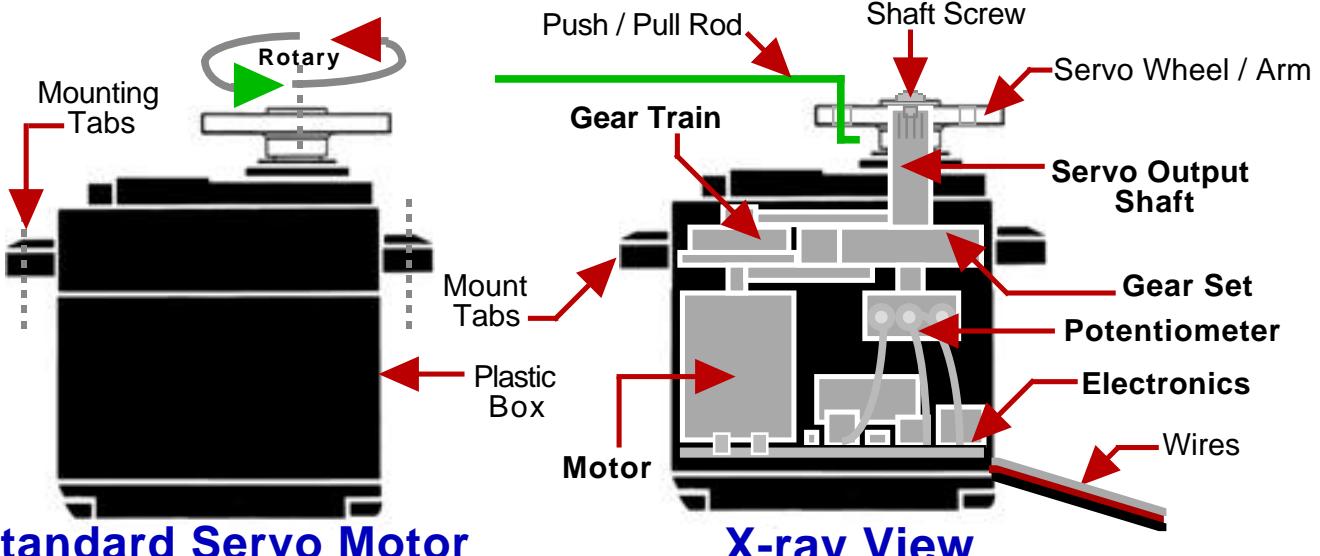


Servo Info and Centering

A servo is a mechanical motorized device that can be instructed to move the output shaft attached to a servo wheel or arm to a specified position. Inside the servo box is a DC motor mechanically linked to a position feedback potentiometer, gearbox, electronic feedback control loop circuitry and motor drive electronic circuit.



Standard Servo Motor

X-ray View

A typical R/C servo looks like a plastic rectangular box with a rotary shaft coming up and out the top of the box and three wires out of the servo side to a connector. Attached to the output shaft out the top of the box is a servo wheel or Arm. These wheels or arms are usually a plastic part with holes in it for attaching push / pull rods or other mechanical linkage devices to the servo. The three electrical connection wires out of the side are V- (Ground), V+ (Plus voltage) and S Control (Signal).

The control S (Signal) wire receives Pulse Width Modulation (PWM) signals sent from an external electronic controller and is converted by the servo on board circuitry to rotate the motor, gearbox, potentiometer and output shaft connected to the servo arm or wheel.

R/C servos run on 5 volts DC but they often work with voltages V-, V+ between 4 and 6 volts DC power, near 1 Amp of current. (Torque load determines amps and can be from 200 mA to 1 Amp depending on moving or holding force the servo needs for position)

R/C Servos are controlled by sending a pulse width signal (PWM) from an external electronic device such as a servo controller, servo driver module or R/C transmitter and receiver. Pulse Width Modulation or PWM signals sent to the servo are translated into position instructions by electronics inside the servo. When the servo is instructed to rotate, the DC motor is powered on until the rotating potentiometer linked, geared to the DC motor reaches the electric value corresponding to the instructed position sent to the servo and translated by the on board electronics.

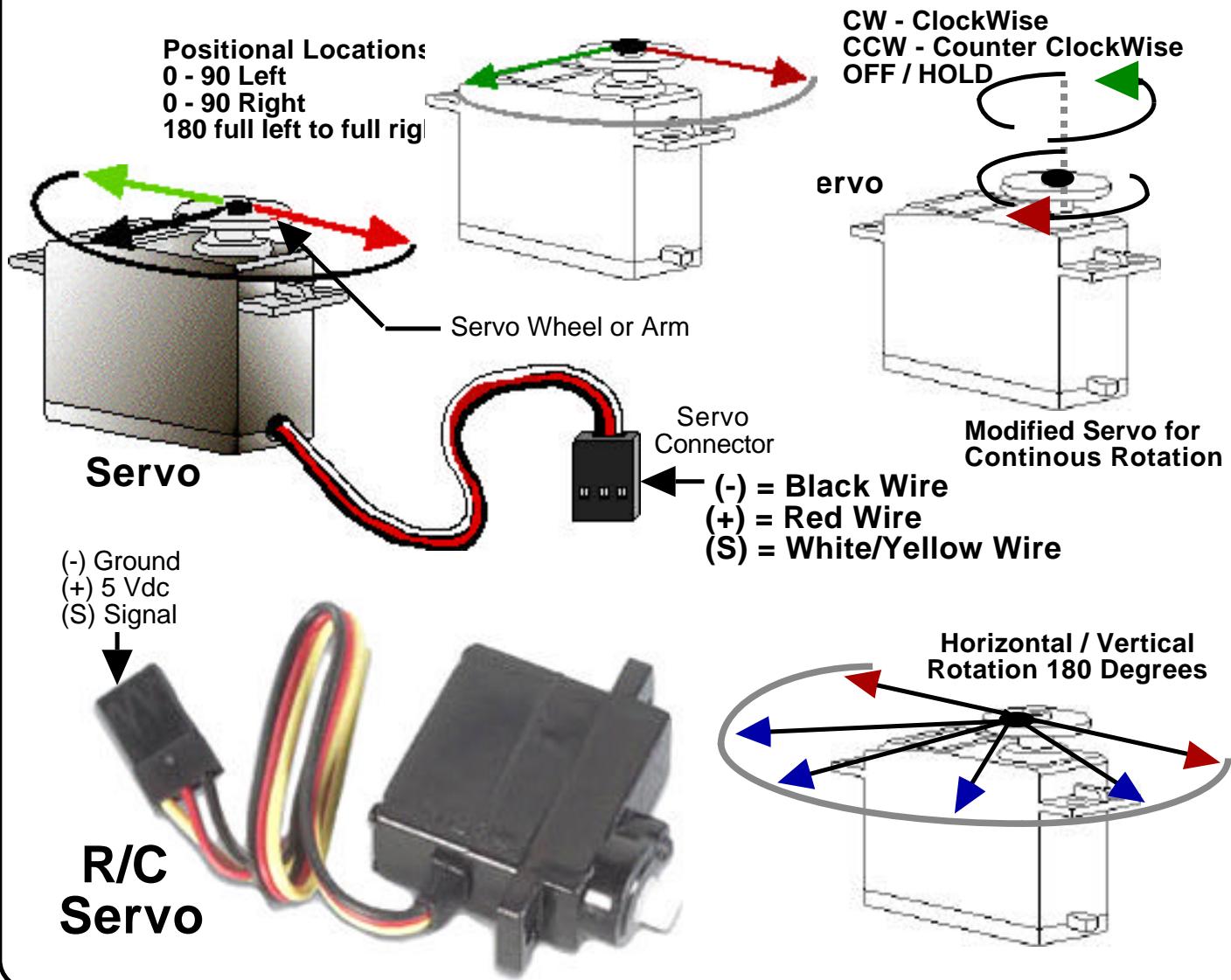
A pulse width signal (PWM) of approximately 1.5 mS (1500 uS) is the "neutral" position for the servo. The servo, neutral is defined to be the point where the servomotor has exactly the same amount of potential rotation in the counter clockwise direction as it does in the clockwise direction. When the pulse width signal (PWM) sent to a servo is less than 1.5 mS. the servo moves some number of degrees counterclockwise from the neutral point. When the pulse is greater than 1.5mS the servo moves some number of degrees clockwise from the neutral point. Generally the minimum pulse will be about 1.0 ms and the maximum pulse will be 2.0 ms with neutral (Stop) movement at 1.5 mS

Servo Info and Centering

R/C servos are usually mechanically stopped from moving at full rotation. They have limited rotation through a mechanical, plastic block on the internal gearing and can rotate about 90 to 180 degrees or less only. Servos are unable to continually rotate and usually can't be used for driving rotating wheels. A servos precision positioning makes them ideal for robotics and animatronics, since servos are self contained with control loop circuitry, drive circuits, servo position, speed control, and are very easy to control by an external device such as a electronic servo controller board used in animatronic character and robotic applications.

Servos are dynamic devices that when instructed to move position, will actively move to hold the position. If for example a servo is instructed to move in the clockwise position and an external force is present and pushing against the servo such as a mechanical linkage, the servo will resist being moved out of that position or continue to try and move to the instructed position, even if the servo arm is incorrectly placed on the motor shaft, until powered off. It is for this reason that every servo output arm or servo wheel used should be placed into the neutral position before instillation into your project.

Setting the servo arm or wheel to the neutral position prevents stress to the servo motor, damages to the electronics and provides wider movement ranges and angles for operating the mechanical linkages connected to the servo arm or servo wheel.



Servo Info and Centering

How to Determine the Center Position of a R/C Servo

Automated Servo Center Position

There are several ways to do this:

(See Servo Checker Operation Guide)

The best and easiest way to set a servo's center position is to connect the servo to a servo checker or tester. There are several low cost servo checkers worth purchasing and having in your toolbox if planning to work with servos. To use a Servo Checker simple set the Servo Checker to its automated center position and let the controller move the connected servo to center. If the servo arm is pre-attached, you may have to remove the servo arm on top of the servo shaft and re-position it back onto the servo shaft center point. The servo is now ready for installation. Once centered place the servo arm on top of the servo shaft, secure it with servo screw and install the servo as needed or carefully remove the servo arm from the servo if not needed for installation. Do not move the shaft at this point, if it moves, simply repeat the above procedure to find the servo center again.

Manual Servo Center Position - Steps:

Carefully place one of the servo arms or wheel onto the servo shaft, mark a reference line through (across) the servo arm or wheel center point.

Slowly and carefully rotate the servo arm or wheel by hand as far to one side as it will go, do not force servo arm / wheel.

Mark a line on the servo base where the servo arm or wheel reference line stops.

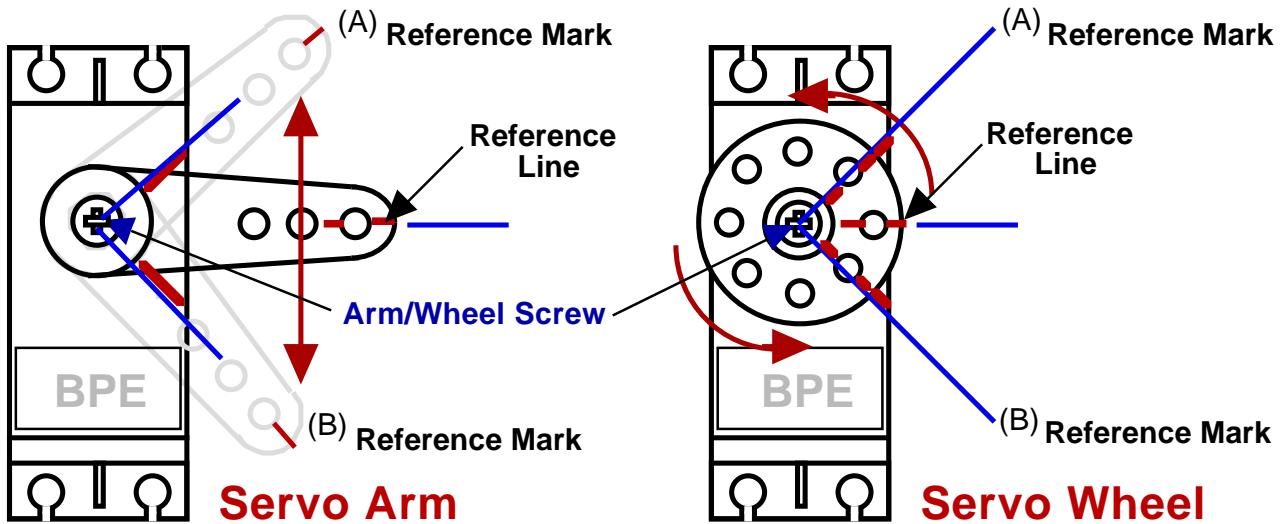
Slowly and carefully rotate the servo arm or wheel by hand to the opposite position, as far to one side as it will go, do not force servo arm / wheel. Should travel about 180 degrees.

Mark a line on the servo base where the servo arm reference line stops.

Rotate the servo arm back to 90 degrees between the two end reference line positions (A,B) marked on the servo base. You may have to remove the servo arm on top of the servo shaft and re-position it back onto the output shaft to get the center point if the arm is off center position. This should put the servo arm close to center position.

Carefully remove the servo arm from the servo if not needed for installation or place the servo arms on top of the servo shaft, secure it with servo screw and install the servo as needed. Do not move the shaft at this point. If it moves, simply repeat the above steps to find the servo center again.

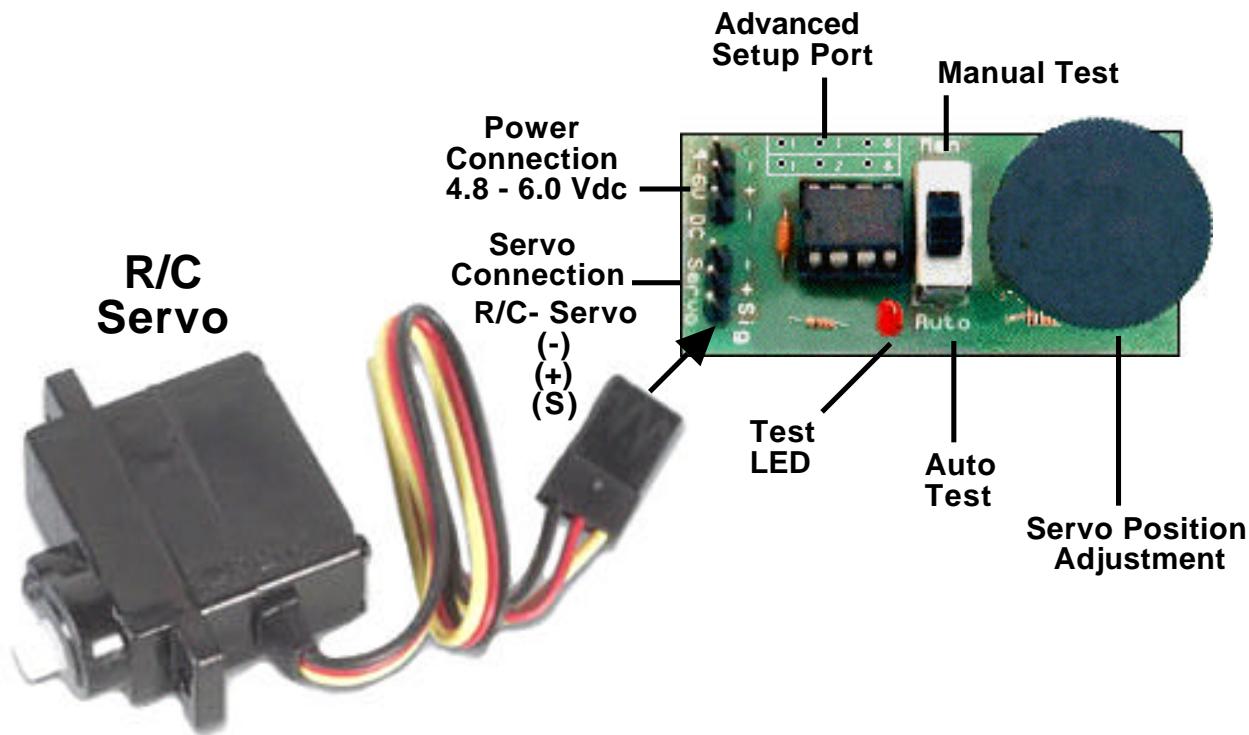
SERVO CENTERING



Servo Checker

Test and calibrate hobbyist "Radio Control" type servos.

- Manual and Automatic Sweep Mode.
- Slow 90 degree sweep function.
- 0 and 90 degree calibration marks (servo 1ms and 2ms pulse widths)
- Calibration marker every 15 Degrees



Connections:

Battery = 4.8 to 6 Vdc only-middle pin connection (Plus (+Vdc)), either side connection pin (Negative (-Vdc)). **NOTE: Incorrect polarity will damage the servo checker.**

Operation

Connect a battery and servo to the servo tester.

NOTE: Check servo connector polarity (-minus) (+Plus) (Signal)

Manual Mode: (Slide switch to MAN position)

The servo checker generates a standard servo pulse stream. The width of the pulses varies between **1.0 msec** and **2.0 msec** depending on the position of the potentiometer. Turning the potentiometer fully to either end of its travel will cause the Red LED to turn ON, indicating that either a **1.0** or **2.0** pulse with which should correspond with a servo angle of either **0** or **90** degrees.

Additionally, as the potentiometer is turned, the Red LED will turn ON at positions corresponding to **15, 30, 45, 60 and 75 degrees**, thereby providing a visual calibration status of where the servo should be at these angle degree points.

Automatic Mode: (Slide switch to AUTO position)

This mode will demonstrate a smooth action of the servo. The output pulse stream to the servo is gradually increased from **1.0** to **2.0 msec** which should make the servo smoothly transverse from one end stop to the other without any sign of servo jitter. At the end of the servo sweep the servo should quickly transverse to the start point. The potentiometer will adjust travel speed.

Servo Checker

Setup

