



STRUCTURE AND TECHNOLOGY OF THE NUMERICAL RELAY PROTECTION IN THE POWER SYSTEMS

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Abstract. Numerical relays permit development of new functions as well as development of adaptive relaying schemes. Digital relays, providing flexibility to the user and to electromagnetic and static relays are superior advanced microprocessors, and economic empowerment, increased attention to the supply and use of microprocessor-based protective relays were. This paper introduces the technology of power system relay protection. Refers to the generation of protective relays and upgrade them and eventually to relay the new generation of digital signal processing technology deals.

Keywords: Protection; relay; digital signal processing

INTRODUCTION

In the recent years, the electrical power utilities are undergoing rapid restructuring process worldwide[1]. The need to improve the technology and design of the relay protection system with high reliability and accuracy, and ensure the relay is increased day by day [2]. Growth in manufacturing technology, electronic mechanical relays generation semiconductor devices have played a significant role. Growth forward relay manufacturing technology and the impact on system performance of protective relayed, numerical had. Numerical relays so that the accuracy and reliability similar to computer systems at the start of the first self-check system also made[3]. These relayed have important features to reduce the cost and reliability of exponential growth, and fast processing and ultimately higher performance brought with them. Since numerical relay technologies based on digital signal processing are compared with the vagaries of temperature electric heating element to other previous generation of safety relays are more and more attention. Numerical relay burden is low and thus the power consumption from the current and voltage transformers, also significantly reduced compared to the older generation relays[4]. Numerical relay more flexibility than electro-mechanical relays and is static. Electromechanical relays to have several drawbacks such as high volt ampere consumption, long operating time, and mechanical parts wear [5]. Static relays, due to the inherent advantages such as small size, low power consumption, requires less maintenance and greater speed in the 70s and early 80 th increasingly used were. The successful application of static relay, but it also has some disadvantages, inflexibility and lack of adaptation to changing conditions and the complexity of the network. The use of digital protection, based on the use of microprocessors in the past two decades has been considered, and it has been mainly due to improved performance security systems. Digital relays, providing flexibility to the user and to electromagnetic and static relays are superior advanced microprocessors, and economic empowerment, increased attention to the supply and use of microprocessor-based protective relays were, For the relay for planning and more flexible than conventional static electromagnetic relays are preferred [3]. Featuring the design and manufacture of microprocessor-based relays intensified, the economy, small size, high reliability and flexibility and also has better performance than conventional relays. Today, with the use of multifunctional digital relay can have protective properties such as high-current

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protection, directional impedance, reactance, mho, rectangular achieved using hardware. With the advent of optical fiber communication, enabling the development of a network of relays numerical easily provided.

Advantages of fiber-optic transmission reliability and rapid values of current and voltage transformers and rapid processing of data at will. Numerical relays permit development of new functions as well as development of adaptive relaying schemes. Traditionally, relaying systems is designed and set in a conservative manner. They represent the compromise between [4]:

- Economy and performance
- Dependability and security
- Complexity and simplicity
- Speed and accuracy
- Credible and conceivable.

Numerical relay error function has a minimum and also allows the exact configuration of the network based on network conditions apply [6]. Numerical relays ability to store data shortly after the fault has been easily, And due to the relays by GPS time synchronization time Error parameters are precisely recorded and stored in the register. Not only can record GPS position information but also to accurately synchronize the time of sampling pulses so every event such as opening and closing of the breaker to be the accurate and continuous record that is useful in analyzing events Cannot function properly and the proper functioning of other relays and relays or other parts of the system analysis. Time sequence relay functioned to determine the cause of the accident helps [7-9].

So intricate or Black August events in the power system, the possibility of scrutiny functions to help Numerical relays that enables accurate registration of current and voltage parameters and the time they have provided and a great help to experts for analysis and simulation of power system events will. Transformers Numerical relays with a flow of current and voltage, the voltage transformers directly and will yield a protective function The need for zero sequence voltage, transformer voltage is generated in the form of an open triangle, and if need Component zero flows can also help, and neutral current transformer processing with a range of input voltage and current signals and angles is related to the type of error and accurate diagnosis and appropriate action to be differentials in the old relay polarity and continuity and change the phase and neutral application of CT was faced with the difficulty and complexity. While in protection relays Numerical done easily and without previous problems.

Relays Hardware

A block diagram of a Numerical relay shows in figure 1.

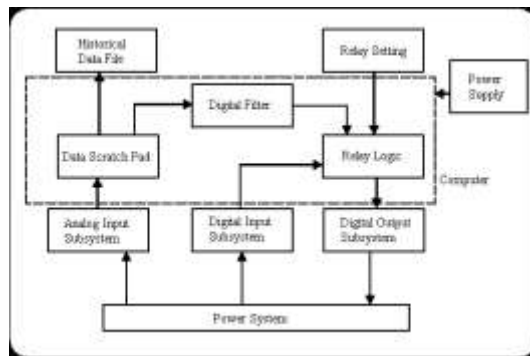


Figure 1. Block diagram of a Numerical relay.

Structure And Technology Of The Numerical Relay Protection In The Power Systems

Relays are Numerical includes the following sections:

1. Analoginput
2. Digitalinputs
3. DigitalOutput
4. Processor
5. Themainmemory
6. Supply

Voltage and current signals are analog and digital data work with Numerical Since relays the signal to an analog-to-digital converted In addition to the segmentation, and protection relays; voltage and current should be changed to suit the input relay +5. To be -5 volts, the voltage at the input of the system. This feature provides relay and analog to digital converter and is typically part of a multi-multiplexing Sample & hold analog to digital converters. Voltage and current signals are sent to the CPU [10-11].

Digital inputs and digital outputs are as well as the opening and closing the breaker, trip and alarm signals. Information was collected from entries in memory after being filtered by the central processing and analysis to help relay logic and algorithms, analysis and original signal are extracted finally, by comparing the existing configuration on the performance or non-performance of the decision will be made [12].

Analog input relays

There are two schemes for analog inputs at the same time as the other one simultaneously introduced.

1. Asynchronous designs:

For more information figure 2 shows the asynchronous design.

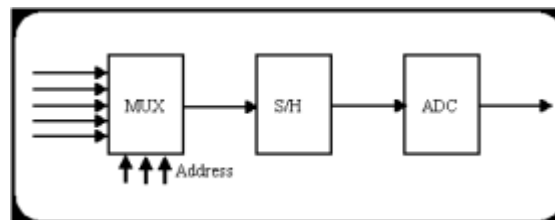


Figure 2. Non-Simultaneous Sampling Scheme.

The Plan de multiplexer, continually receives the input analog signals. Typically in the power system, there is more than one analog input and to reduce hardware costs several multi-channel analog-to-digital conversions and signals de is considered. Each multiplexer de output signal that is generated from the input signal, voltage or current signals are input. A multiplexer is de set of switches. Each analog channel can be selected using binary code, such as a multi-channel, 3 de 8 bits of address space needs. Sample and hold the analog data is maintained in Figure3.

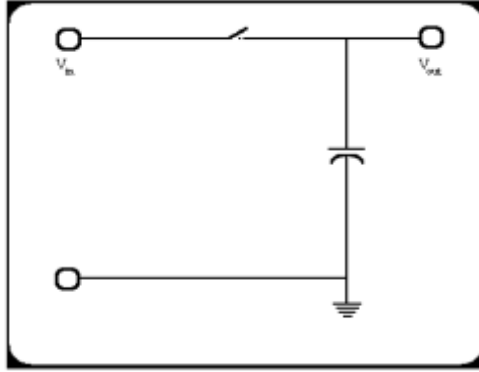


Figure 3. Sample and hold the analog data.

ADC has a limited time and Microprocessor Sample & hold also has a shunt capacitor and a switch and stored the information. When the switch is in the open position the output voltage, the capacitor is discharged and when the switch is closed will be transferred to the output voltage of the capacitor is charged and, at the same time. In the scheme shown in Fig (4) see the relative information between the signal phasor will not be retained, it is for this reason that the sampling of the input signal is not performed.

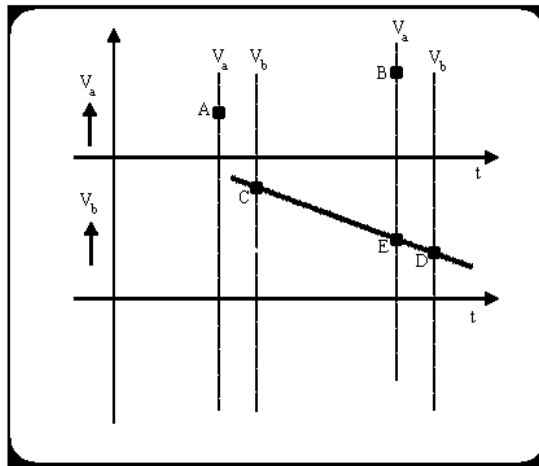


Figure 4. The relative information for the signal phasor.

2. Synchronous sampling plan:

Figure 5 shows the Sampling Synchronization. The plan is to use the number Sample & hold and preserve the relative phase information between multiple analog signals is performed. And then select the multi-channel digital signal de continuously and sequential sampling ranged from 15 to 30 microseconds would output signal The sampling rate must be applied Nyquist plot the curve, and the filter are placed in the next section. The low-pass filter to remove noise input signal values at high frequencies. Select the filter cutoff frequency and the sampling rate are of very high importance to enjoy.

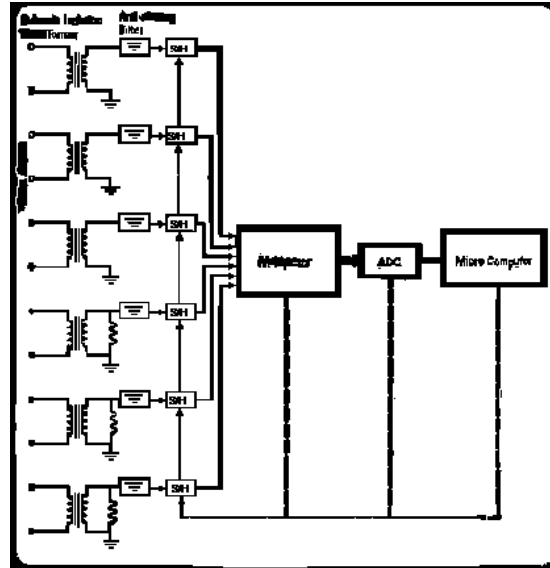


Figure 5. The Sampling Synchronization Scheme.

Relays hardware for the measured values

Design shown in Figure (5) can be used for both function and protection measures with regard to differences in the amount of faults current and accurate time measurement error can be calculated. Consider a hypothetical case where in the maximum load current are 100A and maximum fault current is 20 times this load current (2000A). Let a 12 bit unipolar ADC is used for sampling current signal. This implies that resolution of ADC is $2000 / (2^{12} - 1) = 0.488$ A. This resolution may be inadequate for metering purposes. One solution is to increase resolution, i.e. the number of bits in ADC. For example, one may use 16 bits ADC in place of 12 bits ADC. One solution is to increase accuracy, increase the number of bits of the ADC. For example, if 12 bits instead of 16 bits will be more accurate. Therefore, increasing the number of bits affected the selection process. In a well-designed set of processors with two times the number of bits used for ADC. This ensures that truncation and numerical precision problems associated with finite precision arithmetic do not cause significant loss of accuracy. For example, with 16 bits ADC, 32 bit processor is the natural choice. For example, a processor with 32-bit ADC, 16-bit would be a good choice. Alternatively, a variable gain amplifier can be used for the ADC. During high flows, low interest and low interest will be higher.

Open System Relaying

One of the reasons for the use of open systems, energy management is true, that in order for the equipment manufacturers, without changes in the SCADA system to expand their own equipment. CPU processing ability of the system to be monitored accurately and in a matter of seconds, with the progress of VLSI technology, processing speed has increased day by day. Speed with reasonable costs occurring, in other words, is economically affordable. Thus a more affordable cost numerical relays and digital electro-mechanical relays.

Self-checking and reliability

Numerical relays can be continuously and systematically check health of its members, and in case of fault alarms immediately prompt the operator to inform WATCH DOG. Visit the necessary repairs can be carried out periodically and reliability of these relays to significantly increase.

Integration of digital systems

The new power system automation process has many fans. The benefits of this project improve the reliability of the data transmission system in the context, and transmitted to the control center or server mail transmission cannot remember. Today, with digital electronic equipment above the level of the transmission and distribution substations have been increasingly expanding, and operation is easier and safer.

Flexibility and proper operation of the relay

Numerical relays is multifunctional programmable hardware and the ability to provide protection to various functions in the complex, The logic of complex digital relay protection and control by engineers and processing capabilities of the processor runs. The relays are equipped with advanced communication facilities of talk and optical fiber communications platforms are different from The possibility of communication with upstream systems without error and are easily available.

CONCLUSION

Significant changes to the structure of relay protection of power systems technology in recent decades had occurred. The process of changing the generation of static electro-mechanical relay and then to be digital relays and ending at the end of numerical. This process reduces the physical size of each relay is a relay with an increased number of functions, That this improve is due to the elimination of the additional relay, and the relay is a relay rather than While the reliability into the system is increased compared to the previous state. Besides digital relay and numerical structurally very similar and the only difference is in the processing technology. Numerical the relay instead of the CPU Microprocessor digital relay, due to constraints arising from the processing and memory capacity, the technology of digital signal processing (DSP) is used. Using (DSP) to increase efficiency and improve the basic requirements of such protection; reliability, selectivity, sensitivity, reduce costs and speed of relays, as well as real-time signal processing has improved. It so relays numerical faster and error are cleared. This extraordinary achievement of a good platform for designers to improve their protection relay and jump to next-generation technology provides. All relays are inclusive of numerical widely used in power-systems.

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