COMP2121 User Manual *By Jeremy Chen (z5016815) and Ting Chen (z5023744)*

Wiring Up the Monorail Emulator

Port Group	Function	Pins
LCD	The LCD will request the user to input necessary information (Max Stations, Station Number, Time between Stations, Stop Time and Wrong Inputs). After the necessary Data has been inputted, the LCD will cycle through the City Names based on the Time information from the input Data. We are required to connect Port F to LCD DATA and Port A to LCD CTRL.	PF0 - D0 PF1 - D1 PF2 - D2 PF3 - D3 PF4 - D4 PF5 - D5 PF6 - D6 PF7 - D7 PF8 - D8 PA4 - BE PA5 - RW PA6 - E PA7 - RS
Motor	The Motor will start after all the necessary Data have been inputted by the user. The Motor will travel at an approximate speed of 60 RPS. When the Push Buttons are pressed or the Hash Key is pressed, the motor will pause for a brief moment based on the previously inputted Delay information. Then it will resume again at 60 RPS (for Push Buttons). If the Hash Key is pressed, then the Motor will stop until the Hash Key is pressed again.	PE2 - Mot TDX2 - OpO OpE - +5V LED - PA3
Key Pad	The Keypad is used to input the necessary information to set up the monorail. The Keypad will be modified to display all existing letters and numbers/symbols. The Keypad is required to enter the number of Max Stations, Station Number, Time between Stations, Stop Time and Wrong Inputs. The Hash Key will also be required to briefly stop the Motor and Monorail Emulator (resuming by pressing the hash key again).	PL0 - C3 PL1 - C2 PL2 - C1 PL3 - C0 PL4 - R3 PL5 - R2 PL6 - R1 PL7 - R0
Push Buttons	The Push Buttons (PB0 and PB1) are used to stop and restart the motor after it reaches the next station. The Motor will resume again after a delay period (declared by the user at setup). PB0 indicates that a passenger is getting off at the next station while PB1 indicates that a passenger is getting	PB1 - RDX3 PB0 - RDX4

	on at the next station.	
LED	Two bars for the LEDs will flash whenever the Train / Motor stops (at 3 Hz). The LEDs will continue to flash until the Motor resumes travel again.	PC0 - LED2 PC1 - LED3 PC2 - LED4 PC3 - LED5 PC4 - LED6 PC5 - LED7 PC6 - LED8 PC7 - LED9 PG2 - LED0 PG3 - LED1

Using The Emulator

To start the emulator, we load the hex file and you will enter the first stage of the emulator after 3 seconds, where you will be prompted to enter the maximum number of stations. After entering a value, you will be required to press 'C' to confirm and continue.

Since we are required to express a range of characters, symbols and numbers with a very limited keypad, a few modifications have been made to the actual keypad to address this.

To enter any numbers with the keypad, we are required to press the star key first. This will allow us to use the 1-9 keys on the keypad to enter the numbers 1-9 and A will be the used for 0. To enter letters for the keypad, we will be required to press 0 first. This will allow us to express the letters A-I using the keys 1-9 respectively. If we press #, the 1-9 keys will now express the letters J-R, and then another # will allow us to express R-Z. The Space Key can be expressed with 'B'.

After inputting each variable after every prompt, we will be required to press C again to confirm that input. D can be used at anytime to clear the output in the case that any errors were made. The procedure for the display will follow something similar to the example shown below.

Enter Max:
5

The inputted values will appear on the second line of the LCD. After pressing 'C' to confirm, we will then enter the next stage of our input. Here we will be required to enter the name of a station.

Name Stn 1
CLYDE

After entering the names for all the stations that we are passing through, we are then required to enter the time it takes to get from a station to the next one (for example, from station 1 -> 2). Here, the number 0 will indicate 10 seconds.

Time Stn 1-2
4

After we have inputted all the necessary information, we will be required to press PB0 to start the monorail emulator with all the data and parameters that the user has provided.

Start in 5s

After 5 seconds have elapsed, the motor will then start spinning at 60 RPS (rotations per second). The LCD screen will display the current location of the monorail, this display will change when the monorail arrives in another city (unfortunately we do not have this fully working in the current implementation of our program). PB0 and PB1 can be used to indicate that a passenger is leaving the monorail. This will cause the train to stop when it reaches the next destination and flash (at 3 Hz) for the delay duration, afterwards it will then resume travelling again. When the train is stopped it displays 'STOPPING' on the LCD screen.

STOPPING

The Hash Key would then be used to pause the train as it is travelling, pressing the Hash key again would undo this change. The LEDs would flash when this occurs.
The flash pattern is shown below. This pattern will flash 3 times a second until the motor resumes running.