

RFID BASED METRO TRAIN SYSTEM

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ABSTRACT

This project is designed to demonstrate the technology used in metro train movement which are used in most of the developed countries. This train is equipped with a controller that enables the automatic stopping of the train from station to station.

Keywords : Microcontroller, RFID, IR Sensors, D.C Motor, Train, IC, Station, Fire Alarm, Relay.

1 INTRODUCTION

This project is to make an automated place announcement system for Train using voice IC and the radio frequency wireless card for tracking the station data. It can be extended to any number of stations [1]. The paper describes Land Transport Authority (LTA)'s systems engineering process on safety and reliability for the design and construction of automated metro system projects in Singapore. The approach adopted has been proven to be successful through its implementation on several recent projects in achieving a high level of safety and reliability of automated metro systems [2]. A good metro train system must provide a highly reliable and more efficient service. Automatically controlled vehicles consume less energy with optimized acceleration, traction and braking processes. Depending on the degree of automation, energy consumption can be reduced by as much as 30 percent, at the same time the punctuality of the trains is improved. On the basis of the line data, the automated system calculates exactly how and at which point a train has to be accelerated and braked for it to arrive punctually at the next station. On an automated line, trains can travel at shorter intervals one after another [3].

This proposed system is an autonomous train and it eliminates the need of any driver. Thus, any human error is ruled out. In this project PIC microcontroller (PIC16F877) has been used as CPU. Whenever the train arrives at the station it stops automatically, as sensed by an IR sensor. Then the door is opens automatically so that the passengers can go inside the train. The door then closes after a prescribed time set in the controller by the program. It is also equipped with a load cell kit. It weighs the load inside the train once the passengers leaving and entering the train. The door closes when it reaches maximum occupancy level irrespective of time allotted for the door to remain open. The passenger weight is displayed on a seven segment display interfaced to the microcontroller. The movement of the train is controlled by a motor driver IC interfaced to the microcontroller. The train incorporates a buzzer to alert

the passengers before closing the door and also warn them before starting.

2 PROBLEM DEFINITION

Most of the accidents occur due to human error only and also track maintenance people are not bothering about the small wear and tear of the tracks. Secondly in electric trains fault occurring chances are more. In chennai metro train daily 10 to 15 trains are getting faulty due to the overload condition and lack of maintenance. By observing all these parameter we decided to make such a train mechanism which is not giving any overload problem and cost maintenance system (driverless).

3 BLOCK DIAGRAM

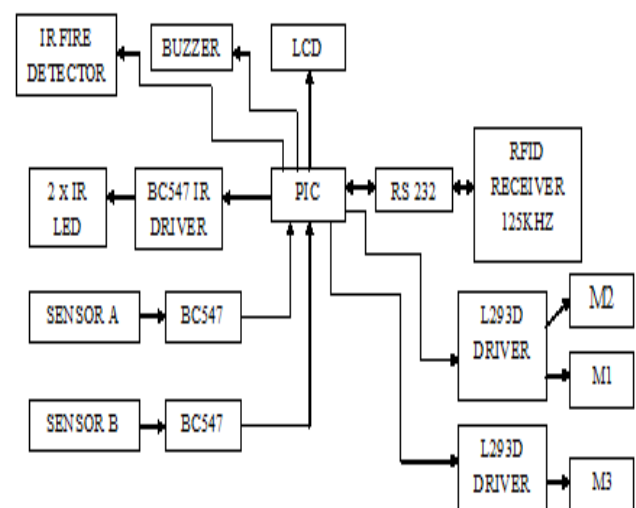


Fig 1: Block Diagram of RFID Metro Train

4 METHODOLOGY

Microcontroller is the central component which controls all the activities like reading data from serial port, writing and reading data to/from EEPROM, displaying information on LCD (Liquid Crystal Display), controlling buzzer and Relay. In order to do all the activities a program (sequence of instruction) must be written for the microcontroller. This program is called firmware. In order to execute the program, microcontroller requires basic configuration like 5V regulated power supply, clock, and reset circuit. 16*2 (2 line of 16 character) LCD is used for displaying people counting and relay status. It provides easy user interface. It needs to initialize before displaying data. This initialization is done by microcontroller. EPROM is used to store tag number. Buzzer is used for audio indication for ongoing activities. Microcontroller and IC's require 5V regulated power supply, which is obtained from 230V AC by using step down transformer, rectifier, filter and regulators. Fire detector is based on IR detector diode. RFID receiver is based on 125KHz trans receiver module. L293D motor driver is used to drive the three motors. M1, M2 is for driving the vehicle, M3 is for door. Keyboard is used to input the user set parameters. RS232 is used to communicate between microcontroller and RFID module.

5 CIRCUIT DIAGRAM

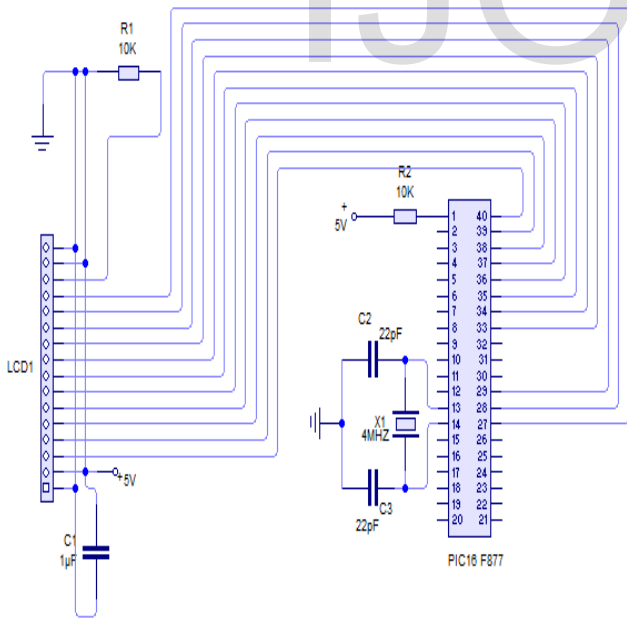


Fig 2: LCD Interfacing with PIC Microcontroller.

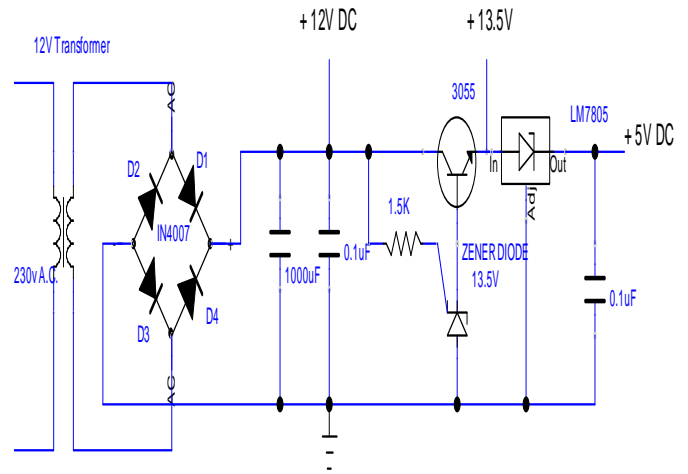


Fig 3: Power Supply Diagram.

PIC16F877 is used in the project. In order to execute the program, the microcontroller requires minimum configurations like - clock, power on reset (POR), program memory, and regulated power supply. The clock signal is obtained from built in clock generator. This clock generator requires crystal or resonator to work. Hence a crystal of value 11.0592 MHz is connected to microcontroller clock input with a pair of 22pF loading capacitor. 10K resistor is used for system resetting purpose. LED and buzzer are connected to RFID module to indicate tag (Smart card) detection. LCD is operated in 4-bit mode. Hence higher order nibble is connected to microcontroller. Pot 10K is used to vary the contrast Resistor 33ohm limits the current through back light LED. When the power is applied to microcontroller, it reset because of power on reset configuration and initializes LCD, Relay Driver, EEPROM, and Keyboard. Power Supply Section: Transformers is used in this section to powering the Micro Controller section and Relay Driving, Sensor section. This transformer is used to step down the 220 volts A.C mains supply into 12 volts A.C supply. Current handling capacity of the transformer is 500 mA. Power Supply Regulation Stage: This section is 8 bridge rectifier diode 1N4007. The current handling capacity of this diode is 1 amps and voltage handling capacity is 1000 volts. These diodes are used rectifier the low voltage i.e. 12 volt A.C into 12 volt D.C. 1000µF 25 volt electrolyte capacitor; these are used to filter the unregulated D.C voltage. By this capacitor D.C ripples are removed. 100µF capacitor is used to remove the EMI noise generated by the internal devices such as motor, relay. 7805 voltage regulator is used to regulate the 12V power supply to 5V. 78 means positive end regulations 05 stands for 5 volt regulation. Current carrying capacity is 1 amp. 0.1µF capacitor is used to filter the RFI noise.

6 SNAPSHOTS

The following are few snapshots of the working model at our workplace, MITE Mangalore.

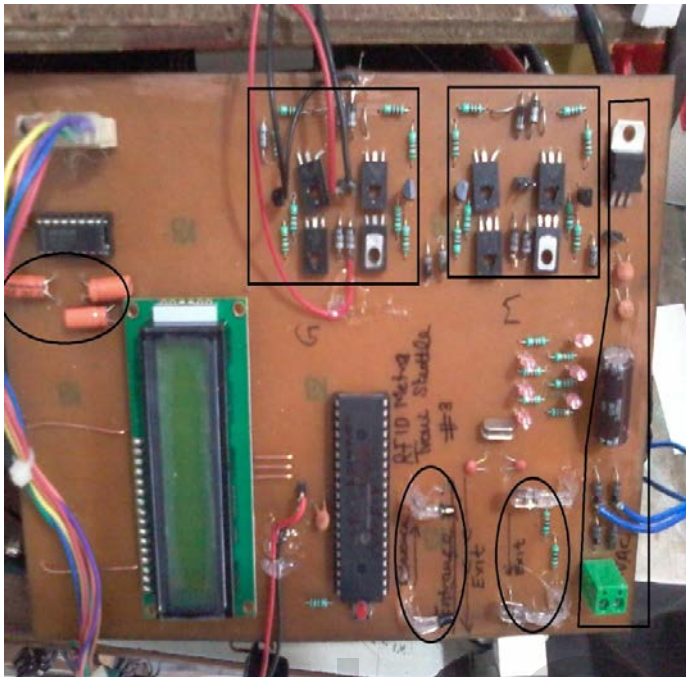


Fig 4: PCB showing controller and interfaced components.



Fig 5: Auto Metro Train.

HARDWARE REQUIREMENTS: PIC Microcontroller (PIC16F877), Motor Driver IC, DC Motors, Track, Wheels, Chassis.

SOFTWARE REQUIREMENTS: MP Lab IDE, Language: C or Assembly, Programming Kit: PIC KIT 2.

7 CONCLUSION

The main aim of this project is to make an automated system

for stopping of the train from station to station using voice IC and the radio frequency wireless card for tracking the station data. Automated metro lines are more energy-efficient and optimize passenger service automatically in real time. In terms of operational efficiency and cost-saving, driverless networks offer many advantages, such as lower expenditure for staff, avoiding human error and providing reliable auto metro train.

8 REFERENCES

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