■ Serial sensor board, how to control (1) Circuit

Introduction

This Kondo Science Servo motor has a system that allows us to operate directly from our PC and Robot controller easily.
We will introduce this systems in a series of five documents including this one.

Circuit

We will explain the necessary electronic circuit to control your own work robot.

ICS

We will explain the details of ICS commands in serial Servo motor for robots.

Software

We will explain the technique of how to use ICS commands on your own via PC.

Direct control from PC (part1)

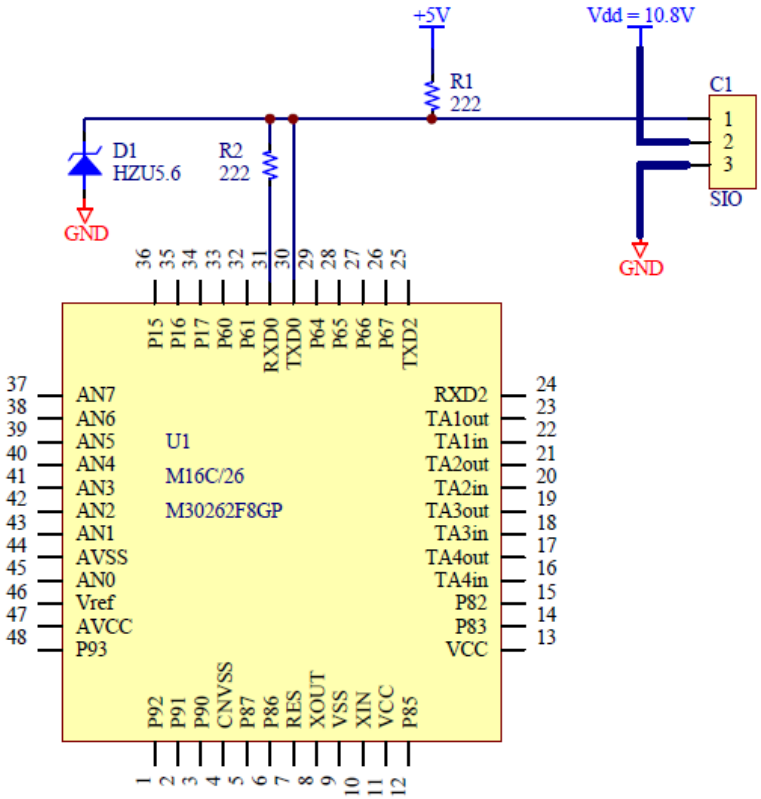
We will prepare for sending ICS commands from PC using Microsoft Visual Basic,

Direct control from PC (part2)

We will conduct the program to move the serial Servo motor on slide bar using Microsoft Visual Basic.

Circuit Details

The circuit diagram below is a partial schematic which shows the portions associated with serial servo control on the Kondo KBC-1 microcontroller board. From the circuit schematic, the SIO connector numbering is as follows;
1 = signal, 2 = power, 3 = ground. Our robot serial Servo motor is rated to run on 10.8V using half-duplex serial communication.　Serial communication is CMOS level (roughly 3.3V or higher registers as a 'HIGH') logic



To enable half-duplex operation, TXD (transmission) and RXD (receiving) lines are tied together on the microcontroller side of the circuit and are connected to the signal pin (number 1) on the SIO connector. The system uses a negative logic circuit, so to keep the signal at 5V, a 2.2kΩ pull-up resister (R1) is used. RXD is an input signal - and so to prevent damaging the CPU from electrical noise or electrostatic discharges, a resister (R2) is placed in series.

In addition, the KCB-1 microcontroller makes use of a 5.6V zener diode in the circuit. The zener diode orientation is in the direction of the signal so that in normal operation, electricity will not flow toward the ground, however in instances where the voltage exceeds 5.6V, the zener diode will allow electricity to flow to ground preventing high voltages from reaching the CPU.

Servo Power (10.8V) is connected to pin2 and ground to pin 3. This completes the description of the circuit necessary for moving a Kondo Serial Servo Motor.

Explanation of Terminology

Half-duplex system

A half-duplex system allows for data to travel in both directions on a single line, where signal transmission and reception take place alternately. Tranceivers (walky talkies) and taxi wireless communications use this system. Communication devices like telephones which allow for simultaneous transmission and receiving of data use what is called a full-duplex system. The advantage of a half-duplex system when compared to a full-duplex system is that it only needs a single line for transmission and receiving, and by giving a servo motor an ID - allows for a single common line of communication.

Negative logic circuit

When a signal goes 'HIGH', a value of [1] is typically recognized - this is a positive logic circuit. The opposite of this is a negative logic circuit. Kondo Serial Servo motors make use of negative logic circuits for communication.

Pull-up/ Pull-down

Microcontrollers which have nothing connected to it's pins (ports, terminals) may have unstable voltages (this is typically referred to as 'floating').
Generally, because terminals on microcomputer have high impedance, a weak current could become a high voltage voltage. (V=IR)
By tying the microcontroller terminal to a power source through a resistance, the microcontroller terminal voltage can match the signal voltage (typically 5V). This is referred to as Pull-up (the term comes from "pulling" up the voltage).
The opposite function of making the microcontroller terminal voltage 0V is achieved by tying the terminal to ground through a resistance. This is referred to as Pull-down.