

## Servos

Your steering servo has 3 pins: power, ground, and control. Power should be 4.5 to 6 volts. To control the servo angle you must provide a high (5V) pulse with a pulse width of 1- 2 ms. Nominally, 1.52 ms is dead center. The specs on the servos do not specify the pulse rate (see the specs below). The servos have a motor, some gears, a potentiometer (pot), and some electronics (It is possible to take one apart and get it back together with a little effort. If you take yours apart and can't get it back together, they cost \$15.). The pot tells the electronics the actual angle of the servo shaft, and that is fed back to control which way and how much the motor should turn. If you set up a pulse generator to send single pulses to the servo, you can watch how the control loop works; it usually takes about 10 pulses to settle to the new position (corresponding to a new pulse length), but it may take as many as 30 pulses to settle (often it overshoots and then oscillates a bit). Here is some information you might verify by playing with a servo:

- If the servo is not moving, it draws about 10 mA.
- When the servo is moving (its motor is running) it draws a couple hundred mA.
- The control line draws 100 micro amps at 5V - a GPIO pin should drive the servo control line directly without problems.

The actual range of useful pulse widths will vary from car to car - measure your servo to determine the pulse widths you'll need for your car. Just be sure not to go out of the range of 1 to 2 ms. Up to about 100 Hz, the faster you pulse it the faster it will respond; don't go beyond 100 Hz! From the specs you can see that it can turn at a maximum rate of 60 degrees in .22 sec. If it takes 10 pulses to settle, that means that any frequency of about 50 Hz or above will give the same response time.

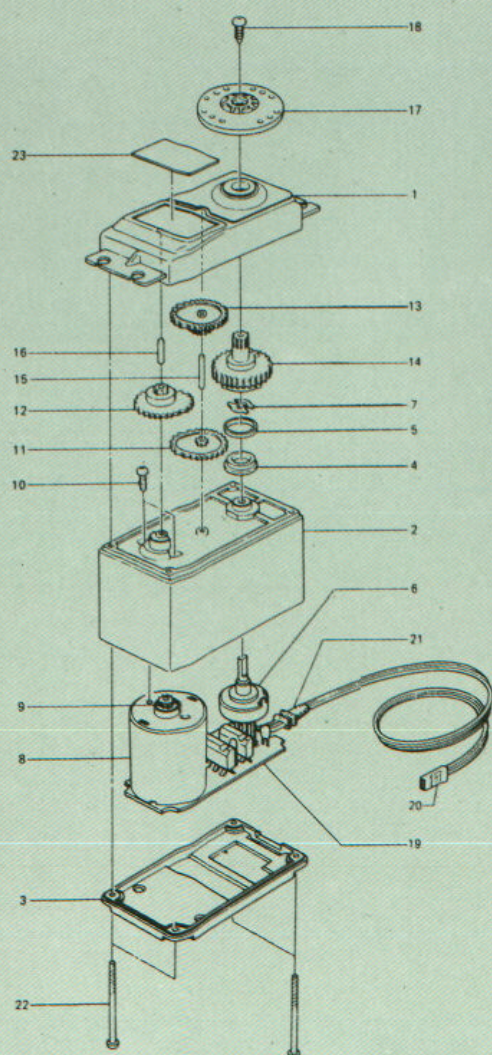
Remember, the servos typically draw a couple hundred mA while turning. That could be more than your regulator can supply while maintaining 5V. Running the servo might momentarily drop the voltage enough to cause a processor reset. This doesn't always happen, but be aware of this potential problem.

# Futaba®

## SERVO FP-S148

Rugged low-profile servo

FP - S 148



No.	Part name	Part No.
1.	Upper case	FCS-48
2.	Middle case	FCS-48
3.	Bottom case	FCS-48
4.	Metal bearing	S04137
5.	Metal bearing	S04137
6.	Potentiometer	I39668
7.	Potentiometer drive plate	S02753
8.	Motor	S91239
9.	Motor pinion	S02461
10.	Screw	J50002
11.	1st gear	FGS-48
12.	2nd gear	FGS-48
13.	3rd gear	FGS-48
14.	Final gear	FGS-48
15.	Intermediate shaft	S02495
16.	2nd shaft	S02494
17.	Servo horn D	FSH-6W
18.	Binding head tapping screw 2.6×8	FSH-41
19.	Printed wiring board	AS1157
20.	3PB-WRB300G	AT2453
21.	w/gum bush	S90045
22.	Pan head truss screw	J50360
23.	Nameplate	S60099



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# FP-S148

D61000

Rugged low-profile servo

The FP-S148 is a rugged low-profile servo for Futaba Corporation digital proportional radio control sets. Trouble caused by breaking of lead wires from shock and vibration have been eliminated by using new technology which eliminates wires inside the servo. Movement equal to that of high quality servos has been realized by using a new small, high-performance motor. Use them for channel expansion, or as replacement parts.

## [FEATURES]

- \* The FP-S148 is a low 1.4 inches (36mm) high and has a thin design that can be easily mounted in all models.
- \* Vibration and shock resistance have been improved further by using a direct wiring system which directly connects the servo amp, motor and potentiometer.
- \* The height of the servo has been reduced and high torque, high speed, and smooth movement equal to that of the coreless servo have been realized by using a new small, high-performance motor. (Output torque 42 oz-in (3kg, cm), operating speed 0.22 sec/60°)
- \* New indirect drive/completely sealed potentiometer substantially improves vibration and shock resistance, and neutral accuracy.
- \* Unique Futaba power-saving custom IC provides high starting torque narrow dead band, and excellent trackability.
- \* Fiberglass PBT (polybutylene terephthalate) servo case is mechanically strong and is invulnerable to glow fuel.
- \* Strong polyacetyl resin precision servo gear featuring smooth operation, accurate neutral, and minimal backlash.
- \* Fiberglass epoxy PC board with THRU-THE-HOLE plating improves the servo amp vibration and shock resistance.
- \* Thick plated connector pins eliminate the problem of faulty contact, improve reliability against shock and vibration, and prevent reverse insertion.
- \* Special pad grommets simplify mounting of the servo, and are extremely vibration-resistant.
- \* Seven kind of special adjustable (splined) horns are available.
- \* High 42 oz-in (3kg, cm) output torque is perfect for almost all models.

## [RATINGS]

Control system	.....+ pulse control 1520μs neutral
Operation angle	.....Rotary system, one side 45° or greater (including trim)
Power supply	.....4.8V or 6.0V (shared with receiver)
Power consumption	.....6.0V 8mA (at idle)
Output torque	.....42 oz/in (3kg, cm)
Operating speed	.....0.22 sec/60°
Dimensions	.....1.59×0.77×1.4 inch (40.4×19.8×36 mm)
Weight	.....1.5 oz (44.4 g)

## [USAGE PRECAUTIONS]

- \* Use the FP-S148 with a J, PCM, FGK-FM, CONQUEST-FM, MAGNUM, NEW ATTACK series other 2 ch.
  - \* Futaba servos can not be used with other makes of RC sets.
  - \* Select the servo mounting position and install the push rod, hinges, etc, so each control operates smoothly.
  - \* When installing the servo with screws. Use the screws through grommets and tighten the screws so the grommets is slightly crushed. Be especially careful when the steering angle is large because if the screws are too tight, the vibration proofing effect will be lost.
  - \* Spare horns are provided. Use them according to the application.
- (Specifications are subject to change without prior notice.)

SPLINED SERVO HORNS

