
基于单片机的数字相位差测量仪设计

摘要

随着科学技术突飞猛进的发展，相位差测量技术作为一种常用的信号测量技术得到了迅速的发展。相位差测量技术已经不断渗透到动力能源、工业、航天、计算机电子技术等多个部门和领域。近年来，得到了迅速发展的新型测量技术，又提出了许多与相位测量相关的研究技术，如动态相位测量技术，对于断续信号的相位测量等等。当前，测量相位差的方法研究，理论分析计算不断趋向成熟，相位差的测量技术更加完备，相位测量仪器也实现了商品化，被普遍的推广与使用。

本次课题设计了一个基于 51 单片机的数字式相位差测量仪，控制核心为单片机 AT89C51。通过相位差测量模块，PWM 脉冲模块，显示模块完成本次课题。它能准确的测量两路交流信号频率的数值，相位差值等参数，且测量的绝对误差可达到小于 0.1° 。相位差的测量通过将两个同频但相位不同的交流信号经过整形形成方波，将得到的方波通过鉴相器得到相位差信号。再将信号发送到单片机，通过单片机内部各个部件对数据的处理，最终在液晶显示屏上显示频率与相位。本次设计相较于传统的电路系统，有硬件结构更简单，易于操作。软件程序精简，仿真运行快速，效率高的优点。

关键字：单片机；相位差；液晶显示屏

Abstract

With the rapid development of science and technology, the phase difference measurement technology as a common signal measurement technology has been developed rapidly. Phase difference measurement technology has been continuously penetrated into power energy, industry, aerospace, computer and electronic technology and other departments and fields. In recent years, the rapid development of new measurement technology, and put forward a lot of phase measurement related to the research technology, such as dynamic phase measurement technology, for the intermittent signal phase measurement and so on. At present, the method of measuring phase difference is being studied, the theoretical analysis and calculation are becoming increasingly mature, the measuring technology of phase difference is becoming more complete, and the phase measuring instrument has also realized commercialization, which has been widely promoted and used.

This subject designs a digital phase difference measuring instrument based on 51 single chip microcomputer, the control core is the single chip microcomputer AT89C51. Through the phase difference measurement module, PWM pulse module, display module to complete the project. It can accurately measure parameters such as frequency value and phase difference value of two ac signals, and the absolute error of measurement can be less than 0.1° . The phase difference is measured by shaping two ac signals of the same frequency but with different phases to form a square wave. Then the signal is sent to the single chip microcomputer, through the internal components of the single chip microcomputer to the data processing, finally on the LCD display screen to display the frequency and phase. Compared with the traditional circuit system, the hardware structure is simpler and easier to operate. Software program is concise, simulation runs quickly, the advantage of high efficiency.

Keywords: single-chip computer; phase difference; LCD

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