

# QUASAR PROJECT # 3102 - SERVO-MOTOR DRIVER

Servo motors are used in radio-controlled models (cars, planes), robotics, theme park special effects, test equipment, industrial automation. At the hobbyist end of the market they are small, compact and relatively inexpensive at around £20.00. The motors themselves are black boxes which contain a motor, gearbox and decoder electronics. Three wires go into the box; 5V, ground and signal. A short shaft comes out of the motor which usually has a circular interface plate attached to it. Most servos will rotate through about 100 degrees in less than a second according to the signal input. This Kit will control up to 4 servo motors simultaneously.

## ASSEMBLY

Check the components in the kit against the Components List. Some of the resistors stand up on the board. Make sure to get the electrolytic capacitor and the IC1 around the correct way.

To complete the kit between one and four 5K - 10K potentiometers are required to produce the input signal. Connect each pot as a voltage divider with the center pin going to the signal input. Servo motors are required. They have not been included in this kit because users will usually have their own particular servos they wish to control.

## CIRCUIT DESCRIPTION

All the work controlling the servos is done in the preprogrammed PIC micro-controller (uC). As such the kit provides a text-book example of how a uC can replace a handfull of IC's & other glue chips. Everything is done in software. Connect a 5V power supply capable of delivering an amp.

The input signals are between 0 - 5V delivered by connecting up the potentiometers as voltage dividers. Inside the PIC an AD converter (multiplexed when there is more than one input signal) changes the voltage signal into the Pulse Code Modulation system used by servo motors. This signal is a 5V pulse between 1 and 2 msec long repeated 50 times per second. That is, a 20msec frame rate. The width of the pulse determines the position of the servo. Most servos will move to the center of their travel when they receive a 1.5msec pulse. One extreme of motion generally equates to a pulse width of 1.0msec; the other extreme to 2.0msec with a smooth variation throughout the range, and neutral at 1.5msec. The period between the pulses is used to synchronise the receiver.

Servos are closed loop devices. They are constantly comparing their position (proportional to the pulse width) to their actual position (proportional to the signal voltage input.) If there is a difference between the two the servo electronics will turn the motor to adjust the difference error. This also means that servos will resist forces which try to change their position. When a servo is unpowered or not receiving positioning pulses the output shaft can be easily turned by hand.

Kit 3102 Components		
Resistors 1/4W, 5%:		
.....R1 to R5 .....	5	
.....R6 to R9 .....	4	
.....C4.....	1	
ceramic capacitor.....C1 C2 .....	2	
electrolytic capacitor .C3.....	1	
crystal .....	XTAL..... 1	
Programmed PIC16C71-04/P .....	IC1 .....	1
18 pin IC socket.....	.....	1
2 pole terminal block .....	.....	1
3102 PCB .....	.....	1
Potentiometers & servo motors not supplied.		

For ordering information please see:

<http://www.quasarelectronics.com/3102.htm>

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