

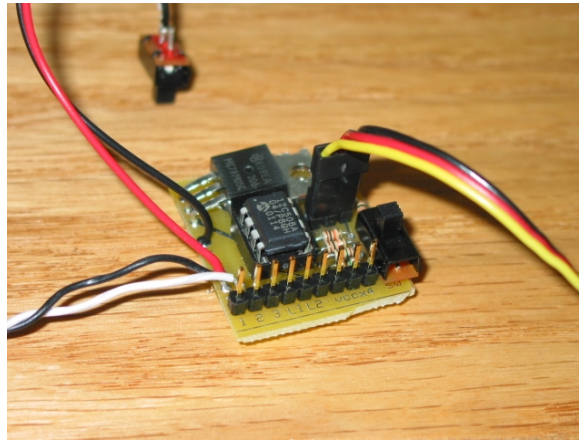
# Rangefinder Servo and LED Controller Board

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<http://www.hyperdynelabs.com>

**\*\*\* DO NOT HOOK UP THE SERVO INCORRECTLY. READ BELOW FIRST \*\*\***

## Overview

The rangefinder servo and LED board will fit inside a Fett helmet and allow you to motorize the rangefinder using a standard off the shelf servo. The board also controls 2 LEDs, which come on automatically when the rangefinder is the down position. These LEDs can be fitted in the rangefinder head or other relevant place. The board also has 2 inputs to control the up and down motion of the servo. The servo can be controlled to go up and down using a myriad of interfaces, including momentary pushbuttons, voice recognition board, or an IR/radio link. Here is a pic of the unit:

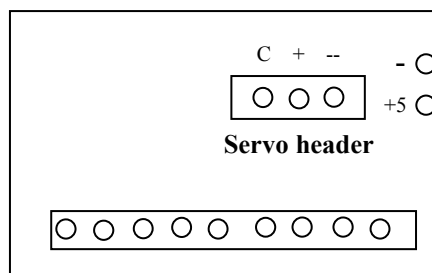


The board has a header of 9 pins that are used to hook up the external “activation” interface, which is used to tell the servo when to go up and down. The LEDs are also connected up to these pins. The header has labels on it that correspond to the pin function. Pins 1 and 2 are the up and down interface pins. Pins L1 and L2 are the negative side of the 2 LEDs. The last 4 pins are the common leads that you should connect to the positive side of the LEDs and interface pins. The board runs of a 9V battery or other DC source < 12V.

## Servo Connections

Any off-the-shelf 4.5-6V servo will work, as long as it has enough torque to lift your rangefinder. You can plug your servo right onto the controller board. A 3-pin header is there to connect the servo. **NOTE THE POLARITY! The servo ground is near the small resistor on the end of the board, and the servo control line is near the main chip. Make sure you plug the servo in correctly or it can be damaged!** The black wire on the servo is GROUND (-). The red is POWER (+). The control wire is typically yellow or white. A picture is shown below.

Top of servo board



## Servos Tested

Here is a list of the tested servos with the board:

Tower Hobbies: Hitec HS-77BBJ, <http://www2.towerhobbies.com/cgi-bin/WTI0001P?Q=1&I=LXN620>

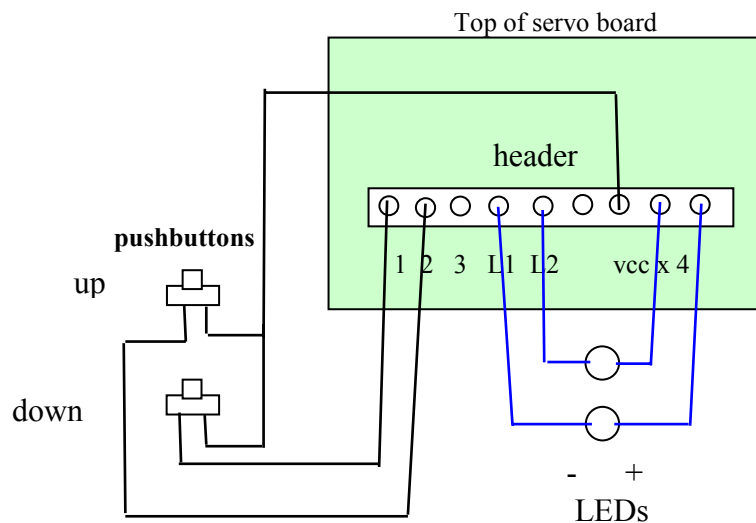
Jameco: #157067 - HS303 robotic servo, <http://www.jameco.com>

FMA Direct: PS30, <https://www.fmadirect.com/home.htm>

**NOTE:** The tested servos were able to travel 120 degrees with 1-2ms input control pulses. The board is tuned for this, so the servo travels only 90 degrees for the rangefinder head. If you have a servo that travels a maximum of 90 degrees with 1-2ms input pulses, contact us and we will get you a new chip for your board so that the rangefinder head will travel all the way up and down.

## Button and LED Hookup

Here are the connections for the 2 LEDs and 2 pushbuttons. The pushbuttons are used to control the servo direction.



## Mode Selection

When the board powers up, it selects the "interface" mode via the onboard slide switch. The 2 inputs on the board respond to high signal, i.e., when a logic "1" is seen on the pin, the servo responds.

The 2 input interface modes are:

- 1) Normal up/down servo controller mode
- 2) Automated up/down servo controller mode.

In mode 1), the servo travels up and down as long as the button or other interface input is pushed or activated. This is the mode to use for a pushbutton, IR or RF link, etc. This gives you total control over the final position of the servo by the amount of time the input is active.

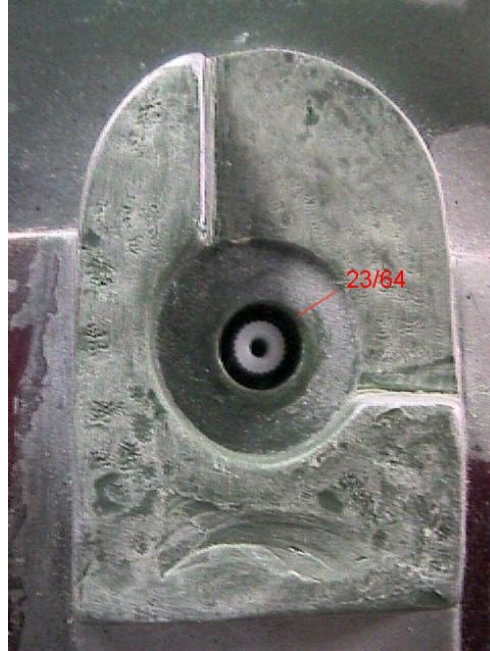
In mode 2), the servo goes all the way up or all the way down with just one button press or pulse on the interface pins. This mode is used for the voice recognition board or other input that only pulses the input pins briefly. The servo will travel a full 90 degrees (up or down) and automatically stop in this mode. In mode 2, the servo board also waits for 4 seconds upon power up before accepting commands, which is used to allow the voice recognition board time to boot up.

In both modes, when the servo travels all the way to the down position, it activates both LEDs. The LEDs blink in a sequence which mimics the pinging sound seen in ESB.

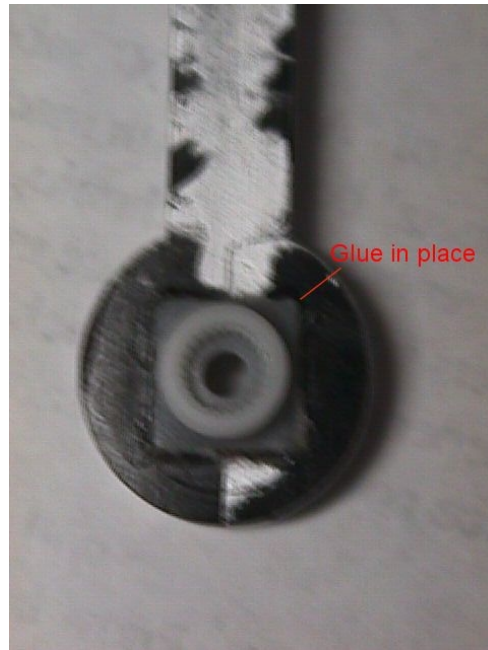
**NOTE:** Upon powerup, the servo will also reset itself at high speed. The servo will go to the up position automatically, so the board knows where the RF position is. In mode 1), the servo resets right away. In mode 2) the servo waits 4 seconds (to allow the voice rec or other interface board to settle), then resets itself.

### **Servo install into helmet (courtesy C. Hunt)**

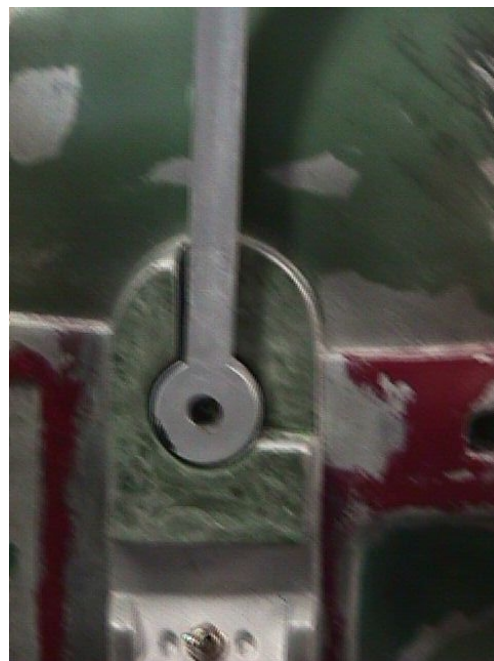
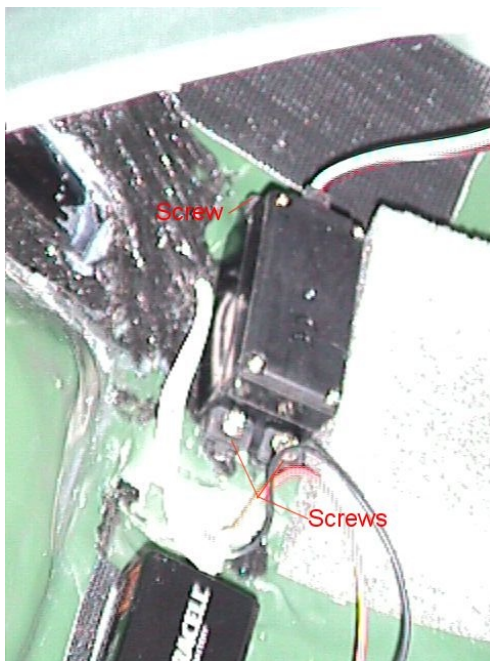
First you need to carefully pop off the outer ear piece that covers the rangefinder stalk. Then I drilled a 23/64 hole as shown, starting with smaller drills to make it easier to get centered. You will also have to smooth out the area where the rangefinder stalk travels.



I used one of the adapters that came with the servo and glued it to the inside part of the stalk to connect it to the servo.



After the glue set up, I put the servo in the helmet attached the rangefinder. Making sure that the servo was set in up position I adjusted it so the rangefinder was pointing straight up. I used the rubber bushings and screws that came with the servo to hold it in place. I was only able to get three of the screws to bite into the helmet, but it seems stable.



You will have to grind down or file the post that the rangefinder was rotating on so the the outside ear piece will fit back on. Right now I am using double faced foam tape to hold the outside earpiece on so that I can make adjustments rather than glue.

Here is the finished helmet. I did a repaint on the helmet from the standard DP and had Richie install a full visor.



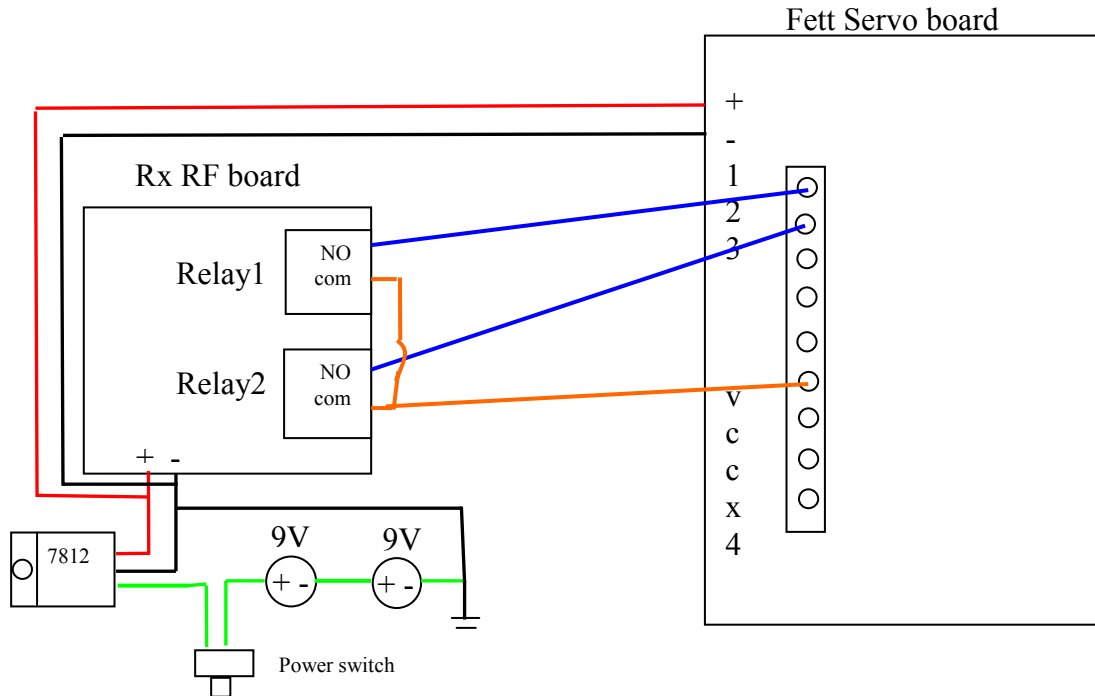
### **Radio link board to control servo**

If you would like to use an RF link to control the servo, you can do this also. As long as the RF receiver board can feed a TTL signal to the servo board, this should work like the voice recognition instructions below. If you power the receiver board and servo board from the same battery, all you need to do is to provide a TTL signal to the servo inputs 1 and 2.

One board you can use is part #ck1617 from <http://www.electronickits.com>. This board has been tested with the servo board. The relay outputs on this RF receiver board can be connected to the switch inputs 1 and 2 and to the vcc pins on the servo header (just like you are connecting up 2 pushbuttons). When the relay trips, the corresponding input will control the servo automatically.

If you are doing your own hookup, you want to choose the normally open (NO) relay output and the common output. You hook each relay to the up/down pins on your servo board (just like you would if you were attaching pushbuttons). Then one button on your transmitter keyfob controls the up movement, and the other transmitter button controls the down movement.

Example servo board hookup:



Note, this and most RF receiver boards require +12V DC to operate. Thus one 9V battery is not enough the power it (although a fresh one might for some time). The safe way is to connect up two 9V batteries in series to give you 18V, then use a 7812 voltage regulator to supply +12V to the Rx receiver board. You can also power your servo board off this voltage so you have one power supply for the entire system. A toggle switch is put inline to turn the boards on and off. This does require some rewiring to your existing servo board, and we also provide this service when we get in stock of the Rx RF units.