On the create form, the user can customize their track.
   1. There are 4 generic track pieces that can be manipulated and placed on the gray panel. The user simply must click the piece, and while the mouse is down, drag it to their desired location. When the mouse is released, an “auto-fit” feature has been implemented so pieces will not overlap or become staggered. If a piece is placed outside the panel or in a location that is not acceptable, the piece will be returned to its original location.
   2. If the user wishes to delete a piece that has been placed, they must right click on that piece in that panel.
   3. To rotate pieces, the user must double click on the track piece in the palette.
   4. The user can clear the panel by clicking the clear button. The user will be asked to verify if they wish to clear the panel.
   5. The user can save their track to be used at another time by clicking the save button. This will bring up a prompt for the user to select a location for the file and a name.
   6. Clicking the done button will bring the user to the train info form. If no track has been placed, the user will not be allowed to continue and will be prompted to create a track.
4. On the train info form, the user can customize their trains.
   1. The user can decide to run their simulation with 1 to 5 trains. The number of trains is controlled by which radio button is selected. Depending on which radio button is checked, the corresponding number of train fields will become activated.
   2. For each train the user can:
      1. Modify color by selecting a color from the drop down box of colors. Colors include: red, orange, yellow, green, blue, purple and pink.
      2. Modify speed by using the arrows to increase or decrease the speed. Speed ranges from 0-10.
      3. Change direction. Directions are forward and backward. Forward represents moving right or down. Backwards represents moving left or up.
   3. When the user is content with their trains, clicking OK will take them to the place trains form. If any of the activated trains do not have a color selected, the user will not be allowed to continue and will be prompted to select a color for the necessary trains. (Color was the deciding factor because technically a train can have the default speed of 0 and a default direction of forward)
5. On the place trains form, the user can place their desired number of trains on the track.
   1. The track they have designed is redrawn on the screen.
   2. On the side of the panel, the trains the user requested have been drawn each with their desired color.
   3. To place on the track, the user clicks the train and, while the mouse is down, drags the train to its desired location on the track. Again, an “auto-fit” feature has been added so once the train is placed, the train will center on the track. If it has been placed in a location that is not acceptable, it will be returned to the palette.
   4. Once a train is placed, it still can be moved to a different location.
   5. When the user is content with their placing, clicking the play button will take them to the simulator form. If all the trains are not placed, the user will not be allowed to continue and will be prompted to place the remaining trains on the track.
6. On the simulator form, the user can see their trains moving.
   1. When the start button is clicked, the user can see all their trains moving, as long as their speed is not 0.
   2. They can change their trains speed and direction by selecting the train they wish to modify in the dropdown box of trains. The selected trains information is brought up and ready to be modified. Once a change has been made, the train immediately takes on its new attributes.
   3. To pause the simulation, the user simply has to click the pause button.
   4. To start again, the user clicks the start button.
   5. To restart all the trains in their original starting location, and with the original speeds and directions, the user clicks the restart button. They will be asked to verify that the wish to restart.
   6. If a train moves off the track, the user is notified that a train has derailed. The train will be removed from the track and the dropdown box of trains.
   7. If two trains collide, the user is notified that two trains have collided. Both trains will be removed from the track and the dropdown box of trains.
   8. If all trains have been removed from the track, the user is notified that all trains have derailed. They can then end the simulation or restart.

\*\*Note: Using any means of quitting on a form other than the welcome screen will return the user to the welcome screen. Exiting from the welcome screen will end the program.

**5. Detailed exceptions**

The use of turnouts has not been implemented in this design. So when a user hits an intersection (cross piece) or a T piece, the train will continue to go in the same direction as before. For example, if the train was traveling forward through a cross piece, it will continue to move up through the intersection. The user cannot change the train to go left or right.

**6. Hints on operation**

The operation is pretty straightforward. It is useful to save track designs so that they can be revisited later, however this is not a necessary part of the simulation.