

Transformer Overload Alert with Voice Announcing Feature

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Abstract - An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Micro-controllers. Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a micro-controller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result. The project "Transformer Overload alert with voice announcing feature" using PIC16F72 micro-controller is an exclusive project which is used to detect the overload of transformer and trip the circuit automatically and also it can give the voice alert if the system detect overload.

Key Words: Regulated Power Supply, Micro-controller, Current transformer, Relay with driver, Crystal oscillator, reset, voice circuit, LED indicators

1. INTRODUCTION

The transformer is one of the good number notable families in a nation system. And it is a static gadget which transforms electrical energy from one path to an added circuit. To shelter the trans-former from atmospheric dust and dirt, it is absolutely enclosed and oil immersed. As transformer has no rotating part, the likelihood of a slip stirring in them is exceedingly rare. However, a pink drawback may be awfully treacherous except the trans-former is cursorily disconnected from the system. This necessitates ample certain fortification for transformers against probable faults. Lesser function transformers are provided with sequence fuses for defense against overloading. However, the probability of faults on intensity transformers is extra and so habitual shelter is necessary.

2. HARDWARE SETUP

The brief introduction of different modules used in this project is discussed below:

2.1 PERIPHERAL INTERFACE CONTROLLER (PIC16F72):

The PIC16F72 is a type of peripheral interface controller that is commonly used as a controlling device in electronic systems. It is a Micro-controller, which means it is a programmable digital processor with the necessary peripherals integrated into a single chip. The PIC16F72 has a memory of 4KB ROM and 128 bytes RAM. The operating voltage of this Micro-controller is usually between 2 volts and 5.5 volts. The ROM inside the Micro-controller stores the program code that controls the operation of the system, while the RAM is used to store data during program execution. The components of the Micro-controller include input/output ports, timers, counters, and analog-to-digital converters, among others. The PIC16F72 Micro-controller is widely used in various industries such as industrial control systems, automotive electronics, medical devices, and home automation systems, among others. Its low power consumption, cost effectiveness, and efficiency make it a popular choice for many embedded systems designers.



Fig-2.1: PIC Micro-controller

2.2 CURRENT TRANSFORMER:

Current transformer (CT) is a device used in electrical engineering for measuring current. It consists of an instrument transformer, plus potential transformers (PT). When the current in a circuit is too high to measure directly, a current transformer provides a reduced current that is exactly proportional to the current in the circuit and can be easily connected to measuring and recording equipment cassette tapes. In addition, a current transformer isolates the measuring equipment from potential voltage buildup in the monitored

circuit, improving safety. CT are widely used in meters and protection relays in the electrical industry.

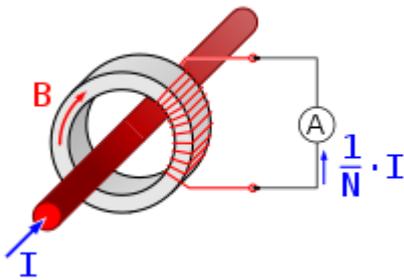


Fig-2.2: Current Transformer

The transformer is now operated by connecting the primary winding of the high voltage side in series with the power line being measured. The current flowing through the primary winding induces a current in the secondary winding, which is connected to the measuring or protective relay. The secondary current is a reduced and perfectly matched current that reflects the primary current, allowing safe and accurate measurements without exposing the equipment or the operator to the high voltage of the primary circuit straight. The two transformer wires are electrically isolated from each other and are usually rounded on a closed core column to ensure accurate and efficient wire connections.

2.3 RELAY:

Relays are widely used in many applications, including automation, telecommunications, transportation and power lines. They are often used to control circuits that operate at higher voltages or currents than can be safely monitored with conventional switches. Relays can also be used to provide galvanic isolation between power plant components, which helps prevent electrical noise and other miscellaneous interference. A relay usually consists of a coil, a movable armature and a set of contacts. When a current is applied to the coil, it produces a magnetic field which attracts the armature, causing the contacts to close. When the current is removed from the coil, the magnetic field is destroyed and the armature returns to its original position, causing the contacts to open. In addition to being used in switching and control applications, relays are also used in protection systems to help prevent electrical equipment damage due to overloads, faults, and electrical disturbances for the sake of others. These safety relays are typically designed to detect abnormal conditions in an electrical circuit and take appropriate action to protect the equipment and maintain system stability. Modern protective relays typically use advanced digital signal processing and algorithms to protect electrical systems quickly, accurately, and reliably.



Fig-2.3: Relay

2.4 VOICE MODULE:

The APR33A3 circuit is used as a voice circuit in the system. This circuit is a cost-effective and high-performance sound recorder and repeater IC that incorporates flash analog storage technology. The recorded sound is preserved even when the power is removed from the module, and the replayed sound shows good quality at reduced noise levels. The IC can be operated in two modes: serial mode and parallel mode. In serial input, audio can be recorded in 256 segments, while in parallel input, audio can be recorded in 2, 4, or 8 segments. The IC is easy to control and can be controlled by the push of buttons, as well as by external digital circuits such as micro-controllers and computers.



Fig-2.4: Voice module

3. WORKING

Transformer Overload alert with voice announcing feature

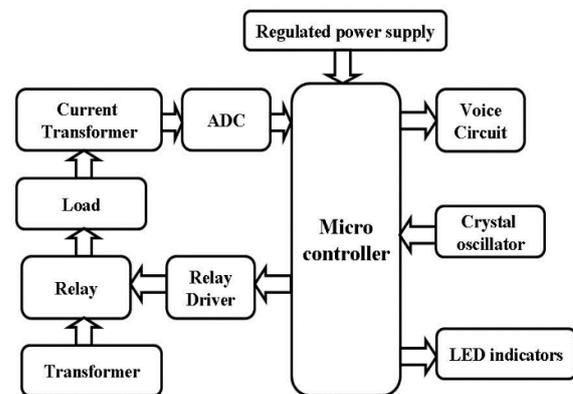


Fig-3.1: Block Diagram

The micro-controller acts as a control device for the entire system. It continuously monitors the load connected to the transformer through CT (Current Transformer) input. The micro-controller decides to trip the transformer based on the load value given in the system. The tripping is done through a Relay switch. In order to report the overload condition, a voice circuit is connected to the Micro-controller. To perform the intelligent function of monitoring and tripping the transformer in case of overload, the Micro-controller is equipped with an intelligent program written in the embedded 'C' language. The system is designed to analyze information from the CT and take appropriate action based on the designed threshold values. The use of a micro-controller and intelligent system enables the system to be more efficient and accurate in protecting the transformer from overloads. It also

makes the system easily programmable and adaptable to different load conditions.

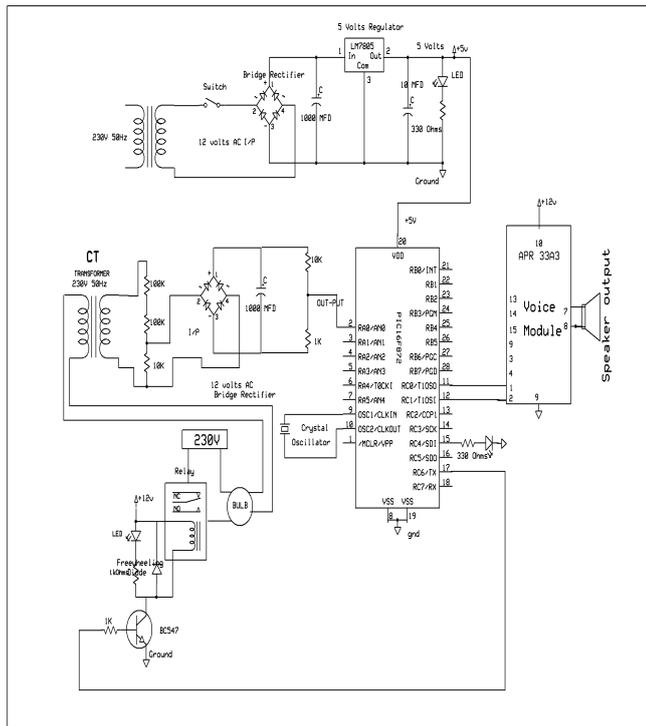


Fig-3.2: Circuit Diagram

The block architecture is shown in Fig-3.1. The micro-controller acts as a control device for the entire system. It continuously monitors the load connected to the transformer through CT (Current Transformer) input. The micro-controller decides to trip the transformer based on the load value given in the system. The tripping is done through a Relay switch. In order to report the overload condition, a voice circuit is connected to the Micro-controller. To perform the intelligent function of monitoring and tripping the transformer in case of overload, the Micro-controller is equipped with an intelligent program written in the embedded 'C' language. The system is designed to analyze information from the CT and take appropriate action based on the designed threshold values. The use of a micro-controller and intelligent system enable the system to be more efficient and accurate in protecting the transformer from overloads. It also makes the system easily programmable and adaptable to different load conditions.

4. CONCLUSION

In conclusion, the present project "Transformer Overload Alert with Voice Announcing Feature" has been developed and thoroughly tested, combining all necessary hardware components with PIC16F72. The installation and functionality of each module has been carefully considered in the design, resulting in a high-performance unit. The differential protection system supported by micro-controller and electromagnetic relay effectively protects the transformer against faults. Future work for this project includes extending the differential protection scheme to three-phase transformer protection using Arduino.

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