USER'S MANUAL

for

COE 1186 Project

Version 0.1 approved

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Training Montage

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Contents

1	Cen	tralized Traffic Control	4
	1.1	File Menu	4
	1.2	Auto/Manual Button	4
	1.3	Dynamic Map Rendering	5
	1.4	CTC Info	6
	1.5	Train Info	6
	1.6	Block Info	$\overline{7}$
	1.7	Schedule	8
	1.8	Train Details Pop-out	9
2	Way	vside / Track Controller	10
	2.1	Top Level	10
		2.1.1 Region Selector	11
		2.1.2 Upload PLC	11
	2.2	Infrastructure	11
		2.2.1 Block Occupancy	12
		2.2.2 Switches, Lights, Crossings, and Broken Rail	12
	2.3	Rolling Stock	12
		2.3.1 Block	12
		2.3.2 Speed	13
		2.3.3 Authority	13
3	Trac	ck Model	14
	3.1	Block Information	14
	3.2	Switch Information	15
	3.3	Force Majeure	16
	3.4	Track Import and Export	16
4	Trai	n Model	17
	4.1	Current	17
	4.2	Dimensions	18
	4.3	Adjust	18
5	Trai	n Controller	20
	5.1	Time & Station	20
	5.2	Basic Info	20
	5.3	Speed & Power	21

5.4	Manual Mode .																		21
5.5	Auxiliary Info .																		22
5.6	Lights & Doors																	•	22

1 Centralized Traffic Control

Mitch Moran



1.1 File Menu

Clicking on file will show a drop down menu containing the following items:

- Upload Schedule Replace the existing schedule with a newly uploaded one
- Save Schedule Export schedule with any manual changes to a file

1.2 Auto/Manual Button

Auto Manual

Toggle between automatic and manual modes by clicking this button. In automatic mode trains will be dispatched according to the internal schedule. In manual mode the dispatcher must deploy all trains.



1.3 Dynamic Map Rendering

The dynamic map rendering displays the current system state. Detailed information of each piece will be displayed in the relevant info boxes when a train or piece of track is clicked.

1.4 CTC Info



The CTC info box displays information about the currently operating system.

- Temperature Current outside temperature.
- Throughput Amount of people that completed a trip within the last hour

1.5 Train Info

Train Info							
ID:	1						
Current Blog	ck: A22						
Origin:	Shadyside						
Destination	: Herron Ave						
Speed:	34 mph						
Authority:	A22,A23,A24						
Popout Tr	rain Details						
New Train	Dispatch Train From Yard						

Information on a train selected in the map view will display here. The following items will be displayed.

- Train ID Unique ID number for the train
- Current Block The current block this train occupies
- Origin Location the train started at
- Destination Final stop for this train
- Speed Speed suggested by the CTC
- Authority The permitted distance until the train must stop

The Pop-out Train Details button will open a new window to allow the viewing of multiple trains at once. This window will be explained in a later section. In manual mode, the New Train button will create a blank template for the dispatcher to add a new train. Once the new train's details are entered, Dispatch Train From Yard will send the new train. Closing the template window without pressing the Dispatch button will cancel the new train.

1.6 Block Info

Block	Info
ID:	1
Region:	A
Occupied:	Yes
Speed Limit:	15 mph
Switch ID:	5
Switch State:	A1 -> A2
Length:	.2 mi
Grade:	.5%
Elevation:	4562 ft
Block Passable:	Yes
Heater:	Disabled
Underground:	Above Ground
Close for ma	intenance

Information on a block selected in the map view will display here. The following items will be displayed. Items marked with an asterisk (*) are contextual and only appear when relevant.

- Block ID Together with Region forms a unique block ID
- Region The region of track in which this block is located
- Occupied (Yes, No) Indicates if the block is occupied or not
- Speed Limit The max safe speed for that block
- Length How long the block is
- Grade The grade of the block
- Elevation The block's elevation

- Block Passable (Yes, Broken, Maintenance) If the block can be passed or the reason it can't be passed
- Heater State (On, Off, N/A) Indicates if the heater is on, off, or there is no heater
- Underground (Yes, No) Indicates if the block is underground
- Light State^{*} (Super Green, Green, Yellow, Red) The light color currently displayed
- \bullet Switch ID* A unique ID for the switch on this block
- Switch State* Shows which track pieces are connected by a switch
- Station Name* The name of the station on that block
- Number of Passengers at Station* How many passengers are waiting at that station
- Railway Crossing State* (Activated, Deactivated) When activated, trains can safely cross

The selected block can be closed or opened for maintenance by clicking the button at the bottom of this box.

1.7 Schedule

Train ID	Destinati on	Track Piece	Arrival Time	Wait Time				
1	ShadySide	C7	7:00 AM	5 min				
1	Herron F16 7:30 AM 5 min Ave							
	Submit Schedule Changes							

Displays the schedule for the whole system. Will be read-only in automatic mode and can be edited in manual mode. Users can select a station from the Destination column or select a specific block from the Track Piece column. Use the Submit button to confirm changes made to the schedule.

l r			-				
	Train	Info					
	ID:	1					
	Current Block:	A22					
	Origin:	Shadyside					
	Destination:	Herron Ave					
	Speed:	34 mph					
	Authority:	A22,A23,A24					
l l							
	Schee	dule					
Destination	Destination Track Piece Arrival Wait Time Time						
ShadySide	C7	7:00 AM	5 min				
Herron Ave	F16	7:30 AM	5 min				
	Submit Sched	ule Changes					

1.8 Train Details Pop-out

The same train information that was displayed in the main GUI will be replicated here. In addition the train's individual schedule can be seen here and edited while in manual mode.

2 Wayside / Track Controller

Isaac Goss

			🗆 X
Region	G4 *		pload PLC
	INFRAST	RUCTURE	
	Block O	ccupancy	
A1: 0 B4 A2: 0 B5 A3: 0 B6	1: 0 C7: 0 D 5: 0 C8: 0 D 5: 1 C9: 0 D C10: 1 D C11: 0 C12: 0	13: 0 14: 0 15: 0 16: 0	
Switches	Lights	Crossings	Broken Rail
C12: 0	C12: 0 D13: 0 A1: 0	NA	NA
	ROLLIN	G STOCK	
	Block	C10 🛡	7
Speed		Authority	
Suggested 100		Suggested A2	
Actual 55		Actual C7	

2.1 Top Level

Region G4 VUpload P	.c	

2.1.1 Region Selector

This is a drop-down menu which allows the user to pick with which Wayside Controller (WC) she would like to interact. The regions define a WC's subset of track which it controls, so this uniquely identifies a WC. The region is specified by line (Green or Red), and the number within that line.

2.1.2 Upload PLC

Beside this, we see a button labeled "Upload PLC" which allows a user to change which PLC file this WC will execute. Hitting this button will open a file menu to allow easy file choice. If the upload and compilation of the PLC code is successful, the user will be returned to the main window. However, if the upload fails in reading the file, or with an error in the code, the user will be presented with an error pop-up.



2.2 Infrastructure

	INFRASTRUCTURE	
	Block Occupancy	
A1: 0 A2: 0 A3: 0	B4: 0 C7: 0 D13: 0 B5: 0 C8: 0 D14: 0 B6: 1 C9: 0 D15: 0 C10: 1 D16: 0 C11: 0 C12: 0	
Switches C12: 0	Lights Crossings Broken Rail C12: 0 D13: 0 A1: 0	

2.2.1 Block Occupancy

This view displays all blocks which this WC controls. They are printed by name (section and number), followed by the binary value of occupancy: 1 if occupied, 0 otherwise. It is automatically refreshed as this information changes.

2.2.2 Switches, Lights, Crossings, and Broken Rail

Each of these boxes work much like the Block Occupancy box above. Information is presented by block number, in the same format, and each of these blocks will only print the relevant blocks, i.e., the only switch in this region is on C12, so only that block is printed. The following additional information will be printed along with the block number, per box:

Switches Position, that is, whether the switch is engaged.

Lights Color, from D (double green), G (green), Y (yellow), R (red).

Crossings Whether a crossing is active, so that a train can pass over; 1 for activated, 0 for not activated.

Broken Rail In maintenance; 0 for no (broken), 1 for yes.

2.3 Rolling Stock



2.3.1 Block

This drop-down allows a user to pick the train to interact with by the block it is currently on. This will be changing rapidly, but the drop-down menu will keep up with these changes to make selection painless.

2.3.2 Speed

Below, and to the left, there are 2 boxes, both of which represent some kind of speed assigned to this train. The first is **Suggested** Speed, which comes from the CTC. As this is a vital component, the WC shall not allow this speed to exceed the speed limit of the train's current block. This is called **Actual** Speed, and is what the WC assigns to the train in question. These speeds shall be in miles per hour.

2.3.3 Authority

To the right of this, there are 2 very similar boxes. These represent the Authority which was **Suggested** by the CTC, and the **Actual** Authority assigned by the WC controller. The WC shall not allow a trains authority to exceed where it can safely go. That is, the WC shall not allow a trains authority to overlap with any of the following:

- 1. That of another train.
- 2. A switch which a train cannot use at that time.
- 3. A railroad crossing which it cannot cross at this time.
- 4. Rail which it cannot use at this time.

3 Track Model

Alec Rosenbaum

Track Model					
		11:	46 AM	76°F	
	Block Info	ormation		Switch I	nformation
Wayside ID: Speed Limit: Length:	1 15 mph .2 mi	Block ID: Reload I	A1 V Block Info	Switch ID: 2 Connected Blocks: A State: A	1, A3, A4 1-→A3
Grade: Underground:	.5 %	Submit	t Changes	Force	Majeure
Bidirectional:	No	Elevation:	252ft	Power Failure	Broken Rail
Occuppied: Track Heater:	No Disabled	State: Line:	Operational Green	Extra Train	Track Circuit Failure
Next Blocks: Signal:	A1, A3 Super Green	RR Crossing: Authority	Inactive Super Green	No Train	No Communications
Infrastructure:	SWITCH			Import Track	Export Track

3.1 Block Information

	Block Inf	ormation	
Wayside ID:	1	Block ID:	A1 🗸
Speed Limit:	(15 mph		
Length:	.2 mi	Reload H	Block Info
Grade:	.5%		-
Underground:	No	Submit	Changes
Bidirectional:	No	Elevation:	252ft
Occuppied:	No	State:	Operational
Track Heater:	Disabled	Line:	Green
Next Blocks:	A1, A3	RR Crossing:	Inactive
Signal:	Super Green	Authority	Super Green
Infrastructure:	SWITCH		

The block information section allows the user to select a block (from a dropdown), view stored block details, and reconfigure block details. Once the user selects a block from the dropdown, that blocks information will be populated onto the appropriate fields. The user may then reload the information about that block using the "Reload Block Info" button, or they may edit any field and click the "Submit Changes" button to modify the details stored by the Track Model.

The user may expect to see one or more of the following block states in the "State" field:

Operational The selected block is fully functional.

- Broken Rail The selected block includes a section of broken rail.
- **Extra Train** The selected block detects a train, when there is no train actually present.
- **No Train** The selected block does not detect a train, when a train is present.
- **Power Failure** The selected block is experiencing a power failure.
- **No Communication** The selected block's communications aren't functional, thus no communication is relayed to any train present.

3.2 Switch Information



If there is a switch connected to the selected block, details will be presented in this section. Details include:

- Switch ID
- Connected Blocks
- Switch State

3.3 Force Majeure

Force	Majeure
Power Failure	Broken Rail
Extra Train	Track Circuit Failure
No Train	No Communications

All options for causing Force Majeure failures are presented here. When the user clicks an option, the Force Majeure failure is applied to the selected block.

3.4 Track Import and Export

THINGTE LEACE	internet line als
IIIIDOIL IIDOL	EXPORT HACK

Track import and export options are presented here. The "Import Track" button allows the entire track to be replaced with an imported track. The "Export Track" button allows the entire track to be exported based on its current state.

4 Train Model

Parth Dadhania

TRAIN MODEL		
Area man as man as man as h		
Current	Adjust	
Train ID 1 4 Speed Limit 20 mph	Manual Mode ON OFF	
Authority ^{2 mi} Temperature ^{72 °F}	Emergency ON OFF Lights ON OFF	
Power 300 kW Acceleration: 10 mph*2	Set Power: 200 kW Set Temperature 65 "F	
Current Train Speed: 8 mph	Authority ⁵ mi Failures	
Lights ON OFF Emergency ON OFF	Doors Brakes ON OFF	
Doors Dimensions	Left OPEN CLOSED Engine ON OFF	
Left OPEN CLOSED Mass: 40,000	Bight OPEN CLOSED Signal ON OFF	
Right OPEN CLOSED Height: 3.421		
Counts Width: 2.65	n	
Passenger: 50 Length: 32.2	n	
Crew: 1 Number of Cars 1		

4.1 Current

- Train Id: Drop down to let user select a train
- Speed Limit: Displays the current speed limit
- Authority: Displays the current authority
- Temperature: Displays the current temperature inside the train

- Power: Displays the current power
- Acceleration: Displays the current acceleration of the train
- Current Train Speed: Displays the speed of the train
- Lights: Displays the current status of the headlights
- Emergency Brake: Displays current status of the emergency brakes
- Doors: Displays the status of the left and right doors on the train
- Passengers: Displays the number of passengers on the train
- Crew: Displays the number of crew members on the train

4.2 Dimensions

- Mass: Displays the mass of the train
- Height: Displays the height of the train
- Width: Displays the width of the train
- Length: Displays the length of the train
- Number of Cars: Displays the number of cars for

4.3 Adjust

- Manual Mode: Select ON to adjust specific aspects of the train
- Emergency Brake: Select ON to engage emergency brakes
- Lights: Lets user turn on and off the train's headlights
- Power: User can set power input
- Temperature: User can set inside temperature for the train

- Authority: User can set authority of the train
- Doors: User can open or close the doors on the left and right side
- Failures: Users can turn on and off failures that could occur in the train
- Apply Changes: Submits the inputs that the user provided in the fields above

5 Train Controller

Aric Hudson



5.1 Time & Station

- Upcoming and Current Station Information: Displays the next station or the current station if stopped at one.
- Clock Icon: displays the current time, and speed of simulation

5.2 Basic Info

- Train ID: Displays ID of current train; dropdown menu allows user to view different trains.
- Authority: Displays current train's authority in miles.

• Speed Limit: displays the current speed limit the train is under, if it knows what that speed limit is.

5.3 Speed & Power

- Suggested Speed: Speed suggested for the train by the Wayside Controller.
- Current Train Speed: Current speed of the train currently being viewed.
- Max Safe Speed: Maximum safe speed for train as calculated by Train Controller.
- Set Speed: Speed to set train to; can be dictated in manual mode; updated automatically in automatic mode.
- Calculated Power: The necessary power required by the train to attain the desired speed. Will display "brake" if the train needs to slow down.
- Set Power: Power to set the train to; can be dictated in manual mode; updated automatically in automatic mode.
- Std Brake: Applies the regular brake to the system as long as it is held.

5.4 Manual Mode

- Manual: Toggles manual mode when "ON" is selected; toggles automatic mode when "OFF" is selected.
- Apply Changes: When manual changes have been set, this applies the changes to the current train.

5.5 Auxiliary Info

- Current Safe Braking Distance: The current safe braking distance as calculated by train controller.
- Current Power: The current power applied to the train.

5.6 Lights & Doors

- Lights: Toggles lights on or off. Lights should be on when "ON" is toggled; lights should be off when "OFF" is toggled.
- Doors: Toggles doors to open. If doors on left are open, toggling "LEFT" closes them; if the doors on the left are closed, toggling "LEFT" opens them. The "RIGHT" toggle has identical functionality, but for the right doors.