

Automation Implementation In Train

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ABSTRACT

The automated system for a train is an integrated application which gives us announcements and displays the related station information when the train reaches a particular station and also detect any breaking of the track which prevent from occurrence of major accident. The implementation of the paper is based on Radio Frequency Identification Device. Serial communication, non-volatile memory storage, voice chip implementation and others devices in bringing out the desired functionality. This embedded application mainly use to focus on reducing loop holes in the existing system. Its improve performance is used to meet the cost and power consumption requirements. The main aim of this paper is to make an automated station announcement system for Train using voice IC and the RFID system and crack detection in track. The paper comprise of microcontroller with the RF receiver and the voice recorder chip with speaker.

Keyword: - *Use RFID technology, track (break) detection, Sensor based stoppage, Auto braking, LCD display to show the station, Voice announcement, automatic door opening and closing*

1. INTRODUCTION

The current or previous system involves announcing the arrival and departure information manually in a related station, some disadvantages of the existing system are Constant human intervention, High cost, large Manpower is required, Installation and integration is more time consuming.

The proposed system reduces and overcomes the above disadvantages and has the follows mentioned merits Automated system requiring minimum manpower, It uses a voice chip which records and plays the recorded voice, Reutilization of the recorded message, RFID Tags and readers are contact less and do not have range limit unlike RF receivers and transmitters, Databases requirement not be maintained, The project can also be interfaced to provide automatic opening of doors.

These all system is provided to the vehicle Train. The micro-controller 89C52 is the heart of the system. In this the microcontroller is interfaced with the RF Reader by the UART of the controller. The communication in between the controller and the RF Reader happen with the help of this UART.

So whenever the train reaches the station, the reader in the train receives the codes, the RF reader make and gives the unique code of the tag when the tag comes in the range of the RF Reader that is about 5 to 7cm. The controller receives this serially transmitted code through the RF Reader and then after that it decodes the same to obtain the desired code. If desired code matches these code then the controller will gives the command to the voice chip and LED indication to play that particular voice. Whenever train stop on the station then door will be automatically open after sensor sensing the particular signals.

At the same time the train stops for about 10-15 seconds in the station and then before leaving the station, it will again start to announce and the train starts to move to next station at the same time doors are closed or locked. The voice chip will play the voice and this will be heard in the speaker. This voice is repeated till train leaves the station.

In addition to this system crack detection circuit are also provided in this system. Whenever any crack or breakages are available or occur in track it will detect this crack and breakages then giving single to the control system and it is stop the train immediately.

2. PROBLEM DEFINATION

In some nations new function is provided to automatically stop the train if it crosses red signal are in place. These avoid on collisions to a large extent. But no such function are provided in Indian Railways leading to certain avoidable collisions. Most of the accidents occur due to human error (require constant human intervention) only also the track maintenance people are not attention about small or large breakage of track, it may chances of major accidents causes more property get damaged.

By surveying in Chennai metro train 10 to 15 trains are obtaining faulty due to this problem and lack of maintenance. By considering all these problem we implement train system must provide a highly reliable and decided to provide such train mechanism which is automatically controlled train introduce problem and cost of maintenance system, less energy with improved acceleration ,traction and braking processes . Depending on types of automation, energy consumption can be minimized by as ample as 30 percent, at same time of the functionality of train is optimized.

This new system is an autonomous train and it removes the need of any driver. Thus any human error is over out. In this project microcontroller (AT89C52) has been used as CPU. Whenever the train arrives at the station it stops automatically announcing and displaying the station name before some time from reaching the station. Then the door is opens automatically so that the passengers go inside and outside the train. The door closes after the time provided for related station or set in the controller by the program.

3. BLOCK DIAGRAM AND CIRCUIT DIAGRAM

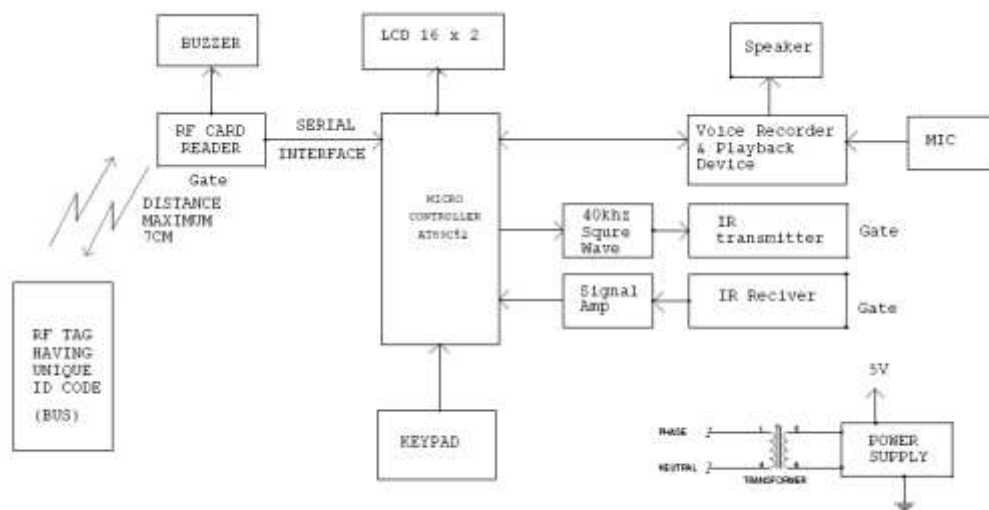


FIG -1: BLOCK DIAGRAM OF AUTOMATION TRAIN SYSTEM

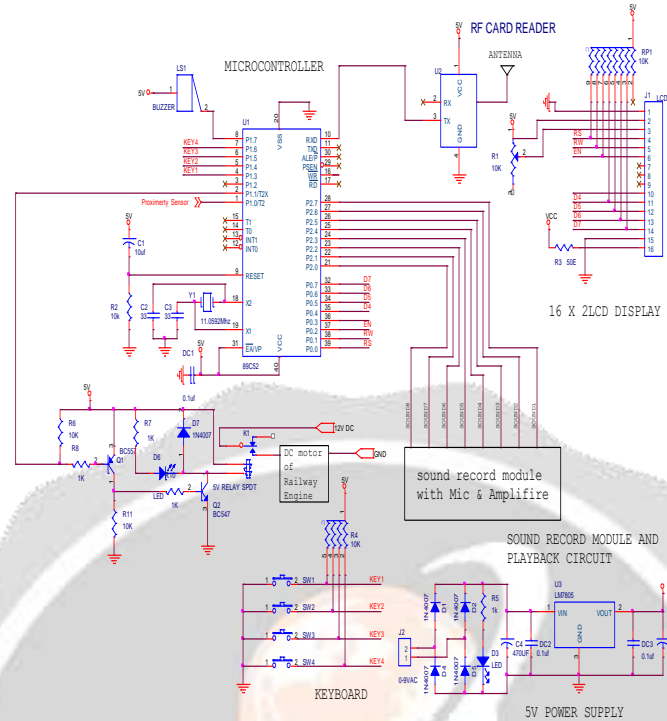


FIG -2:CIRCUIT DIAGRAM

4. EXPERIMENTAL MAIN COMPONENTS DETAILS:

4.1 RFID SYSTEM

RFID is abbreviation for Radio Frequency Identification. Generally a RFID system contains 2 parts. First one is Reader, and second one or more Transponders, also known as Tags. RFID systems evolved from barcode labels as a means to automatically identify and track products and people.

RFID SPECIFICATION

- Supported LF tag types -Texas instruments TIRIS (read only)
- Supported UHF tag types -Class 1 Gen 2 EPC/ISO 18000-6C (read and write)
- Frequency range
 - 1)LF tags at 134.2 kHz(half duplex)
 - 2)UHF tags at 902 to928 MHz
- Read and write range (Typical maximum)
 - 1)Up to 45.1 cm (18 in) for UHF tags
 - 2)Up to 2.2 cm (1 in) for LF tags
- Rf output power -6 to 25 dBm
- Antenna orientation - Forward-facing linear directional, radiating from the back plane of the reader

Maximum output power and operating frequency varies from country to country depend on regulations. Read and write range varies based on tag performances , radar, antenna gain, reader output power, and environmental conditions.

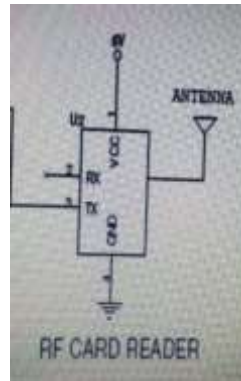


FIG -3: RFID SYSTEM

4.2. MICRO-CONTROLLER AT89C52

The AT89C52 is a low-power, high-performance CMOS 8-bit microcomputer with 8K bytes of Flash programmable and erasable read only memory (PEROM). The device is produced using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 and 80C52 instruction set and pin out. The On-chip Flash permitted the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C52 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control Applications.

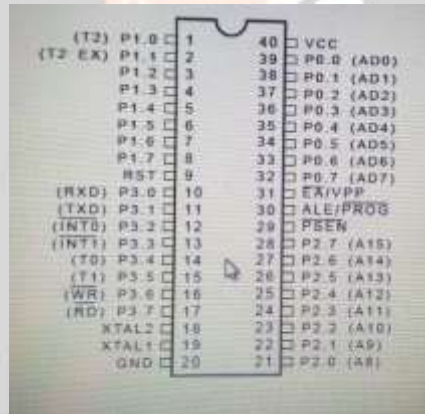


FIG -2: PIN DIAGRAM AT89C52 CONTROLLER

FEATURES

1. 32 Programmable I/O lines.
2. Three 16-bit Timer/Counter.
3. Eight Interrupt Sources.
4. Fully Static Operation: 0 Hz to 24 MHz
5. 256 x 8-bit Internal RAM
6. 32 Programmable I/O Lines
7. Three 16-bit Timer/Counters
8. Eight Interrupt Sources
9. Programmable Serial Channel
10. Low-power Idle and Power-down Modes

Absolute Maximum Rating	
Operating Temperature.....	-55°C to +125°C
Storage Temperature	-65°C to +150°C
Voltage on Any Pin	
with Respect to Ground	-1.0V to +7.0V
Maximum Operating Voltage.....	6.6V
DC Output Current.....	15.0 Ma

4.3. LCD 16X2 DISPLAY

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each and every character is displayed in 5x7 pixel matrix. This LCD have 2 registers, namely, Command and Data. The command register stores the command instructions provided to the LCD. A command is an instruction provided to LCD to do a before defined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

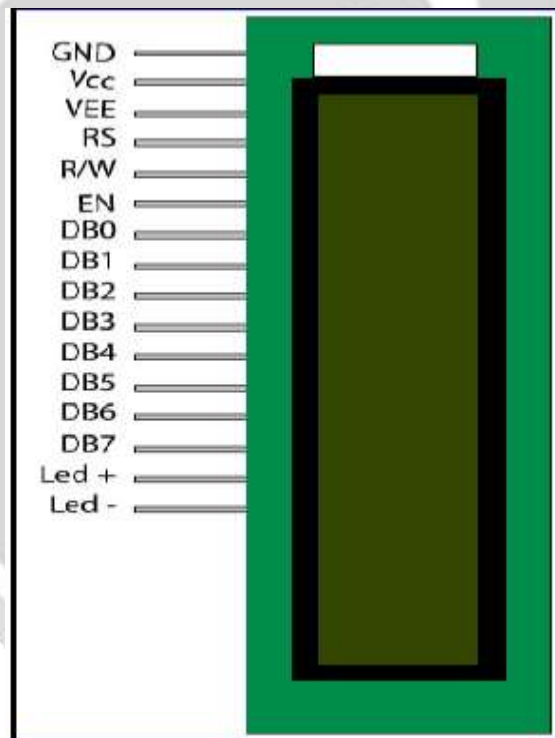


FIG -5: LCD 16X2 DISPLAY RFID SYSTEM

FEATURES

1. 5 x 8 dots with cursor.
2. Built-in controller(KS 0066 or Equivalent)
3. +5V power supply (Also available for 3V)
4. 1/16 Duty cycle
5. B/L to be driven by pin1,pin2 or pin15,pin16
6. N.V. optional for +3V power supply

4.4. REGULATOR IC (LM 7805)

The LM7805 monolithic 3-terminal +ve voltage regulators employ internal current-limiting, thermal shutdown and safe-area compensation, making them essentially indestructible. If satisfied heat sinking is provided, they can deliver over 1.0A output current. Their main aim is to fix voltage regulators in a wide range of applications including local (on-card) regulation for removal of noise and distribution problems associated with single-point regulation.

It also uses as fixed voltage regulators, these devices can be provided with external components to obtain adjustable output voltages and currents. Considerable practice was expended to make the entire series of regulators easy to use and minimize the number of external components. It is not necessary to bypass the output, although this does improve transient response. Input bypassing is required only if the regulator is located far from the filter capacitor of the power supply.

FEATURES:

1. Complete specifications at 1A load
2. Output voltage tolerances of $\pm 2\%$ at $T_j = 25^\circ$
3. Line regulation of 0.01% of V_{OUT}/V of $\square V_{IN}$ at 1A load
4. Load regulation of 0.3% of V_{OUT}/A
5. Internal thermal overload protection
6. Internal short-circuit current limit
7. Output transistor safe area protection

3.5. IR PROXIMITY SENSOR

It uses infrared beam reflection for detecting proximity of objects. Proximity sensors are used to detect objects and obstacles in front of the sensor. The sensor keeps transmitting modulated infrared light and when any object comes near, it is detected by the sensor by monitoring the reflected light from the object. It can be used in robots for obstacle avoidance, for automatic doors, for parking aid devices or for security alarm systems, or contactless tachometer by measuring rpm of rotation on detecting objects in blades.

Features:

1. Modulated IR transmitter
2. Ambient light protected IR receiver
3. 3 pin easy interface connectors
4. Bus powered module
5. Indicator LED
6. Up to 20 cm range for white object
7. Can differentiate between dark and light colours
8. Active low on object detection

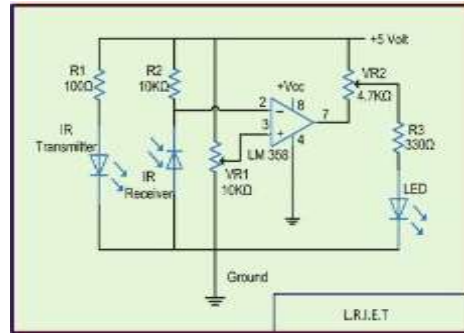


FIG-6 IR PROXIMITY SENSOR

4.6. RELAY (12v DPDT 8 PIN)

Relay are switches that open and close circuit by opening and closing contact in another circuit. As relay diagram show, when a relay contact Normally Open (NO), there is an open contact when the relay is not energized. When a relay contact is Normally Closed (NC), there is a closed contact when the relay is not energized .

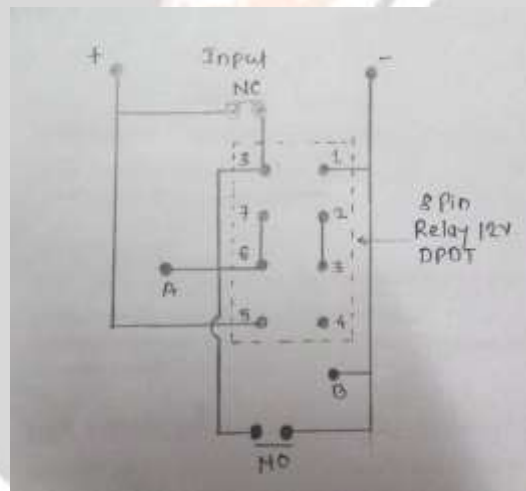


FIG -7: 12V DPDT REALY INTERNAL CONGIGURATION

5. CONCLUSIONS

This project is designed so understand the technology used in the now a day’s driver less metro train which is used in most of the developed countries like Germany, France and Japan etc. This propogated technology upgradation have less dependence on human intervention, the report said “Inspection of Rails is a complex exercise and must be automated as much as possible to reduce dependence on human judgement.” As many rail lines run at or near their capacity limits, automation is often way to maximize the operational performance of a train service systm. This embedded application mainly focuses on reducing loop holes in the existing system.

06. ACKNOWLEDGEMENT

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