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Design of Remote Controlled Supply Disconnector Using Microcontroller

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ABSTRACT

This paper presents a new method of disconnection of service mains using microcontrollers and remote control. This methodology can prove to be advantageous over conventional methods as disconnection is hassle free, no risk of physical injury and shock hazards and the operation is quick and more reliable. We interface the microcontroller 8051 with R.F module and P.C.B version of power relays through relay drivers to control the continuity of supply.

KEYWORDS : Service Connection, Microcontroller, Relay, remote control.

1 INTRODUCTION

Power distribution companies in India are facing many problems involved with disconnection of service connections of defaulter consumers. This disconnection is desirable owing to many reasons such as planned or proposed maintenance work, meter replacement, house wiring alteration or the connection may be suspended on account of due payments of electricity bills.

In the conventional method for service connection interruption, a lineman climbs up the L.T. pole and manually disconnects the cable from distribution lines. Thus for a mere action analogous to turning off a switch, this method is tedious and time consuming. Other problems such as the lineman suffering an electric shock or some physical injury also show up quite often. Sometimes public agitation also causes serious problems to the distribution companies when the connection termination is due to non payment of bills.

This paper proposes a method to avoid all these troubles at a very low cost without altering, in any way, the present distribution system. The event of service connection disconnection is as simple as pressing a button the remote while standing near the pole and that is it.

2 PROPOSED METHODOLOGY

2.1 Working Principle:

The device has two units namely, the Relay-Microcontroller unit and the Remote Control Unit.

The Relay-Microcontroller unit is mounted on the pole. There is a (unique) remote for every device, hence a separate remote for every pole. The neutral of service connection is connected directly to the pole and the phase is connected to the device. The button corresponding to the position of phase connection is pressed while being in close proximity to the pole and the connection switches off.

As a button is pressed on the remote, its position is encoded by the microcontroller. Then we transmit this using R.F. transmitter. This is received by the device at the R.F. receiver and accepted by the SIPO (Serial in Parallel out) buffer of the microcontroller through RxD pin. The data is transmitted serially and comes out in parallel through this buffer. We use this 7 bit data as input to a [7 x 128] decoder through

port A. These 128 lines are used as signal input to relay driver. These relay driver ICs consist of n-p-n transistors in Darlington configuration. We use these to control relays which are bistable (latching) type relays. These relays consist of two coils, one of which is used to make contact and the other is used to break the contact. Thus, power is required only in the transient period of switching.

Hence, just by pressing a button on the remote, we disconnect the supply.

2.2 Circuit Components:

i. **For Remote Control Unit:**

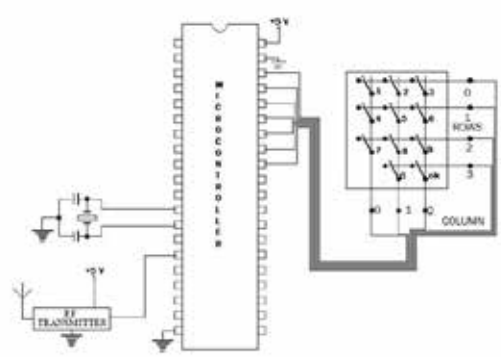
a. 8-bit microcontroller
b. Keypad (4x3 Matrix type)
c. R-F Transmitter

ii. **For Relay-Microcontroller Unit:**

a. 8-bit microcontroller
b. R-F Receiver
c. Decoder
d. Power Relays (PCB Version)
e. Relay Drivers
f. Diodes (To implement bridge rectifier)
g. Capacitors and resistors
h. Transformer (230/12 V; 1 A)
i. Voltage Regulator IC
j. Switch (SPST) and press button

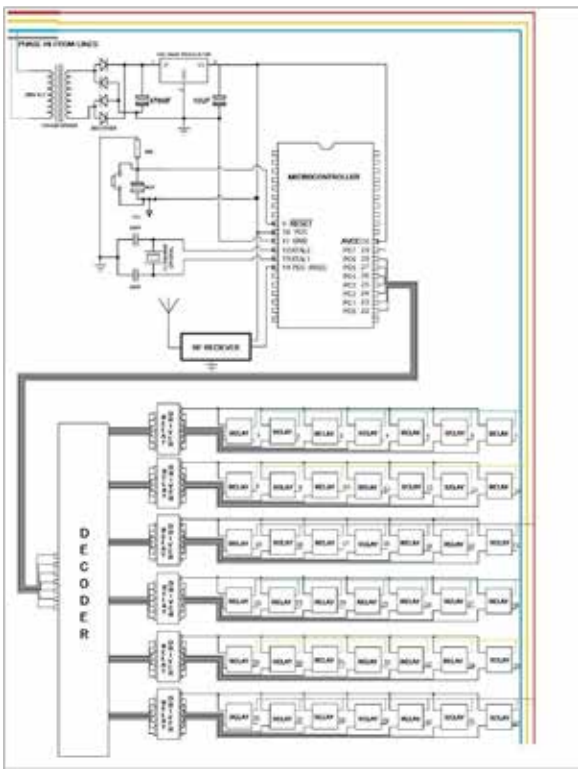
2.3 Circuit Diagrams:

i. Remote Control Unit:



KEYPAD

ii. Relay-Microcontroller Unit:



2.4 Dimensions:

- The device to be mounted will have approximate dimensions of [40 cm x 30 cm x 10 cm].
- A small box, with arrangement to lock it externally, will have dimensions of [8cm x 8cm x 5cm].

3 BENEFITS

3.1 Comfort:

Mounting this device is safe and easy. Also to operate, one has to just turn on a switch and press a button on a remote. Thus, this methodology is easy, safe, quick and comfortable to work on.

3.2 Scalability and Cost:

There is provision for having 256 connections from a single device if we use all 8 bits of the data. Thus, this methodology is easily scalable for future expansion requirements. Total Cost (per pole for an average of 15 connections) is computed approximate Rs. 2500/- per unit.

4 ADVANTAGES

The proposed device holds the following advantages

1. Prevention against electrical accidents (electric shocks).
2. Prevention from public agitation against connection termination.
3. Prevention from physical injuries involved with climbing poles.
4. Easy and quick control.
5. Prevention from chances of wrong connection termination.
6. Negligible power requirement.
7. Required manpower for connection termination is reduced.

5 CONCLUSION

The major motivation behind this paper is safety and ease of operation. The device has to be installed just once and the further new and old connections can be managed very easily. The safety of the lineman is also a major consideration. The initial cost of device can be compensated by taking a nominal amount of Rs. 120/- from every customer just once. Power requirements for the device are also negligible owing to the use of latching type relay. Using radio frequency for remote control ensures that "LOS" between device and operator is not necessary. In the event of fault in the device, the continuity of supply is not hindered. Thus, this device is highly safe and reliable.