COMP2121

User Manual

Monorail Emulator

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Contents

1.0 Board Setup

The table below displays the general port connections.

Table 1 General Port Connections

Devices	Pin
KEYPAD	PL0–PL3 => C3–C0 PL4–PL7 => R3–R0
LED	PC0–PC7 => LED2–LED9 PG2–PG3 => LED0–LED1
MOTOR	Mot => POT PE2 => JP91 TDX2 => OpO PA3 => LED +5V => OpE
PUSH BUTTONS	RDX3 => PB1 PDX4 => PB0
LCD	PF0–PF7 => D0–D7 PE5 => BL PA4 => BE PA5 => RW PA6 => E PA7 => RS

2.0 Operating Instructions

2.1 System Configuration

The following steps outline the process which configures the system.

2.11 Step 1: Enter number of stations

The LCD display will appear as follows:

> **max stations:**

In this step, the user must input the number of stations. The maximum number of stations that can be entered in 10. The following table displays how different error cases are handled.

Table 2 Error Cases for Number of Stations

Error Case	Input Result
Enter 0 or number larger than 10	Prompt input again

To confirm number of stations, the # key needs to be pressed.

2.12 Step 2: Enter name of each station

The station name can be a combination of characters and white spaces where the maximum number of characters is 10.

Keys A, B, C are to represent characters on the number keys. To enter a character, you must first press either A, B or C and then select the number key, which will print the associated character on the LCD screen. For example, to select the character "J", A must be pressed followed by the number key 4. You

can observe that J is the first character on the "4" key, which corresponds to key A. A white space is given by the * key. The following table outlines the functioning of this step.

Table 3 Functionality of buttons in step 2

Button	Function
1-9	Enter Characters
#	Finish inputting and store name
A	Represents first character on key
B	Represents second character on key
C	Represents third character on key
D	Will not work
0	White space

When the # button is pressed, the name is stored. After this, the program will be taken to the next stage in configuration.

2.13 Step 3: Entering Travel time between stations

The LCD screen will display:

time SN -> S(N+1)

Where N is the station number.

In this step, the travel time, in seconds, between stations is inputted. The maximum travel time is 10 seconds. Error handling is exactly the same as with the number of stations. For error handling cases refer to Table 2. After the correct travel time is inputted, press # to store and move to the next stations.

Table 4 Functionality of buttons in step 3

Button	Function
0-9	Enter number stop time
#	Finish inputting and store number of stations
A	Will not work
B	Will not work
C	Will not work
D	Will not work
*	Will not work

2.14 Step 4: Enter stop time

The LCD screen will display:

stop time

Where N is the station number.

In this step, the user must configure the stop time of all the monorail stations. The minimum time for stopping is 2 seconds while the maximum stop time is 5 seconds. Like Step 1 and Step 3, only the number keys and # button will be available to prevent input of any incorrect data structures. When a correct stop time is inputted and # is pressed, the program will store the value and move to the next station.

The following table outlines how different error cases are handled.

Error Case	Input
2 < Input < 5	Prompt input again

After the stop time of all stations have been entered, the configuration phase of the emulator has finished and the board will start to simulate the action of a monorail.

2.2 Monorail Emulation

After configuration of the system has completed, the emulation begins. When this phase occurs, the LCD screen will display as follows:

```
wait 5 sec
```

When waiting at a particular station (this is to emulate stop time).

```
NEXT STATION NAME
```

When travelling to the next station.

After waiting for 5 seconds, the motor will start spinning at a speed of 60 revolutions per second. This is to represent the motor moving. At this stage, the LCD screen will display the name of the next station and the travel time associated with it.

PB0 and PB1 are to simulate the embarking or disembarking of a tourist at the next station. When one of them is pressed, the monorail will stop at the next station. Otherwise there is no change in passengers and so the monorail will continue to the next station.

The # key is to simulate an emergency stop of the monorail. After stopping, pressing the # key again will resume travel. Moreover, when the monorail is halted, two LEDs will blink at a frequency of 3Hz and will stop blinking when the monorail resumes its movement.