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STUDIES ON THE USE OF OSCILLOSCOPES IN THE DETECTION OF ELECTRICAL VOLTAGE SIGNALS

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Abstract. *This article discusses power quality monitoring processes and provides data analysis and reporting techniques that can be used to analyze and visualize power quality data. First of all, the concept of power quality monitoring is described, including guidelines for its implementation. The following discussion provides information on the role of standards in energy quality monitoring. A methodology to be used for reviewing power quality disturbances, including their monitoring, analysis and reporting, is presented. Then power quality measuring instruments and transducers are considered. Three reasons for power quality monitoring are detailed before the article concludes with a description of methods for analyzing power and reporting power quality data.*

Keywords: *Oscilloscope, electrical signals, sound waves, analog oscilloscope, light waves, digital oscilloscope, voltage waves, digital converters, isolated cases.*

ИССЛЕДОВАНИЯ ПО ИСПОЛЬЗОВАНИЮ ОСЦИЛЛОГРАФОВ ДЛЯ ОБНАРУЖЕНИЯ СИГНАЛОВ ЭЛЕКТРИЧЕСКОГО НАПРЯЖЕНИЯ

Аннотация. *В этой статье обсуждаются процессы мониторинга качества электроэнергии и приводятся методы анализа данных и создания отчетов, которые можно использовать для анализа и визуализации данных о качестве электроэнергии. В первую очередь описывается концепция мониторинга качества электроэнергии, включая рекомендации по ее реализации. Следующее обсуждение предоставляет информацию о роли стандартов в мониторинге качества энергии. Представлена методология, которая будет использоваться для рассмотрения нарушений качества электроэнергии, включая их мониторинг, анализ и отчетность. Затем рассматриваются средства измерения качества электроэнергии и преобразователи. Прежде чем статья завершится описанием методов анализа мощности и представления данных о качестве электроэнергии, подробно описаны три причины для мониторинга качества электроэнергии.*

Ключевые слова: *осциллограф, электрические сигналы, звуковые волны, аналоговый осциллограф, световые волны, цифровой осциллограф, волны напряжения, цифровые преобразователи, единичные случаи.*

Introduction

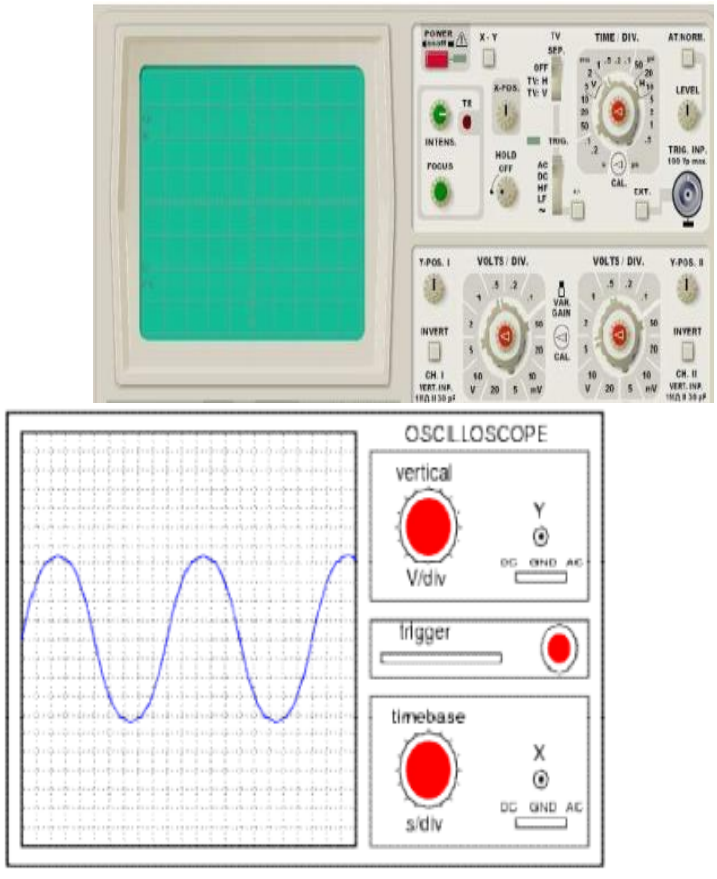
An oscilloscope is an important technological tool that can be used to test electronic systems. This allows us to to determine the indicators of electrical signals for easy analysis. In addition, using possible transducers converts various forces and energies into electrical signals, oscilloscopes can be used for observation. In terms of electronic measurement, a transducer refers to any element and produces an electrical signal in response to physical stimuli, such as sound, mechanical stress. Basically pressure, light or heat. For example, an aircraft's altitude sensor is a transducer. For example, it can convert atmospheric pressure into an electrical signal to measure altitude. Therefore, the use of oscilloscopes is not limited to them. The possibilities are endless because an auto technician can use an oscilloscope. It is also used to measure engine vibrations.

So, it becomes necessary for scientists, engineers and for technicians to know how to use an oscilloscope properly, it is necessary to know the principles and technical parameters of its operation. An oscilloscope is primarily a graphic display device. That is, it draws a graph of electricity, gives a signal and displays it on the screen. How the graph is displayed in most applications signals change over time: the vertical axis represents voltage and the horizontal axis. The intensity or brightness of the display is sometimes called the Z-axis. Possible in the graph there are many options to inform the user about the alarm. For example, it informs the user about the time limit and he voltage values of the signal the frequency of the vibrating signal and the "moving parts" of the signal creates a circuit represented by a signal. It can also tell the user how often a certain part is played. This the alarm appears against other components and if the malfunctioning component is damaged warns with a signal. In addition, the display on oscilloscopes can tell the user how much the signal is direct current DC or alternating current AC; as well as how much noise it has and whether or not noise changes over time, etc. So, the importance of oscilloscopes cannot be overstated and emphasized when it comes to electrical signal analysis. For this purpose, we have singles and doubles trace oscilloscopes. The next one can show the result of analyzing two input signals in contrast to the process. Most digital oscilloscopes (especially the more expensive ones) have a push button, instrument front panel to automatically calculate and display its frequency is sent to the input signal as a digital value. If this direct device is not available (in some digital oscilloscopes and all analog ones), there are two alternative ways of using the instrument to measure frequency. Firstly, the internal timebase can be adjusted up to the distance between two consecutive cycles and the measured signal can be read against a calibrated grid on the screen. Measurement accuracy is limited by this method, but can be optimized by measuring between points and a cycle in which the slope of the waveform is steep, usually where it crosses the waves negative effects on the positive part of the cycle. When calculating the unknown frequency from this a relatively simple process occurs over a measured period of time. For example, suppose the distance between two and with the internal time base set to 20 ms/div, cycles are 4.5 divisions. So cycle time 35 ms and therefore the frequency is 1000/35, which is 28.57 Hz. Measurement accuracy depends about how accurately the distance between two cycles can be read, and it is very difficult to reduce it the error rate is below 5% of the reading.

About the principles and parameters of the oscilloscope

Similar to multimeters, oscilloscopes also come in two types: analog and digital. An analog oscilloscope works by applying the voltage being measured directly to the circuit and radiation appears across the oscilloscope screen. The voltage bends the beam up or down and proportionally there will be options to monitor the waveform on the screen. This gives an immediate picture. In contrast, a digital oscilloscope samples the waveform and uses analog. That's it digital converters are used to convert the measured voltage into digital data. Then using this digital data is collected to reconstruct the waveform on the screen. For most applications, or analog and digital oscilloscopes are compatible. However, each type has its own characteristics. This features make it more suitable for certain tasks. Analog oscilloscopes often preferred when "real-time" display of rapidly changing signals is important. Digital oscilloscopes allow recording and viewing of events that occur only once. They are can perform the processes of processing digital waveform data or sending data to a computer for processing. In addition, they there are also options to save their data as digital waveforms for later viewing and printing. Learning new technological

measurement tools often involves learning new vocabulary. This idea is true for learning and we will learn how to use an oscilloscope. This article describes a useful measurement and oscilloscope information about the working conditions is given. A general term for a pattern that repeats itself over time is wave - sound waves, light waves and voltage waves are all repeating patterns. Oscilloscope measures voltage waves. A cycle of a wave is the repeating portion of the wave's duration. A waveform is a graphical representation of a wave. The voltage waveform shows the time. Also shows the stress on the horizontal axis and the vertical axis. Waveform shapes tell you a lot about measurement limit readings, and that's it is intrinsically dependent on signals. Whenever you see a change in the height of the waveform, you know the voltage is present and constant has changed. Any time there is a straight horizontal line, you know there is no change for that length and you establish the principle of time. Straight diagonal lines represent linear changes - we can see the voltage rise or fall at a steady rate. Sharp angles in the waveform mean a sudden change. Waves can be divided into groups based on their characteristics they are: a) Sinusoidal waves, b) Square and rectangular waves, c) Triangular waves, d) Step pulse shapes, e) Waves with complex parameters. Oscilloscopes are often thought of as portable electronic boxes that can be conveniently placed and test bench, although some new models are on hand, it will be possible to determine the performance. The front panel part of the oscilloscope includes the buttons, switches and indicators used to control the alarm on the display screen. These are the indicators display capacity is determined per unit of time. Front panel controls are usually divided into vertical and horizontal types in addition, there will be display controls and input connectors as shown. Picture 1.



Picture 1. Front view of a typical HM-7Model oscilloscope image.

This article briefly describes how to set up and run an oscilloscope, specifically how to do it. place the oscilloscope on the ground, set the controls to the standard position and pre-compensate the probe and press the button to perform various measurements. Proper grounding is an important step to installation and work with measurements or circuits. It is up to you to connect the oscilloscope to the correct ground protects against dangerous shock and grounding circuits. For safety, the oscilloscope must be grounded. Can cause high voltage circuit ungrounded oscilloscope, any part of the housing, including a button that appears isolated, protects against shocks. However, with a properly grounded oscilloscope, current flows through and the way to the earth, not to the earth through you oscilloscope means connecting it to an electrically neutral reference point (eg ground). Ground the oscilloscope by plugging the three-pronged power cord into a grounded outlet. It is also necessary to obtain accurate measurements there are different types of oscilloscopes. An oscilloscope must share the same ground with any circuit. Some oscilloscopes do not require a separate ground connection. These are the oscilloscope has insulated housings and controls that avoid any shock hazard consists of a user.

Conclusion

As for frequency measurement of electrical energy, many digital oscilloscopes have a push-button instrument on the front panel and we will be able to determine the phase of the input signal through a system that automatically calculates and displays it as a digital value. If this direct device is not available (in some digital oscilloscopes and all analog signals), approximate measurement of the phase difference between signals can be done using any oscilloscope. The two signals are applied to the inputs of the two oscilloscopes and matched and the time base is chosen so that it can be the time between the crossing points of the two signals is measured. It will be possible to measure the phase difference of low and high frequency signals. The upper frequency and voltage limit that can be measured with this method is determined by the bandwidth. Through the results obtained from this article, we have come to this conclusion, which is related to the review of performance methods we can see in the measurement sensor that it is not in the form of an easily measured voltage signal. We do a lot of research to identify different alternative forms of production that we can deal with. Now various electrical changes we study parameters such as resistance, inductance, capacitance and current phase and changes in phase or we determine their frequency capacity and electrical signals. We first learned in this study that bridge circuits are a particularly important type and variable conversion element and therefore we continued to cover them in detail. One particularly important thing we know is that there are two types of bridge chains. Using different types of them is tedious, but allows for better measurement accuracy indicators are low, which leads to preferences in the calibration of sensors. In measurement processes one for sensors that indicate changes in resistance and the other for sensors that convert what is measured quantity becomes a change in inductance or capacitance. In turn, we measurement of covered resistance (alternative methods of using a constant current bridge circuit), inductance measurement depends on capacitance measurement and current measurement. Finally, we see the roads interpret the output of sensors in the form of frequency or change in frequency and we have given information about the phase of the electrical signal.

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