

# Automatic Fuel Cut Off System for Coolant Loss

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**ABSTRACT:** In day to day cars the ground clearance is one of most important factor which affects the stability of car. There is problem associated with high ground clearance and low ground clearance. If ground clearance is more it will result in chance of rollover. Where low ground clearance damages radiator (loss of coolant) which result into engine Seize. Our paper mainly intend to solution over this problem.

**KEYWORDS:** Low & High Ground Clearance, Engine Seized, .

## I.INTRODUCTION

In day to day cars the designers work more on ground clearance in order to get stability in driving. Ride height (also called ground clearance or simply clearance) is the amount of space between the base of an automobile tire and the underside of the chassis; or, more properly, to the shortest distance between a flat, level surface, and any part of a vehicle other than those parts designed to contact the ground (such as tires, tracks, skis, etc.).

The ground clearance for a perfect car cannot be increase as it results in improper gripping. Ground clearance is a critical factor in several important characteristics of a vehicle. For all vehicles, especially cars, variations in clearance represent a trade-off between handling and practicality. A higher ground clearance means that the center of mass of the car is higher, which makes for less precise and more dangerous handling characteristics (most notably, the chance of [rollover](#) is higher). Due to which the designers keep less clearance between ground and lowest part of vehicle. This increases risk of radiator damage which results in overheating of engine. If this overheating is ignored which most probably happens will lock the engine. In this case we have to replace the whole engine which is very costly. We all know prevention is better than cure, so, our paper aim to avoid the problem of engine lock using automation.

## II.LITRATURE SURVEY

Justin Cupler wrote in an article over engine seized, car's engine is like a delicate ballet or a synchronized swimming event; everything must work in perfect harmony or the whole thing is thrown off. An engine, however, does not just get up and start over. It typically causes major damages when all of its components are not working properly. One thing that can happen is that the engine can seize. Seizing of the engine is when a major component stops moving, stopping the entire engine. When an engine seizes, you attempt to turn the vehicle over, and all of the electronics seem to work: radio turns on, heater fan blows and the lights turn on. When you attempt to crank the vehicle's engine though, nothing happens except a loud clunking noise from the vehicle's starter impacting the engine's flywheel.

When an engine seizes and can no longer move, the starter will still attempt to crank the engine when the key is turned. Because the starter cannot turn the motor, the electric wires can overheat and begin smoking, a tell-tale sign of a seized engine.

According to an article published by kiwi cylinders most engines today are designed to operate within a "normal" temperature range of about 195 to 220 degrees F. A relatively constant operating temperature is absolutely essential for proper emissions control, good fuel economy and performance.

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A 50/50 mixture of water and ethylene glycol antifreeze in the cooling system will boil at 225 degrees if the cap is open. But as long as the system is sealed and holds pressure, a radiator cap rated at 15 psi will increase the boiling temperature of a 50/50 coolant blend up to 265 degrees. If the concentration of antifreeze to water is upped to 70/30 (the maximum recommended), the boiling temperature under 15 psi of pressure goes up to 276 degrees. So does this mean a cooling system with a maximum concentration of antifreeze in the coolant (70 percent) can run as hot as 276 degrees without boiling over? Theoretically yes - but realistically no. The clearances in most of today's engines are much, much closer than those in engines built in the 1970s and early 1980s. Piston-to-cylinder clearances are much tighter to reduce blow by for lower emissions. Valve stem-to-guide clearances also are closer to reduce oil consumption and emissions, too. Plus, many engines today have aluminium heads with overhead cams. Such engines don't handle higher than normal temperatures well, and are very vulnerable to heat damage if the engine gets too hot.

Ken Nelson in his article mentioned that engine overheating has been around as long as the automobile and the Model "A" is not exempt from the problem. However, the "A's" cooling system, if working properly, is more than adequate for almost any set of driving conditions you might encounter. There are many causes for engine overheating, but once identified, most can be easily corrected.

After reading papers and articles I came to know that, the engine lock is a serious problem which is caused by overheating of engine. This results in expansion of piston and due to this it gets welded with cylinder. In this case the engine cannot be repaired and hence replaced with a new one. The engine replacement is unaffordable and due to which the name and fame of the company is reducing day by day. There is an urgent requirement of a solution to this problem. The solution provided by the company is a thermostat sensor which gives indication of overheating and glows red light. Mostly the drivers don't pay attention to it and after a certain time the engine gets seized.

### III.OBJECTIVE

To avoid engine seizure using NTC & solenoid valve in fuel supply & press the clutch pedal automatically.

### IV.METHODOLOGY

In this system we are going to use NTC thermistor which works on the principle of change in resistance with change in temperature. This change in resistance is sensed by a comparator IC which will provide a power supply of 12V to a solenoid valve.

### V.THEORETICAL DETAILS: PROBLEM STATEMENT

#### GROUND CLEARANCE

Ground clearance can be defined as the space or distance from the lowest point of your vehicle to the level surface below it. The tires are not considered for the definition as they are designed to be in contact with ground. The ground clearance is not something that you have to go and measure or calculate as the manufacturers usually give the distance in millimetres or inches in the overall list of dimensions.

The lowest part of the vehicle can be a differential or some part of the undercarriage of your vehicle and the specifications given are for an empty vehicle so the ground clearance would be slightly lower when fuel, passengers and cargo is added.

#### VI.HIGH GROUND CLEARANCE

Ground clearance is a critical factor in several important characteristics of a vehicle. For all vehicles, especially cars, variations in clearance represent a trade-off between handling and practicality. A higher ground clearance means that the centre of mass of the car is higher, which makes for less precise and more dangerous handling characteristics (most notably, the chance of rollover is higher). However, it also means that the car is more capable of being driven on roads that are not level, without the road scraping against and likely damaging the chassis and underbody. Higher ride heights

will typically adversely affect aerodynamic properties. This is why sports cars typically have very low clearances, while off-road vehicles and SUVs have higher ones. Two well-known extremes of each are the Ferrari F40 and the Hummer.

For armored fighting vehicles (AFV), ground clearance presents an additional factor in a vehicle's overall performance: a lower ground clearance means that the vehicle minus the chassis is lower to the ground and thus harder to spot and harder to hit. The final design of any AFV reflects a compromise between being a smaller target on one hand, and having greater battlefield mobility on the other. Very few AFVs have top speeds at which car-like handling becomes an issue, though rollovers can and do occur. By contrast, an AFV is far more likely to need high ground clearance than a road vehicle.

Higher ground clearance is used on vehicles with good off road abilities. A higher ground clearance .The high clearance allows these vehicles to have more practically such as transporting more cargo and travelling on rough roads or off road with a reduced possibility of the vehicle sticking or the undercarriage being damaged by the rough surfaces. One drawback is the higher ground clearance equals a higher centre of gravity.

## **VII.LOW GROUND CLEARANCE**

Vehicles with a lower ground clearance will benefit from an increase in handling as their center of gravity will be significantly lower than average. A lower ground clearance equals better handling and performance. the lower stance will assist in aerodynamics as less air will pass under the vehicle during driving but these vehicles will not be practicable.

Sometimes a compromise between a high and low ride height is need and this balance is adopted by some of the most executive sedans and other cars.

To further improve on the compromise some vehicle's ride height can be adjusted via air suspension either automatically or via controls inside the vehicle while you're driving to cater to the road conditions.

This is achieved by altering the height of the suspension to raise or lower the overall height of the vehicle. Imagine you're driving your high end vehicle through rough roads with ease because your ground clearance is above the normal settings and in a few minutes later you can be driving the same vehicle along an open smooth road with increased handling and aerodynamics because your ground clearance is now lower than the normal settings.

Lowering a car's suspension is a common and relatively inexpensive aftermarket modification. Many people prefer the more aggressive look of a lowered body, and there is an easily realized car handling improvement from the lower center of gravity. Most passenger cars are produced such that one or two inches of lowering won't increase the probability of damage significantly. On most automobiles, ride height is modified by changing the length of the suspension springs, and is the essence of many aftermarket suspension kits supplied by manufacturers such as Hibachi and H&R.

Some cars have used underling frames to achieve a lower ride height and the consequent improvement in center of gravity. The brass-era cars of the American Motor Car Company are one example.

Self-leveling suspension systems are designed to maintain a constant ride height regardless of load. Vehicles not equipped with self-leveling will pitch down at one end when laden; this adversely affects ride, handling, and aerodynamic properties.

Some modern automobiles (such as Audi's Allroad Quattro) have adjustable suspension systems, which can vary the ride height by locating the suspension mounting points, depending on road conditions and/or the settings selected by the driver.

Other, simpler suspension systems, such as coilover springs, offer a way of manually adjusting ride height (and often,

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spring stiffness) by compressing the spring in situ, using a threaded shaft and adjustable knob or nut. The lower ground clearance damages radiators usually when vehicle is driven off road. We will see the problem in details related to engine n next topic i.e Engine

### VIII.OVER HEATING PROBLEM

The first engine was created in 1878, but it has undergone major design changes. Today's car engine is quieter, smaller, and more fuel-efficient than ever. Perhaps most important of all, it's more durable than ever; modern car engines generally don't need service within their first five to seven years. Some car engines can go a decade without a major problem.

Treating the car well lessens a driver's odds of needing to work on the engine, or worse, replace it outright. Despite the car engine's durability, it can't withstand incredibly high temperatures for long periods of time. It's not just the engine that balks at such extremities either; seals and gaskets can suffer irreparable damage after being exposed to temperatures they're not designed to handle.

Long story short, overheating can permanently damage a car beyond financially responsible repair. It may help car drivers to understand how they can avoid this catastrophe and why it happens in the first place.

### IX.CAUSES OF OVERHEATING

Anything that lessens an engine's ability to absorb, transfer, and dissipate heat has the capability of overheating an engine. Unfortunately for drivers, there are a lot of potential causes, but some are more common and than others. Many of them are easily fixable by a reputable mechanic and generally involve replacing relatively inexpensive parts.

#### 1) FAULTY THERMOSTAT

Moving from the most common cause to the most frustrating, a faulty thermostat can easily overheat an engine. Basically, a bad thermostat can say to the engine, "The temperature is just right. There's no need for additional cooling," when the temperature is actually too hot. Giving false readings prevents the car's release of antifreeze. After being driven for a while, the car gradually becomes hotter and hotter, eventually billowing smoke or stalling out. The solution is replacing the [thermostat](#), and the car should no longer overheat, as long as that was the only problem.

#### 2) LOW MOTOR OIL LEVELS

A car with a low oil level may overheat because oil carries heat away from the engine. Running low on oil is harmful in other ways too; for example, oil acts as a lubricant, and no oil can lead to excessive wear on some parts because they're not adequately lubricated. Drivers can refer to their car manuals or local car dealership to determine how much oil their car needs and how often it should be changed or topped off. Different cars require different kinds of oil. Drivers should never put a random oil in their car. The price range of motor oil varies a lot, depending on the type.

### X.OVERHEATING DAMAGE

In general, the parts to prevent overheating are less expensive than fixing the damage overheating has done. There are exceptions to this rule, of course, but prevention is almost always better than cleaning up the mess afterward. Have no doubt; damage due to overheating can be messy, often with antifreeze creating the destruction.

## **XI. CONSEQUENCES OF OVERHEATING**

If the engine overheats, the first thing that will happen is a gasoline engine will start to detonate. The engine will ping and start to lose power under load as the combination of heat and pressure exceed the octane rating of the fuel. If the detonation problem persists, the hammer-like blows may damage the rings, pistons or rod bearings.

Overheating can also cause pre-ignition. Hot spots develop inside the combustion chamber that becomes a source of ignition for the fuel. The erratic combustion can cause detonation as well as engine run-on in older vehicles with carburetors. Hot spots can also be very damaging and burn holes right through the top of pistons.

Another consequence of overheating may be a blown head gasket. Heat makes aluminum swell almost three times faster than cast iron. The resulting stress can distort the head and make it swell in areas that are hottest like those between exhaust valves in adjoining cylinders, and areas that have restricted coolant flow like the narrow area that separates the cylinders. The typical aluminum head swells most in the middle, which can crush the head gasket if the head gets hot enough. This will cause a loss of torque in the gasket allowing coolant and combustion leaks to occur when the head cools.

Overheating is also a common cause of OHC cam seizure and breakage. If the coolant gets hot enough to boil, it may cause old hoses or an age-weakened radiator to burst under the increased pressure. Pistons may swell up and scuff or seize in their bores, causing serious Engine Damage. Exhaust valve stems may stick or scuff in their guides. This, in turn, may cause valves to hang open which can damage pistons, valves and other valve train components. And if coolant gets into the crankcase, you can kiss the bearings and bottom end of the engine.

A HOT warning lamp should never be ignored. Though a few high tech cars like Cadillac's with the

North star engine can disable cylinders to "air-cool" the engine and keep it running at reduced power in the event of coolant loss, most engines will suffer serious damage if they overheat. So advise your customers to stop driving at the first sign of overheating. Turn the engine off, let it cool down and try to find and fix the cause before risking further travel.

### **1. PRE-IGNITION**

When an engine overheats, hot spots develop in the combustion chamber. These hot spots can literally ignite the fuel and can also result in holes burnt through the top of the pistons.

### **2. BURST RADIATOR**

If an engine overheats to the point of boiling, the end result can be a burst radiator or hoses due to the buildup of pressure. Older equipment is more susceptible to this consequence.

### **3. ENGINE SEIZE**

The most detrimental effect of an overheated automobile is engine seize. A seized engine, in many cases, will require a complete rebuild, which is extremely costly and time-consuming, or replacing the engine with a new or used one

**XII.THEORETICAL DETAILS: SOLUTION**

**WORKING OF SYSTEM**

The thermistor changes attracted to fins of engine senses the temperature indirectly it changes its resistance. This change in resistance is responsible for changes supply voltage to IC (LM324) i/p.

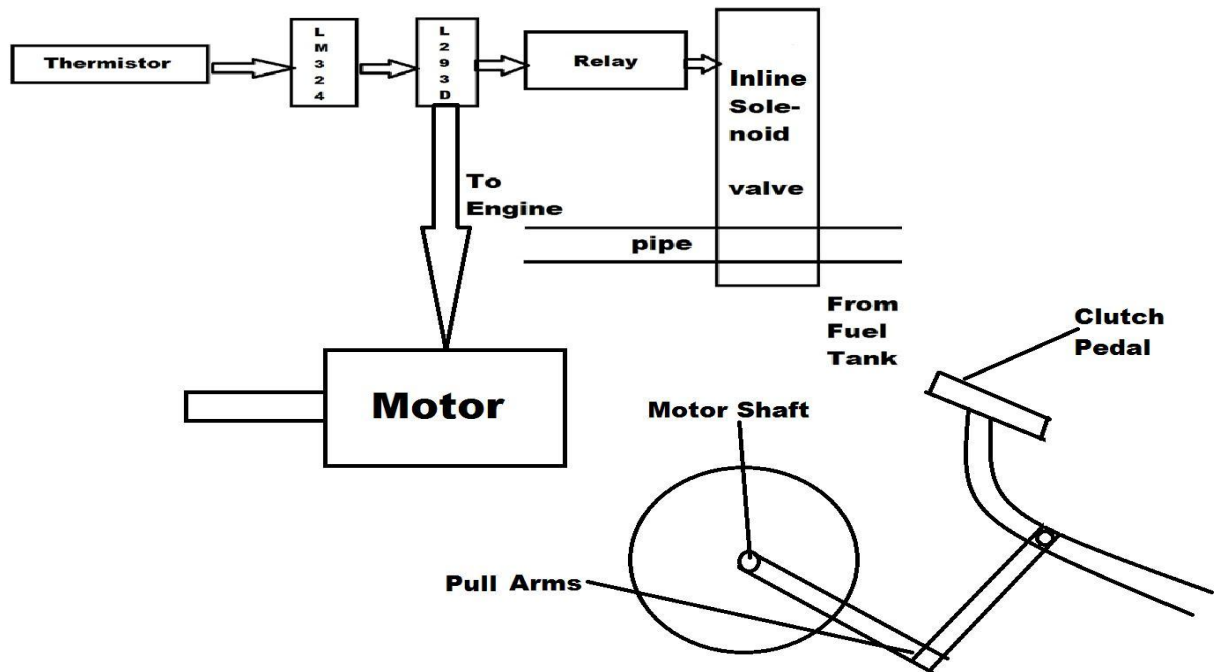


Figure 1: Block Diagram of System

The IC i/p is inverting terminal so it inverts the supply and provide it in o/p. This supply is i/p to another IC called driver IC for amplifying the voltage to certain level. Even at this level the voltage is not sufficient to actuate the solenoid valve. Hence it is provided to relay. The o/p of relay is provided to Solenoid valve which cut off the fuel supply.

As the fuel supply is off the engine does not generate power. In this condition there is a chance of getting jerk due to sudden loss in velocity as car is in gear, which may cause the accident (Collision with other cars). To avoid this problem we are going to use a arm to press clutch pedal automatically with the help of high torque motor, so that vehicle can slower down gradually. At the upper side of high torque motor there is stopper present to stop further movement of arm or either we stop it by sensor or by providing pulse for short period.



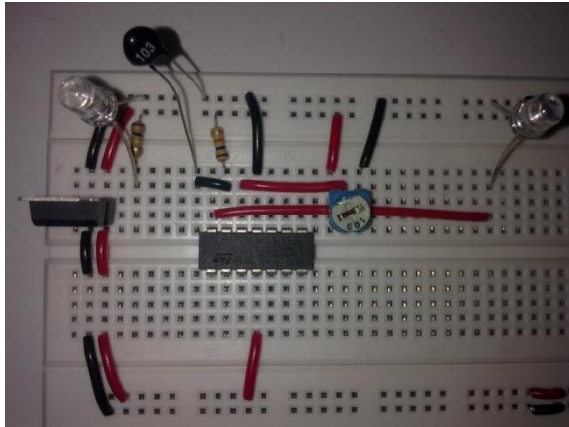


Figure 2: Sensor Circuit

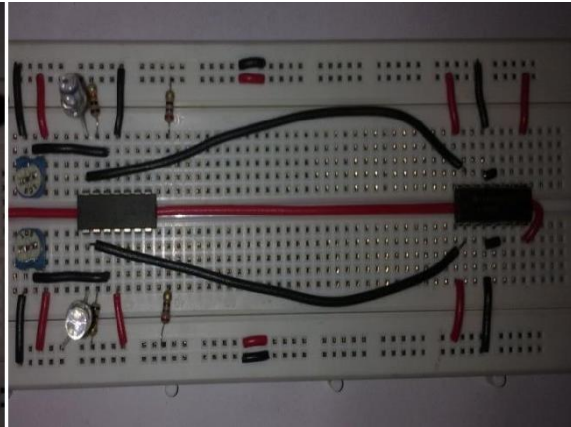


Figure 3: Sensor Driver Circuit

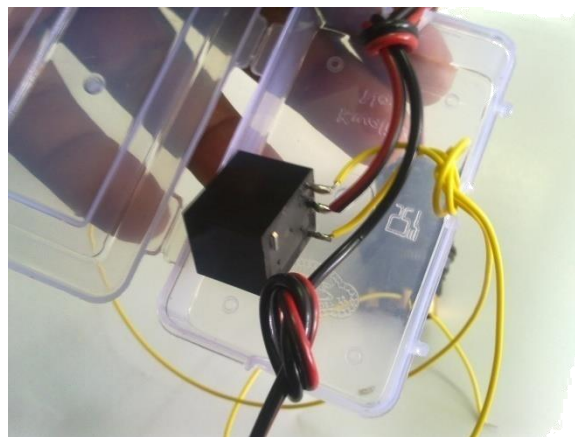


Figure 4: Relay Circuit

### XIII. PRACTICAL EQUIPMENTS DETAILS OF PROJECT

The key to the operation of a proportional valve is a balance established between the forces in action on the plunger.

These balanced forces include a mechanical force provided by a spring specially developed for proportional valves and a magnetic force created by the current level passing through the coil. The spring force is proportionally opposed by the magnetic force.

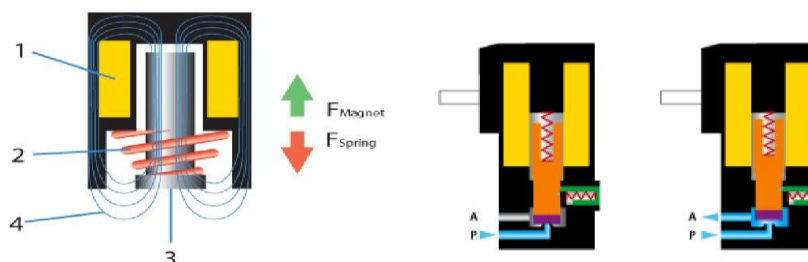


Figure 5: Solenoid Valve Internal Composition

Often, one hears that proportional valves react proportionally to the voltage supplied. However, in practice, the current passing through the valve will heat the coil and eventually increase the internal resistance.

At constant voltage, increasing the resistance will provoke a current drop and thus a drop of the magnetic force. As a result, the valve will tend to slowly close.

The magnetic plunger (orange) is acting directly on the valve seal to open or close the valve orifice depending upon whether the solenoid is energized or de-energized. The pressure and flow of this type of solenoid valve depend directly on the orifice size and the coil (yellow) power. Its function is not dependent upon line pressure or flow rate.

**XIV.IC LM324**

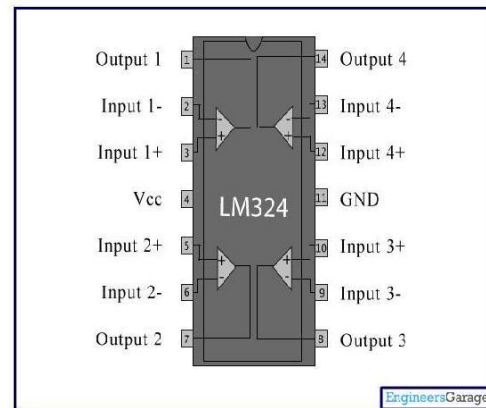
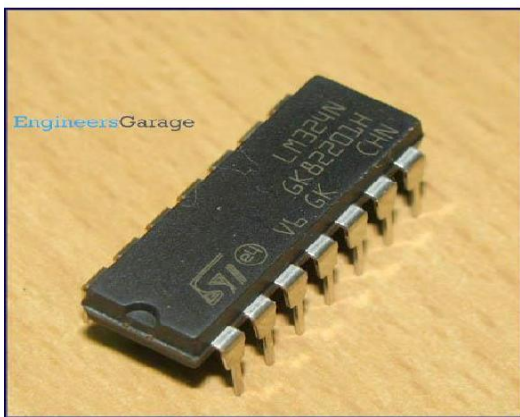


Figure 6: IC Pin diagram

**LM324** is a 14-pin IC consisting of four independent operational amplifiers (op-amps) compensated in a single package. Op-amps are high gain electronic voltage amplifier with differential input and, usually, a single-ended output. The output voltage is many times higher than the voltage difference between input terminals of an op-amp.

These op-amps are operated by a single power supply **LM324** and need for a dual supply is eliminated. They can be used as amplifiers, comparators, oscillators, rectifiers etc. The conventional op-amp applications can be more easily implemented with LM324.

**XV.L293D**

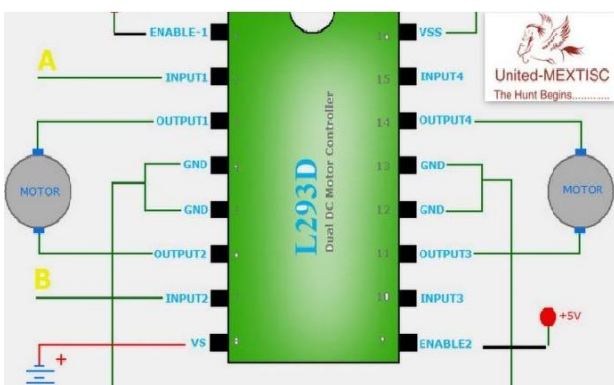


Figure 7: Circuit of Driver Ic



Figure 8: Internal Structure Of Relay.



L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC).

## **XVI.RELAY**

Relay switch shown in the image above consists of five terminals. Two terminals are used to give the input DC voltage also known as the operating voltage of the relay. Relays are available in different operating voltages like 6V, 12V, 24V etc. The rest of the three terminals are used to connect the high voltage AC circuit. The terminals are called Common, Normally Open (NO) and Normally Closed (NC). Relays are available in various types & categories and in order to identify the correct configuration of the output terminals, it is best to see the data sheet or manual.

We can also identify the terminals using a multi-meter and at times it is printed on the relay itself. The internal structure of the relay is shown in the image above which is embedded inside the plastic covering. A relay mechanism basically consists of a coil and a spring loaded contact which is free to move across a pivoted axis.

The contact is hinged in such a way that when its not operated it connects with one of the terminals of the device called the N/C contact (Normally/Closed). Conversely when the contact is operated it disconnects itself from the N/C terminal and joins itself with a second terminal called the N/O contact

(Normally/Closed). During it's operations it switches from N/C to N/O alternately depending upon the activation states.

The above activation of the relay contact is done by energizing the coil inside the relay. The coil of the relay which is wound over an iron core behaves like a strong electromagnet when a DC is passed through the coil. When the coil is energized the generated electromagnetic field instantly pulls the nearby spring loaded contact giving rise to the above situations.

The above movable spring loaded contact inherently forms the main central switching lead or the pin out of the relay. The other two contacts N/C and the N/P form the associated complementary pairs of relay terminals or the pin outs which alternately get connected and disconnected with the central relay contact in response to the coil activations.

The terminals of the coils also become the major pin outs of the relay.

Therefore in all we have the central movable or switching terminal, a pair of N/C and the N/O terminals and finally the two coil terminals which all together constitute a relays pin outs.

## **XVII.MOTORS**

The motors used for moving the robot having is 160RPM 12V DC geared motors for robotics applications. It gives a massive torque of 30Kgcm. The motor comes with metal gearbox and centered shaft. Shaft has a metal bushing for wear resistance. This high torque capacity helps to carry additional load if required.

### **FEATURES**

- 160RPM 12V DC motors with Metal Gearbox
- 9000RPM base motor
- 8mm shaft diameter
- Gearbox diameter 40 mm.

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- Motor Diameter 40 mm
- 300gm weight
- 30kgcm torque
- No-load current = 500 mA(Max), Load current = upto 3 A(Max) Simple Dc Motor



**Square Geared Motor**

Figure 10 : High Torque Motor

The motors used for cutter actuation & positioning is 10RPM 12V DC Geared motors for robotics applications.

Device	Theoretical o/p	Experimental o/p	Expected o/p
Thermistor	1k -15k	9.78K	5K-12K
LM324	3V	3.107V	2.8V-3.2V
L293D	Supply dependent 9V	Supply dependent 9V	Supply dependent 9V
Relay	12V	12.17V	12V-13V

**XIX.CONCLUSION**

From this we conclude that the project is successful as per required o/p and system proves to be prevention from engine seized. The block of fuel supply to engine proves to be risky to human health and may cause accident. For this a pull arms proves to be helpful. This whole system can avoid engine seized.

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LINKS

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