



This document contains general servo information and frequently asked questions regarding the use and care of Hitec servos. Please note that modifying your servo will void the warranty.

## General Servo Information

### Pulse Data

All Hitec servos require 3-5V peak to peak square wave pulse. Pulse duration is from 0.9mS to 2.1mS with 1.5mS as center. The pulse refreshes at 50Hz (20mS).

### Voltage Range

All Hitec Servos can be operated within a 4.8V-6V. range.

Only the HS-50 operates exclusively with 4 Nicad cells ( 4.8 volt ).

### Wire Color Meanings

On all Hitec servos the Black wire is 'ground', the Red wire ( center ) is 'power' and the third wire is 'signal'.

### Direction of Rotation

All Hitec servos turn Clockwise direction ( CW ).

## The Appropriate Servo for Your Application

One of the most frequently asked questions is "What servo should I use for...".

While there have been many magazine articles that attempted to provide a general rule of thumb to answer these questions, we offer you the following suggestions.

1. Servos are rated for Speed and Torque. In many cases, Hitec will create one servo and then gear it for speed and sacrifice torque, then create its twin, geared for torque at the sacrifice of speed, i.e. 525/545, 625/645, 925/945.
2. If you are not sure, it is better to have more torque than you need, as torque is your friend.
3. When in doubt ask your peers about servo application questions. Look at what others are using in comparable applications. Usually the kit manufacturer will suggest a servo of a certain physical size and torque value specification in the aircraft, car or boat plans. It is wise to follow their guidelines.
4. Even though micro servos like the HS-81 may offer 38oz/in of torque, they are not appropriate for larger powered aircraft due to the flight loads placed on the control surfaces during flight. The geartrain can fail under excessive flight loads. Smaller servos have thinner gears that are inherently more fragile than those of "standard" sized servos.

## Digital Servo Information

In addition to our full line of analog servos, Hitec produces several digital servo products. These powerful servos offer programmable features such as, direction of rotation, center point, end points, failsafe option, speed and dead bandwidth adjustment using Hitec's proprietary programmer and servo tester device.(Model HFP-10).

### What are the advantages of digital servos ?

#### 1. Instantaneous Response

The digital micro processor sends out signals five times faster than analog servos. This results in much quicker response.

#### 2. Precision Resolution

There are many more steps in the digital format compared to the conventional analog version. This means the servo is capable of finer adjustments.

#### 3. Enormous Standing Torque

The standing torque of the digital servos is 3 times that of the analog counterpart.

Check it out, try moving the transmitter stick or wheel and at the same time hold the servo horn to keep it from twisting.

You will not be able to prevent the horn from turning. *Muy fuerte mi amigo!*

#### 4. Metal Servo Arm

Hitec is the first servo manufacturer to include metal horns as a standard accessory for our digital servo line. Not just any metal horn but our own design super horn.

Hitec engineers were not satisfied with the traditional plastic or composite servo arms as they would flex and fail long before the servo reaches its maximum torque capability. Just another very unique feature of Hitec digital servos.

### Special Warning for Digital servos !!!

- (1) If you accidentally plug in the Hitec "S" type digital servo into the old Airtronics(Sanwa)
  - receiver, this will blow up the servo circuits so please take special care.
- (2) Digital servos consume tremendous amount of power, so dry batteries cannot be used
  - at all. Use large capacity Nicd batteries or better yet NiMH batteries.
- (3) Do not use BEC system built in most 2 channel receivers.
  - Make sure you bypass the BEC for stable operation.

## Servo Maintenance

### Changing Gears

Hitec offers gear sets for all our servos and these are available from your local hobby shop or from a mail order retailer. To replace the gears on any servo, carefully lay out the new gears on a clean work surface to have them available for re-assembly. You will also need a supply of servo gear lubricant. We suggest the Hitec lube part # 58450.

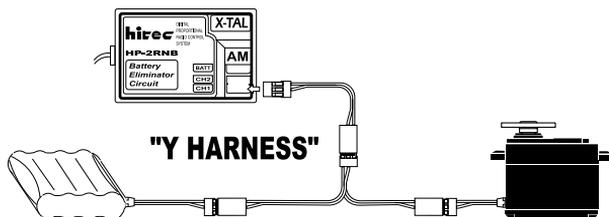
Loosen or remove the screws located on the bottom of the servo case enough to pop the upper case off and expose the gears. If any gears or shafts are stuck in the upper case, remove them and plug them back into position on the lower case. Now carefully remove the gears while placing them in approximate order on your work surface in front of you.

This is done so you can refer back to their positioning as you assemble the new set into the lower servo case. Clean all the old lubricant from the servo case in both the lower and upper case components. Be aware of small chunks of gear material that may be lodged in the lubricant and get it all cleaned out. Apply servo gear lube to the shafts and assemble the geartrain applying lube to all gear components. When complete, pop the case top back on and tighten up the case screws.

**CAUTION: Do not force the case top back on. If it will not fit back on smoothly, chances are the gears were installed incorrectly.**

#### How to by-pass the BEC circuit on the HAS-02MB/03MB and HP-2RNB receivers

The Hitec AM, model HAS-02MB, HAS-03MB and HP-2RNB receivers are built with a BEC or battery eliminator circuit built into the battery port of the receiver. This will limit the amount of power some of the larger servos can draw from the receiver. It is suggested that using these receivers with large power consumption servos like the HS-805BB, HS-815BB or the high end, premium coreless motor servos and digital servos, a "Y" harness be used to connect the receiver battery / switch harness and servo to the receiver. Typically this is done by connecting one of the upper "Y" connectors to the servo, the other upper connector to the switch harness and the lower "Y" connector into receiver port 1,2 or 3, depending on what channel you wish the servo to operate. This will allow the BEC to be bypassed, your large servo will always have power and the rest of the servos and the receiver will be powered from the port you plug the "Y" into.



#### Too Many Servos

Modern coreless and digital servos have impressive torque values. This takes a lot of power. Receivers are capable of delivering only so much power to the servos plugged into it before the voltage draw down caused by the servo power consumption falls below what the receiver requires to "hear" the signal from the transmitter. When this occurs a "glitch" will result from loss of signal to the receiver. Large aircraft can easily use 6 or more powerful servos with some 1/3rd scale planes having multiple servos per control surface. There are several answers to this issue. Many modelers choose to use two receivers and others power the servos with a separate battery from that of the receiver. The point here is to be cautious when "Y" harnessing or "ganging" powerful servos together. Using larger capacity Nicad batteries as well as Heavy Duty switch harnesses are highly recommended in these applications.

#### Servo Grease

Use only specially designated servo grease when replacing servo gears. Using other type of grease not intended for servo gears may produce gas when used in sealed cases which may coat a nasty film on the motor brush that could stop the servo operation.

#### Coreless Motor Care

We would like to strongly discourage you from ever working on the coreless motors. Unlike conventional cored motors, the brush base of the coreless motors is extremely fragile and can be easily separated from the Printed Circuit Board. This is best left to authorized service technicians with the proper equipment.

#### Servo Trouble Shooting

**Servo makes a grinding noise or acts erratic:**Open the case and remove the gears. Examine them for broken teeth. If broken, replace with a new gear set.

**Servo jitters:**This may be a dirty potentiometer. Open the case and remove the gears. Spray a zero-residue tuner cleaner into and around the "pot" and work it in. Once the cleaner has dried, re-install the gears and close up the case.

**Checking Servo Centering:**Remove the servo from the plane or vehicle. With the arm still attached to the servo, place an ink dot towards the end of the wheel and another one on the case, these should be lined up for a reference point. Plug the servo into the receiver and move the corresponding transmitter gimbal stick or wheel from stop to stop. After each movement, check the reference points for alignment.

**Servo is locked in place:**Open the case and make sure the gears are properly aligned. Next check the case top for wear. If wear is evident, replace the case.

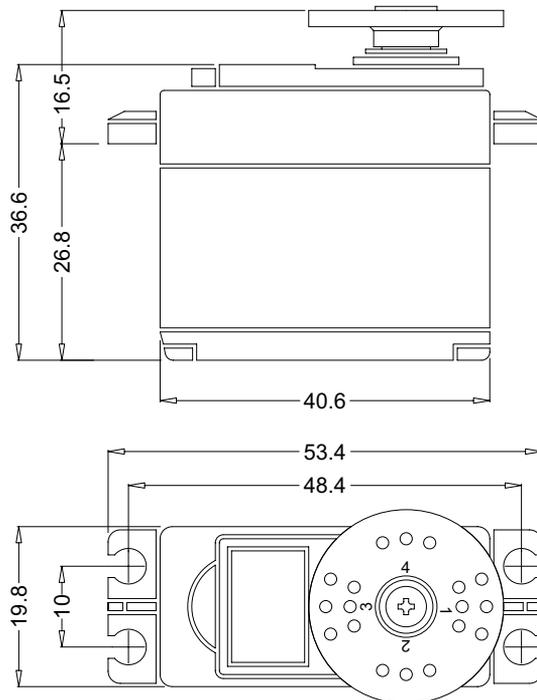
**Servo hums under load:**This can be normal, the servo is trying to hold position against the force of a load. If it hums when no load is applied, try loosening the servo case screws a quarter to a half a turn.

**Servo gets hot:**Get out the fire extinguisher! Check the servo wiring, it should match the receiver being used. The motor could be stalled due to a failed geartrain. Actually several things could be wrong, this sounds like a candidate for the service department.

# ANNOUNCED SPECIFICATION OF HS-422 STANDARD DELUXE SERVO

## 1. TECHNICAL VALUES

CONTROL SYSTEM	: +PULSE WIDTH CONTROL 1500usec NEUTRAL	
OPERATING VOLTAGE RANGE	: 4.8V TO 6.0V	
OPERATING TEMPERATURE RANGE	: -20 TO +60°C	
TEST VOLTAGE	: AT 4.8V	AT 6.0V
OPERATING SPEED	: 0.21sec/60° AT NO LOAD	0.16sec/60° AT NO LOAD
STALL TORQUE	: 3.3kg.cm(45.82oz.in)	4.1kg.cm(56.93oz.in)
OPERATING ANGLE	: 45°ONE SIDE PULSE TRAVELING 400usec	
DIRECTION	: CLOCK WISE/PULSE TRAVELING 1500 TO 1900usec	
CURRENT DRAIN	: 8mA/IDLE AND 150mA/NO LOAD RUNNING	
DEAD BAND WIDTH	: 8usec	
CONNECTOR WIRE LENGTH	: 300mm(11.81in)	
DIMENSIONS	: 40.6x19.8x36.6mm(1.59x0.77x1.44in)	
WEIGHT	: 45.5g(1.6oz)	



## 2. FEATURES

- 3-POLE FERRITE MOTOR
- LONG LIFE POTENTIOMETER
- DUAL OILITE BUSHING
- INDIRECT POTENTIOMETER DRIVE

## 3. APPLICATIONS

- AIRCRAFT 20-60 SIZE
- 30 SIZE HELICOPTERS
- STEERING AND THROTTLE SERVO FOR CARS
- TRUCK AND BOATS