

DESIGN AND BUILD AUTOMATIC GOODS LOCKER WITH RADIO FREQUENCY IDENTIFICATION (RFID) SECURITY

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Abstract - Locker is one of the facilities that many people use to store, and locker very useful for human right now, eiter in Gym, Mall, School and other public places. In general lockers are used to store valuables so that visitors can carry out activities more freely and also to preven theft in that place. **Microcontroller based Radio Frequency Identification (RFID) security locker is a**

1. INTRODUCTION

Storage of valuables so that visitors who carry out activities Lockers are one of the facilities used by many people to store goods. Storage lockers are very useful for humans today, both in malls, sports venues such as basketball courts, gyms, swimming pools, schools, laboratories and many more places that really need them. Usually, lockers are used as a storage area for goods so that these items do not interfere with their activities.

Locker is used for public places more freely and also to prevent theft in that place. Usually, lockers in public areas only have a key or locker card to open and close the locker door. Such a system is less secure if

2. METHOD

The research method used is the method of research and development (Research and Development or R&D). The research method Research and Development which is abbreviated as R & Dad is a research method used to produce certain products, and to test the effectiveness of these products. (Sugiyono, 2012: 297). According to Sugiyono, (2012:

locker that uses RFID security to replace the card or key that has been used in lockers that still use a manual system. Safety in the form of RFID can make it easier for locker users with a microcontroller based to control all system inputs and outputs.

Keywords: locker, microcontroller, radio frequency identification (rfid)

someone forgets where to store keys or cards. Keys or locker cards can also be lost so that it can be used by irresponsible people who find them. However, as technology develops, the use of conventional keys can be replaced with electric keys in the hope of a more practical use, and can be made easily and cheaply.

To solve this problem, a storage and retrieval system was created in a locker with RFID security so that the storage area becomes safer and easier to use. In this study, the Arduino uno was used with the Atmega328 IC as a controller and RFID as a safety sensor. The development of this system is expected to be able to create a more integrated and useful safety system.

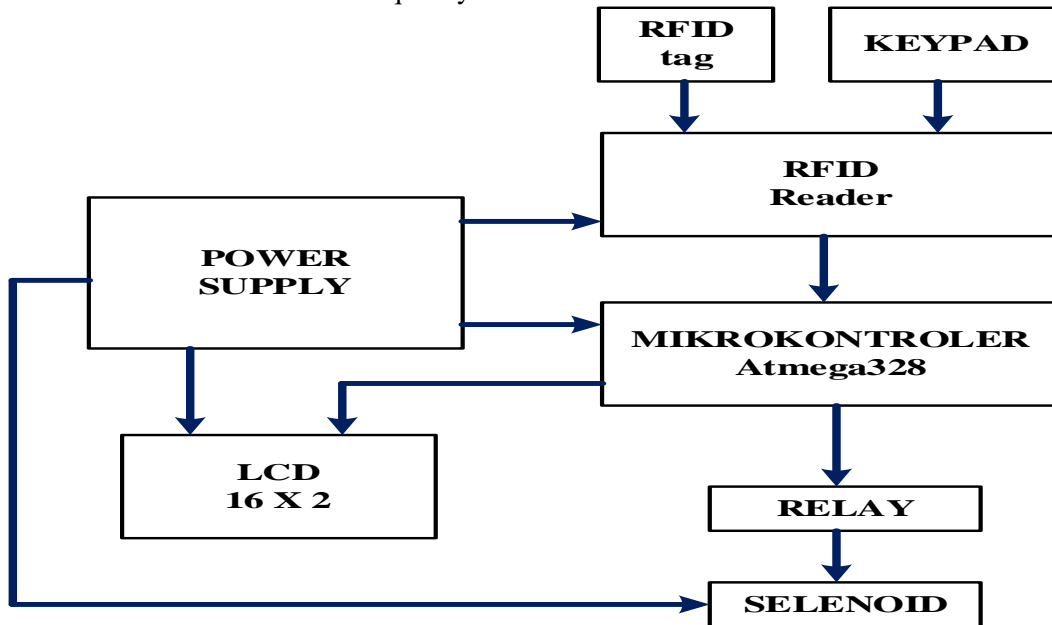
300-301), the products produced in Research and Development research are various. In the field of technology, the orientation of technology products that can be utilized for human life is quality, energy efficient, attractive, low price, light weight, and economical products.

In this case the product is a security device for an item locker using Radio frequency identification (RFID), this tool is attractive and useful as a safety door for

automatic goods lockers. The research begins with designing the overall system work, namely designing the hardware and software. In the design of the system work is made so that the locker door opens and closes based on the Radio Frequency

Identification (RFID) sensor as a door security, based on the Atmega328 microcontroller.

2.1 Block Diagram



From the block diagram above, you can know a little about the description of this research object and the following is an explanation of the function of each block diagram:

- The hardware design has an RFID reader sensor which functions to read the ID data from the RFID tag.
- The ATmega328 microcontroller functions to access data from the RFID reader sensor.
- 16x2 LCD functions to display characters according to the program given by the microcontroller.
- Atmega328. The keypad functions to provide input to the ATmega328 microcontroller to open the locker door. The microcontroller functions as a circuit control center that will activate the relay so that the solenoid is active and the LOCKER door can be opened.

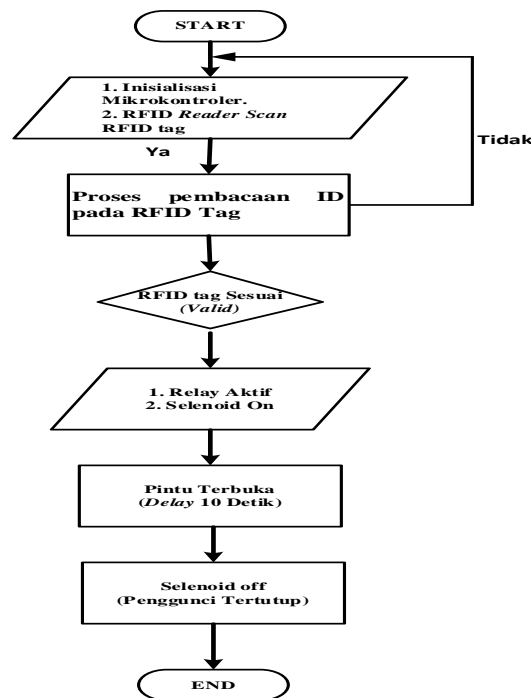
2.2 Scope

- The scope to be discussed in this research is as follows: Applying the work of sensors in opening and closing locker doors automatically.
- Able to design components using RFID security based on the AVR microcontroller with the Atmega328 type as control components.
- This tool uses the RC522 RFID reader sensor.

2.3 Tools and materials

- Mikrokontroler Atmega328
- Liquid Cristal Display (LCD)
- Aduino uno
- Radio Frequency identification (RFID)
- Solenoid Door lock
- Relay
- Adaptor
- Keypad

2.4 Flowchart



Explanation of locker safety flowchart using RFID.

- a. **Start**, the first step to operating the tool, namely, by applying voltage to the system or circuit.
- b. **Microcontroller initialization**, after the system is active the ATmega328 microcontroller will perform its function as a control of all inputs and outputs. The ATmega328 microcontroller enables the RFID reader and LCD. Once active, the LCD will display the text to paste the RFID tag.
- c. **RFID Reader Scan RFID tag**, The RFID reader will read the data on the RFID tag by emitting electromagnetic waves. The data read by the RFID reader will be forwarded to the microcontroller to be validated with the database on the ATmega328 microcontroller memory.
- d. **RFID valid**, If the data sent by the RFID reader is valid (according to the database) the microcontroller will carry out the next instruction, which is to activate the relay and the solenoid.
- e. **Relay Aktif**, After the RFID tag data is correct, the microcontroller will activate the relay to unlock the door.

- f. **Open door**, After the solenoid is active, the lock will open, so the door can be opened for 10 seconds.
- g. **Solenoid Off**, After 10 seconds, the ATmega328 microcontroller will give instructions to the relay to be active low and the locking solenoid (off) will be closed.
- h. **END**, is that all locking and unlocking processes will return to the ATmega328 initialization position (Looping).

2.5 Data Collection Techniques

The technique used in data collection in this study is to test the product. Where in this product test is to determine the performance and to measure the ability of these tools.

2.6 Data Analysis Techniques.

The analysis used in this research is an experiment of the accuracy of the tool through the right components after the measurement trial is carried out. Besides, descriptive analysis to describe the results of the experiment through:

- a. Measure the reading distance between the RFID Reader and the RFID tag by using a ruler (cm) to open and close the locker door.

- b. Testing per component tools, so that each component of the tool can work in accordance with a predetermined program to achieve more accurate data results.

2.7 Independent and Bound Variables

In this study, there are several variables that aim to get the results that are achieved.

- a. The independent variables are: Radio Frequency Identification (RFID)
Variable operational definition: RFID, a tool that can be used to change data between a tarminal and an object such as a product, or a human with the aim of identifying and tracing traces via electromagnetic waves.
- b. The dependent variable is: RFID distance measurement.
Variable operational definition: the design of this tool is done by measuring the sensor reading distance between the RFID tag and the RFID Reader using a ruler (cm) and

programming the Arduino Uno which functions to process data.

3. RESULTS AND DISCUSSION

3.1 Testing the whole circuit.



3.2 RFID Reader Sensor Distance Testing with RFID tag

Testing the reading distance of the RFID reader sensor with a FRID tag was carried out using a ruler (cm) and the RFID reader was in a plastic box with a thickness of 2mm. Measuring the distance between the RFID tag and the RFID reader aims to determine the distance the RFID reader can read the ID on the RFID tag.

Table 3.1 Retrieval of RFID tag distance data with the RFID Reader sensor

No	Tipe ID	Jarak (cm)	Keterangan
1.	RFID tag	0 cm	Terbaca
2.		0.2 cm	Terbaca
3.		0.4 cm	Terbaca
4.		0.6 cm	Terbaca
5.		0.8 cm	Terbaca
6.		1 cm	Terbaca
7.		1.2 cm	Terbaca
8.		1.4 cm	Terbaca
9.		1.6 cm	Terbaca
10.		1.8 cm	Terbaca
11.		2 cm	Tidak Terbaca
12.		2.2 cm	Tidak Terbaca
13.		2.4 cm	Tidak Terbaca

Table 3.2 Testing of RFID tags with RFID Reader and Selenoid sensors

Type ID	Jarak	RFID Reader		Selenoid	
		Membaca	Tidak Membaca	Posisi Membuka	Posisi Menutup
RFID tag	0 cm	√		√	
	0.2 cm	√		√	
	0.4cm	√		√	
	0.6 cm	√		√	
	0.8 cm	√		√	
	1 cm	√		√	
	1.2 cm	√		√	
	1.4 cm	√		√	
	1.6 cm	√		√	
	1.8 cm	√		√	
	2 cm		√		√
2.2 cm		√		√	

3.3 Discussion

This test is carried out to determine the work of the system as a whole, starting from the process of designing tools and programming on the microcontroller. In the first test, namely the Atmega328 microcontroller test, which is to control input and output on the locker safety, so

relay test which functions to control selenoid. The relay used is songle-RSD which has a voltage of up to 30 with a maximum current of 10A ($I = 10A$). Then in the selenoid test, which is DC selenoid and has a supply voltage of 12, measurements are made when the selenoid is active with a script to control the relay. And testing the RFID Reader, which is to read the ID on the RFID tag, then the ID will be processed by the microcontroller. And then measuring the distance of the RFID Reader sensor with an RFID tag using a ruler (cm), which is at a distance of 1.8 cm the RFID Reader sensor reads the ID on the RFID tag.

4 CONCLUSION

From the results of the research and discussion, it can be concluded that:

1. Automatic item locker with RFID security can be created and operated with the ATmega328 microcontroller as a circuit control center and

that the microcontroller requires an appropriate voltage supply.

Measurement of the input voltage on the Atmega328 microcontroller using an analog multimeter is 5V, from the measurement results with the Atmega328 microcontroller datasheet requires an operational voltage of 1.8-5.5. Then in the programmed using the Arduino IDE software.

2. This automatic item locker safety device using RFID is able to read the ID RFID tag with a maximum distance of 1.8cm with the MFRC522 RFID reader sensor which has a frequency of 13.56 Mhz.
3. Solenoid as a locker lock to close and open the locker door can work automatically within 10 seconds.

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REFERENCE

- [1] A, Kadir. 2012 Panduan Praktis Mempelajari Aplikasi Mikrokontroler dan Pemrogramannya Menggunakan Arduino. Edisi 1. Andi Offset. Yogyakarta.
- [2] Astono, R. 2006. Implementasi Dan Perancangan Kunci Pintu Hotel Dengan Radio Frequency Identification (RFID). Skripsi. Program Studi Pendidikan Teknik Elektro Universitas Negeri Semarang. Semarang.
- [3] Djuandi, F. 2011. Pengenalan Arduino. www.tobuku.com. 24 JUNI 2020
- [4] Guntoro, dkk. 2013. Rancang Bangun Magnetic Door Lock Menggunakan Keypad Dan Solenoid Berbasis Mikrokontroler Arduino Uno. Electrans, Vol 12, No. 1, Maret 2013. Bandung.
- [5] Pedoman Dan SOP Tugas Akhir, Fakultas Teknik, Universitas PGRI Adi Buana, Surabaya, 2018
- [6] Riza, M. 2014. Perancangan Keamanan Pintu Otomatis Berbasis RFID (Radio Frekuensi Identification). Skripsi. Program Studi Teknik Informatika Universitas U'budiyah Indonesia. Aceh.
- [7] Rochman, Sagita, and Akbar Sujiwa. "Peningkatan Daya Output Generator Listrik Tipe Afpmg Pada Putaran Rendah Menggunakan 3 Rotor Dan 2 Stator."
- [8] Sujiwa, Akbar, and Sagita Rochman. "Pengembangan Sistem Kontrol Serta Monitoring Suhu dan Volume Air Berbasis Web Pada Perangkat Desalinasi Air Laut." *SNHRP* (2019): 1-9.
- [9] Sugiyono. 2012. Metode penelitian kuantitatif, Kualitatif, Dan R&D. Cetakan ke-17. Alfabeta. Bandung.
- [10] Suyoko Didik. 2012. Alat Pengaman Pintu Rumah Menggunakan Rfid (Radio Frequency Identification) 125 Khz Berbasis Mikrokontroler Atmega328. Skripsi. Universitas Negeri Yogyakarta. Yogyakarta.
- [11] Supriyanto. W dan Ahmad. M. 2008. Teknologi Informasi Perpustakaan. Kanisius (Anggota IKAPI). Yogyakarta
- [12] Wibowo, Yudhi and Hermawan, Arief (2019) *Rancang Bangun Alat Pengaman Pintu Kamar Hotel Berbasis Password Terpusat*. Tugas Akhir thesis, University of Technology Yogyakarta.
- [13] Yudhana, A., Sunardi, S., & Priyatno, P. (2018). Perancangan Pengaman Pintu Rumah Berbasis Sidik Jari Menggunakan Metode Uml. *Jurnal Teknologi*, 10(2),