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MATLAB Based Wireless Operation of Circuit Breaker Control

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Abstract— **This paper facilitates the monitoring of circuit breaker to trip and close by switches created using GUI in the MATLAB so as to avoid manual operation in switching the circuit breaker in the distribution system. The proposed technique is very simple and efficient operation circuit breaker. This technique can be extended for monitoring of numerous circuit breakers in the industrial distribution system. In this project we are using radio frequency which will not introduce any interference with the neighboring circuit, works accurately. The controlling of circuit breaker directly from a computer in control room can be achieved. The concept of this paper is verified with field data to show its practicality.**

Index Terms—**Circuit breaker, Transmitter/Receiver circuit, Voltage regulator, Wireless.**

I. INTRODUCTION

Now a day the demand of electrical energy is increasing, so in order to meet the increased demand, it is necessary to install more generating plants, which in turn increases the complexity of the power system. In the present days of modernization, the size and complexity of electrical network are increasing day by day. Hence power system is one of the complex networks in the world.

In order to provide continuous supply required to maintain the power system in healthy condition. This is a very difficult task in case of fault takes place. Once the fault takes place the related circuit breakers must trip in order to avoid accidents and damage to the equipment. The transformer is one of the most important devices in power system so it is necessary to provide protection for it under abnormal condition.

To protect the transformer normally using differential protection, which works when there is a difference in current flows.For the operation of differential relay usually connected with pilot cables. It is clear that pilot cable will insert some impedance in the relay circuit; if this impedance varies then there will be the difference in current through the relay and relay trips even when there is no fault. Once the relay will trip it isolates the transformer from the system, which makes big difference if it is a power transformer.

In order to avoid this necessary to adopt new technology that is wireless. In the wireless control of circuit breaker no need of pilot cables. By this method, the power loss in

pilot cables as well as avoids mall operation of the circuit breaker. In this project, the radio frequency signal which will not introduce any interference with neighboring circuit works accurately with minimum distortion.

In this project, the circuit breaker can be controlled directly from the control room by wireless. No need to bring any pilot cables up to control room from the field as we are doing now. It saves the cost of pilot cables. With the help of proper design of transmitter and receiver, we can achieve the circuit breaker operation very easily which will avoid the complicated cabling and which make the system economical.

II. METHODOLOGY

For mobility, Wireless technology is a key enabling technology that allows institutions to extend their existing network into areas where hardwiring would be expensive or difficult. It allows users to achieve total PC portability and location independence. The technology allows for rapid deployment anywhere even outdoors without the inconvenience. Wireless networks are a powerful tool for boosting productivity and encouraging information sharing. With untethered access to documents, applications and other network resources, employees can roam where they need to and have constant access to the tools required to do their jobs.

TRANSMITTER RECEIVER BLOCK DIAGRAM

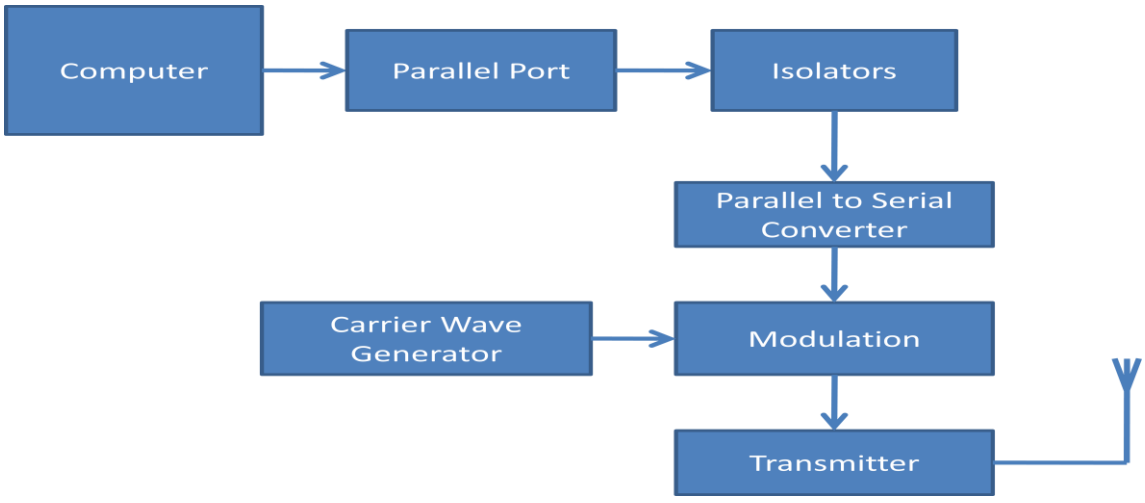

Fig 1. Transmitter circuit

The Receiver receives the signal from the transmitter and demodulation takes place and converts to parallel data by serial to parallel converter and microcontroller checks the given code to trip or close and performs that particular operation.

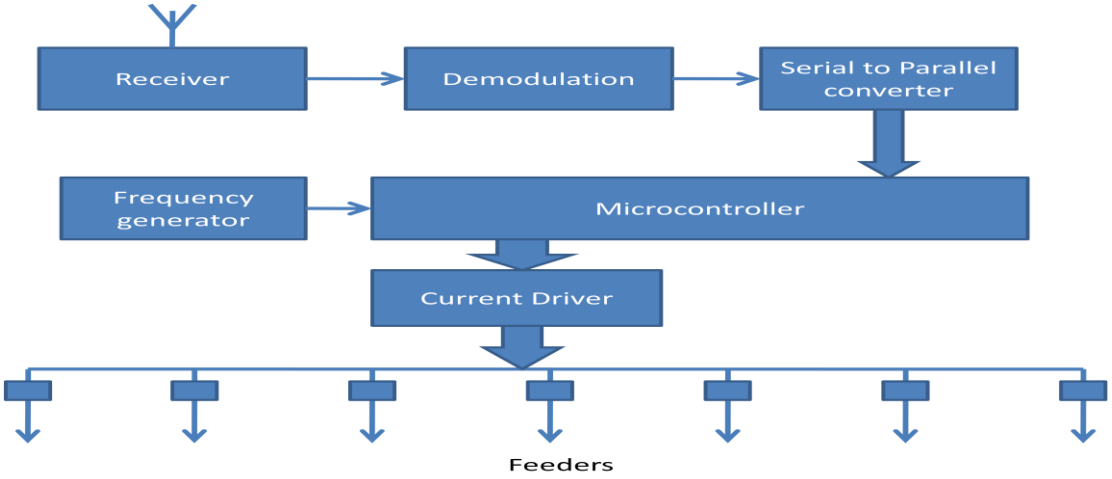

Fig 2. Receiver circuit

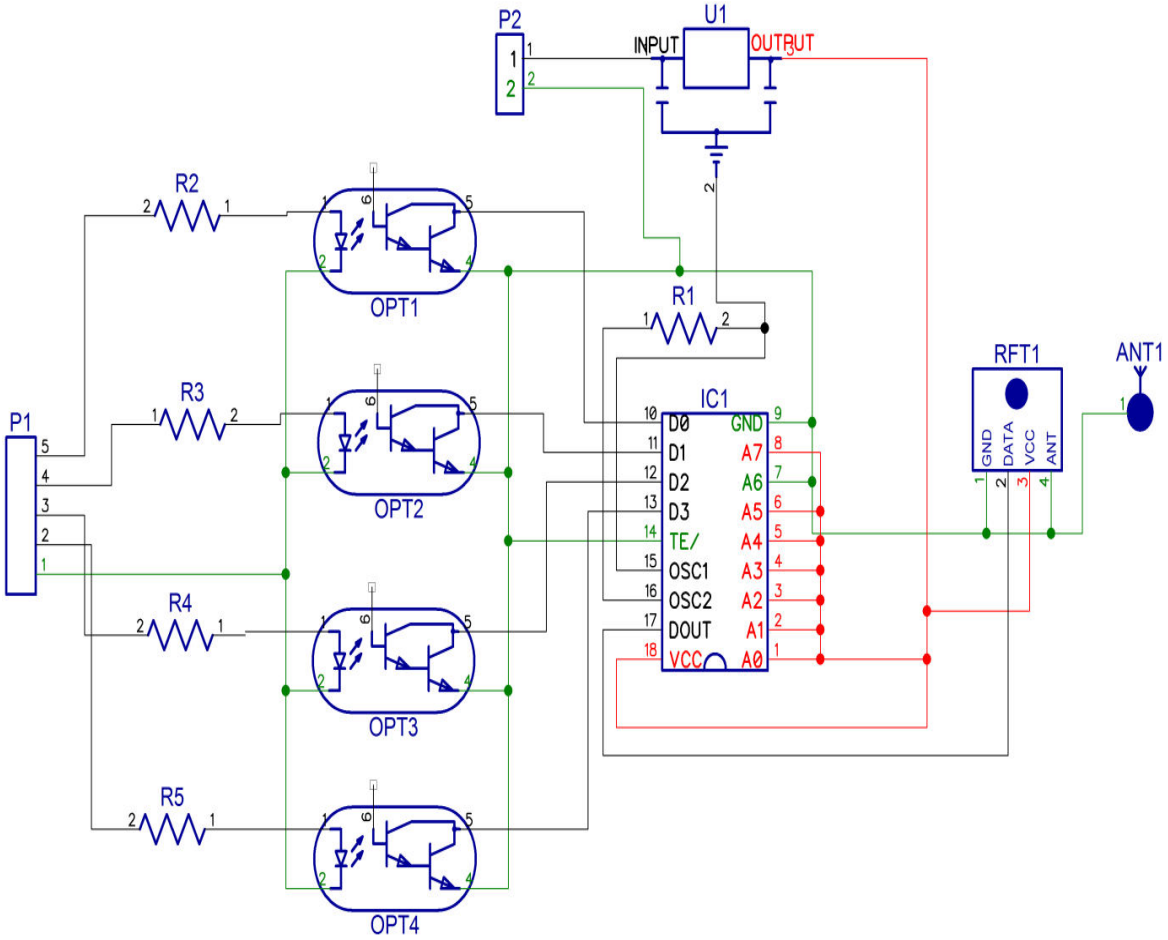

Fig 3. Transmitter circuit

The parallel port of the computer is a port through which we can communicate to the external world. It is 25 pins D type connector. Using MATLAB code we can control the parallel port pin status. In this project pin 2 to 9 are used for the control of circuit breakers. Using MATLAB code we can write 1's to these pins. In MATLAB using Graphical User Interface, we can send data to the parallel port. Once we will press a particular switch the

code behind the switch will execute and produces data at the output pins of the parallel port. The status can be read by using an optocoupler. Optocoupler senses the status of the parallel port pins as well as it provides isolation to the parallel port from the external circuit. The output of the parallel port is parallel data which will be given to the optocoupler. The parallel output of the optocoupler is converted into serial data by using parallel to serial converter. The serial output of the parallel to serial converter is given to the RF transmitter which then transmits the serial data into the air.

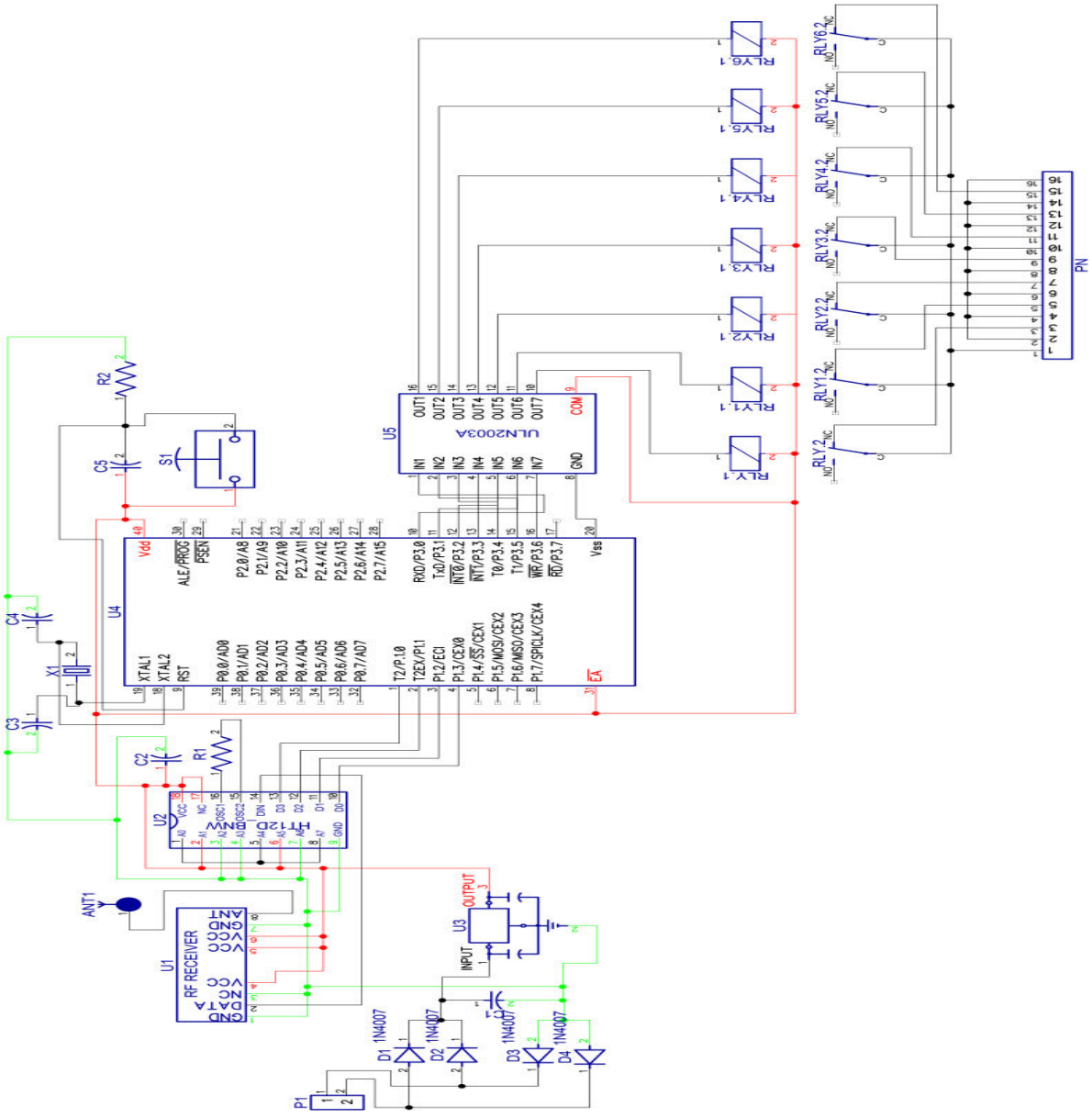

Fig 4. Receiver circuit

The RF receiver at the receiver end will receive the serial data transmitted by the transmitter. This serial data from the receiver is then given to the serial to parallel converter. The serial to parallel converter converts the serial data into parallel data. The output of the serial to parallel converter is given to the Microcontroller. Microcontroller analyses the data and produces the output. The output of the controller is given to the current driver for the

support of high current required to drive the relay. The current driver drives the relay which then controls the circuit breaker.

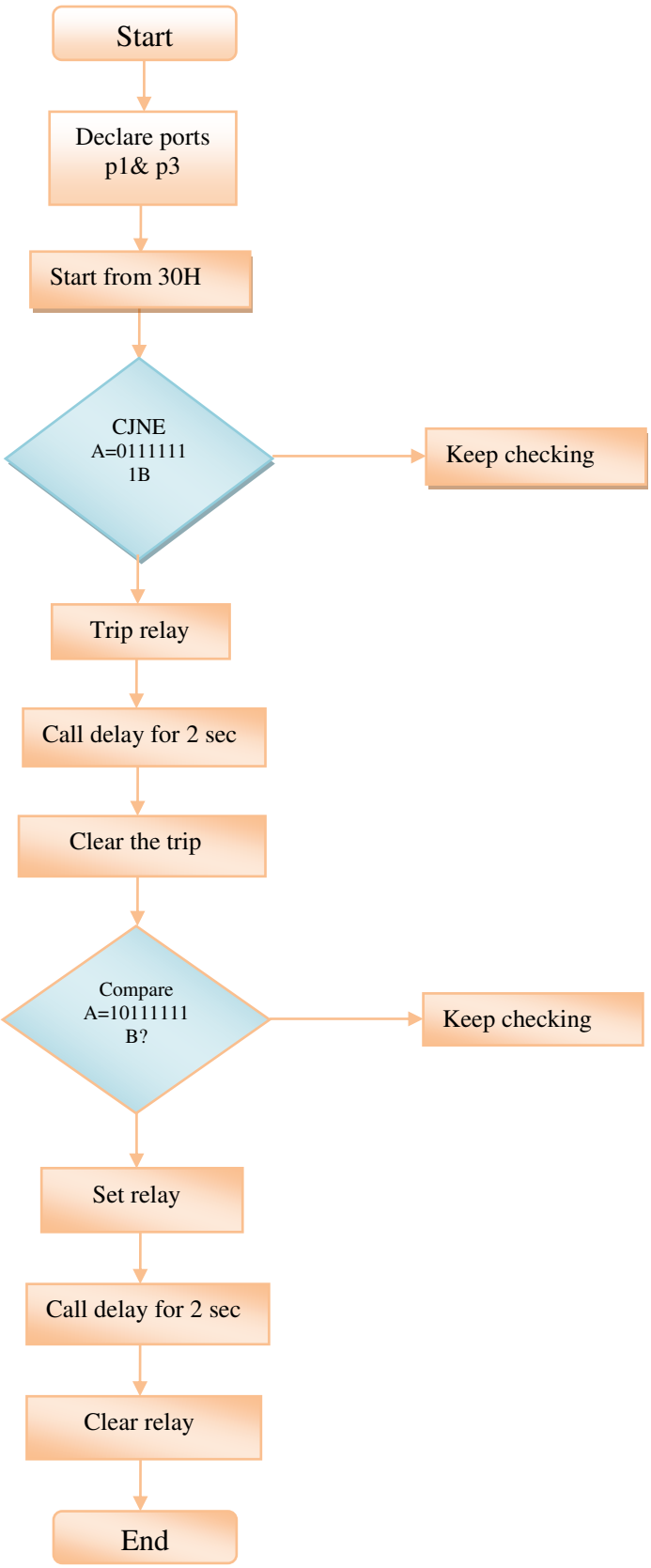

Fig.5 Flowchart

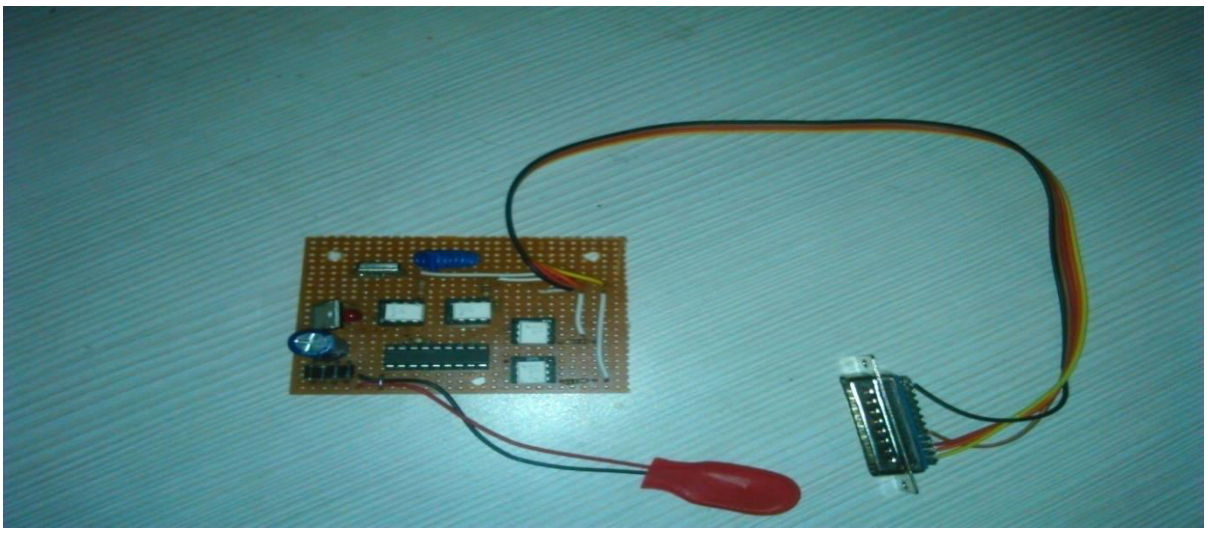

Fig 6. Model circuit (Setup –I)

Using MATLAB code we can control the parallel port pin status. In this project pin 2 to 9 are used for the control of circuit breakers. Using MATLAB code we can write 1's to these pins. In MATLAB using Graphical User Interface, we can send data to the parallel port. Once we will press a particular switch the code behind the switch will execute and produces data at the output pins of the parallel port. The status can be read by using an MC2E optocoupler. Optocoupler senses the status of the parallel port pins as well as it provides isolation to the parallel port from the external circuit. The parallel output of the optocouplers is converted into serial data by using parallel to serial converter. The serial output of the parallel to serial converter is given to the RF transmitter which then transmits the serial data into the air.

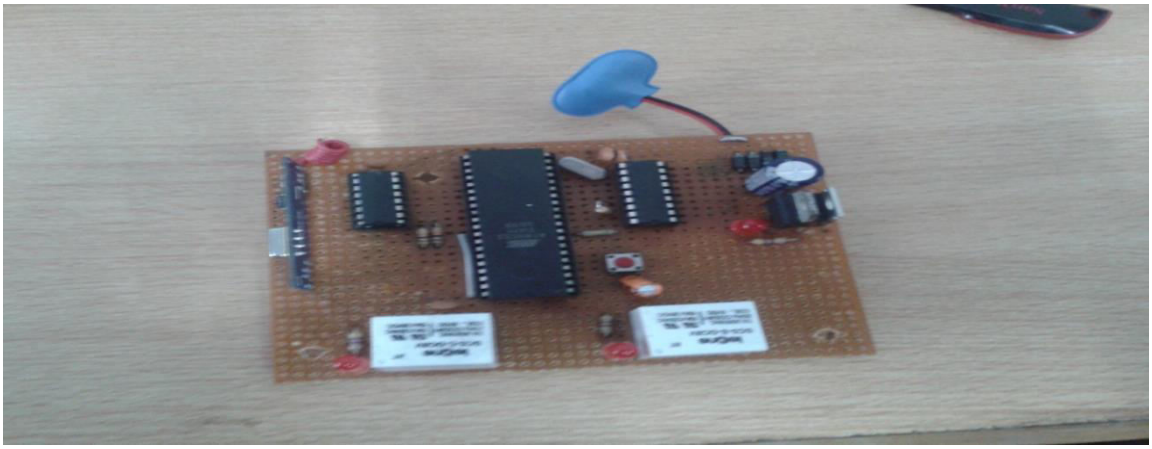

Fig 7. Model circuit (Setup –II)

The RF receiver at the receiver end will receive the serial data transmitted by the transmitter. This serial data from the receiver is then given to the serial to parallel converter. The serial to parallel converter converts the serial data into parallel data. The output of the serial to parallel

converter is given to the Microcontroller. Microcontroller analyses the data and produces the output. The output of the controller is given to the current driver for the support of high current required to drive the relay. The current driver drives the relay which then controls the circuit breaker.

IV. CONCLUSION

The wireless control of circuit breaker no need of pilot cables so the impedance cable doesn't come into the picture. The proposed technique will reduce power loss in pilot cables as well as avoids mall operation of the circuit breaker. In the method, radio frequency is used to operate circuit breaker which will not introduce any interference with the neighboring circuit, works accurately with minimum distortion. Wireless operation of circuit breaker avoids the bringing of any pilot cables up to control room from the field.

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