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Smart driving with automatic control mechanism

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ABSTRACT

Every vehicle has its own emission of gases, but the problem occurs when the emission is beyond the standardized values. The primary reason for this breach of emission level being the incomplete combustion of fuel supplied to the engine which is due to the improper maintenance of vehicles. This emission from vehicles cannot be completely avoided, but it definitely can be controlled. The aim of the project is to monitor and control the pollutants in the vehicle by using the pollution control circuit. Internal Co Emission Check and Control for Clean Environment. Vehicle can be controlled by government authority by Server. Automatic Speed Control based on vehicle distance measurement. Fuel Theft detection using ultrasonic sensor and sending SMS to owner using GSM technology. Automatic Air conditioner Functioning based on High precision temperature measurement and control.

INTRODUCTION

The incomplete combustion in the engine of a vehicle leads to emission of different gases contributing to increase in the pollution and adversely affecting the environment. Detection and control of these gases is an important area of work. This emission from vehicles cannot be completely avoided but, it definitely can be controlled. Now a day's accidents are common reason for deaths. These are critical things to control so here we come

up with a concept to reduce pollution and detect the location of accident using GPS. As a solution to the above problems we aim to build an automated control system for emission level control of vehicle and accident place detection. Smoke detector is used to detect the carbon percentage in the smoke released by the vehicle due to combustion of fuel in it. Smoke detector is fixed at the end of the exhaust of vehicle from where smoke is released into the environment.

Pre-defined values

POLLUTANT	PERMISSIBLE LIMIT
■ Nitrogen dioxide	60-80g/m ³
■ Carbon monoxide	2-4mg/m ³
■ Sulphur dioxide	60-80g/m ³

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LITERATURE SURVEY

Over the years, there have been several regulations made by the Government to control the emission from vehicles; most of them being unsuccessful at the same. The standards and the timeline for implementation are set by the Central Pollution Control Board under the Ministry of Environment & Forests. Bharat stage emission standards are emission standards instituted by the Government of India to regulate the output of air Pollutants from internal combustion engine equipment, including motor vehicles. The first emission norms were introduced in India in 1991 for petrol and 1992 for diesel vehicles. These were followed by making the Catalytic converter mandatory for petrol vehicles and the introduction of unleaded petrol in the market. On April 29, 1999 the Supreme Court of India ruled that all vehicles in India have to meet Euro I or India 2000 norms by June 1, 1999 and Euro II will be mandatory in the NCR by April 2000. Car makers were not prepared for this transition and in a subsequent judgment the implementation date for Euro II was not enforced. The standards, based on European regulations were first introduced in 2000. Progressively stringent norms have been rolled out since then. All new vehicles manufactured after the implementation of the norms have to be compliant with the regulations. Since October 2010, Bharat stage III norms have been enforced across the country. In 13 major cities, Bharat stage IV emission norms are in place since April 2010.

[1] A System detecting an Air Pollution and tracking using GPS & GSM- Prof.D.D Mondal, Rutuja Deshpande², Pooja Bhagat³, Gitanjali Bandal - International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 04 Issue: 04 | Apr -2017

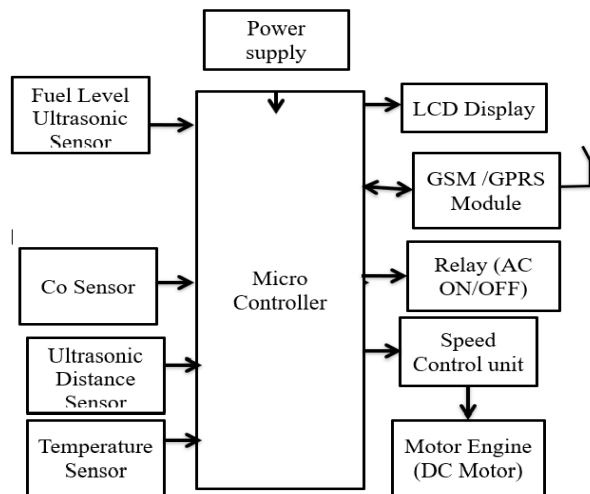
Vehicles and Industries are the major origin of Environmental Pollution. Every vehicle will have emission but the problem occurs, which is due to the improper maintenance of vehicles. This emission

from vehicles cannot be completely avert but, it definitely can be controlled. As a solution to the above problems we aim to build an automated control system for emission level detection in vehicles and indicate this level with a meter. When the pollution/emission level shoots beyond the already set threshold level, there will be a buzz in the vehicle to indicate that the limit has been breached and this information has been send to traffic control room which includes vehicle number, owner details and location of the vehicle by using GPS. In future we can add additional features like traffic police have an authority to stop the vehicle remotely by sending a SMS using GSM. This paper, when aggrandize as a real time project, will asset the society and help in reducing the air pollution.

[2] Automated System for Air Pollution Detection and Control in Vehicles -Anita kulkarni, T. Ravi Teja² -International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering 2014

The aim of the project is to monitor and control the pollutants in the vehicle by using the pollution control circuit. This pollution control circuit consists of various sensors like smoke sensor, temperature sensor and GSM, GPS kind of devices, and all of them are integrated and connected to a Controller. It is a real time work where a demo application has been made in which ARM 7 processor is used and a controller board is made where all these devices get integrated and work accordingly. The vehicle is controlled by this circuit. When a vehicle attains certain threshold pollution level then the engine gets automatically switched off and an SMS is generated and sent to the pre-defined number stored in the memory through the GSM module. The GPS module is used to locate the vehicle position where it is halted. This paper demonstrates an effective utilization of technology by which we save our environment by controlling the pollution of vehicles.

BLOCKDIAGRAM



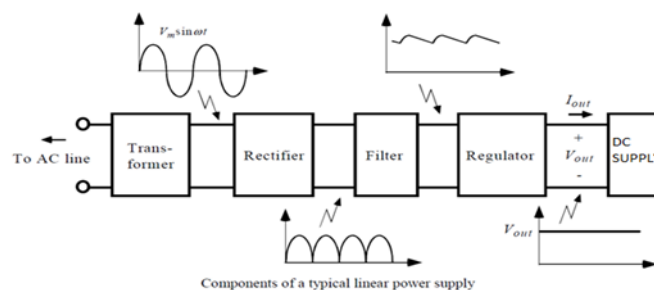
PROPOSED SYSTEM

- Internally fitted Co₂ Emission control makes the driving person to act immediately when emission level is higher than set point.
- Government authority can have the control of vehicle in case of emission control is not taken care.
- Clean Environment is maintained.
- Automatic Air conditioner control makes fuel consumption efficient and lesser compared to other system.
- Fuel theft detection using ultrasonic sensor. When there is a sudden drop in fuel level, the SMS is sent to owner using GSM module.
- Automatic Speed Control based on vehicle distance measurement makes safe driving.

HARDWARE DESCRIPTION

Device power supply

The circuit below gives a high-level view of the working of a “regulated power supply”.



The components used are very common and simple. Most of you know what goes on inside of them.

Transformer

The transformer contains two huge copper coils, one between the two terminals of the input power supply and other between the two terminals of the output. Here we use a step-down transformer which means it will convert high voltage to low voltage.

The number of turns of the coil inside will determine the voltage supported at input and output both.

$$\text{i.e. } V_{in}/V_{out}=N_{in}/N_{out}$$

V_{in} = Input AC voltage

V_{out} = Output AC voltage

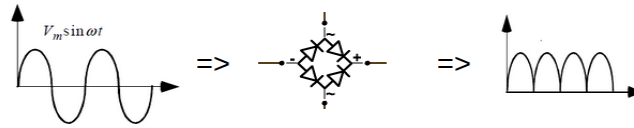
N_{in} = Number of turns at the input terminal of transformer

N_{out} = Number of turns at the output terminal of transformer

Rectifier

Now comes the rectifier part. This converts the AC voltage output of the transformer to a DC

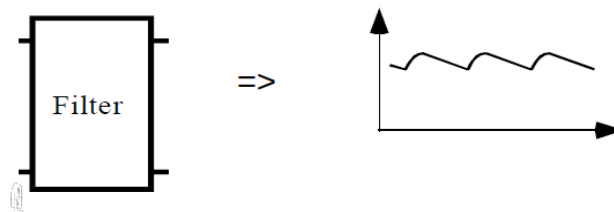
voltage. It just reverses the polarity of one half of the period of the AC signal. This will make both parts have the same polarity. Here we use a full wave bridge rectifier to convert AC to DC.



Filter

The output from the rectification stage is DC, but hardly constant. So, we use capacitive filtering to smoothen the output. In this example, using a

simple low pass filter at the output of the rectifier, however in real life, higher order filters may be used, which would give a much more smoother output.

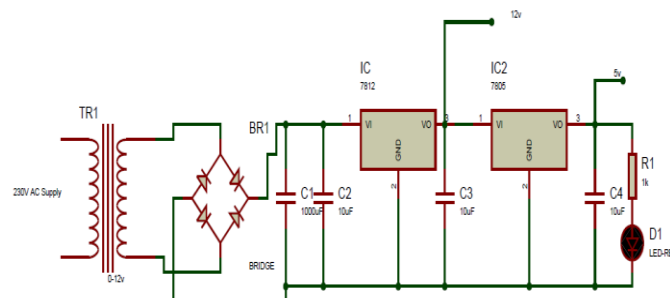


Regulator

The filtering significantly smoothenes the output, but even after that small ripples remain. If we use this directly to charge our phones, the constant fluctuation in the voltage may damage the device. It is very important to have a steady output voltage with minimal fluctuations. This is where the regulator stage kicks in.

Here we have used a simple Zener diode based regulator. The tendency of a zener diode is to have a fixed voltage between its two terminals when reversed biased. So when input voltage changes, the current through the zener diode also changes inversely so that the output is constant. This regulator is quite simple to create, but its is that it wastes a lot of power. So, the cell phone chargers typically use IC voltage regulators, such as IC 7805, IC 7806, IC 7812 etc.

12V AND 5V POWER SUPPLY CIRCUIT DIAGRAM



Description

This is a circuit of 12V 5V power supply. We can also say it combine or dual power supply circuit. The circuit is using two different fixed voltage regulator ICs. The first IC is LM7812 which will convert the voltage coming from the transformer and provides a 12V regulated output on the pin 1 of LM7805 IC.

The voltage will then converted to 5V DC by the LM7805 IC, due to which you will receive two different voltages at the same time. Use suitable

heatsinks with the ICs. The transformer can be a 230V to 12v 500maA ratings.

Arduino

Arduino interface boards provide the engineers, artists, designers ,hobbyists and anyone who tinker with technology with a low-cost, easy-to-use technology to create their creative, interactive objects, useful projects etc., A whole new breed of projects can now be built that can be controlled from a computer.



What is arduino?

Arduino is a open source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments. It's an open -source physical computing platform based on a microcontroller board, and a development environment for writing software for the board. In simple words, Arduino is a small microcontroller board with a USB plug to connect to your computer and a number of connection sockets that can be wired up to external electronics, such as motors, relays, light sensors, laser diodes, loudspeakers, microphones, etc., They can either be powered through the USB connection from the computer or from a 9V battery. They can be controlled from the computer or programmed by the computer and then disconnected and allowed to work independently. Since the Arduino is an open-source hardware designs and create their own clones of the Arduino and sell them, so the market for the boards is competitive.

Microcontroller

Microcontroller can be described as a computer embedded on a rather small circuit board. To describe the function of a microcontroller more

precisely, it is a single chip that can perform various calculations and tasks and send/receive signals from other devices via the available pins.

Precisely what tasks and communication with the world it does, is what is governed by what instructions we give to the Microcontroller. It is this job of telling the chip what to do, is what we refer to as programming on it. However, the uC by itself, cannot accomplish much; it needs several external inputs: power, for one; a steady clock signal, for another. Also, the job of programming it has to be accomplished by an external circuit. So typically, a uC is used along with a circuit which provides these things to it; this combination is called a microcontroller board. The Arduino Uno that you have received, is one such microcontroller board. The actual microcontroller at its heart is the chip called **Atmega328**. The advantages that Arduino offers over other microcontroller boards are largely in terms of reliability of the circuit hardware as well as the ease of programming and using it

Overview

The Arduino Uno is a microcontroller board based on the ATmega328 .It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic

resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. IOREF placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.

The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions.

Summary

- Microcontroller ATmega328
- Operating Voltage 5V
- Input Voltage (recommended) 7-12V
- Input Voltage (limits) 6-20V
- Digital I/O Pins 14 (of which 6 provide PWM output)
- Analog Input Pins 6
- DC Current per I/O Pin 40 mA
- DC Current for 3.3V Pin 50 mA
- Flash Memory 32 KB (ATmega328) of which 0.5 KB used by bootloader
- SRAM 2 KB (ATmega328)
- EEPROM 1 KB (ATmega328)
- Clock Speed 16 MHz

Power The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts. The power pins are as follows: VIN. The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from

the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin. This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it. 3V3. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA. Memory The ATmega328 has 32 KB (with 0.5 KB used for the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library). Input and Output Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions: Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the arduino USB-to-TTL Serial chip. External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attach Interrupt function for details. PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite function.

SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication

LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off. The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analogReference() function. Additionally, some pins have specialized functionality: TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library. There are a couple of other pins on the board: AREF: Reference voltage for the analog inputs. Used with analogReference().

Reset

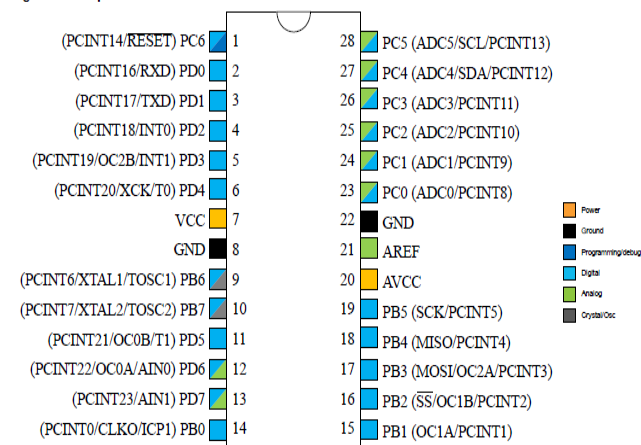
Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board. See also the mapping between Arduino pins and ATmega328 ports. The mapping for the ATmega8, 168, and 328 is identical. Communication The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a

virtual com port to software on the computer. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A SoftwareSerial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus; For SPI communication, use the SPI library. Programming The Arduino Uno can be programmed with the Arduino software.

Pin Configurations

Pin-out

Figure 5-1. 28-pin PDIP



Pin descriptions

Vcc

Digital supply voltage.

Gnd

Ground.

Port B (PB [7:0]) XTAL1/XTAL2/TOSC1/TOSC2

Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up

resistors are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running. Depending on the clock selection fuse settings, PB6 can be used as input to the inverting Oscillator amplifier and input to the internal clock operating circuit. Depending on the clock selection fuse settings, PB7 can be used as output from the inverting Oscillator amplifier. If the Internal Calibrated RC Oscillator is used as chip clock source, PB [7:6] is used as TOSC[2:1] input for the Asynchronous Timer/Counter2 if the AS2 bit in ASSR is set.

Port C (PC [5:0])

Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit).

The PC[5:0] output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri-stated when a reset condition becomes active, even if the clock is not running.

Pc6/reset

If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. Note that the electrical characteristics of PC6 differ from those of the other pins of Port C. If the RSTDISBL Fuse is unprogrammed, PC6 is used as a Reset input. A low level on this pin for longer than the minimum pulse length will generate a Reset, even if the clock is not running. Shorter pulses are not guaranteed to generate a Reset.

Port D (PD [7:0])

Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running.

AVCC

AVCC is the supply voltage pin for the A/D Converter, PC[3:0], and PE[3:2]. It should be externally connected to VCC, even if the ADC is

not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that PC [6:4] use digital supply voltage, VCC.

AREF

AREF is the analog reference pin for the A/D Converter.

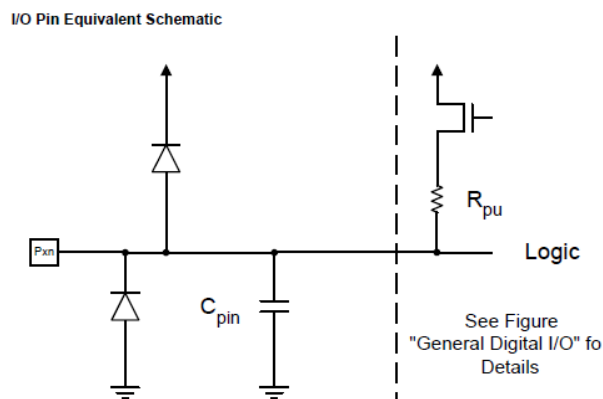
ADC [7:6] (TQFP and VFQFN Package Only)

In the TQFP and VFQFN package, ADC [7:6] serve as analog inputs to the A/D converter. These pins are powered from the analog supply and serve as 10-bit ADC channels.

I/o-ports

Overview

All AVR ports have true Read-Modify-Write functionality when used as general digital I/O ports. This means that the direction of one port pin can be changed without unintentionally changing the direction of any other pin with the SBI and CBI instructions. The same applies when changing drive value (if configured as output) or enabling/disabling of pull-up resistors (if configured as input). Each output buffer has symmetrical drive characteristics with both high sink and source capability. The pin driver is strong enough to drive LED displays directly. All port pins have individually selectable pull-up resistors with a supply-voltage invariant resistance. All I/O pins have protection diodes to both VCC and Ground as indicated in the following figure.



All registers and bit references in this section are written in general form. A lower case "x" represents the numbering letter for the port, and a

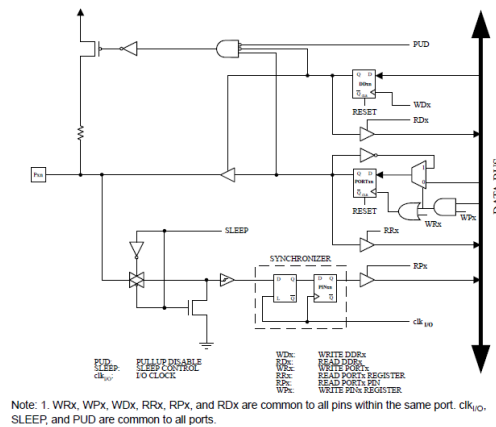
lower case "n" represents the bit number. However, when using the register or bit defines in a program, the precise form must be used. For example,

PORTB3 for bit no. 3 in Port B, here documented generally as PORT_{xn}. I/O memory address locations are allocated for each port, one each for the Data Register – PORT_x, Data Direction Register – DDR_x, and the Port Input Pins – PIN_x. The Port Input Pins I/O location is read only, while the Data Register and the Data Direction Register are read/write. However, writing '1' to a bit in the PIN_x Register will result in a toggle in the corresponding bit in the Data Register. In addition, the Pull-up Disable – PUD bit in MCUCR disables the pull-up function for all pins in all ports when set. Using the I/O port as General Digital I/O is described in next section. Most port pins are multiplexed with alternate functions for the

peripheral features on the device. How each alternate function interferes with the port pin is described in Alternate Port Functions section in this chapter. Refer to the individual module sections for a full description of the alternate functions. Enabling the alternate function of some of the port pins does not affect the use of the other pins in the port as general digital I/O.

Ports as General Digital I/O

The ports are bi-directional I/O ports with optional internal pull-ups. The following figure shows the functional description of one I/O-port pin, here generically called P_{xn}.



Configuring the Pin

Each port pin consists of three register bits: DD_{xn}, PORT_{xn}, and PIN_{xn}. As shown in the Register Description, the DD_{xn} bits are accessed at the DDR_x I/O address, the PORT_{xn} bits at the PORT_x I/O address, and the PIN_{xn} bits at the PIN_x I/O address. The DD_{xn} bit in the DDR_x Register selects the direction of this pin. If DD_{xn} is written to '1', P_{xn} is configured as an output pin. If DD_{xn} is written to '0', P_{xn} is configured as an input pin. If PORT_{xn} is written to '1' when the pin is configured as an input pin, the pull-up resistor is activated. To switch the pull-up resistor off, PORT_{xn} has to be written to '0' or the pin has to be configured as an output pin. The port pins are tri-stated when reset condition becomes active, even if no clocks are running. If PORT_{xn} is written to '1' when the pin is configured as an output pin, the port pin is driven high. If PORT_{xn} is written logic zero when the pin is configured as an output pin, the port pin is driven low.

ADC - Analog to Digital Converter

Features

- 10-bit Resolution
- 0.5 LSB Integral Non-Linearity
- ± 2 LSB Absolute Accuracy
- 13 - 260 μ s Conversion Time
- Up to 76.9kSPS (Up to 15kSPS at Maximum Resolution)
- Six Multiplexed Single Ended Input Channels
- Two Additional Multiplexed Single Ended Input Channels (TQFP and VFQFN Package only)
- Temperature Sensor Input Channel
- Optional Left Adjustment for ADC Result Readout
- 0 - VCC ADC Input Voltage Range
- Selectable 1.1V ADC Reference Voltage
- Free Running or Single Conversion Mode
- Interrupt on ADC Conversion Complete
- Sleep Mode Noise Canceller.

Overview

The device features a 10-bit successive approximation ADC. The ADC is connected to an 8-channel Analog Multiplexer which allows eight single-ended voltage inputs constructed from the pins of Port A. The single-ended voltage inputs refer to 0V (GND). The ADC contains a Sample and Hold circuit which ensures that the input voltage to the ADC is held at a constant level during conversion. A block diagram of the ADC is shown below. The ADC has a separate analog supply voltage pin, AVCC. AVCC must not differ more than $\pm 0.3V$ from VCC. See section ADC Noise Canceler on how to connect this pin. The Power Reduction ADC bit in the Power Reduction Register (PRR.PRADC) must be written to '0' in order to be enable the ADC. The ADC converts an analog input voltage to a 10-bit digital value through successive approximation. The minimum value represents GND and the maximum value represents the voltage on the AREF pin minus 1 LSB. Optionally, AVCC or an internal 1.1V reference voltage may be connected to the AREF pin by writing to the REFSn bits in the ADMUX Register. The internal voltage reference must be decoupled by an external capacitor at the AREF pin to improve noise immunity.

The analog input channel is selected by writing to the MUX bits in the ADC Multiplexer Selection register ADMUX.MUX[3:0]. Any of the ADC input pins, as well as GND and a fixed bandgap voltage reference, can be selected as single ended inputs to the ADC. The ADC is enabled by writing a '1' to the ADC Enable bit in the ADC Control and Status Register A (ADCSRA.ADEN). Voltage reference and input channel selections will not take effect until ADEN is set. The ADC does not consume power when ADEN is cleared, so it is recommended to switch off the ADC before entering power saving sleep modes. The ADC generates a 10-bit result which is presented in the ADC Data Registers, ADCH and ADCL. By default, the result is presented right adjusted, but can optionally be presented left adjusted by setting the ADC Left Adjust Result bit ADMUX.ADLAR. If the result is left adjusted and no more than 8-bit precision is required, it is sufficient to read ADCH. Otherwise, ADCL must be read first, then ADCH, to ensure that the content of the Data Registers belongs to the same conversion: Once ADCL is

read, ADC access to Data Registers is blocked. This means that if ADCL has been read, and a second conversion completes before ADCH is read, neither register is updated and the result from the second conversion is lost. When ADCH is read, ADC access to the ADCH and ADCL Registers is re-enabled. The ADC has its own interrupt which can be triggered when a conversion completes. When ADC access to the Data Registers is prohibited between reading of ADCH and ADCL, the interrupt will trigger even if the result is lost.

Usart - universal synchronous asynchronous receiver transceiver

Features

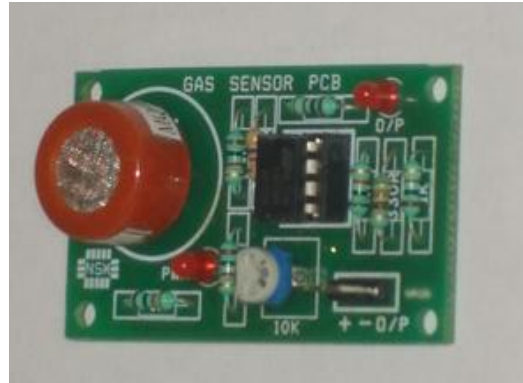
- Full Duplex Operation (Independent Serial Receive and Transmit Registers)
- Asynchronous or Synchronous Operation
- Master or Slave Clocked Synchronous Operation
- High Resolution Baud Rate Generator
- Supports Serial Frames with 5, 6, 7, 8, or 9 data bits and 1 or 2 stop bits
- Odd or Even Parity Generation and Parity Check Supported by Hardware
- Data Over Run Detection
- Framing Error Detection
- Noise Filtering Includes False Start Bit Detection and Digital Low Pass Filter
- Three Separate Interrupts on TX Complete, TX Data Register Empty and RX Complete
- Multi-processor Communication Mode
- Double Speed Asynchronous Communication Mode

In the USART Block Diagram, the CPU accessible I/O Registers and I/O pins are shown in bold. The dashed boxes in the block diagram separate the three main parts of the USART (listed from the top): Clock Generator, Transmitter, and Receiver. Control Registers are shared by all units. The Clock Generation logic consists of synchronization logic for external clock input used by synchronous slave operation, and the baud rate generator. The XCKn (Transfer Clock) pin is only used by synchronous transfer mode. The Transmitter consists of a single write buffer, a serial Shift Register, Parity Generator, and Control logic for handling different serial frame formats. The write buffer allows a continuous transfer of data without any delay between frames. The

Receiver is the most complex part of the USART module due to its clock and data recovery units. The recovery units are used for asynchronous data reception. In addition to the recovery units, the Receiver includes a Parity Checker, Control logic,

a Shift Register, and a two level receive buffer (UDRn). The Receiver supports the same frame formats as the Transmitter, and can detect Frame Error, Data OverRun, and Parity Errors.

Carbon monoxide sensor - mq-7

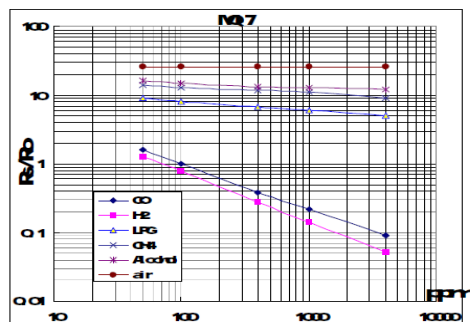


Description

This is a simple-to-use Carbon Monoxide (CO) sensor, suitable for sensing CO concentrations in the air. The MQ-7 can detect CO-gas concentrations anywhere from 20 to 2000ppm.

This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.

Sensitivity characteristic curve



Operation principle

The surface resistance of the sensor R_s is obtained through effected voltage signal output of

the load resistance R_L which series-wound. The relationship between them is described:

$$R_s \backslash R_L = (V_c - V_{RL}) / V_{RL}$$

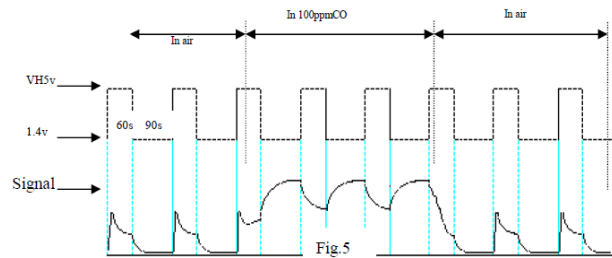


Fig. shows alterable situation of RL signal output measured by using Fig. circuit output

Signal when the sensor is shifted from clean air to carbon monoxide (CO), output signal measurement is made within one or two complete heating period (2.5 minute from high voltage to low voltage).

Sensitive layer of MQ-7 gas sensitive components is made of SnO₂ with stability, So, it has excellent long term stability. Its service life can reach 5 years under using condition.

Sensitivity adjustment

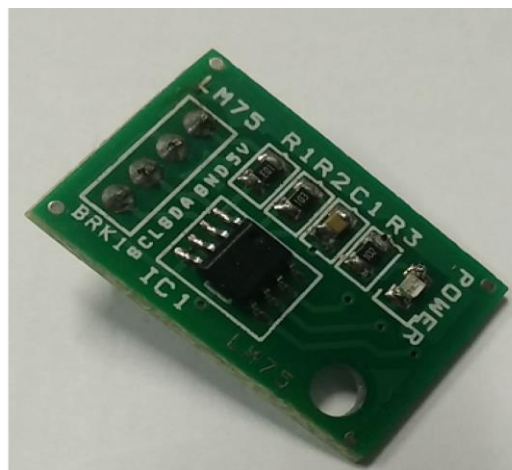
Resistance value of MQ-7 is difference to various kinds and various concentration gases. So, when using these components, sensitivity adjustment is very necessary. We recommend that you calibrate the detector for 200ppm CO in air and

use value of Load resistance that (RL) about 10 K Ω (5K Ω to 47 K Ω).

When accurately measuring, the proper alarm point for the gas detector should be determined after considering the temperature and humidity influence. The sensitivity adjusting program:

- Connect the sensor to the application circuit.
- Turn on the power; keep preheating through electricity over 48 hours.
- Adjust the load resistance RL until you get a signal value which is respond to a certain Carbon monoxide concentration at the end point of 90 seconds.
- Adjust the another load resistance RL until you get a signal value which is respond to a CO concentration at the end point of 60 seconds .

Temperature sensor-lm75



Description

The LM75 temperature sensor includes a delta-sigma analog-to-digital converter and a digital over temperature detector. The host can query the LM75

through its I²C interface to read temperature at any time.

Features

- I²C Bus Interface
- Register Read back Capability

- Power-Up Defaults Permit Stand-Alone Operation as a Thermostat
- 3.0V to 5.5V Supply Voltage
- Low Operating Supply Current 250µA (typ), 1mA (max)
- 4µA (typ) Shutdown Mode Minimizes Power Consumption
- Up to Eight LM75s Can Be Connected to a Single Bus

Applications

- Computers and Office Electronics
- Test Equipment
- Thermal Protection
- Thermal System Management

Ultrasonic sensor

Introduction

In general, Ultrasonic sensors are based on the measurement of the properties of acoustic waves with frequencies above the human audible range, often at roughly 40 kHz. They typically operate by generating a high-frequency pulse of sound, and then receiving and evaluating the properties of the echo pulse. Ultrasonic sensor module SRF-04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm.

The HC-SR04 ultrasonic sensor uses sonar to determine distance to an object like bats or dolphins do. It offers excellent range accuracy and stable readings in an easy-to-use package. Its operation is not affected by sunlight or black material like Sharp rangefinders are (although acoustically soft materials like cloth can be difficult to detect).



Interfacing pins

- > 5V Supply
- > Trigger Pulse Input
- <- Echo Pulse Output
- > 0V Ground

Electric parameters

- Working Voltage DC 5 V
- Working Current 15mA
- Working Frequency 40Hz
- Max Range 40cm
- Min Range 2cm
- Measuring Angle 15 degree
- Trigger Input Signal 10µs TTL pulse
- Echo Output Signal Input TTL level signal and the range in proportion

Ultrasonic distance measurement principles

The transmitter emits a 8 bursts of an directional 40KHz ultrasonic wave when triggered and starts a timer. Ultrasonic pulses travel outward

until they encounter an object. The object causes the wave to be reflected towards the unit. The ultrasonic receiver would detect the reflected wave and stop the stop timer. The velocity of the ultrasonic burst is 340m/sec. in air. Based on the number of counts by the timer, the distance can be calculated between the object and transmitter. The TRD Measurement formula is expressed as: $D = C \times T$ which is known as the time/rate/distance measurement formula where D is the measured distance, and R is the propagation velocity (Rate) in air (speed of sound) and T represents time. In this application T is divided by 2 as T is double the time value from transmitter to object back to receiver.

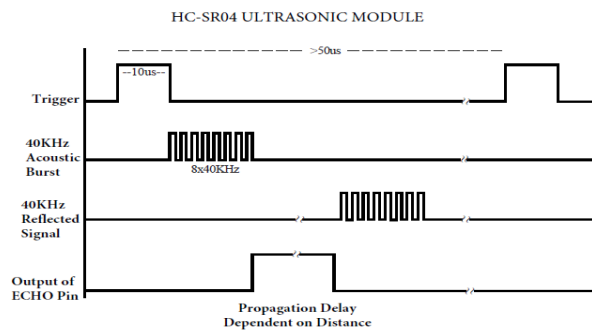
Hc sr-04 operation

Set Trig and Echo Low to initialize module. Place a minimum 10µs High level pulse to "Trigger" (module will automatically send eight 40KHz acoustic bursts). At the same time, Gate the microcontroller timer to start timing. Wait to

capture the rising edge output of ECHO port to stop the timer. Now read the time of the counter, which is the ultrasonic propagation time in the air. According to the formula: Distance = (ECHO high level time X ultrasonic velocity (Speed of Sound in

air 340m/sec) / 2, you can calculate the distance to the obstacle. For best results and maximum range, the Object should be larger than 0.5M2 the nearer the target object.

Module timing



Trigger

- 10µs min. start measurement from microcontroller.
- Max Rep. Rate: 50µs

ECHO

- Output pulse to microcontroller, width is the time from last of 8 40KHz
- Bursts to detected reflected signal (microcontroller Timer gate signal)
- Distance in cm = echo pulse width in µs/58

- Distance in inch = echo pulse width in µs/148

Application

Applications ranging occasions;
Measuring the distance between objects;
Programmable car obstacle avoidance;
Robot obstacle avoidance;
Teaching apparatus;
Security, industrial control

LIQUID CRYSTAL DISPLAY



LCD character 2 x 16 module

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are

economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix.

This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined 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. Click to learn more about internal structure of a LCD.

Pin details of 2x16 module

PIN No	Name	Function
1	VSS	Ground voltage
2	VCC	+5V
3	VEE	Contrast voltage
4	RS	Register Select 0 = Instruction Register 1 = Data Register
5	R/W	Read/Write, to choose write or read mode 0 = write mode 1 = read mode
6	E	Enable 0 = start to latch data to LCD character 1 = disable
7	DB0	Data bit 0 (LSB)
8	DB1	Data bit 1
9	DB2	Data bit 2
10	DB3	Data bit 3
11	DB4	Data bit 4
12	DB5	Data bit 5
13	DB6	Data bit 6
14	DB7	Data bit 7 (MSB)
15	BPL	Back Plane Light +5V or lower (Optional)
16	GND	Ground voltage (Optional)

Features of LCD

1. The declining prices of LCDs.
2. The ability to display numbers, characters, and graphics. This contrasts with LED Seven Segment Displays, which are limited to numbers and a few characters.
3. Incorporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing the LCD. In contrast, the LED Seven Segment Displays must be refreshed by the CPU (or in some other way) to keep displaying data, in case of multiplexed displays.
4. Ease of programming for characters and graphics.

Pin descriptions of LCD

Data lines

The LCD Character standard requires 3 control lines. You may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus. If a 4-bit data bus is used the LCD will require a total of 7 data lines (3 control lines plus the 4 lines for

the data bus). If an 8-bit data bus is used the LCD will require a total of 11 data lines (3 control lines plus the 8 lines for the data bus).

Db0 – db7

The 8-bit data pins, D0-D7, are used to send information to the LCD or read the contents of the LCD's internal registers. In the case of an 8-bit data bus, the lines are referred to as DB0, DB1, DB2, DB3, DB4, DB5, DB6, and DB7.

Control lines

The three control lines are referred to as EN, RS, and RW.

En line

The EN line is called "Enable.". This control line is used to tell the LCD that you are sending it data. The enable pin is used by the LCD to latch information presented to its data pins. When data is supplied to data pins, a high – to – low pulse must be applied to this pin in order for the LCD to latch

in the data present at the data pins. This pulse must be a minimum of 450 ns wide. EN line is high (1) and wait for the minimum amount of time required by the LCD datasheet (this varies from LCD to LCD), and end by bringing it low (0) again.

RS register Line

The RS line is the "Register Select" line. There are two very important registers inside the LCD. The RS pin is used for their follows. IF RS=0, the instruction command code register is selected, allowing the user to send a command such as clear display, cursor at home, etc. If RS=1 the data

register is selected allowing the user to send data to be displayed on the LCD.

For example, to display the letter "T" on the screen you would set RS high.

R/w line

The RW line is the "Read/Write" control line. When RW is low (0), the information on the data bus is being written to the LCD. When RW is high (1), the program is effectively querying (or reading) the LCD. Only one instruction ("Get LCD status") is a read command. All others are write commands--so RW will almost always be low.

LCD Command codes

Code (Hex)	Command to LCD Instruction Register
1	Clear Display screen
2	Return home
4	Decrement cursor (Shift cursor to left)
6	Increment cursor (Shift cursor to Right)
5	Shift display right
7	Shift display left
8	Display off, cursor off
A	Display on, cursor off
C	Display on, cursor off
E	Display on, cursor blinking
F	Display on, cursor blinking
10	Shift cursor position to left
14	Shift cursor position to right
18	Shift the entire display to the left
1C	Shift the entire display to the right
80	Force cursor to beginning of 1 st line
0C0	Force cursor to beginning of 2 nd line
38	2 lines and 5x7 Matrix

LCD initialization

The steps that has to be done for initializing the LCD display is given below and these steps are common for almost all applications.

Send 38H to the 8 bit data line for initialization

Send 0FH for making LCD ON, cursor ON and cursor blinking ON.

Send 06H for incrementing cursor position.

Send 01H for clearing the display and return the cursor.

Sending data to the LCD

The steps for sending data to the LCD module are given below. I have already said that the LCD

module has pins namely RS, R/W and E. It is the logic state of these pins that make the module to determine whether a given data input is a command or data to be displayed.

Make R/W low.

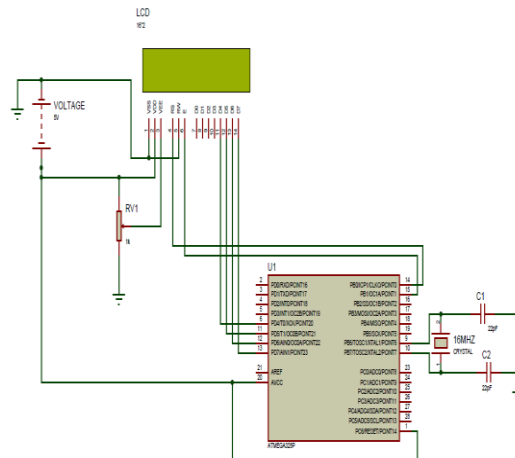
Make RS=0 if data byte is a command and make RS=1 if the data byte is a data to be displayed.

Place data byte on the data register.

Pulse E from high to low.

Repeat above steps for sending another data.

LCD interface arduino



Sim800c

Description

GSM/GPRS TTL+232 UART Modem is built with Dual Band GSM/GPRS engine- SIM800C , works on frequencies 900/ 1800 MHz The level The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer application in M2M interface.

The modem comes with selectable interfacing voltage which allows you to connect 5V & 3V3 microcontroller directly without any additional level conversion chips. SIM800C module is having internal TCP/IP stack to enable you to connect with internet via GPRS (supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4). The Modem is coming with RS232 interface, which allows you connect PC as well as microcontroller with RS232 Chip (MAX232).

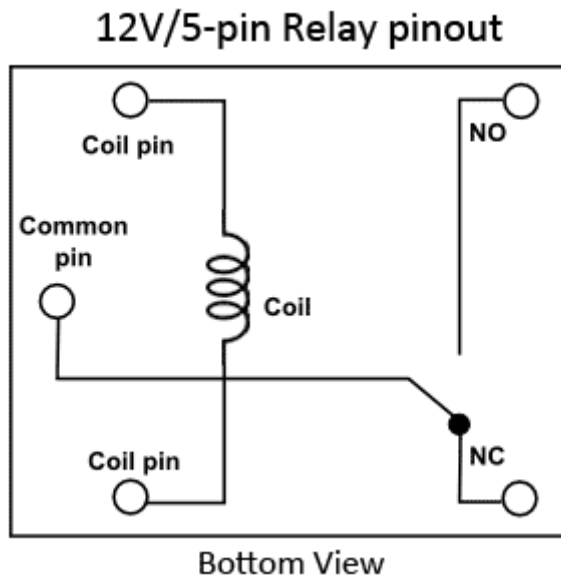
GSM/GPRS modem features

- High Quality Product.
- Configurable baud rate, Dual-Band GSM/GPRS 900/ 1800 MHz.
- RS232 interface for direct communication with computer or MCU kit.
- SIM Card holder.
- Built in Network Status LED.
- Inbuilt Powerful TCP/IP protocol stack for internet data transfer over GPRS.
- Audio interface Connector.
- Normal operation temperature: -20 °C to +55 °C.
- Input Voltage: 3.6- 4.5 VDC.

Applications

- Industrial automation.
- Agriculture automation.
- Home automation.
- Health monitoring.
- Vehicle tracking.
- Remote monitoring and controlling.

Relay



Introduction

Relays are very versatile - but they're not magic. All they do is make and break sets of mechanical contacts. With careful observation - and a little logical thought - you can work out exactly what's happening inside the case.

Start by finding the two pins connected to the relay coil. You can do this with your multimeter. The coil pins will be the only pair that exhibit a resistance. It's likely to be somewhere between about 50Ω and 1000Ω . Low voltage DC relay coils obey Ohm's Law. That is: - $\text{Current} = \text{Voltage} \div \text{Resistance}$. For example - the standard version of the 12v Omron G2E relay - has a coil resistance of 330Ω . So the current through the coil is $12\text{v} \div 330\Omega = 36\text{mA}$.

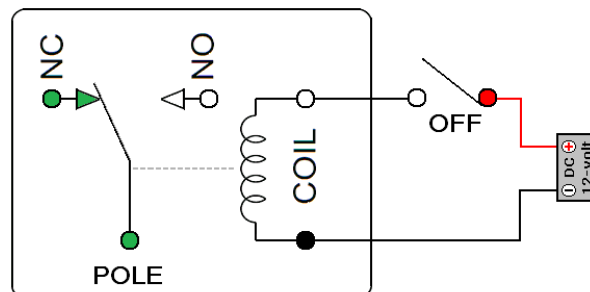
You'll probably find that most relays will work satisfactorily with a range of supply voltages. For example - the standard 12v G2E will work from about 8 Volts - up to about 14 Volts. If you have no

idea what voltage your coil is - start with say 3 volts - and increase it until the relay energizes.

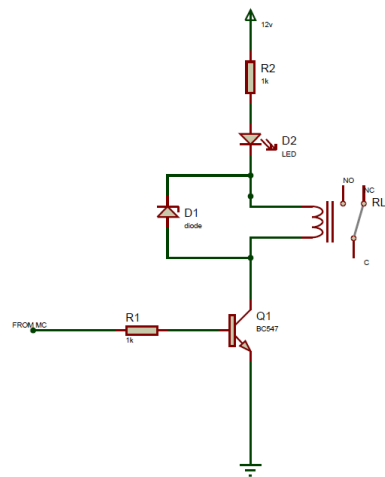
Next - switch the power off - and turn your attention to the remaining pins. With your meter - you should be able to divide them into two groups. Some pins will be joined together in pairs. And some pins will stand alone - with no connection to any other pin. Take a careful note of each.

Although there will be exceptions - the stand alone pins are likely to be normally-open contacts. And the pairs of pins are most likely to be the pole and normally-closed contacts.

Start with a normally-closed pair. One will be the pole - and the other will be the normally-closed contact. When power is applied to the coil - the pole will part from the normally-closed contact - and establish a new connection with the normally-open contact. When you switch off the power, the pole should part from the normally-open contact - and return to the normally-closed contact.



Transistor using relay circuit



Description

Now that we're using a transistor to drive the relay, we can use considerably less power to get the relay driven. Because a transistor is an amplifier, we just have to make sure that the base lead gets enough current to cause a larger current to flow from the emitter of the transistor to the collector. Once the base receives sufficient power, the transistor will conduct from emitter to collector and power the relay.

With no voltage or input current applied to the transistor's base lead, the transistor's emitter-to-collector channel is open, hence blocking current flow through the relay's coil. However, if sufficient voltage and input current are applied to the base lead, the transistor's emitter-to-collector channel will be closed, allowing current to flow through the relay's coil.

The benefit of this circuit is a smaller and arbitrary (DC or AC) current can be used to power the circuit and the relay.

H – bridge used motor speed control

Features

The L293D is a popular motor driver IC that is usable from 6 to 12V, at up to 1A total output current. By itself, the IC is somewhat difficult to wire and use, but the Compact L293D Motor Driver makes it much more convenient to use.

Board special features

- Four motor direction indicator LEDs.
- Schottky EMF-protection diodes.
- Socket pin connectors for easy logic interfacing.
- Enable pins are user accessible.

L293 features

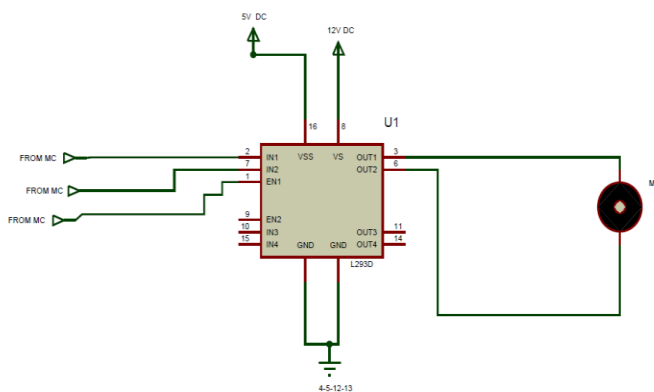
SGS THOMPSON DATASHEET CHARACTERISTICS

Logic / Motor supply maximum voltage 4.5V to 36V
 Input & enable line voltage range 7V
 Peak output current (nonrepetitive), $t_r \leq 100\mu s$ (per 2 channels) $\pm 2.4A$
 Continuous output current (per 2 channels) 1.2A
 Total continuous heat dissipation 4W
 Maximum switching frequency (ie: PWM applications) 5kHz

LOGIC TABLE

Inputs			M1, M2 Output
Enable	D1	D2	
H	H	H	Both outputs HIGH (motor brake)
H	L	L	Both outputs LOW (motor brake)
H	H	L	Current flow from M1 to M2 (rotates dir 1)
H	L	H	Current flow from M2 to M1 (rotates dir 2)
L	X	X	High impedance (motor coasts)

X = Doesn't matter
 H = Logic High
 L = Logic Low



L293D is a dual H-Bridge transistor circuitry used to isolate and control DC Motors, Microcontrollers has current limitations so it can't drive a high power element such as a motor, the H-Bridge solves the problem by providing a different power supply for driving the motors.

For a single motor connected to OUT1,OUT2 respectively, the inputs IN1,IN2 controls the direction of rotation, setting IN1=1

IN2=0 would rotate the motor clockwise, while setting IN1=0 IN2=1 would rotate it counter clockwise, and the setting IN1=0 IN2=0 would turn it OFF.

The pin ENA (Enable motor A) is used to turn ON/OFF the motor regardless of the inputs IN1 IN2, thus, our PWM signal could be connected to ENA to control the speed of the motor. Increase/decrease the speed (the duty cycle)

Single shaft bo motor



Description

300 rpm l-type single shaft bo motor

BO (Battery Operated) light weight DC geared motor which gives good torque and rpm at lower voltages. This motor can run at approximately 300 rpm when driven by a single Li-Ion cell. Great for

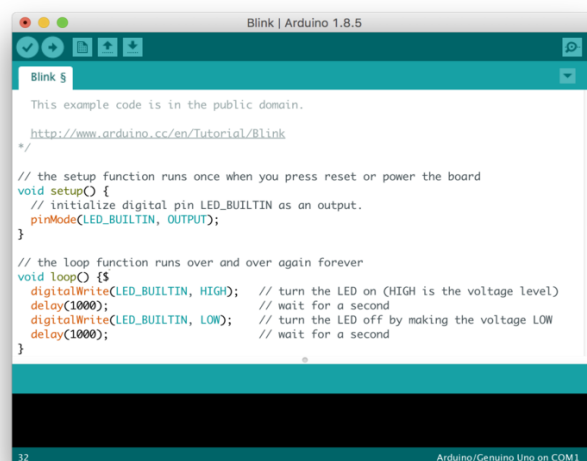
battery operated light weight robots. It can do reverse and forward directions.

Specifications

- Working Voltage 3-12V
- No Load Speed: 300rpm +/- 10rpm
- No Load Current: 125mA (max.170mA)
- Torque: 400gf.cm min 40gm weight

Software

Arduino ide



Arduino ide

Arduino programs are written in the Arduino Integrated Development Environment (IDE). Arduino IDE is a special software running on your system that allows you to write sketches (synonym for program in Arduino language) for different Arduino boards. The Arduino programming language is based on a very simple hardware programming language called processing, which is similar to the C language. After the sketch is written in the Arduino IDE, it should be uploaded on the Arduino board for execution.

The first step in programming the Arduino board is downloading and installing the Arduino IDE. The open source Arduino IDE runs on Windows, Mac OS X, and Linux. Download the Arduino software (depending on your OS) from the official website and follow the instructions to install.

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them

independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

Arduino advantage

Thanks to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. Teachers and students use it to build low cost scientific instruments, to prove chemistry and physics principles, or to get started with programming and robotics. Designers and architects build interactive prototypes, musicians and artists use it for installations and to experiment with new musical instruments. Makers, of course, use it to build many of the projects exhibited at the Maker Faire, for example. Arduino is a key tool to learn new things. Anyone - children, hobbyists, artists, programmers - can start tinkering just following the step by step instructions of a kit, or sharing ideas online with other members of the Arduino community.

There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

Inexpensive - Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than \$50

Cross-platform - The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.

Simple, clear programming environment - The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's

conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.

Open source and extensible software - The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.

Open source and extensible hardware - The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money.

RESULT

When the drunken driver enters in the vehicle alcohol sensor senses the alcohol, therefore buzzer rings and LCD displays that alcohol is detected as shown in fig.6 and ignition of vehicle automatically turns off by relay. So, by this the purpose of our project succeeds.

Software code

```
#include <LiquidCrystal.h>
const int rs = 7, en = 6, d4 = 5, d5 = 4, d6 = 3, d7 = 2;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
int sen1=11;
int sen2=12;
unsigned long t1=0;
unsigned long t2=0;
float velocity;
void setup()
{
  lcd.begin(16, 2);
  pinMode(sen1,INPUT);
  pinMode(sen2,INPUT);
```

```
  Serial.begin(9600);
  lcd.setCursor(0,0);
  lcd.print(" Speed Detector ");
}
void loop()
{
  while(digitalRead(sen1));
  while(digitalRead(sen1)==0);
  t1=millis();
  while(digitalRead(sen2));
  t2=millis();
  velocity=t2-t1;
  velocity=velocity/1000;//convert millisecond to second
  velocity=(5.0/velocity);//v=d/t
  velocity=velocity*3600;//multiply by seconds per hr
  velocity=velocity/1000;//division by meters per Km
  for(int i=5;i>0;i
  {
    lcd.setCursor(3,1);
    lcd.print(velocity);
    lcd.print(" Km/hr ");
    delay(500);
    lcd.setCursor(3,1);
    lcd.print(" ");
    delay(500);
  }
}
```

CONCLUSION

The concept of detecting the level of Pollution and indicating it to the government authorities is implemented. There is an increase in the level of Pollution over the last couple of decades, leading to several Environmental problems. There will be a huge population, who do not take care of the pollution from their vehicles seriously, which has already resulted in several environmental problems such as Ozone layer depletion and so on. Hence this system will be highly beneficial in curbing this problem. Additionally we also tested speed control based on distance. Fuel theft identified and air conditioning control based on temperature also tested and verified.

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