Auto power supply from four different sources monitoring and control over IOT

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ABSTRACT
This project is designed to automatically supply continuous power to a load through one of the four sources of supply that are: solar, mains, thermal, and wind when any one of them is unavailable. The four switches represent the four causes. The switches are connected to microcontroller of which they provide input signals. Whenever a switch is pressed, it shows the absence of that particular reference. A relay driver is used that receives microcontroller generated output and switches that specific relay to provide continuous power supply. A lamp or bulb was used as a load for demonstration purpose which draws power from main. When the primary fails to supply power, automatically next available source was used like thermal. If thermal fails then the next one is used and so on. An LCD is used to show which power supply is on.

INTRODUCTION
The outline of the project is selection of supply from mains, generator, and inverter and solar automatically by using microcontroller concept. As it is not feasible to provide all 4 different sources of supply, one source with alternate switches are provided to get the same function. In this project we are having 4 switches which we consider as 4 different sources of supply. When we press any of the switches it shows the absence of that particular source which is connected to microcontroller as input signals. Here we are using 8051 family microcontrollers. The output of microcontroller is given to the ULN2803 this acts as a relay driver. This can drive up to 7 relays. The relays which are used hear are 12V relay. The output can be observed using lamp which is getting uninterrupted power supply from other means if main supply is cut off. The power supply consists of a step-down transformer 230/12V, which steps down the voltage to 12V AC. This is converted to DC using a Bridge rectifier. The ripples are removed using a capacitive filter and it is then regulated to +5V using a voltage regulator 7805 which is required for the operation of the microcontroller and other components. Automating feature is now the need of the day. It is user friendly and easy to use. It saves time too. This project is also a proto-type to automation of the system. In the earlier days (even today at some places) the manual operations are frequent. When the main supply goes off the person manually turn on the generator. In case of the electrical appliance control using automation causes more safety. This project is a prototype for the same which is auto change over to generator when main supply fails. In this system we are designing an embedded circuit to control this. In case there are four phases, then the switching will be in the default phase. Four relays are there to control the switching. The phases will be shown by the operation of switch that is on /off. According to the conventional model of current flow originally established by Benjamin Franklin and still followed by most engineers today, current is assumed to flow through electrical conductors from the positive to the negative pole. In actuality, free electrons in a conductor nearly always flow from the negative tohe positive pole. In the vast majority of applications, however, the actual direction of current flow is irrelevant. Therefore, in the discussion below the conventional model is retained. Terminal to the right along the red (positive) path to the output, and returns to the lower supply terminal via the blue (negative) path. In each case, the upper right output remains positive and lower right output negative. Since this is true whether the input is AC or DC, this circuit not only produces a DC output from an AC input, it can also provide what is sometimes called "reverse polarity protection". In the diagrams below, when the input connected to the left corner of the diamond is positive, and the input connected

to the right corner is negative, current flows from the upper supply Switches it shows the absence of that particular source which is connected to microcontroller as input signals. Here we are using 8051 family microcontroller. The output of microcontroller is given to the ULN2003 this acts as a relay driver. This can drive up to 7 relays. The relays which are used hear are 12V relay. The output can be observed using lamp which is getting uninterrupted power supply from other means if main supply is cut off. The power supply consists of a step down transformer 230/12V, which steps down the voltage to 12V AC. This is converted to DC using a Bridge rectifier. The ripples are removed using a capacitive filter and it is then regulated to +5V using a voltage regulator 7805 which is required for the operation of the microcontroller and other components. Automating feature is now the need of the day. It is user friendly and easy to use. It saves time too. This project is also a proto-type to automation of the system shown in Fig. 1.1. In the earlier days (even today at some places) the manual operations are frequent. When the main supply goes off the person manually turn on the generator. In case of the electrical appliance control using automation causes more safety. This project is a prototype for the same which is auto change over to generator when main supply fails. In this system we are designing an embedded circuit to control this. In case there are four phases, then the switching will be in the default phase. Four relays are there to control the switching. The phases will shown by the operation of switch that is on /off.

SCOPE OF THE PROJECT

This system can used to automate the electrical system where switching is required. It also serves for the safety in heavy industrial duty. Manual changeover can be replaced by automatic change over in home.

LITERATURE REVIEW

IN "MODELLING AND ANALYSIS OF WIND POWER GENERATION USING PID CONTROLLER"

In recent years, wind energy has become one of the most important and promising sources of renewable energy, which demands additional transmission capacity and better means of maintaining system reliability. The evolution of technology related to wind systems industry leaded to the development of a generation of variable speed wind turbines that present many advantages compared to the fixed speed wind turbines. A new control strategy stator field oriented control to capture optimum power from the wind through closed loop current control and rotor speed regulation of DFIG. The wind turbine characteristics and optimum power curve has been introduced. The generator active and reactive power is decoupled and controlled by stator currents. Mathematical model of DFIG with current control loop using PID controller is designed simulation results in Simulink show the effectiveness of the strategy to maximize the power extracted from the windGeneration of power from renewable energy sources is more promising due to its clean character and free availability. In the last two decades, research carried out specifically on wind power generation systems to capture more power at fluctuating wind speeds. The conventional energy sources are limited and have pollution to the environment. So more attention and interest have been paid to the utilization of renewable energy sources such as wind energy, fuel cell and solar energy etc. Wind energy is the fastest growing and most promising renewable energy source among them because it is abundant, cheap, inexhaustible, widely distributed, clean, and climate-benign, a set of attributes that no other energy source can match. In India, is been the total installed capacity of wind power generation is 8754 MW in the year 2008. By the end of 2012 the total installed capacity is going to be reached to 12000 MW according to ministry of new and renewable energy. Turbine generators (WTGs) can be divided into two basic categories :(i) fixed speed and (ii) variable speed. The fixed-speed generator has a low efficiency of wind power conversion and no ability to provide reactive power support. It also imposes mechanical stress on the turbine and requires complex pitch control to maintain a constant rotor speed. During the last few years, the variable speed wind turbines with Doubly-fed induction generator (DFIG) dominant the wind energy conversion system (WECS). The reasons being clean power delivery to the grid, higher capacity to extract power with control flexibility. Doubly fed induction generators (DFIG) are popular with such technology. The main advantages offered by DFIG are they cover wide speed range, provide decoupling control of active and reactive power and reduced rating of converters

IN "POWER LOSS MINIMIZATION IN DISTRIBUTION SYSTEM USING NETWORK RECONFIGURATION WITH PARTICLE SWARM OPTIMIZATION" Reconfiguration of radial distribution system is significant way of altering the power flow through lines. This paper presents a new method to solve the network reconfiguration problem with an objective of minimizing real power loss and improving voltage profile in radial distribution system(RDS). A Meta-heuristic Particle Swarm Optimization (PSO) is used to reconfigure and identify the optimal tie switches for minimization of real power loss in a distribution network. Different scenarios of reconfiguration of distributed network are considered to study the performance of the proposed method. The constraints of voltage and branch current carrying capacity are included in the evaluation of the fitness or objective function. The method has been tested on 33-bus at four different load levels to demonstrate the performance and effectiveness of the proposed method. The results obtained, shows that improvement in voltages and reduced losses.Power Generation and Transmission is a complex process, wherever power is to be transferred, the two main components are active and reactive power. In a three phase ac power system active and reactive power flows from the generating station to the load through different transmission lines and networks buses. The active and reactive power flow in transmission line is called power flow or load flow. Power flow analysis is also used to determine the steady state operating condition of a power system. For the planning, operation and future expansion of power distribution system, Power flow analysis is used. Due to uncertainty of system loads on different feeders, which vary from time to time, the operation and control of distribution systems is more complex particularly in the areas where load density is high. Power loss in a distributed network will not be minimum for a fixed network configuration for all cases of varying loads. Hence, there is a need for reconfiguration of the network from time to time. Network reconfiguration is the process of altering the topological structure of feeders by changing open/closed status of sectionalizing and tie switches. In general, networks are reconfigured to reduce real power loss and to relieve overload in the network. However, due to dynamic nature of loads, total system load is more than its generation capacity that makes relieving of load on the feeders not possible and hence voltage profile of the system will not be improved to the required level. In order to meet required level of load demand, DG units are integrated in distribution network to improve voltage profile, to provide reliable and uninterrupted power supply and also to achieve economic benefits such as minimum power loss, energy efficiency and load leveling. However, in the proposed method, network reconfiguration for improved loss minimization and voltage profile at some level. Since network reconfiguration is a complex combinatorial, non-differentiable constrainedoptimization problem, many algorithms are proposed in the past. Merlin and Back [1] first proposed network reconfiguration problem and they used a branch and bound-type optimization technique. The drawback with this technique is the solution proved to be very time consuming as the possible system configurations are 2n , where n is line sections equipped with switches. Based on the method of Merlin and Back [1], a heuristic algorithm has been suggested by Shir-mohammadi and Hong [2]. The particle swarm optimization algorithm is proposed [3].

IN "A NEW CONTROL TOPOLOGY FOR SMART POWER GRIDS USING BI-DIRECTIONAL SYNCHRONOUS VSC" —This paper presents a new control strategy for voltage-source converters (VSCs) in the frequency-angle domain which enables dc-link voltage regulation via frequency and load angle adjustment. A major advantage of the proposed controller is emulating the behavior of synchronous machines (SMs) with proper regulation of dc-link voltage which eases integration of VSCs interfacing distributed and renewable generation units into ac systems in the presence of conventional SMs. A cascaded frequency, angle and virtual torque control topology is developed to emulate the mechanical behavior of an SM which offers synchronization power to eliminate the need for a phase-locked-loop after initial converter synchronization, and damping power dynamics to damp power oscillations; and presents frequency dynamics similar to SMs, thus it introduces some inertia to the grid. The controller presents high stability margin and fast dc-link voltage regulation, whereas it can provide frequency support in the ac-side during contingencies. Frequency and voltage amplitude are adjusted by two separate loops. Two different variants are proposed for dc-link voltage control; namely direct dc-link voltage control and indirect dc-link voltage control via a dc-link voltage controller. Small-signal dynamics, analysis, and design process are presented. Both simulation and experimental results are provided to validate the controller effectiveness.NOWADAYS, because of high penetration levels of renewable energy resources, the paradigms of microgrids (MGs) and distribution generation (DG) are gaining vital role in power and distribution systems. MGs are categorized as ac MGs, dc MGs, and hybrid ac–dc MGs. Since a considerable portion of renewable energy resources, such as wind turbines, photovoltaic (PV), fuel cells and energy storage systems, and many modern loads such as communication technology facilities, data centers, and motor drives is dc-type, dynamics and controls of rectifiers and dc MGs are gaining high interest [1]. However, in dc grids, many generation units such as wind turbines must be interfaced to the utility grid via electronically interfaced (EI)rectifiers. In addition, several modern ac loads are coupled to ac grids through back-to-back rectifier-inverter to provide variable frequency operation. Based on predictions given in [2], the resistive load share will be significantly reduced whereas the EI loads share will increase to of the total load by 2015. The conventional control topologies for three-phase converters are the voltage-oriented vector control [3] and direct-power control [4]. The dq components of the current vector are regulated by a controller generating appropriate values for the converter dq voltage components. A phase locked-loop (PLL) is required to transform current and voltage variables from the abc frame to the dq frame. It is also feasible to implement the controller in the stationary frame or the abc frame using a proportional-resonant (PR) controller [5]. An alternative control strategy is to use direct power control in which voltage components are adjusted based on active and reactive power errors. None of these methods, however, can directly control the frequency and the load angle. One of the major challenges facing future power systems is significant reduction in grid equivalent rotational inertia due to the expected high penetration level of EI units, which in turn may lead to frequency-stability degradation. To overcome this difficulty, controlling VSCs as virtual synchronous machines is proposed for power system frequency stabilization [6] by embedding a short-term energy storage to the VSC facilitating power flow to and from to the energy storage device proportional to the variation in grid frequency. In [7], the idea of synchronverter was addressed to emulate the mechanical behavior of a synchronous generator (SG) in inverters. However, the dc-link is considered as an ideal one with infinite energy and the dynamics of dc-link voltage is not considered. Moreover, its application to rectifiers has not been addressed. In [8]–[10], methods to emulate virtual inertia in VSCs interfacing wind turbines and HVDC systems, are presented; however, the embedded inertia does not emulate the behavior of an SG. The analogy between voltage-source inverters and SG-based MGs has also been addressed in [11], [12]. The aforementioned survey indicates the interest in developing new and improved control algorithms for VSCs to emulate the dynamic behavior of SGs. Beside overall low inertia, future power systems and MGs will suffer from interactions between fast responding VSCs and slower SMs which may contribute to angle, frequency, and voltage instability [13]. With the expected high penetration level of power converters in future power grids, a power system may face severe difficulty in terms of frequency regulation because of lack of rotational inertia in converter-interfacedgenerators. Another challenge is that frequency dynamics are not known in the conventional control techniques of VSCs (e.g., voltage-oriented control and direct-power control) which makes it difficult to analyze the angle and frequency stability of a system containing several EI units and conventional synchronous machines (SMs) and line-start motors. Therefore, the development of VSCs with well-defined angle, frequency, and dc-link voltage characteristics (similar to SMs with extension to dc-link dynamics) are of high interest for future smart power systems with a high penetration of VSCs. Moreover, a general control scheme which is suitable for both rectification and inversion modes without reconfiguration is very attractive in power system applications since bidirectional VSCs can work in generative and motoring modes similar to SMs. Another concern related to conventional controls is the existence of a PLL. In these controllers, a PLL is required to extract the grid angle and frequency to transform current and voltage variables from abc to dq frame and vice versa and to synchronize the VSC with the grid. However, it is well understood that PLL dynamics can affect VSC stability, particularly in weak grids [14]. Therefore, there is a persistent need to eliminate the PLL after initial synchronization. In [14] and [15], a power synchronization technique is proposed to remove the PLL in the steady state by a simple power loop with an integrator to adjust the VSC's angle based on real power error; in fact, this loop acts as a virtual PLL. However, this method does not exactly mimic the behavior of SMs. The concept of self-synchronization using linear controllers is discussed in [16]. Novel control strategies using nonlinear synchronizing power are addressed in [17]–[19] to provide self-synchronization ability and large-signal stability for VSCs in MGs and very weak grid applications. Instabilities due to dc-link dynamics are one of major sources of instabilities in VSCs [19]. Most of previous works on virtual SGs and/or self-synchronization of VSCs consider the dc link as an ideal battery with infinite energy [4]–[7], [10]–[15]. However, it is obvious that this is not the case and, in most transient scenarios, dc-link voltage varies; also, its energy and power are limited. Moreover, if dc-link voltage dynamics are slow and the voltage passes some thresholds for a relatively long time, underor over-modulation and, consequently, voltage instability is expected [20]. To improve dc-link voltage stability, fast response short-term energy storage can be installed in distributed generation (DG) units [9]. To overcome the aforementioned difficulties, in this paper, a comprehensive control strategy is proposed for VSCs. It augments all of the aforementioned requirements in one compact topology which has the following salient features. 1) It emulates the behavior of SMs with proper adjustment of the dc-link voltage so the power grid views the VSC dc-link as a virtual rotor. Thus, it can be easily integrated to grids with numerous SMs. 2) It introduces some inertia for the frequency, therefore the stored energy in the dc-link can be used for frequency regulation during contingencies which is the same role of SM's rotor. 3) It is feasible in both rectifying and inverting modes without reconfiguration, i.e., similar to an SM, it can be operate either in motoring or generative mode. Furthermore, since it provides bidirectional power transfer, even active loads can be used as an asset for frequency stabilization [21]. Therefore, the proposed topology can be an interesting choice for multi-terminal dc networks [22], [23]. 4) Since the controller has cascaded frequency, angle and dc-link voltage loops, it offers extra damping and synchronizing powers, therefore, it can automatically synchronize itself with the main grid; offer self-synchronization capability; and eliminate the need for a PLL. This feature is a continuation of [17], [18] where the concepts of cooperative droop and nonlinear self-synchronization are proposed. 5) Since dc-link voltage dynamics is inherently taken into account during design and analysis, it presents more practical control topology and design process. In [24], a simple control strategy for dc-link voltage regulation in frequency domain and polar coordinates is proposed; however, it lacks a comprehensive and general framework for emulating and integrating SM characteristics in VSCs. This paper presents a comprehensive framework for design of VSCs controllers with SMs behavior while the dc-link acts like a virtual rotor. 6) It yields well-defined dynamics for frequency, angle and dc-link voltage, which in turn makes power system analysis easier. 7) Similar to SMs, it has a fault-ride-through capability. Two different topologies, namely, virtual torque and direct dc-link voltage control strategies, are developed for the frequency control loop. In these topologies, the output power and the dc-link voltage are used as control variables, respectively. It will be shown that the direct dc-link voltage control presents very good performance with a simple control structure; however, the virtual torque control offers more degrees of freedom to select design parameters due to the presence of an extra power loop. For the voltage control loop, two variants are addressed to realize either a – bus or – bus operation. A theoretical analysis, simulation, and experimental results are presented to verify the validity and effectiveness of the proposed control strategy

EXISTING SYSTEM

In the existing auto power supply system has the power source only from the one source, which is solar energy. This system doesn't having the different energy sources like wind, generator, and AC main supply.

DISAVANTAGES

1. Waste of time
2. Power consumption.

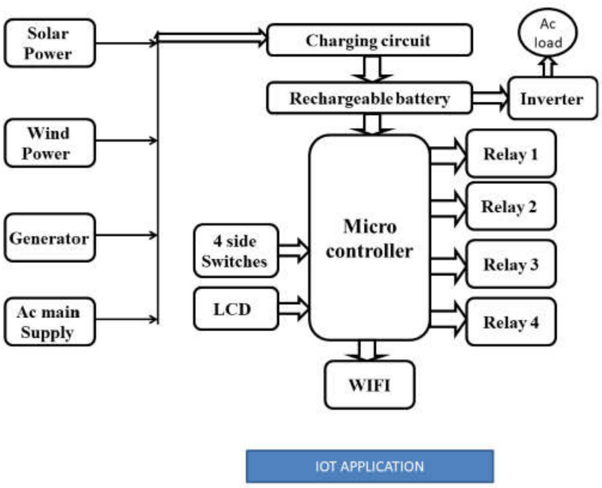
PROPOSED SYSTEM

This project uses an arrangement where four different sources of supply are channelized to a load to have an uninterrupted operation of the load. As it is not practicable to get four sources of supply such as mains supply, wind supply, thermal supply and solar supply, we use relays only. The project has taken one source of 230v mains supply and assumed as if being fed from 4 different sources by connecting all the four incoming sources in parallel as seen in the schematic circuit diagram. The ac source to the lamp is connected to relay 1 to relay 2 to relay 3 and relay four by making the entire 'NO' (normally open) contacts parallel and all the typical contacts in parallel.

ADVANTAGES

1. Automatic load secure using relays and alert information updater to user.
2. Advantages of improved power factor.
3. Better utilization of electrical machines

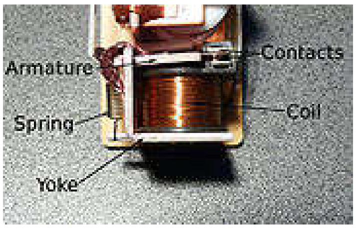
BLOCK DIAGRAM



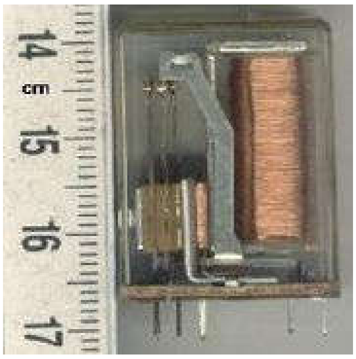
EMBEDDED SYSTEMS

Many embedded systems have substantially different design constraints than desktop computing applications. No single characterization applies to the diverse spectrum of embedded systems. However, some combination of cost pressure, long life-cycle, real-time requirements, reliability requirements, and design culture dysfunction can make it difficult to be successful applying traditional computer design methodologies and tools to embedded applications. Embedded systems in many cases must be optimizedfor life-cycle and business-driven factors rather than for maximum computing throughput. There is currently little *tool* support for expanding embedded computer design to the scope of holistic embedded system design. However, knowing the strengths and weaknesses of current approaches can set expectations appropriately, identify risk areas to tool adopters, and suggest ways in which tool builders can meet industrial needs. If we look around us, today we see numerous appliances which we use daily, be it our refrigerator, the microwave oven, cars, PDAs etc. Most appliances today are powered by something beneath the sheath that makes them do what they do. These are tiny microprocessors, which respond to various keystrokes or inputs. These tiny microprocessors, working on basic assembly languages, are the heart of the appliances. We call them embedded systems. Of all the semiconductor industries, the embedded systems market place is the most conservative, and engineering decisions here usually lean towards established, low risk solutions. Welcome to the world of embedded systems, of computers that will not look like computers and won't function like anything we are familiar with.

Basic design and operation:



Simple electromechanical relay



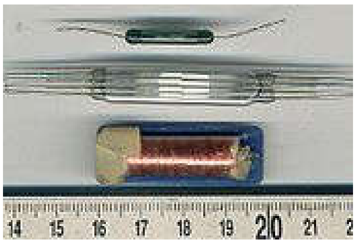
Small relay as used in electronics

A simple electromagnetic relay, such as the one taken from a car in the first picture, is an adaptation of an electromagnet. It consists of a coil of wire surrounding a soft iron core, an iron yoke, which provides a low reluctance path for magnetic flux, a movable iron armature, and a set, or sets, of contacts; two in the relay pictured. The armature is hinged to the yoke and mechanically linked to a moving contact or contacts. It is held in place by a spring so that when the relay is de-energized there is an air gap in the magnetic circuit. In this condition, one of the two sets of contacts in the relay pictured is closed, and the other set is open. Other relays may have more or fewer sets of contacts depending on their function. The relay in the picture also has a wire connecting the armature to the yoke. This ensures continuity of the circuit between the moving contacts on the armature, and the circuit track on the printed circuit board (PCB) via the yoke, which is soldered to the PCB.

When an electric current is passed through the coil, the resulting magnetic field attracts the armature and the consequent movement of the movable contact or contacts either makes or breaks a connection with a fixed contact. If the set of contacts was closed when the relay was De-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open. When the current to the coil is switched off, the armature is returned by a force, approximately half as strong as the magnetic force, to its relaxed position. Usually this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low voltage application, this is to reduce noise. In a high voltage or high current application, this is to reduce arcing.

If the coil is energized with DC, a diode is frequently installed across the coil, to dissipate the energy from the collapsing magnetic field at deactivation, which would otherwise generate a voltage spike dangerous to circuit components. Some automotive relays already include a diode inside the relay case. Alternatively a contact protection network, consisting of a capacitor and resistor in series, may absorb the surge. If the coil is designed to be energized with AC, a small copper ring can be crimped to the end of the solenoid. This "shading ring" creates a small out-of-phase current, which increases the minimum pull on the armature during the AC cycle.
A **latching relay** has two relaxed states (bistable). These are also called "impulse", "keep", or "stay" relays. When the current is switched off, the relay remains in its last state. This is achieved with a solenoid operating a ratchet and cam mechanism, or by having two opposing coils with an over-center spring or permanent magnet to hold the armature and contacts in position while the coil is relaxed, or with a remanent core. In the ratchet and cam example, the first pulse to the coil turns the relay on and the second pulse turns it off. In the two coil example, a pulse to one coil turns the relay on and a pulse to the opposite coil turns the relay off. This type of relay has the advantage that it consumes power only for an instant, while it is being switched, and it retains its last setting across a power outage. A remanent core latching relay requires a current pulse of opposite polarity to make it change state.

Reed relay
A **reed relay** has a set of contacts inside a vacuum or inert gas filled glass tube, which protects the contacts against atmospheric corrosion. The contacts are closed by a magnetic field generated when current passes through a coil around the glass tube. Reed relays are capable of faster switching speeds than larger types of relays, but have low switch current and voltage ratings.

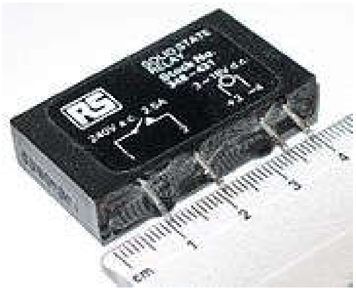


Mercury-wetted relay
A **mercury-wetted reed relay** is a form of reed relay in which the contacts are wetted with mercury. Such relays are used to switch low-voltage signals (one volt or less) because of their low contact resistance, or for high-speed counting and timing applications where the mercury eliminates contact bounce. Mercury wetted relays are position-sensitive and must be mounted vertically to work properly. Because of the toxicity and expense of liquid mercury, these relays are rarely specified for new equipment. See also mercury switch.
Polarized relay
A **polarized relay** placed the armature between the poles of a permanent magnet to increase sensitivity. Polarized relays were used in middle 20th Century telephone exchanges to detect faint pulses and correct telegraphic distortion. The poles were on screws, so a technician could first adjust them for maximum sensitivity and then apply a bias spring to set the critical current that would operate the relay.
Machine tool relay
A **machine tool relay** is a type standardized for industrial control of machine tools, transfer machines, and other sequential control. They are characterized by a large number of contacts (sometimes extendable in the field) which are easily converted from normally-open to normally-closed status, easily replaceable coils, and a form factor that allows compactly installing many relays in a control panel. Although such relays once were the backbone of automation in such industries as automobile assembly, the programmable logic controller (PLC) mostly displaced the machine tool relay from sequential control applications.

Contactor relay

A **contactor** is a very heavy-duty relay used for switching electric motors and lighting loads. Continuous current ratings for common contactors range from 10 amps to several hundred amps. High-current contacts are made with alloys containing silver. The unavoidable arcing causes the contacts to oxidize; however, silver oxide is still a good conductor. Such devices are often used for motor starters. A motor starter is a contactor with overload protection devices attached. The overload sensing devices are a form of heat operated relay where a coil heats a bi-metal strip, or where a solder pot melts, releasing a spring to operate auxiliary contacts. These auxiliary contacts are in series with the coil. If the overload senses excess current in the load, the coil is de-energized. Contactor relays can be extremely loud to operate, making them unfit for use where noise is a chief concern.

Solid-state relay



Solid state relay, which has no moving parts

25 A or 40 A solid state contactors

A **solid state relay** (**SSR**) is a solid state electronic component that provides a similar function to an electromechanical relay but does not have any moving components, increasing long-term reliability. With early SSR's, the tradeoff came from the fact that every transistor has a small voltage drop across it. This voltage drop limited the amount of current a given SSR could handle. As transistors improved, higher current SSR's, able to handle 100 to 1,200 Amperes, have become commercially available. Compared to electromagnetic relays, they may be falsely triggered by transients.

Solid state contactor relay

A **solid state contactor** is a very heavy-duty solid state relay, including the necessary heat sink, used for switching electric heaters, small electric motors and lighting loads; where frequent on/off cycles are required. There are no moving parts to wear out and there is no contact bounce due to vibration. They are activated by AC control signals or DC control signals from Programmable logic controller (PLCs), PCs, Transistor-transistor logic (TTL) sources, or other microprocessor and microcontroller controls.

Buchholz relay

A **Buchholz relay** is a safety device sensing the accumulation of gas in large oil-filled transformers, which will alarm on slow accumulation of gas or shut down the transformer if gas is produced rapidly in the transformer oil.

Forced-guided contacts relay

A **forced-guided contacts relay** has relay contacts that are mechanically linked together, so that when the relay coil is energized or de-energized, all of the linked contacts move together. If one set of contacts in the relay becomes immobilized, no other contact of the same relay will be able to move. The function of forced-guided contacts is to enable the safety circuit to check the status of the relay. Forced-guided contacts are also known as "positive-guided contacts", "captive contacts", "locked contacts", or "safety relays".

Overload protection relay

Electric motors need over current protection to prevent damage from over-loading the motor, or to protect against short circuits in connecting cables or internal faults in the motor windings. One type of electric motor overload protection relay is operated by a heating element in series with the electric motor. The heat generated by the motor current heats a bimetallic strip or melts solder, releasing a spring to operate contacts. Where the overload relay is exposed to the same environment as the motor, a useful though crude compensation for motor ambient temperature is provided.

The diagram on the package of a DPDT AC coil relay

Since relays are switches, the terminology applied to switches is also applied to relays. A relay will switch one or more *poles*, each of whose contacts can be *thrown* by energizing the coil in one of three ways:

- Normally-open (**NO**) contacts connect the circuit when the relay is activated; the circuit is disconnected when the relay is inactive. It is also called a **Form A** contact or "make" contact.
- Normally-closed (**NC**) contacts disconnect the circuit when the relay is activated; the circuit is connected when the relay is inactive. It is also called a **Form B** contact or "break" contact.
- Change-over (**CO**), or double-throw (**DT**), contacts control two circuits: one normally-open contact and one normally-closed contact with a common terminal. It is also called a **Form C** contact or "transfer" contact ("break before make"). If this type of contact utilizes”make before break" functionality, then it is called a **Form D** contact.

Applications:

SOFTWARE DESCRIPTION

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P. It offers the same connectivity and specs of the UNO board in a smaller form factor.

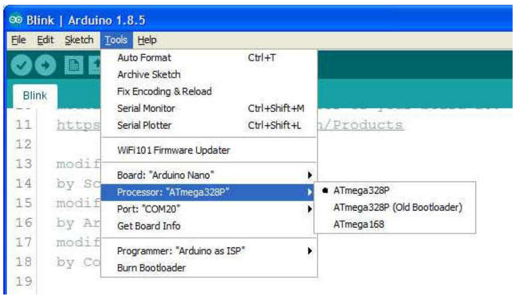
The Arduino Nano is programmed using the Arduino Software (IDE), our Integrated Development Environment common to all our boards

Use your Arduino Nano on the Arduino Desktop IDE

If you want to program your Arduino Nano while offline you need to install the Arduino Desktop IDE To connect the Arduino Nano to your computer, you'll need a Mini-B USB cable. This also provides power to the board, as indicated by the blue LED (which is on the bottom of the Arduino Nano 2.x and the top of the Arduino Nano 3.0).

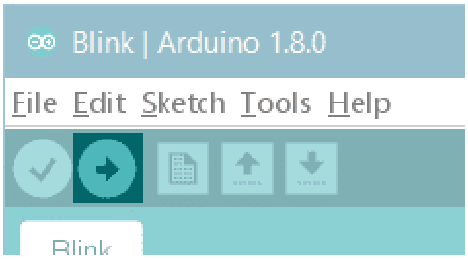
Select your board type and port

Select **Tools > Board > Arduino AVR Boards > Arduino Nano**.



Upload and Run your first Sketch

To upload the sketch to the Arduino Nano, click the **Upload** button in the upper left to load and run the sketch on your board:



Wait a few seconds - you should see the RX and TX LEDs on the board flashing. If the upload is successful, the message "Done uploading." will appear in the status bar.

CONCLUSION

This work is use to provide a continuous power to the load through any of the sources from which we are operating the device i.e. main line, generator, inverter and solar automatically in the absence of any of the source. The complete operation is based on the microcontroller. This work is a low-cost, reliable, efficient system. The work can be further enhanced by using other sources like inverters also and then taking into consideration for using the best possible power source whose tariff remains lowest at that moment.

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