

BASED ON SERIAL PORT COMMUNICATION METEOROLOGY INFORMATION RECEIVING SYSTEM

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ABSTRACT

Radiophotography is being widely used in meteorological observatory, research center maritime safety office, especially in ocean-going ships. It has been proved to have paramount importance to the safety of life at sea. In this paper, a receiving system is designed to receive HF single side band (SSB) radio signal and then feed them into the computer via the serial port and properly treated there. The meteorological map could then simply be demonstrated, stored and analyzed by the computer.

Key words: serial port, meteorological map, receiving system

I. THE PRINCIPLE OF THE DESIGN

Radiophotography is being widely used in meteorological observatory, research center maritime safety office, especially onboard ocean-going ships. It is very important for safety navigation and to the safety of life at sea. But the currently existing weather FAX system and its facsimile machine with its radiophotography prints may not meet the need of requirement. Not only keeping and inquiring meteorological map is difficult onboard ship, but also receiving quality is not satisfied since the influence of environment and attenuation of propagation. Since computer has widely used onboard ships, could we design small equipment, which connects between shortwave receiver and computer? The equipment could translate the sound which receiver patters from short wave signal into the computer. No other equipment can match the superiority on computer's data storage, reproduction and handling. So computer can be responsible for printouts, image storage and do further image processing to improve the level of automation. The study has been started with the research by using a single sideband shortwave radio, which could receive radiophotography signals and convert the signals into audio frequency. The voice-frequency signal will be rectified, amplified and filtered

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through the designed hardware module, and the resulted signals is to combine SCM to make software program for achieving the corresponding function with PC computer.

2. HARDWARE DESIGN AND ANALYSIS

Meteorological information signal can be broadcasted by HF (3-30 MHz), in general for one-way transmission. Currently radiophotographs are debugged into black-and-white color base on band signals, which are correspondence to the double audio band frequencies 1500Hz and 2300Hz. The working process of radiophotography fax is as follows: First audio frequency is treated such as filter and so on, then detect enveloping signal. The envelope signal is judged and compared with the standard binary image signal (TTL Level). This binary image synchronization signal will be detected. While detecting the synchronization signal, produce reliable synchronization trip of simulation, and then is sampled by a certain of sampling pulse clock, finally print out the received meteorological chart in stylus printer.

Through detailed research, we have acquired the radiophotography signals simply by a single side band radio. The radio converts the signal into different audio frequencies, which is Base Band double audio band frequencies. From different audio frequencies, we select and keep signals, which their frequencies are 1500Hz and 2300Hz as working frequency. Then the signal is amplified by amplifiers to the voltage range that the Schmitt trigger can be handled. Schmitt Trigger, which is composed by the timer, can be appropriate to input to the SCM to analysis as TTL digital signals. The principle of hardware circuit chart design is shown in Figure 1. Audio signal uses normally pulse code modulation (PCM-Pulse Code Modulation) to achieve conversion from continuous analog signal to discrete digital signal. Meanwhile Schmitt Trigger has a digital transmission gate, which is a characteristic of lagging. Its circuit has two threshold voltages, will be known as the positive threshold voltage and the negative threshold

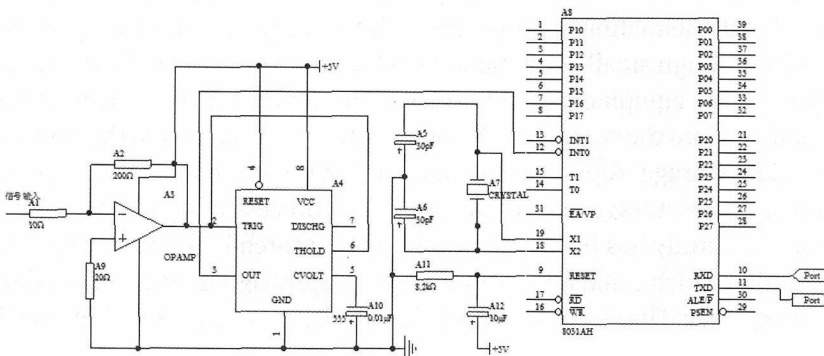


Fig. 1 Principle of hardware circuit chart

voltage. Schmitt trigger belongs to the “trigger level” - type circuit, is not dependent on the steep edge pulse, which is different from monostable trigger and bistable trigger. Schmitt Trigger, which is composed by timer, can be appropriate to input to the SCM to analysis as TTL digital signals.

The standard TTL digital signal from the Schmitt Trigger is output and received by SCM. According to detecting level value from external interrupt INTO, let internal timer in SCM to record INTO cycle of high and low levels, and will send the recorded signal through the interrupt from the serial port communication. The standard TTL digital signal handled by Schmitt trigger for processing and controlling, and link with computer RS232 serial port through the common conversion chip MAX3232 . The signal information will be sent into the computer through the computer’s serial data bus for achieving some operation linking with the meteorological signal. RS232 serial port is shown in figure 2. When SCM microprocessor sends data, the data is paralleled into and sent to the SBUF. At the same time SCM start TXD pin of serial mouth to send data. When finish sending a frame of data, that is, the SBUF is empty, set the TI (which is interruption sign) to send the CPU with interrupt request. CPU response to the interruption, the software will use TI reduction after software’s interruption. Repeat of the writing of next frame data in SBUF until completing all the data sending.

Computer RS-232 serial port provides the logic level, which is different level from the general processor and the SCM. Serial communication is a means of communication that every bit data of one certain information will be transmitted sequentially. The signal accessing to host computer, which is recorded in the 16-band signal manner, will carry on the distinction and post-processing.

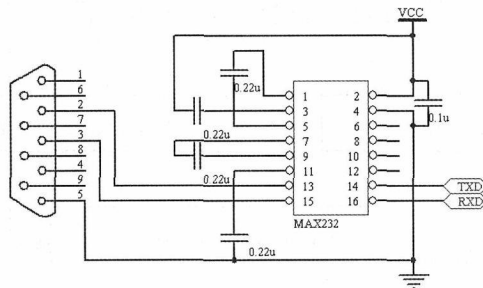


Fig. 2 RS232 serial port communication

3. SOFTWARE DESIGN AND ANALYSIS

In this research, the host computer establishes the communication with the SCM on the procedures using Visual C++6.0. The SCM will adopt 51-series SCM and the procedure is carried on with the compilation of C51 language. We need to set up the serial port communication parameters before serial mouth communication, including communication's baud rate, data bits, initiation bit, stop bit, the test bit of odd and even number and etc. For SCM, some parameters are fixed, such as data are the bits of eight, initiation bit and stop bit are one. The variable parameters include baud rate and the test bit of odd and even number. In addition, we should decide the agreed data format of communication, the control method of data flow and so on. The software system design has two parts.

The SCM software design: The interruption by external 0 (both INTO) access to the TTL signal, which is reflected by weather fax signal and output and processed by Schmitt trigger. When the SCM detect the high level from the INTO, immediately start the internal timer/register 0(both T0) to count with the machine cycle decided by CPU. T0 will stop counting as soon as the INTO's high level is terminated. The value of counting is deposited into TH0 and TLO directly and make transmission to certain unit in internal memory. Meanwhile set up serial transmission parameters and carry on serial data transmission. The low-level duration on INTO can be recorded through internal timer/register 1(both T1) in the same principle.

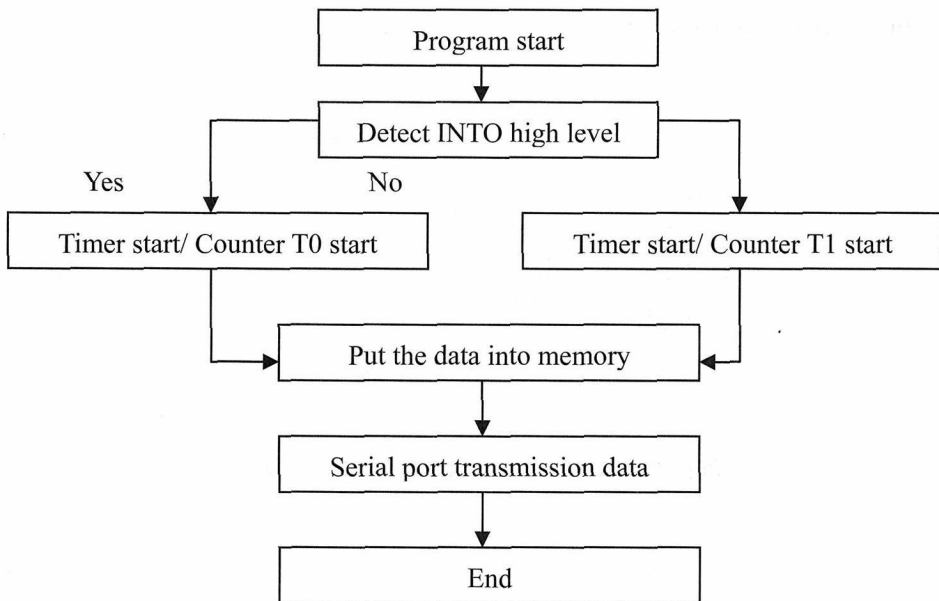


Fig. 3 Program flow structure

The flow chart used by the compilation language is shown in figure 3.

The software design in the host computer: The reception and processing of data will be carried out through the serial port. Firstly, we can use C Serial Port class, which is based on multi-thread. To receive data, its workflow is followed: First, the serial mouth parameters are set up, start the serial monitoring thread on work. The serial monitoring thread monitors the data received by serial port, the incident by flow control or other serial incidents received, then give the information to notify the main procedure, and inspire information processing function for data controlling. Secondly, we can use the MSComm controller (Microsoft Communications Control) carried by VC in serial communication for data reception, which is provided by Microsoft as ActiveX controller, function better. It provides a series of using interface with standard communication orders, and serial link can be established for using it. MSComm controller provided communication handled in two ways: event-driven communications and inquiry method.

Use the MSComm controller in this subject, the first procedure is to establish procedural framework based on single document using VC++6.0; Then cite the head document and declare variables; Load controller and set up its attributes; Send data-requests; Receiving data and handle; Close to the serial port opening.

4. CONCLUDING

From the perspective of technical development, meteorological information of shortwave receiver is get on the transition from a totally functional hardware for receiving to the direction of hardware and software combination, from hardware modules to software forms, from the simple combination of modules to the common hardware platform based on computer as a core. This is a general trend. No other systems cannot match superiority of this manner in which short-wave wireless information is received and handled with the use of the host computer combined with other equipment.

However, electromagnetic wave transmission in short waves has “fading” phenomenon during the weather fax map sending with the use of short wave. The SNR of meteorological map, which is received already, is lower if level interference added in the environment is high, and even make the quality of maps poorer. This is present as the major problem update. First, to overcome the “decline” of the phenomenon and improve signal-to-noise ratio of output signal it should improve sensitivity and automatic gain control performance of weather fax receiver. Moreover, effective measures to interference should be taken in the analog signal preconditioning stage so as to ensure minimize interference effects in the fax image signal that is input into host computer.

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