

Gear Drive Hapkit Assembly Instructions

(1) Order and Print the necessary parts

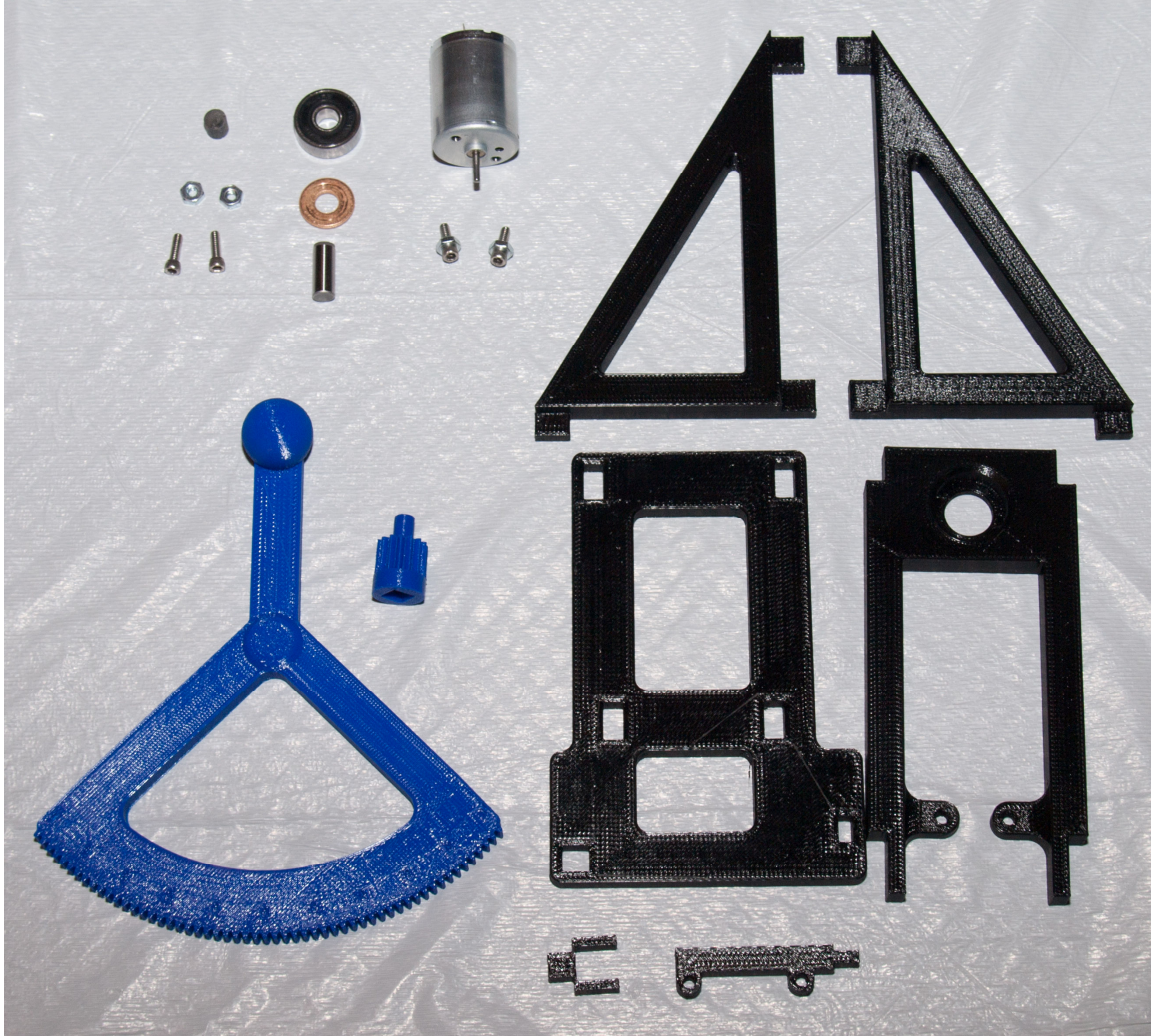


Figure 1: 3D Printed Parts and Hardware

Note: The screws shown were replaced with button head screws and the second pair of machine nuts was discarded. Later modifications were made to the Sector Gear, Drive Gear, and Front Plate printed parts.

Table 1: McMaster Hardware List

Part Number	Description	Quantity Needed	Package Quantity	Price
5906K531	Bronze Thrust Bearing for 1/4" Shaft, 5/8" OD, 1/16" Thickness	1	1	\$0.96
60355K702	Double Sealed ABEC-1 Steel Ball Bearing R4A for 1/4" Shaft	1	1	\$8.16
98381A539	Alloy Steel 1/4" Diameter Dowel Pin, 5/8" Length	1	25	\$3.99
92949A108	Stainless Steel Button-Head #4-40 Socket Cap Screw, 3/8" Length	4	100	\$3.05
90480A005	Low-Strength Steel #4-40 Hex Nut, 1/4" Wide, 3/32" High	2	100	\$0.87
57295K73	Alnico Disc Magnet, 1/4" Diameter, 1/4" Thick	1	1	\$1.87

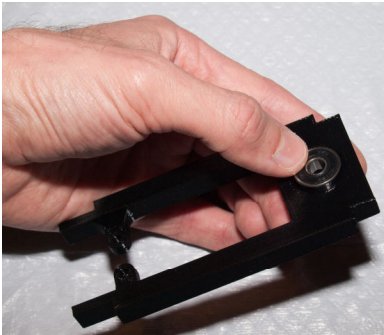
Table 2: Printed Parts List, Miscellaneous Parts List, and Tools List

3D Printed Parts	Miscellaneous Parts	Tools
Sector Gear	Mabuchi Motor	Super Glue
Drive Gear	Hapkit Board	1/16" Hex Key
Front Plate	MR Sensor	Soldering Iron
Side Plate	Power Supply	Flat Head Screwdriver ~1.4mm
Side Plate Mirror	USB Cable	Wire Cutter/Wire Stripper
Board Screw Support	Wire/Alligator Cable	1/4" Hex Wrench (Optional)
Board Inlet Support		Arbor Press (Optional)
Base Plate		3D Printer (Optional)



(2)

Press the dowel pin into the back of the Sector Gear. Depending on the 3D printed part tolerances, it may be possible to press the pin into the part by hand. A tighter fit may require the use of a press, clamp, or pliers.



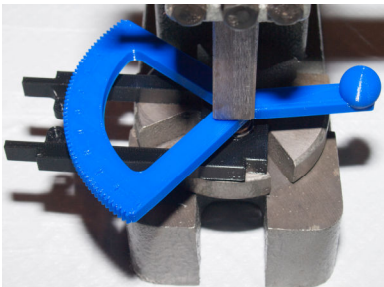
(3)

Press the ball bearing into the front of the Front Plate. Again, ease of installation and required equipment will depend on printed part tolerances.



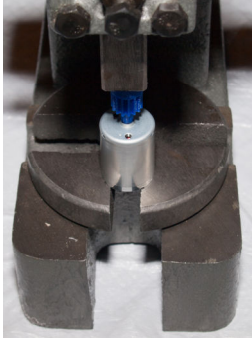
(4)

Place the thrust bearing over the dowel pin on the back of the Sector Gear.



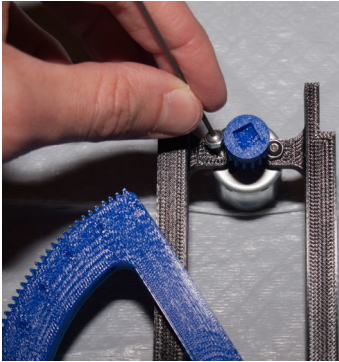
(5)

Press the dowel pin into the ball bearing until no gaps are present on either side of the thrust bearing. Due to the tight tolerances of these parts, this step requires a machine advantage. In this case, an arbor press was utilized. It is also possible to perform steps 2, 4, and 5 prior to performing step 3 in order to better protect the Front Plate.



(6)

Install the Drive Gear on the Mabuchi motor. Depending on the motor shaft and Drive Gear dimensions, it may be necessary to lightly press the parts together. If pressing is required, be careful not to damage the contacts or internal bearings of the motor. If pressing is not required, put a drop of super glue inside the Drive Gear shaft bore prior to installation, keep the motor shaft oriented downward to discourage glue from entering the motor, and make sure that the motor turns freely after 15 seconds.



(7)

Using two of the #4-40 x 3/8" button head screws, install the motor and Drive Gear assembly on the Front Plate.



(8a)

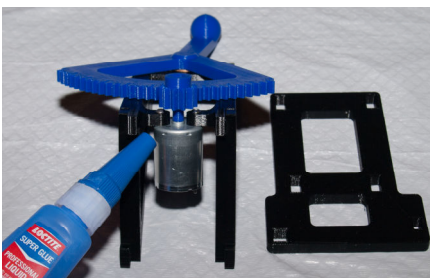


(8b)



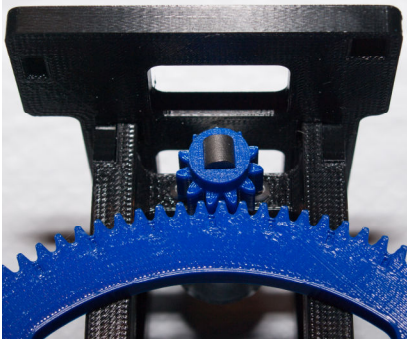
(8c)

Glue a Side Plate to the Front Plate. Apply super glue to the mating surfaces of the Side Plate (a), fit the Side Plate and the Front Plate together, and use the Base Plate to align the assembly (b) – press together for at least 15 seconds. Afterwards, remove the Base Plate (c). Repeat these steps for the second Side Plate.



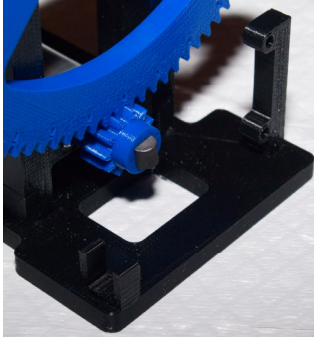
(9)

Glue the Front and Side Plate assembly to the Base Plate. Apply super glue to the mating surfaces of the Side Plates and Front Plate, fit the assembly into the Base Plate, and press together for at least 15 seconds.



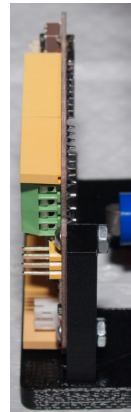
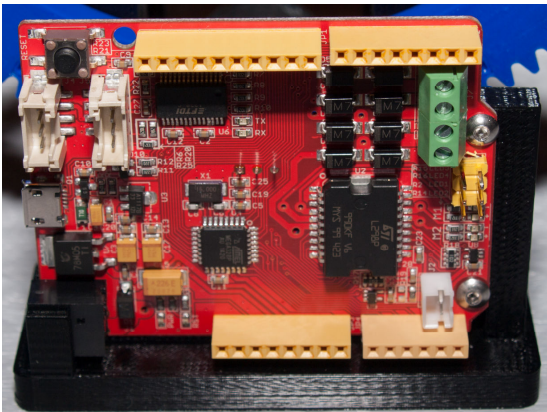
(10)

Glue the magnet into the Drive Gear. Apply a drop of super glue to the magnet recess of the Drive Gear, place the magnet into the recess, and press together for at least 15 seconds.



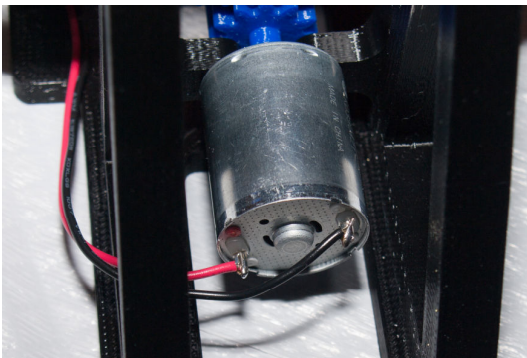
(11)

Glue the Board Screw Support and the Board Inlet Support to the Base Plate by applying super glue to the mating surfaces. Place and press together for at least 15 seconds.



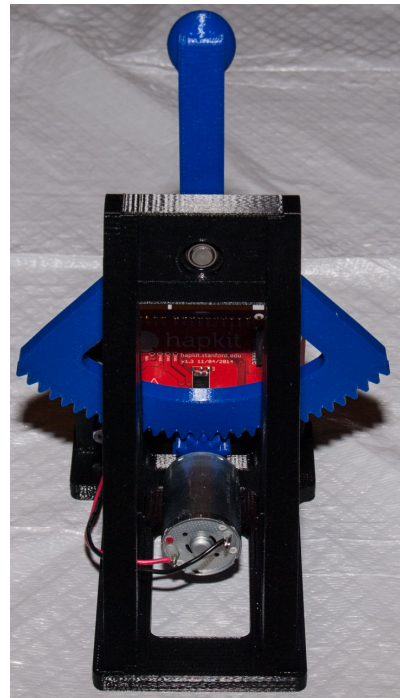
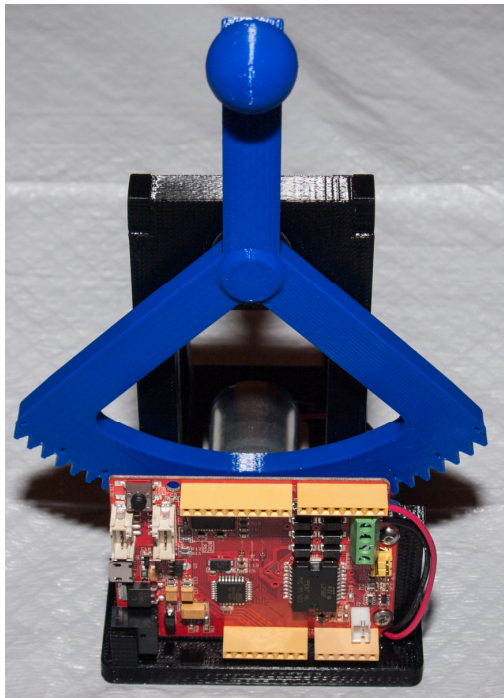
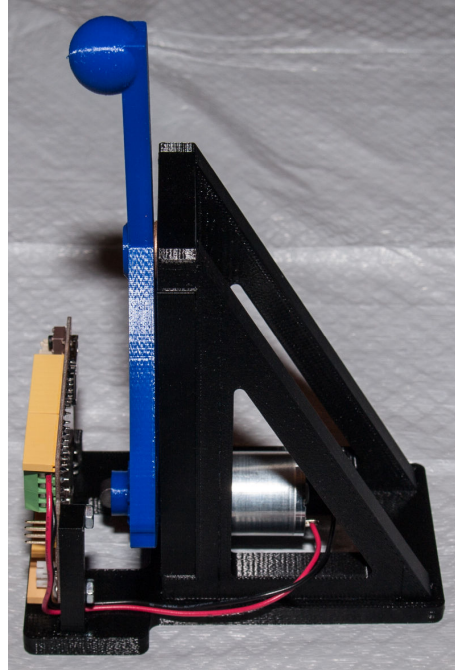
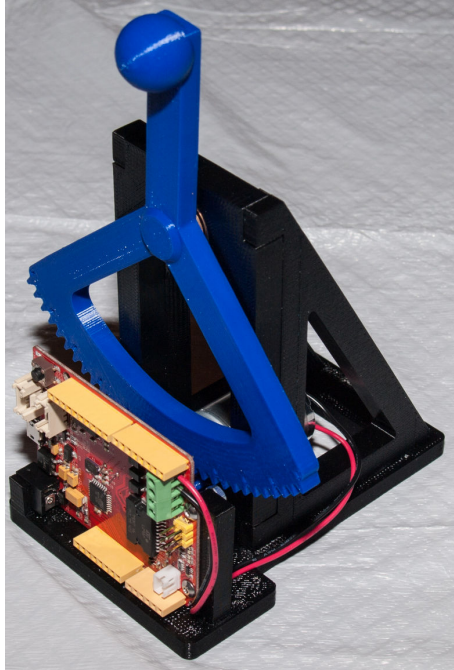
(12)

Solder the MR sensor to the back of the Hapkit board. Using two #4-40 x 3/8" button head screws and two #4 hex nuts, install the Hapkit board.



(13)

Solder wires to the motor contacts or attach two halves of an alligator clip cable as shown in the official instructions. Route the wires through the opening of the Side Plate and then through the gap between the Hapkit board and the Board Screw Support. Strip the ends of the wires and insert them into the top two terminal block openings. Use a flat head screwdriver to secure the terminals.



(14)

Get ready to work with your completed Gear Drive Hapkit!