Smart System Design For Toyota Kijang Super Electrical Cars Based on Microcontroller

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Abstract. Electrical system body has a role important in a vehicle that is as the main lighting when traveling at night as well as cues to signal to other drivers when turning and braking and honking horns as one element of safety in a vehicle as a whole. Lighting systems (lighting system) divided into 2 of the lighting system inside and outside lighting system. A microcontroller is a microprocessor that is devoted to instrumentation and control. Microprocessor is a digital electronic device that has inputs and outputs as well as control with a program that can be written and erased in a special way. Microcontroller is a chip in the form of IC (Integrated Circuit) that can receive input signals, process them and provide an output signal in accordance with a program that is loaded into it ". Microcontroller input signal coming from the sensor that is information from the environment while the output signal addressed to the actuator to give effect to the environment. arduino is an electronic kit or open source electronic circuit board in which there is a major component, ie a chip AVR microcontroller with the type of company Atmel.Tujuan of this design can be used as a medium of learning in SMK Negeri 1 KETAPANG LAMPUNG SOUTH particular subjects electrical system Toyota kijang car vehicle body super. The design was carried out from April to the month of July 2017 at the Workshop School SMK Negeri 1 KETAPANG, located in the village Berundung, Parit 8, District of Ketapang, SOUTH LAMPUNG district. Keywords: Electrical Bodi vehicles and Arduino AT-Mega328

1. Introduction

The current technology encourages people to continue to think creatively, not just dig new discoveries, but also to maximize the performance of existing technologies to alleviate human labor in everyday life such as control of electrical lamps her special vehicle Toyota Kijang Super or other electronic devices based *microcontroller*. Supporting accomplished teaching and learning practices still need to be completed in particular "electrical system of the car" then one of the ways that can be taken is to create a medium of teaching practice in the form of a unit *Trainer* electrical system of *body* the carToyota deer super-based *microcontroller* as a tool to demonstrate the working principles of electrical systems and as *pretest* before the vehicle is used as a step nawal standard operating procedures (SOP).

2. Literature

2.1 The Definition of Microcontroller

Microcontroller is a *chip* in the form of IC*(Integrated Circuit)* that can receive signal, *input* process it and provide an signal *output* in accordance with a program loaded into it ".signal *Microcontroller input* coming from the sensor that is information from the environment while the signal *output* addressed to the actuator to give effect to the environment.

2.2 A Brief History and Introduction AgainstDevelopment Microcontroller

Syahwilsaid that *the microcontroller* first introduced by *Texas Instrument* with TMS 1000 series in 1974 which is a *microcontroller* 4 bit first. *microcontroller* Thisbegan to be made since 1971, which is a microcomputer in a *chip* fullwith RAM and ROM. Later in 1976, Intel issued a *microcontroller* which became popular in 8748 which is a name of *microcontroller*, 8-bit which is a *microcontroller* of MCS 48. At this time, the microcontroller which many in the market are *microcontrollers* 8-bitMCS51 family variant (CISC) issued by Atmel with AT89Sxx series and *microcontroller* AVRis a

microcontroller RISCwith ATMEGA8535 series (although variants of the *microcontroller* AVR very much, with each having different features).

2.3 Overview of Orduino

Arduino is an electronic kit or electronic circuit boards *open* insource Inside are the main components, namely a chip *microcontroller* with the type of firm Atmel AVR. In general, *Arduino* is composed of two parts:

a. *Hardware* a board *input / output* (I / O) that is *open*source.
b. *Arduino software* which is also *open*source,includes *Arduino software* an IDE for writing programs and *drivers* for connection to the computer.

Figure. 1 Arduino Uno

2.4Power (Power)

Arduino UNO can be supplied via the USB connection or with a *power supply externally*.Power source is automatically selected. *External supply (non*-USB) can be obtained from an AC to DC adapter or *battery*.The adapter can be connected by plugging in a *center-positive plug* length of 2.1 mm to *the power jack* on the *board.*Wires *lead* from a *battery* can be inserted in *the header*/ head pin *Ground* (Gnd) and Vin pin of the connector POWER. Arduino UNO board can operate on an external supply of 6 to 20 Volts. If supplied with less than 7 V, presumably pin 5 volt supply may be smaller than 5 Volts and Arduino UNO board could become unstable. If using a large supply of more than 12 volts, the *voltage regulator* may overheat and harm the *board.* Arduino UNO The recommended range is 7 to 12 Volt

2.5 Programming

Arduino UNO can be programmed with the Arduino software*(download).* Select "Arduino Uno from the Tools> *Board* (including *the microcontroller* on board). ATmega328 on the Arduino Uno comes with a *bootloader* that allows us to upload new code to ATmega328 without usingprogrammer. *external hardware*ATmega328 communicates using the original STK500 protocol*(reference,C header*files).

```
#define LED_PIN13

void setup () {
    pinMode (LED_PIN, OUTPUT);      // enable pin 13 for digital output
}

void loop () {
    digitalWrite (LED_PIN, HIGH);  // turn on the LED
    delay (1000);                  // wait one second (1000 milliseconds)
    digitalWrite (LED_PIN, LOW);   // turn off the LED
    delay (1000);                  // wait one second
}
```

Figure .2 An example of application programming arduino

2.6 LCD I2C shield 20x4 Suport Arduino Uno ATmega328PATMEGA 16U2 BOARD COMPATIBLE

Most common and often used in the *project* Arduino andtypes *microcontroller* otherfor simplein the coding and the price is cheap. 1602/2004 LCD Module 16pin interface has VDD VSS V0 RS R / WE D0 D1 D2 D3 D4 D5 D6 D7 BLA BLK Here is the *Wiring Standard* 1602/2004LCD Module withoutI2C *Backpack* using 6pini / 0 and Vcc Gnd (total 8pin).

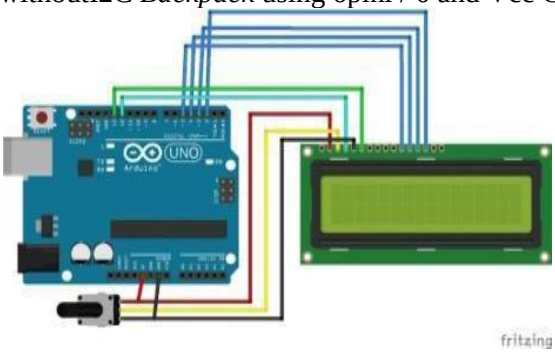


Figure 3 circuit arduino with LCDI2C *shield*

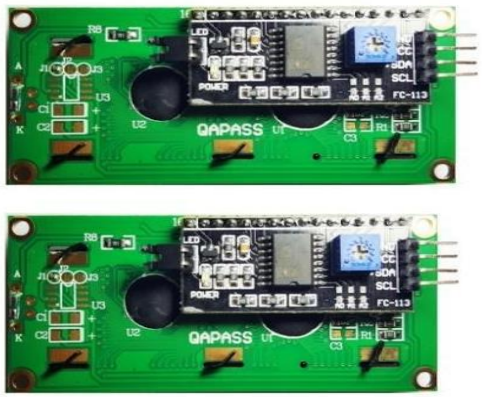


Figure 4 *Module* LCDI2C *shield*

Digitalpins on the Arduino us, to overcomeproblem thisthen we memputuhkan i2c LCD that works like *Shift Register so that the interfacepins. can have fewer* I2CLCD *BackpackModule* has 16pin *Output* can be connected to the LCD pin directly 1602/2004 (permanently soldered) and has a 4pin *input* (VCC, GND, SDA, SCL).

2.7 *Relay*

Relay is a switch used to connect or disconnect power flow is controlled by providing a certain voltage and current in the coil. *Relay* normally only has only one relay coil but may have some contacts. Normal position *relay* depends on the type of *relay* used.

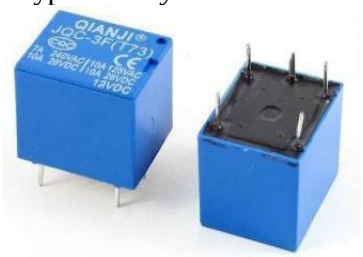


Figure 5 *Relay* 12 volt DC 10 A

Relay consists of a *coil* and *contact coil* is a coil of wire that gets electric current,

2.8. circuit Lamp Electric Body Car

For other types of lights that are on the outside and inside a vehicle are as follows:

- Lights head
- Brake Lights
- turn signal lamp*(turnsignal*light)
- lamp hazard*(hazardwarning*light)
- number plate lights
- Lights backward
- Lights fog

3. Research Methodology

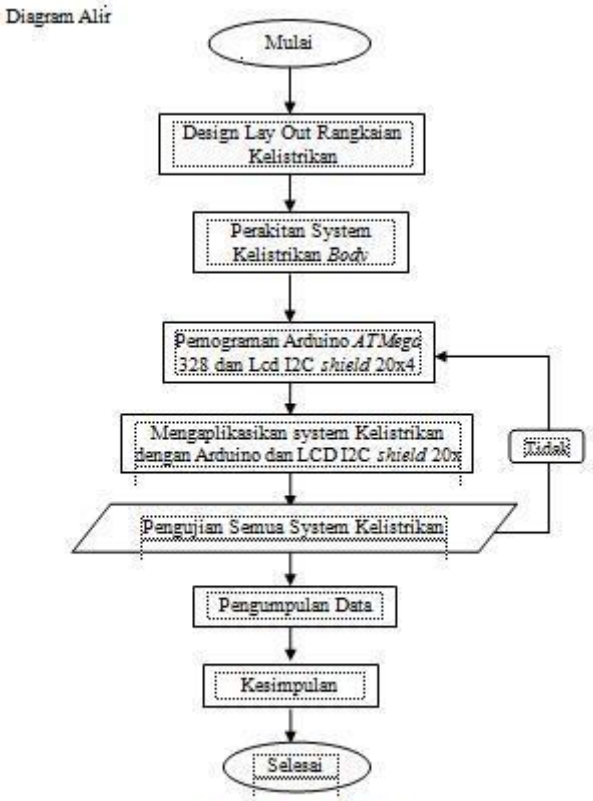
3.1 Research Tools and Tools Materials

ingredients:

- Tang cut
- Solder
- tin Straws
- Screwdriver plus minus
- Multitester

- tespen lamp
- Laptop
- Stand electricity
- Electrical Cables body
- Controlling Electrical
- head lights, turn signal,lights, brake reverse,lights, fog horn, *windshield wipers.*
- *Atmega Arduino Uno USB328* and LCD *shield* 20 x 4
- *Fuse* (Fuses) Tube 30 A
- Relay Hella 12 volt feet 4 and Relay DC to DC 12 volt feet 5
- Board Board and jumper cables
- *Power Bank* 6600 mah

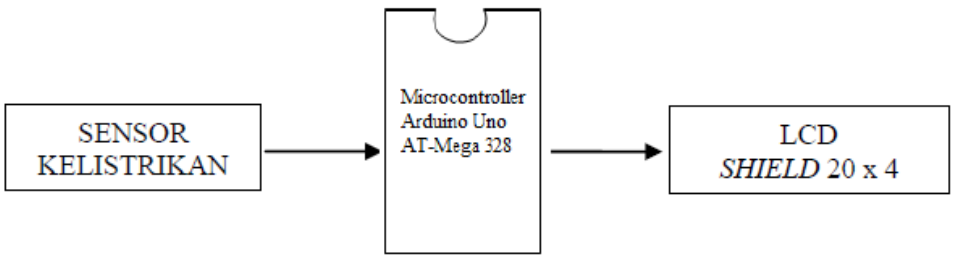
3.2. Diagram flow



Gambar 3.1 Diagram Alir Perancangan

4 Results and Discussion

4.1 Diagram design



Design diagram above electrical sensor will provide a signal *output* from *the relay* 4 feet 12 volt30 *amperes* to *relay* 1012volt foot 5 *amperes* and received by *arduino* in *portis* thatalready in the program and translated into I2C LCD *Shield.*

4.2 Figure Trainer Electrical

Figure .6 circuit Overall *Trainer* electrical

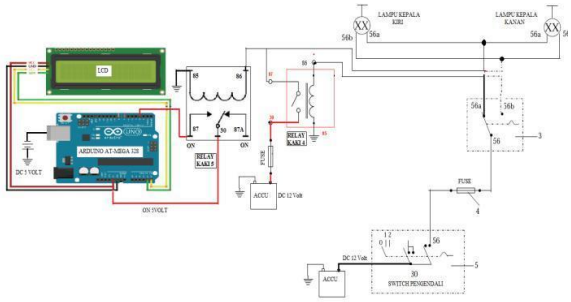


Figure 7. *Wiring Diagram* head lights *(head lamp)*

Pictured above is the entire circuit appears in front of all the series are the head lights *(Head Lamp),* turn signal lamps *(Lamp Sein),* brake lights*(stop lamp),* lamp retreat, Kalakson*(Horn).*

4.3 Wiring Diagrams Networks Head Lamp (Lamp Lamp Far and near)

Above the working principle of the circuit whenis *the switch* controlling the lamp head *(head lamp)* electrical (switches) activated the electric current will flow towards the *relay* DC feet 4 12 30 volt *amperes* leg in code *relay* DC86 and *relay outputs code* 87to turn on the bulb *(head lamp)* and the electric current flows to the *relay* 5 feet 12 volt 10 *ampere-coded* leg 86 and *relay outputs* 87code forwarded to arduino in *portis* thatalready determined at the time of programming (port 3). *Signal relay output* DC 5 feet 12 volt 10 *amperes* is read by the arduino and translated into the display towriting *the LCD I2C* that the *(head lamp)* are alive (I) and ready to use. If the *relay* does not send the output signal to automatically arduino *arduino* will read (O), which means that the lamp head *(head lamp)* die translated into writing display to *the LCD* I2C.

4.4 Wiring Diagram Lights turn Signs (Sein)

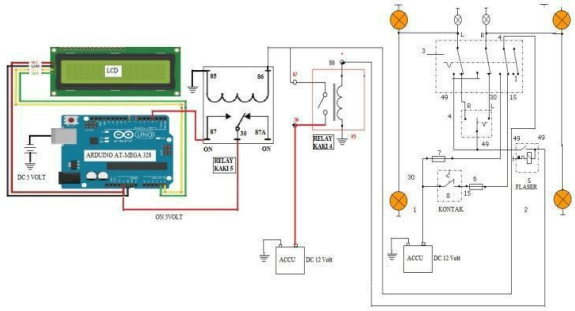


Figure 8 *Wiring Diagram* Lights turn Signs *(Sein)*

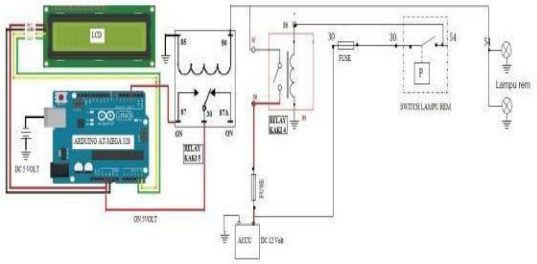


Figure 9 *Wiring Diagram* Brake lights

The working principle of the circuit above is when the *switch* turn signal lampcontroller*(sein lamp)* electrical (switches) activated the electric current will flow towards the *relay* DC feet 4 12 volt 30 *ampere* on foot code *relay* DC 86 and *the output relay code* 87 for the turn signal lights turn*(turn signal lamp)* and the electric current flows to the *relay* 5 feet 12 volt 10 *ampere-coded* leg 86 and a *relay output* code 87 is forwarded to arduino in *port* has been determined at the time of programming (port 3). *Signal relay output* DC 5 feet 12 volt 10 *amperes* is read by the arduino and translated into the display towriting *the LCD I2C* that asignal *turn lamp* Thelife (I) and ready to use. If the *relay* does not send the output signal to arduino automatically *arduino* be read (O), which means that thesignal *turnlamp* die translated into writing display to *the LCD*I2C.

4.5 *Wiring Diagram* Brake lights

Above the working principle of the circuit whenis *the switch* controlling the electrical brake lights (switches) activated the electric current will flow towards the *relay* fourth legDC 12 volt 30 *ampere* at the foot of code *relay* andDC 86 *outputcode relay* 87 to turn the brake light bulb and electric current flows to the *relay* 5 feet 12 volt 10 *amperes* to 86 feet andcode *output relay* code87 is forwarded to arduino in *port* have been determined at the time of programming (port 3). *Signal relay output* DC 5

feet 12 volt 10 *amperes* is read by the arduino and translated into the display towriting *the LCD I2C* that the brake lamp life (I) and ready to use. If the *relay* does not send the output signal to automatically arduino *arduino* will read (O), which means the lights go translated into writing in the show to *LCD* I2C.

4.6 *Wiring Diagram Horn (Horn)*

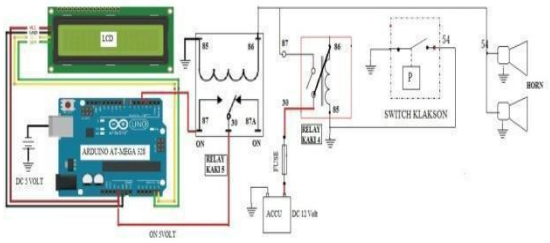


Figure 10 *Wiring Diagram* horn

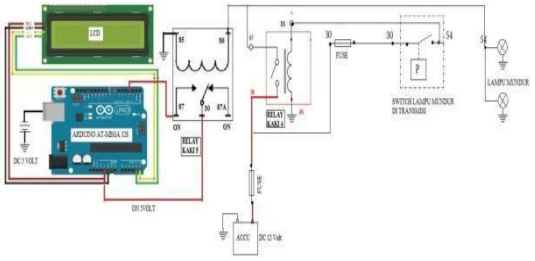


Figure 11 *Wiring diagram* reversing lights

The working principle of the circuit when theabove is *switch* controller *Horn*(horn) electricity (switch) on the switch electric current will flow towards the *relay* fourth legDC 12 volt 30 *ampere* at the foot of code *relay* DC 86 and *relay outputs code* 87to turn the *Horn*(horn) and the electric current flows to the *relay* 5 feet 12 volt 10 *ampere* with code 86 feet and *relay outputs* 87code forwarded to arduino in *portis* thatalready determined at the time of programming (port 3). *Signal relay output* DC 5 feet 12 volt 10 *amperes* is read by the arduino and translated into writing display to *the LCD I2C* that *Horn*(horn) are alive (I) and ready to use. If the *relay* does not send the output signal to automatically arduino *arduino* will read (O), which means *Horn*(horn) die translated into writing display to *the LCD* I2C.

4.7 *Wiring diagram reversing lights*

Above the working principle of the circuit whenis *the switch* reverse light electrical controllers (switches) activated the electric current will flow towards the *relay* fourth legDC 12 volt 30 *ampere* at the foot of code *relay* andDC 86 *outputcode relay* 87 to turn on a light bulb and electric current flows backward toward the *relay* 12 volt5 feet 10 *amperes* tofeet code 86and *relay outputs* code 87forwarded to arduino in *portis* thatalready determined at the time of programming (port 3). *Signal relay output* DC 5 feet 12 volt 10 *amperes* is read by the arduino and translated into the display towriting *the LCD I2C* that the lights are on (I) and ready to use. If the *relay* does not send the output signal to automatically arduino *arduino* will read (O), which means the lights go translated into writing display to *the LCD I2C.*

4.8 Measurement Results in the microcontroller (Relay leg 5)

Table 1. Results of measurements in *microcontroller (Relay* feet 5)

NO	Bagian Yang di Ukur	Hasil Pengukuran Sebelum Switch Di Aktifkan *(Volt)*	Hasil Pengukuran Sesudah Switch Di Aktifkan *(Volt)*	Kesimpulan
1	Lampu Kepala (Jarak dekat)	0 Volt	4,8 Volt	Baik
	Lampu Kepala (Jarak Jauh)	0 Volt	4,8 Volt	Baik
	Lampu Kepala (Dimer)	0 Volt	4,8 Volt	Baik
2	Lampu Sen (Kanan)	0 Volt	4,8 Volt	Baik
	Lampu Sen (Kiri)	0 Volt	4,8 Volt	Baik
	Lampu Sen (Hazard)	0 Volt	4,8 Volt	Baik
3	Lampu Rem	0 Volt	4,9 Volt	Baik
4	Lampu Mundur	0 Volt	4,9 Volt	Baik
5	Klakson *(Horn)*	0 Volt	4,8 Volt	Baik

Keterangan : Sumber Baterai 5 Volt

From table above that affect the measurement results is the Source of battery requires *charge* and expenses of each of the different light and it resulted inresults *output* a differentin each lamp in the electrical circuit.

4.9 Results Measurement in Electrical Networks (Relay leg 4)

Table. 2 Results Measurement in *Rangkapian Electrical (Relay* feet 4)

NO	Bagian Yang di Ukur	Hasil Pengukuran Sebelum Switch Di Aktifkan *(Volt)*	Hasil Pengukuran Sesudah Switch Di Aktifkan *(Volt)*	Kesimpulan
1	Lampu Kepala (Jarak dekat)	0 Volt	10,55 Volt	Baik
	Lampu Kepala (Jarak Jauh)	0 Volt	10,55 Volt	Baik
	Lampu Kepala *(Dimsr)*	0 Volt	10,55 Volt	Baik
2	Lampu Sen (Kanan)	0 Volt	11,25 Volt	Baik
	Lampu Sen (Kiri)	0 Volt	11,25 Volt	Baik
	Lampu Sen *(Hazard)*	0 Volt	11,25 Volt	Baik
3	Lampu Rem	0 Volt	12,03 Volt	Baik
4	Lampu Mundur	0 Volt	12,80 Volt	Baik
5	Klakson *(Horn)*	0 Volt	11,05Volt	Baik

Keterangan : Sumber Baterai 13 Volt

From the table above that affect the measurement results are from the source of the battery is not good should be in *charge* because at its basis in the vehicle no charging system*(alternator)* as charging the vehicles while in design this was not made a charging system *(alternator)*as charging the battery. Therefore, the battery used to decrease the power *voltage* which is quite significant and could affectvoltage *the output* that is less than the max

5 Conclusion

1. In each respective series of electricity requires a component that relays DC 12volt 30 amperes feet 4 as an output signal to be forwarded to the relay DC 12volt 10 amperes foot 5 as a signal receiver that will be forwarded to thetools *microcontroller* and translated intoLCD *shield* 20 x4.
2. If the electrical control switches in the switch will automatically turn on the electrical circuit and will always be controlled by arduino *aT-Mega 328* and translated into the C language or programming language.
3. Electrical circuits are controlled by arduino *Mega AT-328* will allow users to monitor the vehicle from the LCD of each respective vehicle lamps.
4. This design is used as a pretest before the vehicle is used as if in an electrical circuit is not functioning properly / off automatically arduino would read such damage.

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