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RF Based Multichannel Control Of Electrical Appliances

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ABSTRACT

In our day to day life science plays very important role. The various devices make our life comfortable. But still we feel that there should be atomization provided in our Home or Industry. To switch ON various Home appliances, there should be any device or remote control that can control it. So that by using this we can control different devices present in our Home. Also, in many industries for e.g. small-scale industries or in offices controlling of various devices or machines is very difficult. In industries each motor or machine is switch on or off manually. So that it increases number of labor's and time is waste. In order to avoid this, we can use this technique. Also, in Industries there are many types of machinery. For Industrial purpose we can use this. The RF based multiple channels remote control provides 1028 channels. By connecting devices to these channels, we can control them. It is convenient to use RF based multiple channel remote control for switching or controlling Home appliances and Industrial devices

1. INTRODUCTION

In today's competitive market, Industries are facing the growing demands for improving process efficiencies, comply with environmental regulations, and meet corporate financial objectives. Given the increasing age of many industrial systems and the dynamic industrial manufacturing market, intelligent and low-cost industrial automation systems are required to improve the productivity and efficiency of such systems. If one can control household devices like TV, fan, light or industrial electrical machines like AC or DC machines with a remote from a distance place just by pressing the button, life will become simpler. Remote control technology is becoming very common these days as technology advances to reduce manual work. To switch on or off the devices one has to move to the switch board which is inconvenient even for an able person. If all this manual work is replaced by a single remote control even the aged and disable person can do the task like a normal person. Much related work has been reported for the same function by different groups with different approaches. Traditionally, industrial controlling systems are realized through wired communications. However, the wire-controlled systems require expensive communication cables to be installed and regularly maintained, and thus, they are not widely implemented in industrial plants because of their high cost. Therefore, there is an urgent need for cost-effective wireless controlling systems that enable significant savings by optimizing the management of industrial systems.

The aim of the system is to provide a cost-effective solution that will provide controlling of home or industrial appliances remotely and will also enable security against intrusion in the absence of owner. In this technique there is no limitation of controlling of devices not to switching but also to vary the speed of fan or controlling speed of AC or DC motors in industries. In this project implementation, only one remote can control up to 1028 devices, it may be AC or DC Motors. This provides high speed switching and more flexibility. It has multiple ports, so connection and control of multiple devices is possible. Its practical implementation is very easy and RF module range is very high so it can control long range easily. This system can be used for industrial based automation systems, also used in small scale industries or used in offices or for Home appliances. This can also be used in Security, Data Networking, Relay controlled devices and Robotics manufacturing systems.[1]

2. BLOCK DIAGRAM AND WORKING:

This circuit utilizes the RF module (Tx/Rx) for making a wireless remote, which could be used to drive an output from a distant place. RF module, as the name suggests, uses radio frequency to send signals. These signals are transmitted at a particular frequency and a baud rate. A receiver can receive these signals only if it is configured for that frequency. An encoder/decoder pair has also been used in this system. The input signals, at the transmitter side, are taken through four switches while the outputs are monitored on a set of four LED 's corresponding to each input switch. The circuit can be used for designing Remote Appliance Control system. The outputs from the receiver can drive corresponding relays connected to any domestic as well as industrial appliances. This radio frequency transmission system employs Amplitude Shift Keying (ASK) with

transmitter/receiver (Tx/Rx) pair operating at 434 MHz the transmitter module takes serial input and transmits these signals through RF. The transmitted signals are received by the receiver module placed away from the source of transmission. The system allows one-way communication between two nodes, namely, transmission and reception. The RF module has been used in conjunction with a set of four channel encoder/decoder ICs. Here HT12E & HT12D have been used as encoder and decoder respectively.

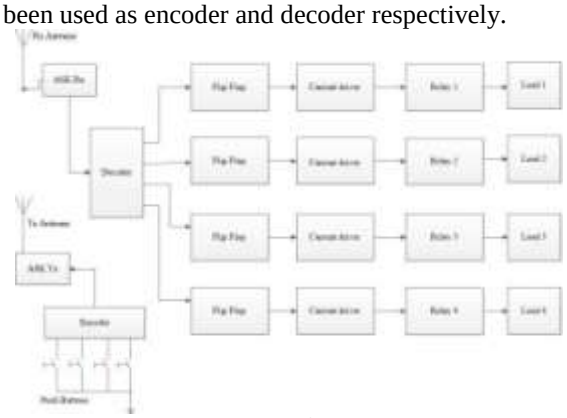

Fig. Block diagram of proposed model

The encoder converts the parallel inputs (from the remote switches) into serial set of signals. These signals are serially transferred through RF to the reception point. The decoder is used after the RF receiver to decode the serial format and retrieve the original signals as outputs. These outputs can be observed on corresponding Load. Encoder IC (HT12E) receives parallel data in the form of address bits and control bits. The control signals from remote switches along with 8 address bits constitute a set of 12 parallel signals. The encoder HT12E encodes these parallel signals into serial bits. Transmission is enabled by providing ground to pin14 which is active low. The control signals are given at pins 10-13 of HT12E. The serial data is fed to the RF transmitter through pin17 of HT12E. Transmitter, upon receiving serial data from encoder IC (HT12E), transmits it wirelessly to the RF receiver. The receiver, upon receiving these signals, sends them to the decoder IC (HT12D) through pin 2. The serial data is received at the data pin (DIN, pin 14) of HT12D. The decoder then retrieves the original parallel format from the received serial data. When no signal is received at data pin of HT12D, it remains in standby mode and consumes very less current (less than 1µA) for a voltage of 5V. When signal is received by receiver, it is given to DIN pin (pin14) of HT12D. On reception of signal, oscillator of HT12D gets activated. IC HT12D then decodes the serial data and checks the address bits three times. If these bits match with the local address pins (pins 1-8) of HT12D, then it puts the data bits on its data pins (pins 10-13) and makes the VT pin high. An LED is connected to VT pin (pin17) of the decoder. This LED works as an indicator to indicate a valid transmission. The corresponding output is thus generated at the data pins of decoder IC. A signal is sent by lowering any or all the pins 10-13 of HT12E and corresponding signal is received at receiver ‘s end (at HT12D). Address bits are configured by using the by using the first 8 pins of both encoder and decoder ICs. To send a signal, address bits must be same at encoder and decoder ICs. By configuring the address bits properly, a single RF transmitter can also be used to control different RF receivers of same frequency. To summarize, on each transmission, 12 bits of data is transmitted consisting of 8 address bits and 4 data bits. The signal is received at receiver ‘s end which is then fed into decoder IC. If address bits get matched, decoder converts it into parallel data and the corresponding data bits get lowered which could be then used to drive the LEDs.

This is a simple type remote control by using RF communication without microcontroller. In this project a remote has been designed for various home appliances like television, fan, lights, etc. It gives lot of comfort to the user since we can operate it by staying at one place. We can control any of the appliances by using this remote within the range of 400 meters. In this project consist of two sections, transmitter (remote) and receiver section. Whenever we are pressing any key in the remote it generates the corresponding RF signals, and these signals are received by the receiver unit. ASK transmitter and receiver is used as transmitter and receiver. HT12E, HT12D encoders and decoders are used in this electronic circuit.

3. CIRCUIT ASSEMBLY

3.1 Remote Section

In remote section consist of an encoder (HT12E) and a ASK transmitter. The encoder generates 8-bit address and 4bit data. We can set the address by using the DIP switch connected in A0 to A7 (pin 1 to 8) encoder. If we set an address in the remote section, the same address will be required in the receiver section. So always set same address in transmitter and receiver. Whenever we press any key in the remote the encoder generates corresponding 4bit data and send this data with 8bit address by using ASK transmitter. The transmitting frequency is 433.92 MHz the transmitter output is up to 8mW at 433.92MHz with a range of approximately 400 meters (open area) outdoors. Indoors, the range is approximately 200 meters.[12]

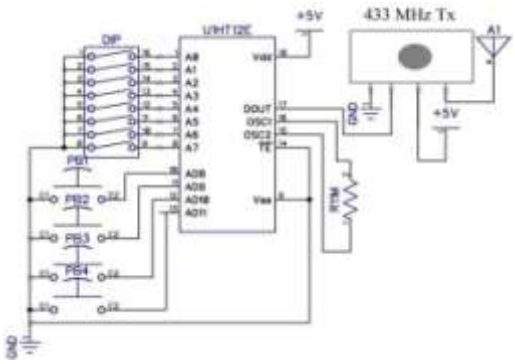

Fig. Circuit diagram of ASK transmitter

3.2 Receiver Section:

At the receiver section ASK receiver is present. The receiver also operates at 434 MHz and has a sensitivity of 3uV. The ASK receiver operates from 4.5 to 5.5 volts-DC and has both linear and digital outputs. It receives the data from the transmitter. Then the decoder (HT 12D) decodes the date and it will enable the corresponding output pin (pin 10, 11, 12, 13). Each output pins are connected to separate flip flops. The output of encoder will change the state of the flip flop. So, its output goes to set (high) from reset (low) state. This change makes a high signal in the output of the flip flop.[12]

3.3 Relay Driver Circuit:

The output of the decoder changes the state of IC CD4014. The output signal from the IC CD4017 is not capable to drive a relay directly. So, we are using current driver, SL100 transistor act as the current driver. The appliance is connected to 230V AC through the relay and the appliance will start. The relay will be re-energized when the same switch is pressed in the remote. This is because we are pressing the same switch in the remote control. The output of the decoder again goes to high so this signal will again change the state of the flip flop. So, the relay gets re- energized and the appliance goes to OFF state. [12]

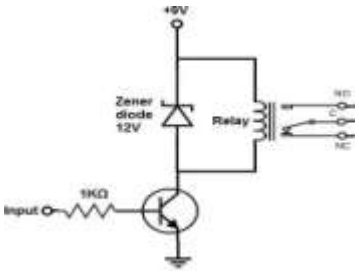

Fig. Relay driver circuit

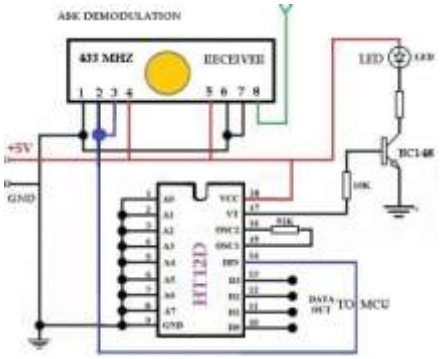

Fig. Circuit diagram of ASK Receiver

4. FUTURE SCOPE

The proposed model not only used for the switching control of single-phase home appliances but also used for the switching control of three phase any electrical appliances. Thus, it may use in agricultural as well as industrial field and it can used to control 1028 appliances without using microprocessor, so it become simple circuit. The number of appliances controlled can be increased to 9999 appliances by using microprocessor with proper programming and by using specific priority encoders It not only ON-OFF control of electrical appliances but also can be implement for speed control of AC or DC motors. The speed control of electrical motors can be

achieved by two ways viz. by mechanical coupling the DC motor with the dimmer so as to vary the speed of motor by using supply voltage control by adding series reactance‘s. In another method speed can be control by adding series resistances with phase winding of single phase AC motor but this method cannot give smooth speed control. So, the first method should be preferred over the second method. The control load monitoring can also possibly use this concept. This is useful in organizations like universities, public sector, etc. the range of RF module can be increased up to 10 km by using proper RF module.

5. RESULT AND CONCLUSION:

The gift of technology to mankind is to make life simpler. In this project, a remote control for multiple home appliances is designed, presented and implemented. The design is durable, robust and sturdy which is built with an available compact IC ‘s and RF module. From any place around the house appliances can be control at will without the requirement of line of sight. The relay action which is connected to the load to be controlled is operated with radio frequency which transmits only when a switch is pressed. Multiple devices can be control using different receiver with different addressing mode using single remote. Industrial appliances control with high degree of quality also may be achieved using this project. Traditionally, this type of control systems is realized through wired communications. However, the wired automation systems require expensive communication cables to be installed and regularly maintained, and thus, they are not widely implemented because of their high cost. Considering the dynamic market this project can provide a way to design intelligent and low-cost controlling systems to improve the efficiency of the systems

6. REFERENCES

1) Miss Sandhya H. Choudhari Assistant Professor Department of Electronics & Telecommunication Engg. Rajarshi Shahu College of Engineering, Buldhana- Maharashtra [India]. Industrial Automation through Rf Base Multi Channel Wireless Remote Controller
2) https://en.wikipedia.org/wiki/Radio_frequency.
3) RF based Remote Control for Home Electrical Appliances N K Kaphungkui Department Of ECE, Dibrugarh University, India.
4) https://en.wikipedia.org/wiki/RF_module.
5) http://www.electroschematics.com/8712/rf-based-wireless-remote-control- system/.
6)http://www.engineersgarage.com/electronic- components/ht12e.
7)http://www.engineersgarage.com/electronic- components/ht12d-datasheet.
8)http://www.electronics-tutorials.ws/blog/relay- switch-circuit.html 9)https://www.elprocus.com/ic-4017-pin-configuration-application/
10)http://www.ensigncorp.com/faq.aspx?t=What%20i s%20a%20transformer 11)http://dbpedia.org/page/BC548
12)http://www.circuitstoday.com/remote-control- circuit-through-rf-without- microcontroller
13)http://amydesscada.blogspot.in/2012/09/pcb- des.html

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