

## The Design of the UAC Ground Station Controller

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**Abstract.** Take-off and landing UAV need through landing the manual control of the controller on the ground, landing on the ground controller design decides the security and reliability of the aircraft during take-off and landing. Because of the complexity of the tilt rotor machine body structure, the number on the steering gear and its control system is numerous, channel number is less, while the ground controller and a control area small, low accuracy of shortcomings, cannot be used to direct control of high precision, more steering gear rotor machine. Therefore, independent design accord with the characteristics of rotated rotor craft landing on the ground controller is very be necessary.

### Introduction

The take-off and landing stage in unmanned tilt rotor machine, due to the complex terrain of landing and flight attitude control is difficult, the ground operators need to rocker landing on the ground controller to control the artificial take-off and landing aircraft. In order to make the aircraft landing task height, high reliability, according to the characteristics of tilt rotor machine, the paper puts forward a set of landing on the ground controller hardware design.

### The Controller

We are landing on the ground controller is designed by a portable remote controller, sending and receiving controller, portable computer of three parts. All three are independent small enclosure structure appearance, easy to carry and wild. The two power supply modes: 220 v power supply, electric or external battery power.

### The Main Function and Working Process of the Controller

**Landing Control.** In helicopter landing mode, send and receive the controller on the remote control of push-pull type rocker analog information digitization, after filtering by radio transmission, motor and various steering gear control unit, realizes the rotated rotorcraft smooth take-off and landing.

**Mode Conversion.** When rotated rotor craft take off by the switch on the remote control switch to the rotated rotor craft cruise mode, the plane flew into the automatic state; End of the cruise, shut off the remote control automatic cruise flight switch, manual control plane landed.

**Servo Control and Information Display.** Before the start of the mission, in the process of the flight and can independently by the controller to adjust on board the steering Angle, realize the flight attitude control and correction. In order to convenient manipulation, we joined the display design in the system, controlled by the LCD shows the potention meter real-time control information, to enhance the level of human-computer interaction and accuracy. The screen can be in the control system operation process real-time display the current operation of each channel number and each switch, and the digital control code, and can display the current console information, make the operation more convenient and simple, be clear at a glance.

## The Single Chip Microcomputer Circuit Board Design

This system controller circuit design includes the following contents: the C8051F020 micro controller parts, power conversion, serial, keyboard and external button access part and LCD display access part, etc. Design the total circuit diagram is shown in Fig.1.

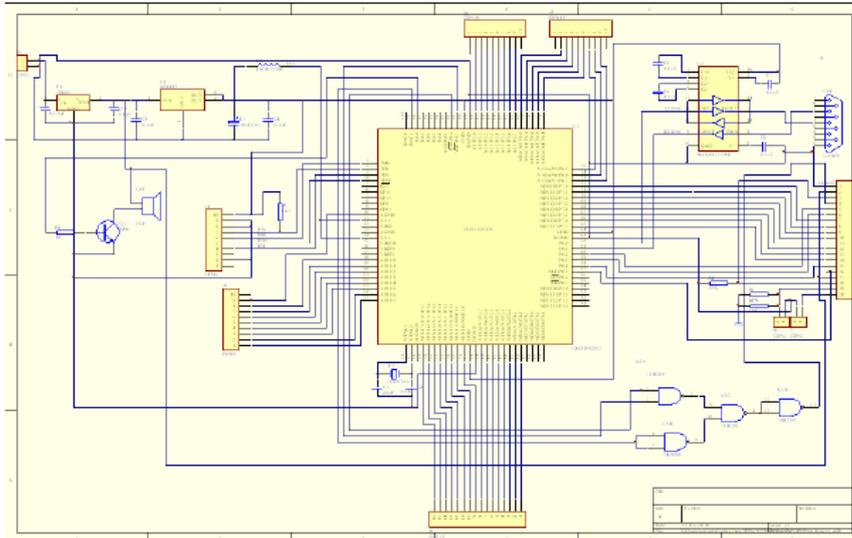


Figure 1. The overall circuit diagram

**Prior to Regulate Circuit Design.** In order to improve the AD conversion accuracy, eliminate noise interference, in front of the number 8 AD transform input to increase the level of prior to regulate circuit, consists of following circuit and filter circuit. Follow the role is to improve the driving ability of the circuit, the second order as filter circuit, voltage control circuit of rocker arm controller input voltage filtering.

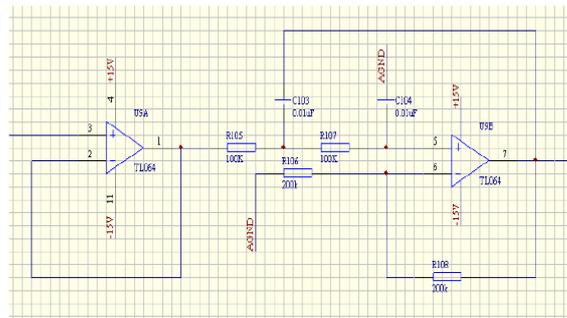


Figure 2. prior to regulate circuit diagram

**Prior to Regulate Circuit Simulation.** Prior to regulate circuit including the following two parts of the circuit and filter circuit, low pass filter for the rocker arm controller voltage input, using the Multisim circuit simulation software to simulate the circuit as shown in Fig.3.

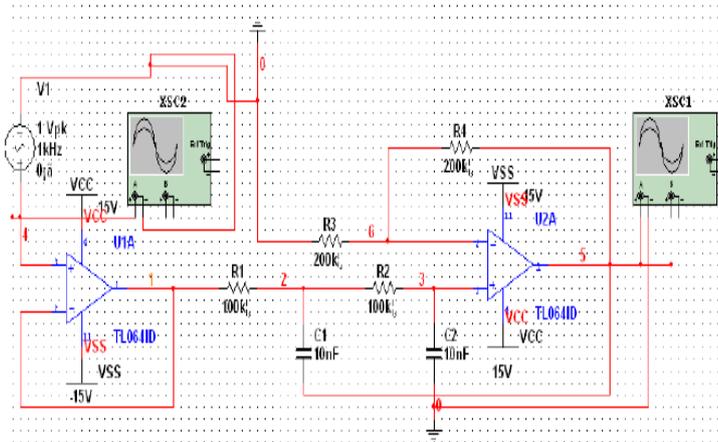


Figure 3. Multisim simulation circuit diagram

We use voltage deviation value of 4.5 V, the peak of 1 V as a source of sine wave, the signal after filtering circuit relatively stable output signals, proved to regulate circuit before filtering effectiveness, effect as shown in Fig.4.

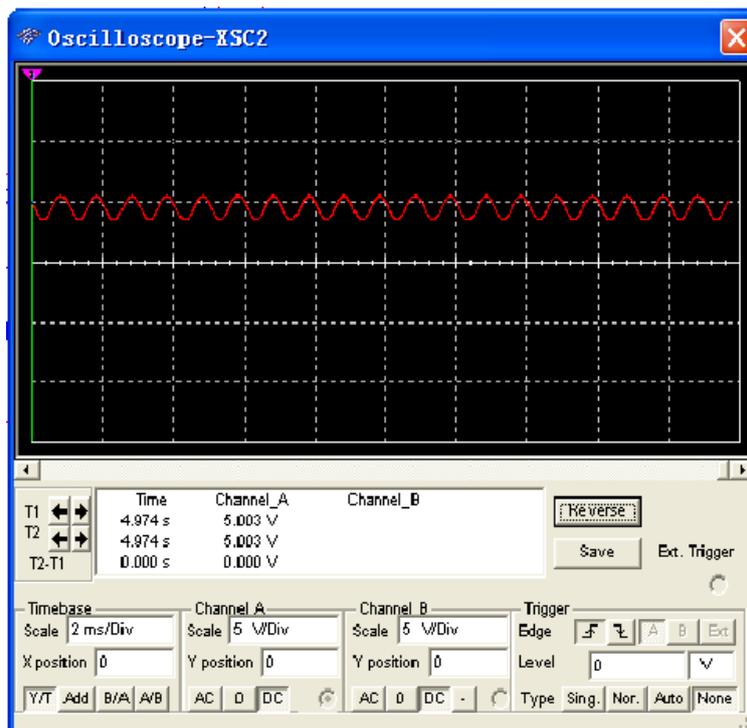


Figure 4. input signal waveform diagram

The signal after filtering function waveform as shown in Fig.5.

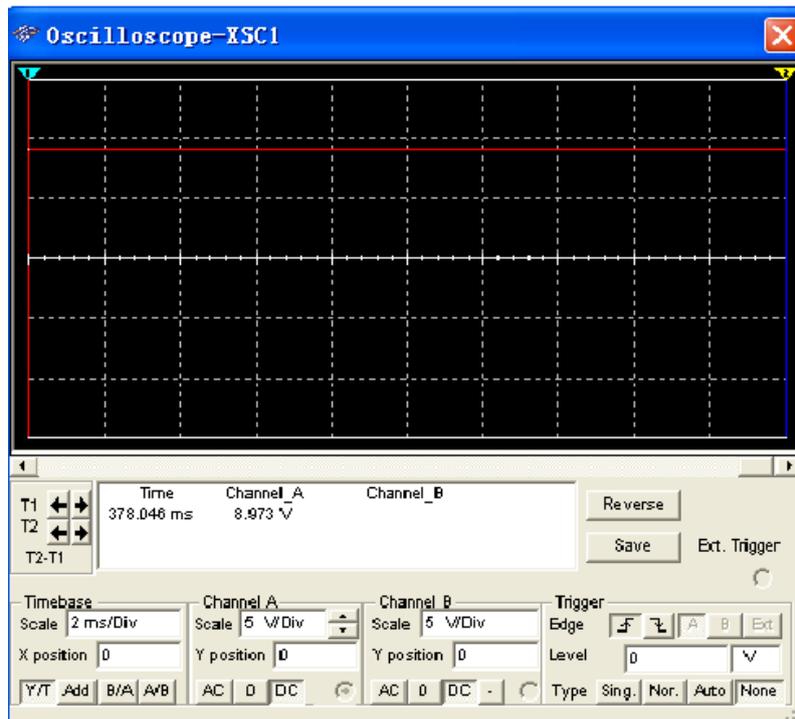


Figure 5. output signal waveform diagram

## Summary

Controller main function is: the joystick control of digital signal processing, communication between control system and airborne systems, control of information display, rotor craft take-off and landing, hovering flight instruction such as output, rotated rotor craft manual control mode and automatic cruise mode switch, receiving computer default instruction and so on.

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