

8101

1 Operation Description,

This produce including transmitter handle and receiver, is one kind of radio control system for the boat. Through the TH. trigger and steering knob, it controls the throttle and direction of the boat(or other targets) .This product uses FM modulation and the antenna gain of the transmitter handle is less than 2.5dbi.

8101 操作描述

一. 操作描述:

该产品是一款遥控船的遥控设备，包括发射手柄和接收机两部分，通过操作遥控手柄上面的油门扳机和方向旋钮可以控制控制目标（船）的油门大小和转向，该产品是一款无线遥控设备，采用调频调制方式，发射手柄的天线增益小于 2。5dBi.

2 Rationale

A Transmitter Part

ST.Wheel and TH.trigger on radio control (as pic.1 J1, J2 show), the potentiometer sent a frequency to relative position after receive an order from user. MCU (U1) collects the two-way frequency and change to digital signals through inner ADC. Then MCU making PCM code according to these two signals. After that, the coded PCM signal will be output through the 6th pin of U1. The output PCM signal will be added to VCD (as D3 in pic.2) by R11 and R12, meanwhile The PCM signal on the base band will modulated to radio-frequency carrier. Pic 2 is VCO

diagram of the handle. The regulated wave will be coupled to Q3 base through C7, then the **amplification circuit** of common emitter consisted by Q3, R5 and R14 will buff and amplify the signal to next amplifier which is an **amplification circuit** composed by Q3,R5,R14.The circuit works on the condition of AB class and the stimulated signal will be coupled to power amplifier by C9. Then the high frequency signal will enter to loop antenna by LPF and matching network composed by C20, L8, C21, L4, and C14. L5 , which is load coil of the antenna, will be resonated with the antenna at 75Ω ,and the regulated wave will be radiated to the air.

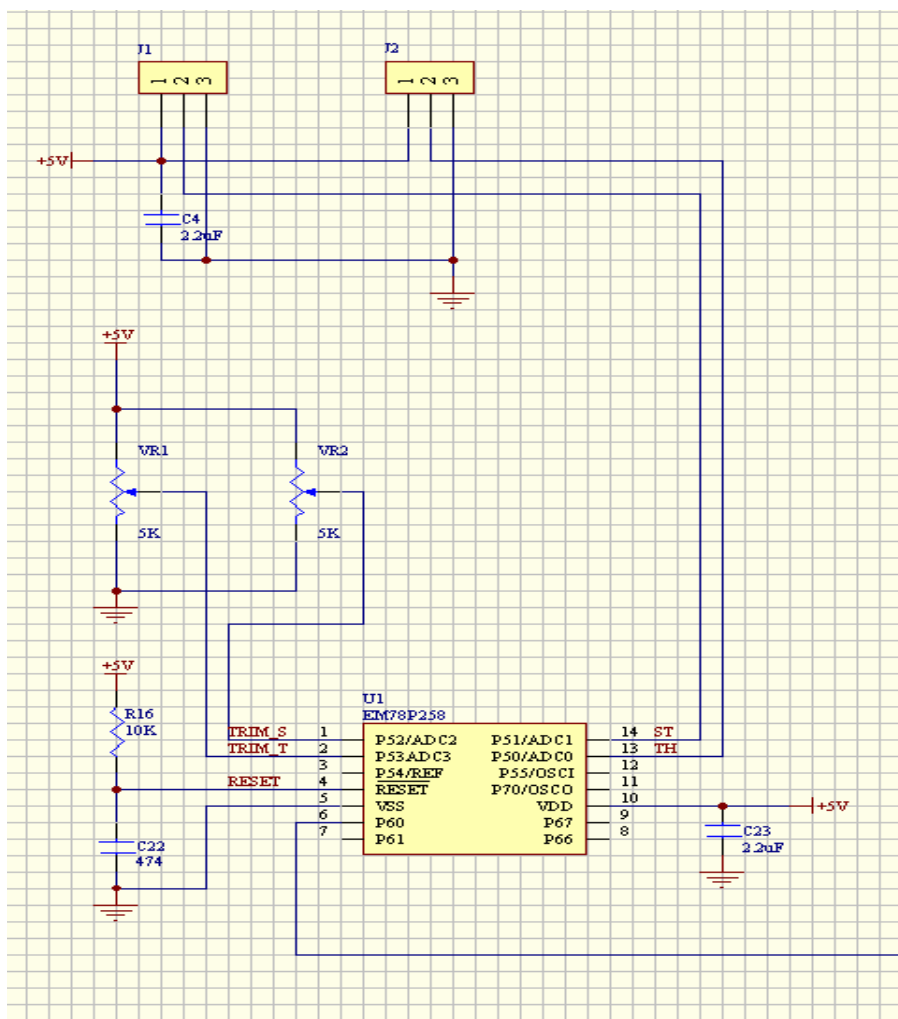
B Receiver Part

Radio-frequency carrier will enter into Q1 TX pole through receiver's antenna. The common base amplifier circuit composed by Q1, C9, R5C3, L1 will enlarge the signal. Then it will be coupled to the 14th pin of U2 by C4.This signal will be demodulated to base band signal by mixing, ZF, and frequency discriminator. Radio-frequency receiver circuit pls ref to pic. 4.

二. 原理描述:

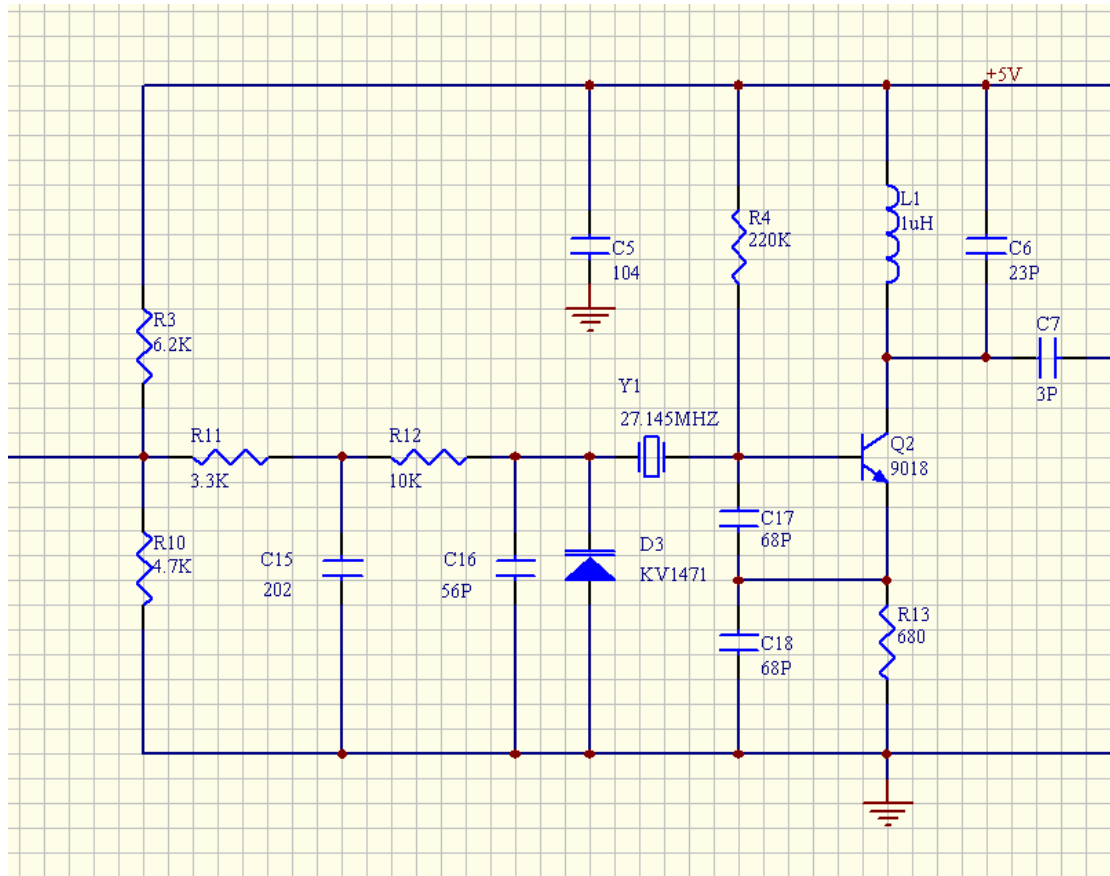
1. 发射部分:

遥控手柄上的方向旋钮和油门扳机（图中 J1, J2 位置）电为器接受用户的指令输出一个和位置对应的电平，MCU（U1）通过内部的 ADC 采集这两路电平转换成数字信号，MCU 根据这两路信号进行 PCM 编码，经过编码的 PCM 信号由 U1 的第 6 脚输出 。



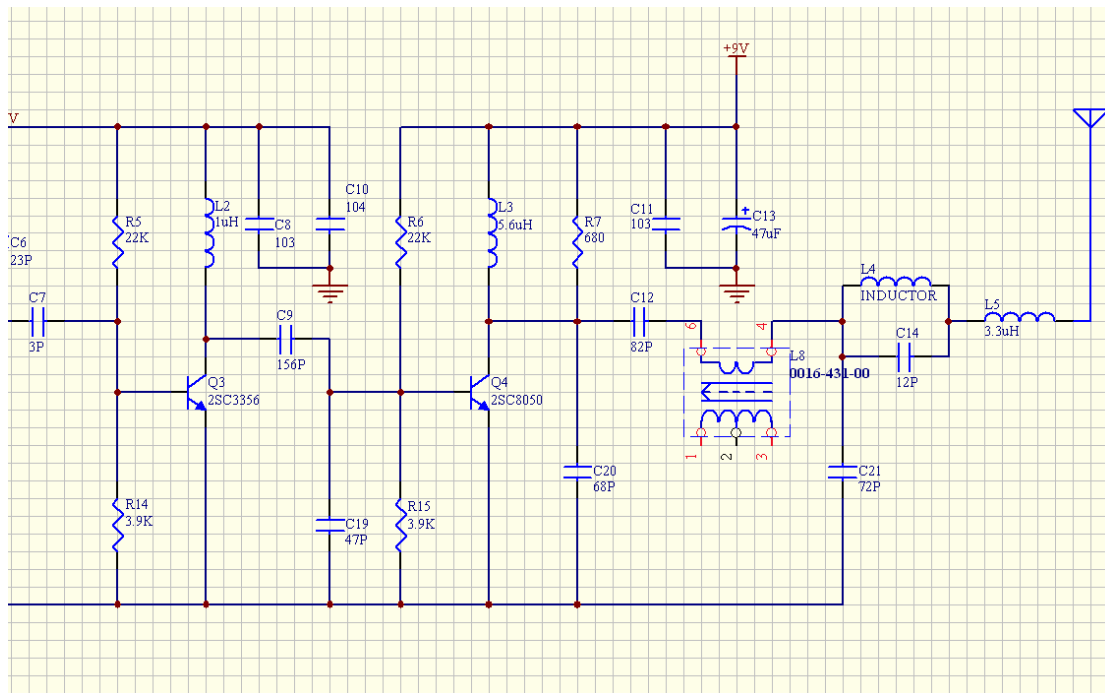
Pic 1 Microprocessor microcircuit

第 6 脚输出的 PCM 信号经过 R11 和 R12 加到变容二极管 (D3) 上, 从而把基带的 PCM 信号调制到高频载波上, 下图是手柄上的本振电路。



Pic 2 The oscillator part of the circuit

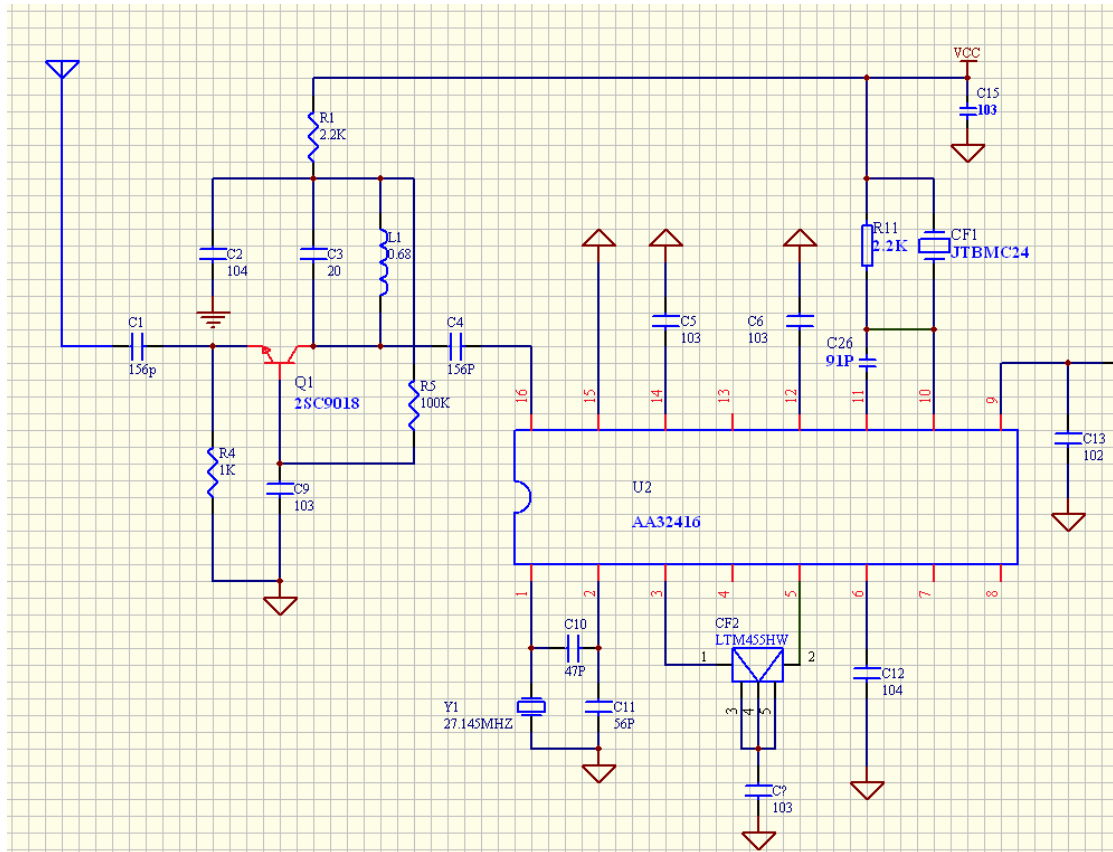
已调波通过 C7 耦合到 Q3 的基极，Q3、R5、R14 组成的共发射极的放大电路对该已调波信号进行缓冲放大激励下一级功放级，功放级是由 Q4、R6、R15 组成的共发射机放大电路，该电路工作在 AB 类放大状态，激励级的信号通过 C9 耦合到功放级进行功率放大，放大后的高频信号通过 C20、L8、C21、L4、C14 组成的低通滤波和匹配网络进入天线回路，L5 是天线的加感线圈，L5 和天线谐振在 75 欧姆上，已调波经过天线回路辐射到空中。



Pic 3 Incentives and power amplifier control circuit

2. 接收部分:

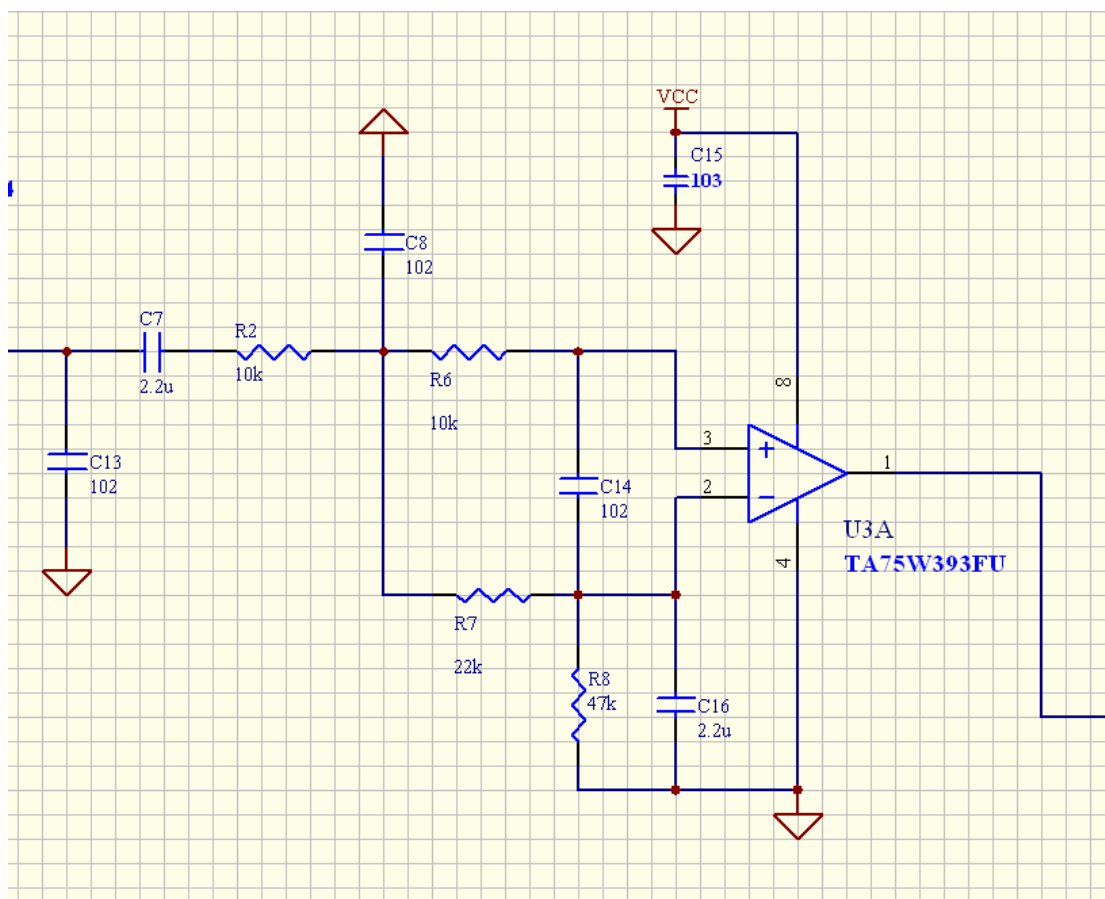
高频载波由接收天线进入到 Q1 的发射极，Q1、C9、R5C3，L1 组成共基极放大电路对输入信号进行放大，放大后的信号通过 C4 耦合到 U2 的第 14 脚，该信号经过 U2 内部的混频、中放、鉴频解调出基带信号。高频接收电路见图 4。



Pic 4 RX Circuit

The demodulated PCM signal will be adjusted to Pulse-code modulated signal by comparator U3(LM393)

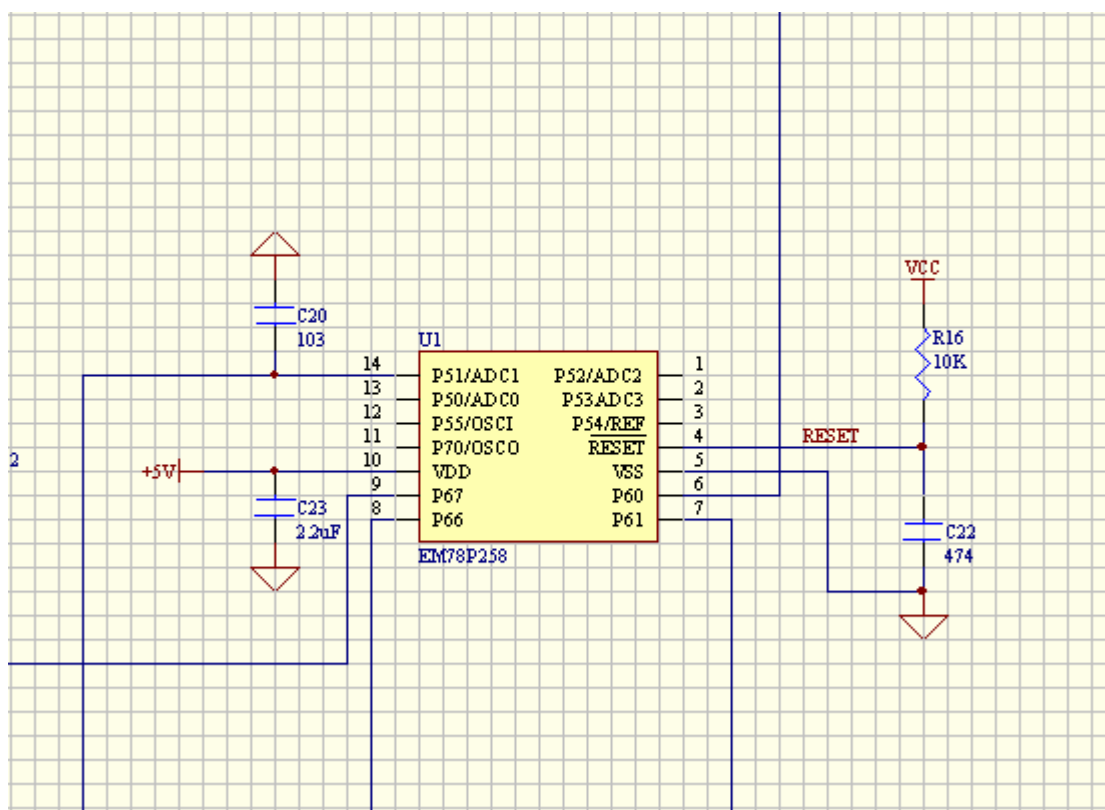
解调出来的 PCM 信号经过比较器 U3 (LM393) 进行整形得到脉冲编码信号。见下图。



Pic 5 Shaping Circuit

The shaped PCM signal will enter into the 6th pin of U1, then U1 will receive after take the sample and decode the signal. It will control the transfer angle and motor speed by the order of the user. See pic 6.

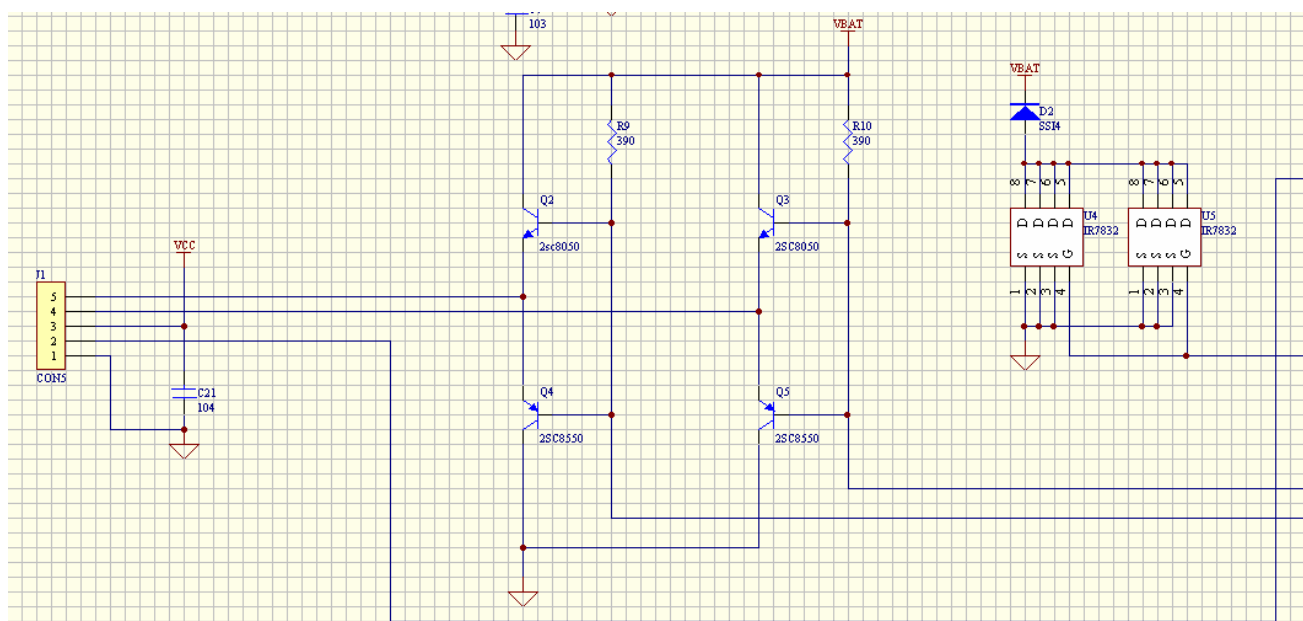
整形的 PCM 信号进入 U1 的第 6 脚，U1 对进入的 PCM 信号进行采样接收，U1 对接收到的 PCM 信号进行解码，根据用户的指令控制伺服器的转角和动力电极的速度。见图 6



Pic 6 MCU Circuit of RX

The order from MCU drives the servo and motor by stimulate the circuit.

MCU 发出的指令通过激励电路驱动伺服器和电机。



Pic 7 Driving Circuit