

DESIGN OF VEHICLE SECURITY SYSTEM USING RADIO FREQUENCY IDENTIFICATION

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ABSTRACT

Vehicle Security system is needed especially for companies that have special access at certain locations, in this study will be designed vehicle security system using Radio Frequency Identification (RFID) to avoid misuse of the vehicle.

Using arduino and rfid tag sensors will be read by the system as a Security System to read driver identity if the vehicle user has access to operate the vehicle, if not have access then the user can not use the vehicle.

Keywords: *RFID, security system, arduino.*

1. Introduction

With the many moves that occur on airport runways, security is an absolute must have, security of Ground Support Equipment vehicles is also needed because of the importance of the operational vehicle in supporting the safety and comfort of air transportation. Abuse of the vehicle by a licensed officer may affect the security and service of passengers and planes.

Ground Handling officers in charge of serving customers in Apron have operational vehicles called Ground Support Equipment, which are:

- A. Towing Car, a vehicle that helps to pull the plane.
- B. Push Back, a vehicle that helps to rewind the plane.
- C. Tug and Tractors, vehicles that help attract or drive ground support that is broken.
- D. Water Service Truck, a vehicle that supplies drinking water into the aircraft tank.
- E. Lavatory Service Vehicle, a vehicle duty unload dirt and clean up the dirt inside the aircraft tank.

2. Literature review

Some research about system security can be described as follows:

Research related to vehicles such as automobile black box system for accident analysis, describes the security of the system will send sms in case of accident [1], car security using internet of things [2], describes the security of stolen vehicle system will send signal to smart phone, Intelligent safety and security system in automobiles [3], describes the safety of vehicles using various sensors such as alcohol sensors.

Security-related research using wireless technology: infrared optical wireless communication for smart door lock using smart phone [4] tells about home door security set up using smart phone. Research implementation of speech based home automation system using Bluetooth and gsm [5], propose about the use of sound facility as its security system. Home monitoring and security system [6], describes the home security system using several sensors that are sent using gsm module.

Rfid-related research: address digitization and smart mailbox with rfid technology [7], describes the use of various sensors with rfid used to send information to the mailbox. Research of applying rfid and gps tracker for signal

processing in a cargo security system [8] and rfid based school bus tracking and security system [9] tells about the security of object security tracking. The design and implementation of intelligent rfid security authentication system [10], describes the security used for the triple DES algorithm authentication system. And the security in rfid based smart retail system [11], explains the use of rfid for retail systems.

Therefore, this research will make security applications can not be run indiscriminately only people who have access that can operate the vehicle. For this reason, this research is made using Radio Frequency Identification (RFID) as security with technology that has reliability in recognition of identity, so that every vehicle user must have license issued by regulator which will be read by this system so that the future of this function can be part From Security System.



Figure 1. Ground Support Equipment vehicles

3. Hardware system

In this section will be described hardware system:

3.1 Radio Frequency Identification

Radio frequency identification (RFID) information systems use tags to store data retrieved wirelessly by a reader, applications of RFID include item management, physical access control, travel documentation, finance, banking, sensors, animal tracking, human identification, and anti-counterfeiting. RFID systems require the application of information systems security to protect the information from tampering, unauthorized disclosure, and denial of service to authorized users.

3.1.1 RFID Reader

RFID reader is a liaison between software applications with antennas that will radiate radio waves to RFID tags. Radio waves transmitted by the antenna spread to the surrounding room. Consequently data can move wirelessly to RFID tags that are adjacent to the antenna.



Figure 2. RFID Reader

3.1.2 RFID Tags

The RFID tag is a device made up of a series of electronics and antennas integrated in the circuit. The electronic circuits of RFID tags generally have memory so that these tags have the ability to store data. The memory in tags is divided into cells. Some cells store Read only data, such as a unique serial number stored at the time the tag is produced.

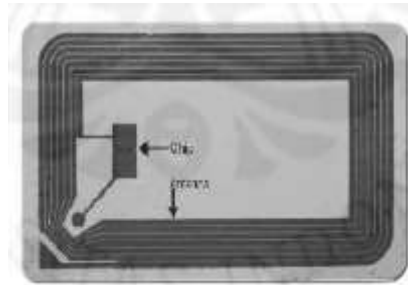


Figure 3. RFID Tag Card

3.1.3 ATmega 328

ATmega328 is a microcontroller output from atmel that has RISC architecture (Reduce Instruction Set Computer) where every data execution process faster than CISC architecture (Completed Instruction Set Computer).

ATmega 328 Microcontroller has a Harvard architecture, which separates the memory for program code and memory for data so as to maximize work and parallelism.

(PCINT14/RESET) PC6	1	28	PC5 (ADC5/SCL/PCINT13)
(PCINT16/RXD) PD0	2	27	PC4 (ADC4/SDA/PCINT12)
(PCINT17/TXD) PD1	3	26	PC3 (ADC3/PCINT11)
(PCINT18/INT0) PD2	4	25	PC2 (ADC2/PCINT10)
(PCINT19/OC2B/INT1) PD3	5	24	PC1 (ADC1/PCINT9)
(PCINT20/XCK/T0) PD4	6	23	PC0 (ADC0/PCINT8)
VCC	7	22	GND
GND	8	21	AREF
(PCINT6/XTAL1/TOSC1) PB6	9	20	AVCC
(PCINT7/XTAL2/TOSC2) PB7	10	19	PB5 (SCK/PCINT5)
(PCINT21/OC0B/T1) PD5	11	18	PB4 (MISO/PCINT4)
(PCINT22/OC0A/AIN0) PD6	12	17	PB3 (MOSI/OC2A/PCINT3)
(PCINT23/AIN1) PD7	13	16	PB2 (SS/OC1B/PCINT2)
(PCINT0/CLK0/ICP1) PB0	14	15	PB1 (OC1A/PCINT1)

Figure 4. Atmega 328

3.1.4 Buck Converter LM2596

Buck Converter which has the function of lowering the voltage with fixed output level and level input varies. The input voltage must be greater than the output voltage. Buck Converter is widely used in various household electronic devices, industrial, and military. The main components of Buck Converter are coil, Diode, capacitor, and Clock circuit generator with a certain frequency. Currently Buck Converter is sold in the form of ready-made modules.



Figure 5. Buck Converter LM2596

3.1.5 Micro SD Adapter

The module (Micro SD Card Adapter) is a Micro SD card reader module, and the SPI interface via the file system driver, microcontroller system completes the micro SD card for reading and writing files.



Figure 6. Micro SD Adapter

3.1.6 Micro SD Card

Memory Card or memory card is a tool that serves as a place of digital data storage (such as images, audio and video) on a gadget such as digital cameras, PDAs and Mobile. The size of this memory card ranges from 128MB, 512MB, 1GB and so on even until there is a Memory Card with a capacity of 32GB or more.



Figure 7. Micro SD Card

3.1.7 LCD LM016L

Electronic display is one component of electronics that serves as a display of data, either characters, letters or graphics. LCD (Liquid Cristal Display) is one type of electronic display made with CMOS logic technology that works by not producing light but reflects the surrounding light on the front-lit or transmits light from the back-lit. LCD (Liquid Cristal Display) serves as a data viewer either in the form of characters, letters, numbers or graphs.



Figure 8. LCD

3.1.8 Engine Contact Key

The primary function of the ignition is to connect and disconnect the current / voltage on the ignition system, from the battery to the ignition primer circuit. In the ignition key there are several terminals that work to connect the current / voltage from the battery to the ignition component.



Figure 9. Engine Contact Key

4. Software

Software or software is an application that is in hardware as a form of command to process and execute to do work in accordance with the planning and concepts, here are the software that the author uses in the creation of this thesis, which are:

4.1 Arduino IDE

In connection with the discussion for the current software Arduino to be used are drivers and IDE, consisting of:

1. Program editor, a window that allows users to write and edit programs in the Processing language.
2. Compiler, a module that converts the program code (Processing language) into binary code. However a microcontroller will not be able to understand the Processing language. Which can be understood by microcontroller is binary code. That is why the compiler is required in this case.
3. Uploader, a module that loads binary code from computer into memory inside the Arduino board.



Figure 10. Arduino IDE

4.2 Microsoft Visual Basic 6.0

Microsoft Visual Basic 6.0 is a programming language used to create Windows-based graphical applications (GUI-Graphical User Interface). Microsoft Visual Basic is event-driven programming (programming controlled events) means the program waits until a response from the user in the form of events or certain events (buttons clicked, menu selected, and others). Microsoft Visual Basic 6.0 is very popular in recent years this. Microsoft Visual Basic 6.0 is more widely used as a developer than other programming languages like Pascal for example, where we have to write programs for everything. Microsoft Visual Basic 6.0 is able to automatically add part of the program code automatically into the program so that the work of the programmer becomes easier. Microsoft Visual Basic 6.0 provides a lot of convenience for the designers of Windows-based programs in pouring their imagination by using the objects available in Microsoft Visual Basic 6.0 facility and click and drag facility to make the display as attractive as possible in accordance with the wishes of the program maker.

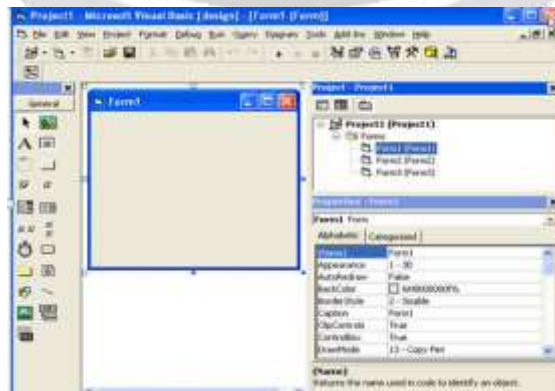


Figure 11. Form Designer Microsoft Visual Basic 6.0

4.3 Microsoft Office Access 2007

Understanding of Microsoft office access is a relational computer database application program used to design, create and process various types of data with a large capacity. A database is a collection of tables - tables that are often called relational databases. Relationships between tables are connected by a key, namely primary key I and foreign key.

Access 2007 has a new user interface (UI) that replaces the menus, toolbars and as large task panes available in previous Microsoft Access versions with single mechanization that is simpler and more efficient. The new user interface (UI) is designed to help you work more productively and easily in using all existing facilities and functions.



Figure 12. Form Microsoft Office Access 2007

5. Design system

This concept is a new innovation in the field of security systems, especially in Ground Support Equipment vehicles. Here is an explanation of the draft concept that the author made in accordance with the image above:

ID Card which is RFID Card Tag login to RFID Reader by way of closer, then RFID Reader give signal to microcontroller to process data, whether ID Card match or not, if suitable then microcontroller will give command to transistor S9014 as switch substitute for ON So the ignition key gets supplied from the batteries used to power the DC machine.

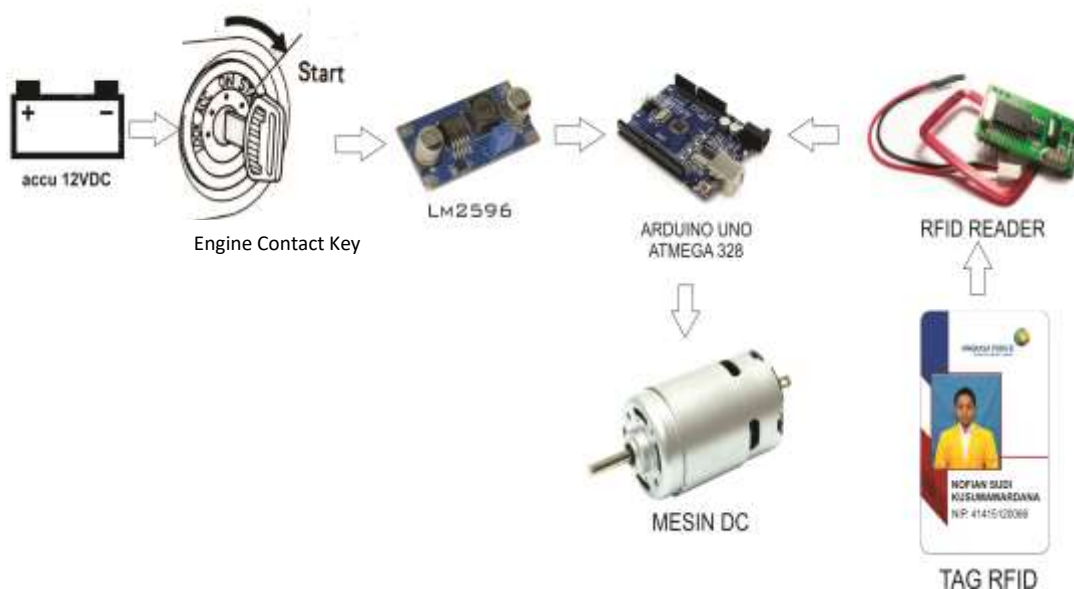


Figure 13. Design system

The control system is designed using automatic and manual control system. In the auto system, the system runs in accordance with the draft concept while the manual of this system will be activated in case of damage by giving switches or switches that are hidden and have limited authority with the intention of only certain people authorized to activate this manual system so as not to be abused by certain elements.

6. Results and analysis

For Ground Handling officers who want to access the database must login by filling the employee's name and password, then pressing the Login button, if the employee's name and password match then the data access to the main form can be done.



Figure 14. Login system

6.1 Login Form Failed

When Login Failed or the name and password does not match the database then will appear the next form of notification that Login failed and press the Repeat button to repeat the appropriate name and password. Here is the Login Form Failed view:



Figure 15. Information when login form failed

6.2 Primary Form

On this form there will be the name of the driver who uses the vehicle.

ID	Nama	Tanggal	Jam
R124100	Suhanto	2017-8-3	17:20:54

Figure 16. Information form there will be the name of the driver who uses the vehicle

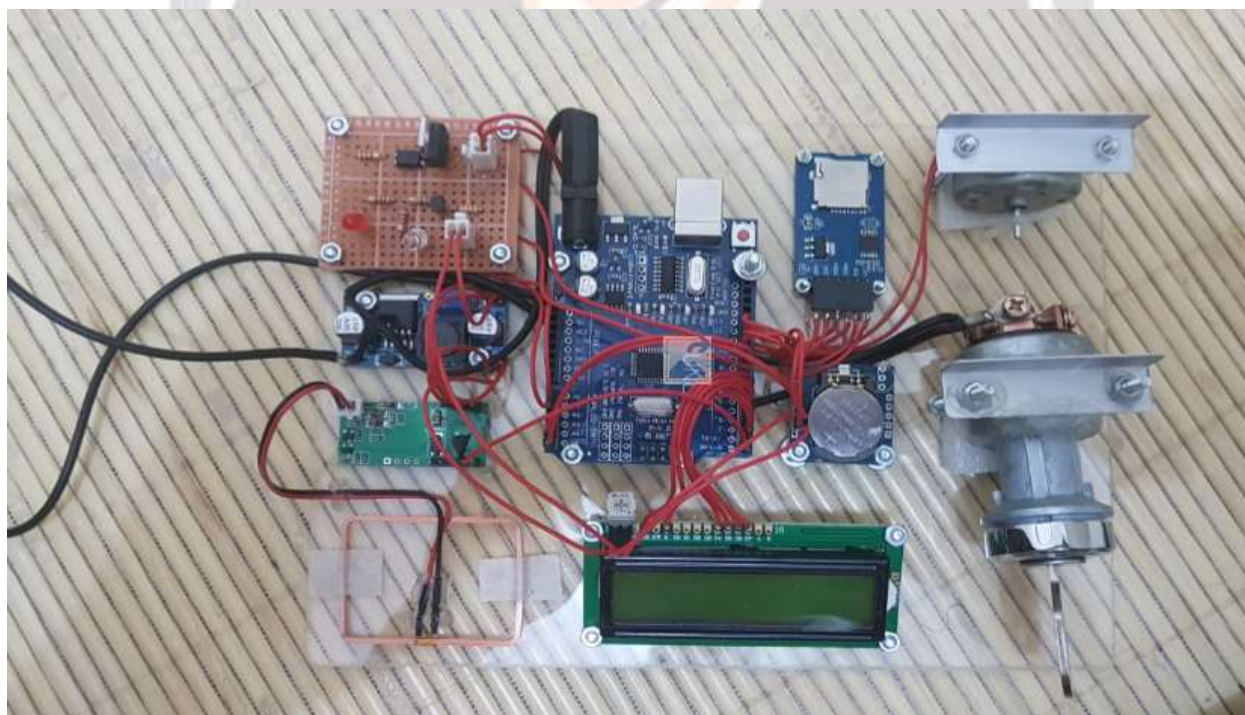


Figure 17. component security system vehicle using rfid

7. Conclusion

From the overall discussion in each of the previous chapters, it can be concluded as follows:

- a. The Implementation Plan of Radio Frequency Identification in Ground Support Equipment vehicles works in accordance with the procedures and can be used as a vehicle security tool especially in the recognition of identity.
- b. The design is capable of recording the identity of the user based on the Person License along with the time of the Ground Support Equipment vehicle usage.

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