

Big Servo V1

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Big Servo V1 is a 2.5 scale 3D printable servo designed to fit an RS775 series motor. It utilizes a control board from an RC servo, paired with a BTS7960B motor driver. The servo is controlled with a conventional RC servo signal, but separate motor supply voltage is required. The gear reduction to the output shaft is 169:1.

Absolute maximum Ratings:

Characteristic	Rating	Unit
Motor Supply Voltage	24	V
Logic Supply Voltage	7.2	V
Signal Voltage	7.2	V

Typical Characteristics:

Characteristic	Test Condition	Min	Max	Unit
Motor Supply Voltage	-	5.5	24	V
Logic Supply Voltage	-	4.8	7.2	V
Signal Voltage	-	4.8	7.2	V
Motor Input Current	No Load @ 12v	-	8	A
Output Torque	12v	-	2.4 ¹	Nm
Speed	No Load @ 11.1v	-	50	s/180°

¹ The motor was not tested beyond this.

BOM

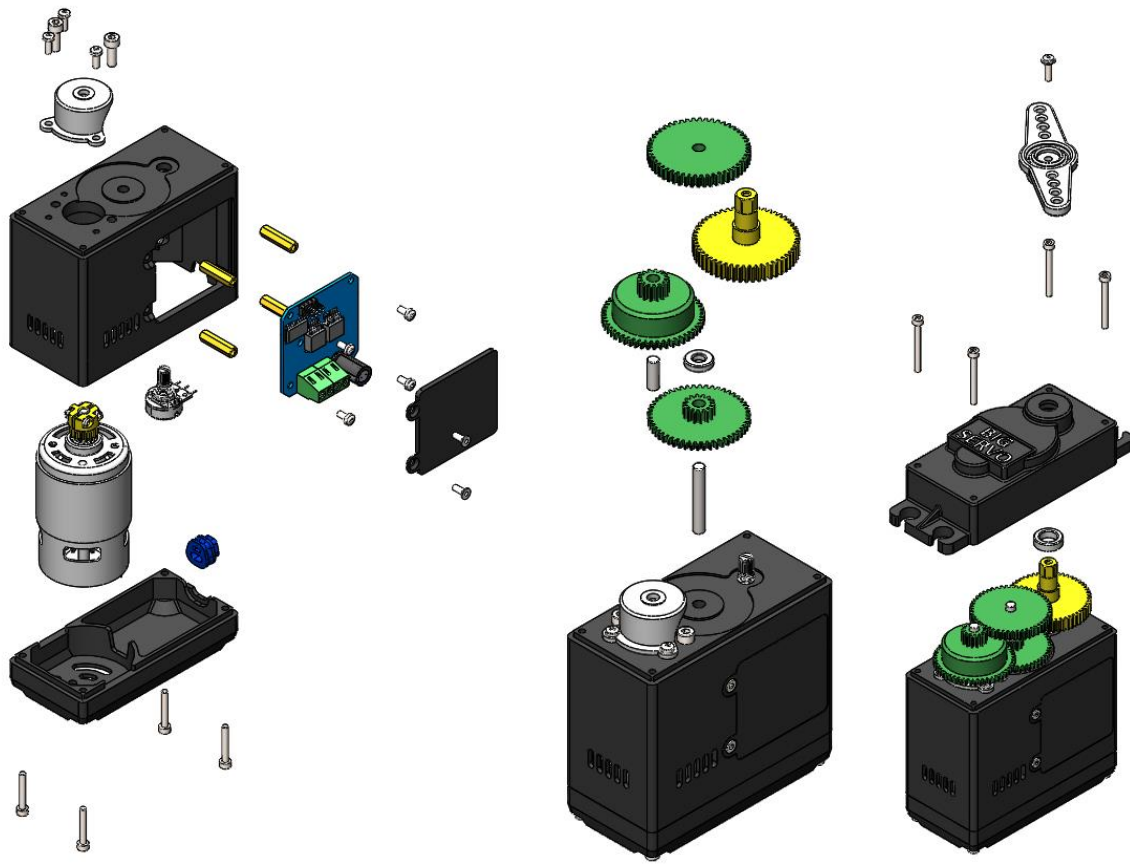
Purchased Components

Component	Qty
Rs775 Type Motor	1
BTS7960B High Current Motor Driver	1
5k Ω Potentiometer, Knurled Shaft, Panel Mount	1
Servo Control Board (Salvaged)	1
M2X8 Screw	2
M2 Nut	2
M3X20 PCB Standoff F-F	4
M3X8 C'Sunk	6
M3X6 Screw	4
M3X8 Screw	3
M3X12 Screw	1
M3X30 Socket Head Cap	4
M3X20 Socket Head Cap	4
M4X12 Socket Head Cap	2
5MM Steel/Alu Rod	1x14mm, 1x32mm

Printed Parts

Component	Qty	Material
ACCESS_PANEL	1	PLA/ABS/PETG
BOTTOM_CAP	1	PLA/ABS/PETG
BUSH_INNER	4	PLA/ABS/PETG
COMPOUND_GEAR_SET_1	1	PLA/ABS/PETG
COMPOUND_GEAR_SET_2	1	PLA/ABS/PETG
COMPOUND_GEAR_SET_3	1	PLA/ABS/PETG
GEAR_CAP	1	PLA/ABS/PETG
GEAR_PLATFORM	1	PLA/ABS/PETG
GROMMET	1	TPU
LAY_SHAFT_SPACER	1	PLA/ABS/PETG
MAIN_CASE	1	PLA/ABS/PETG
MOTOR_PINION	1	PLA/ABS/PETG
MOUNTING_BUSH	4	TPU
OUTPUT_SHAFT	1	PLA/ABS/PETG
OUTPUT_SHAFT_BUSHING	1	PLA/ABS/PETG
SERVO_HORN	1	PLA/ABS/PETG

Assembly



Electronics

The control logic PCB is removed from an existing servo. Most often these are based on an AA51880 IC. The regular 3 pin input wire is retained, the board mounted potentiometer is removed and replaced with wires to the new potentiometer mounted in the 3D printed servo housing. Pins 3 and 4 from the IC need to be connected to the BTS7960B driver LPWM and RPWM pins. The voltage supply and ground from the control PCB also needs to be linked up to the motor driver.

A 5k Ω potentiometer, as specified by the AA51880 datasheet, is required. Ensure it is of the linear not logarithmic and that it has a 6mm knurled shaft.

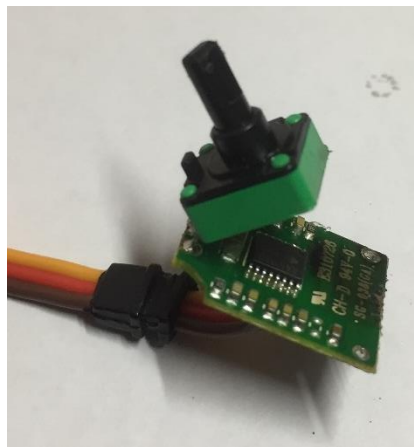


Figure 1 Control Board Removed from MG996R Servo

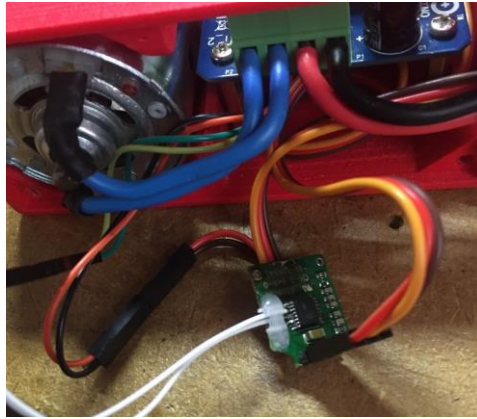


Figure 2 Two Leads soldered to the IC Outputs

The standard BTS7960B module has a large heatsink mounted to it which must be modified or replaced to fit inside the 3D printed housing. The image below shows a smaller replacement heatsink.

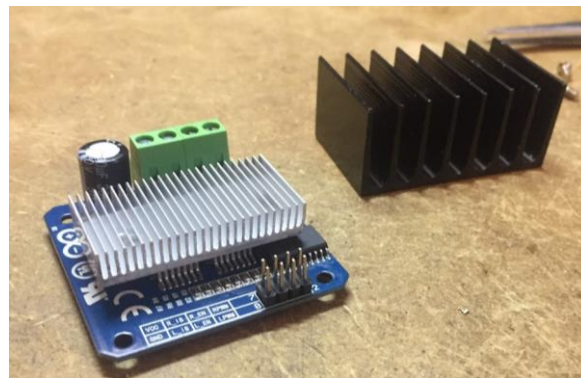


Figure 3 Motor Driver Heatsink Replacement

If the servo does not operate correctly, it maybe be that the feedback signal is reversed. This can be corrected by one of the following: swap the outputs to the motor, reverse the + and – wires to the potentiometer, or swap the two direction signal wires going to LPWM and RPWM.

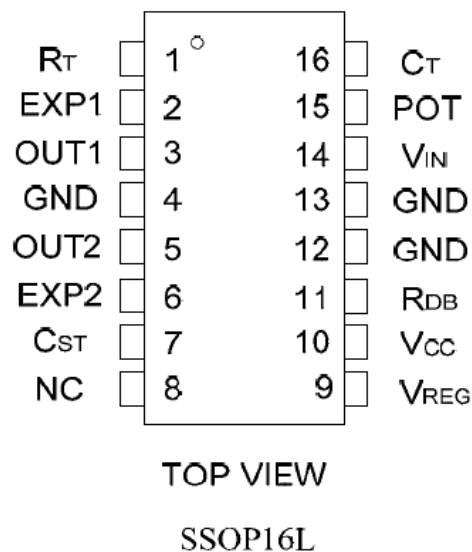


Figure 4 AA51880 Servo Controller IC Pinout