

Design and Construction of an Automatic Power Changeover Switch

Jonathan Gana Kolo

Department of Electrical and Computer Engineering, Federal University of Technology
Minna, Nigeria
<jgkolo@gmail.com>

Abstract

Power failure or outage in general does not promote development to public and private sector. The investors do not feel secure to come into a country with constant or frequent power failure. These limit the development of industries. In addition there are processes that cannot be interrupted because of their importance, for instance surgery operation in hospitals, transfer of money between banks and lots more. This paper presents the design and construction of an automatic power changeover switch that switches power supply from public supply to generator once there is public power supply outage and it does this automatically. This is achieved by the use of integrated circuits that have timing abilities and relays to effect switching.

Keywords: Switching, relay, generator, motor, public power supply, transistor.

Introduction

The project is designed for power supply applications. It involves automatic changeover between the main power supply and an auxiliary power supply, such as a generator. The project implements an automatic switching or starting of the power generator whenever the main power fails. The circuit of the project consists of logical control unit and relay switches. The design of the project takes into consideration practical or real life situations, even though it is a prototype design. Irrespective of that fact, a lot of precautions were put in place to make its performance acceptable.

The basic operation of the project is to switch ON an auxiliary power supply (like a generator). This operation connects the power supply from the generator to the load after a predetermined time interval. This is intended to normalize the current from the generator. Switching is possible through the use of the relays.

The system was designed to automatically change power supply back to the main supply moments after the A.C. mains are restored and to switch OFF the generator. The device

removes the stress of manually switching ON the generator when power failure occurs.

Whenever public power supply is available, relay 3 in Fig. 4 is energized and terminals C_3 and B_3 of the relay are connected together. Whenever public power supply is cut off from the transformer, C_3 and A_3 of the relay are connected together and the power circuit is then powered through the 12V battery.

The first important action as related to the circuit is the automatic resetting of both latches through Schmitt trigger AND gate (4093B) whenever public power supply is available. The gate allows Q and \bar{Q} of the latches to be at logical zero and one respectively, this is required for normal starting state. For the motor control latch Q is connected to Q_1 (transistor 1) through the base. The NPN device controls the relay. For Q at logical 1, Q_1 is saturated and relay 1 is energized. Terminals C_1 and B_1 of the relay is connected together. The operation allows electric current to flow through the motor/starter. It is noted that one of the motors terminals is already connected to 12V+ terminals. The switching of the relay allows the other terminal to be grounded thereby completing the circuit of the electric motor.