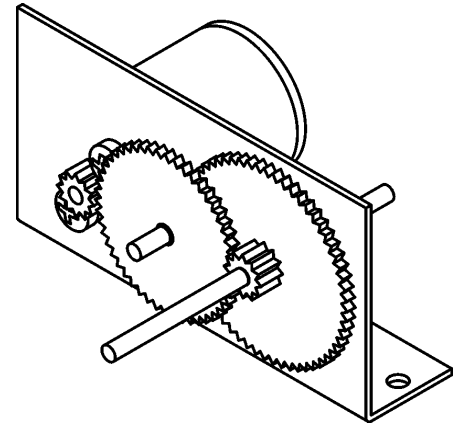


# *BASIC GEARBOX and MOTOR KIT*

The *BASIC GEARBOX and MOTOR KIT* is a very versatile and easy to assemble gear box. The unit is compact and comparatively strong, and can be used in a many applications – anywhere where rotary motion is required. For example, it can be used in isolation (ie to drive or steer a model vehicle), it can have a gear fitted (to interface with other mechanisms), or it can drive a pulley and belt assembly.

The gearbox can be used to drive a wheel or pulley through a single shaft, or the gearbox can be configured to drive two wheels through a longer double sided configuration. This provides four possible configurations of the gearbox, and these are detailed below.



**Optional Configurations:** using the supplied gear set, two choices of gearbox speeds are available. Option A is used for a range of relatively slow speeds, whereas Option B is suitable for faster speeds.

**Technical details:** With the *BASIC GEARBOX and MOTOR KIT*, two reduction ratios are possible.

Note: the First output shaft is the one closest to the motor.

First output shaft      Ratio 50:12

Second output shaft    Ratio 21:12

The nominal voltage of the motor is 4.5V. The speed under load is approximately 9500 rpm. However, use of different voltages allows speeds to be either increased (12,600 rpm (6V/4xAA)) or decreased (6500 rpm (3V/2xAA)). Note: the use of higher voltages may significantly shorten the motor's life.

## INVESTIGATION

This Gearbox unit can be used in many ways, depending on the application chosen for investigation. As a starting point, you can look at how the two gear sets in this gear box work, and the power / torque that is provided.

### 1. COMPONENTS REQUIRED

#### 1.1 COMPONENTS SUPPLIED (IN THE KIT)

1 x Basic Gearbox Mounting plate  
1 x 4.5V Electric Motor (round)  
2 x M2.6 x 4mm self tapping screw  
1 x 2.5mm dia.120mm Steel Rod  
2 x 2.5mm dia.70mm Steel Rod

1 x 12 Tooth Pinion Gear 1.9mm Hole  
2 x 12 Tooth Pinion Gear 2.4 hole  
1 x 60 Tooth x 10T Spur Gear  
1 x 50 Tooth x 12T Spur Gear

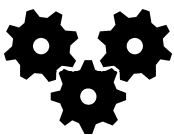
#### 1.2 ADDITIONAL REQUIREMENTS

Depending on the application chosen for this gearbox unit, other items required are available from *Scorpio Technology*. For example: additional gears, pulleys and belts, wheels and additional rods.

### 2. DESIGN STAGE

Before starting assembly, the gear ratio to be used must be decided upon. In addition, the usage for the *BASIC GEARBOX and MOTOR kit* should be planned and drawn up, as this will define the length and orientation of the drive shaft.

Note: we suggest you read the instructions below, before defining the shaft lengths.



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### 3. ASSEMBLY

#### 3.1 PREPARATION FOR ASSEMBLY

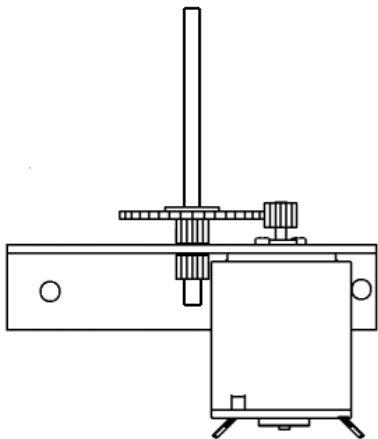
Cut the steel rods to the required lengths. File and remove any burrs from both ends of all shafts.

#### 3.2 CONSTRUCTING THE TRANSMISSION ASSEMBLY

Hint: to assemble gears to shafts, support the gears on a bench or vice and gently tap the shafts into the gears. At other times the gearbox may need to be supported, while a gear is pushed on.

Attach the motor to the Gearbox plate using the two small self tapping screws. Then put the small 12 Tooth pinion gear (1.9 mm hole) onto the bench. Insert the motor shaft into the pinion gear's hole and using a small hammer, gently tap the end of the shaft where it exits the motor. Stop when the shaft is flush with the gear's other side. **WARNING:** Don't push the motor down - this can push the motor armature from its bearings and jam the motor.

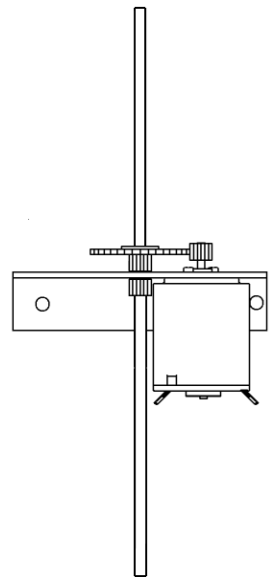
#### OPTION A - SINGLE GEAR CONFIGURATION



Cut the rod to the desired length, for the output shaft. Then place a 12 tooth pinion gear onto the bench top. Place the output shaft into the hole and tap the other end with a hammer until the shaft is flush with the other side of the gear. Install the shaft through the mounting plate hole, and fit the 50 tooth gear (the small pinion gear on the mounting plate side).

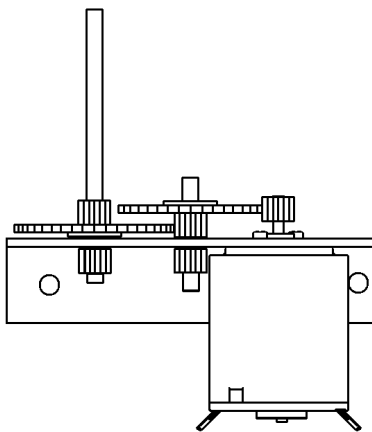
Tap one end of the shaft, until the shaft's protrusion in one or both directions is as designed (refer diagrams).

Note: the gear should be snug but not tight against the Gearbox plate. Turn the pinion gear on the motor shaft with your finger, the 50 tooth gear should turn easily, and the *BASIC GEARBOX and MOTOR KIT* is complete.

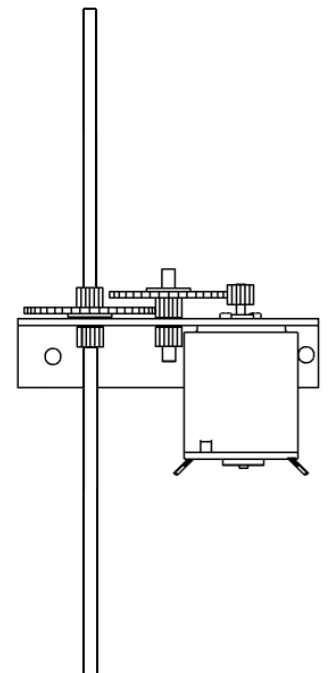


#### OPTION B - TWO GEAR CONFIGURATION

Cut a 20mm length of steel rod, for the shaft closest to the motor. Follow the instructions for the first shaft, as in "Single gear configuration" (above).



Tap the 70 mm shaft into the 12 Pinion gear, locating it either at one end or the middle of the shaft (depending on which of the applications is to be used – one wheel or two). Place the flat side of the 60 tooth gear onto the transmission plate, put the shaft through the plate hole and tap the shaft into the 60 tooth gear hole. The 60 tooth gear is pushed on until the pinion gear and the 60 tooth gear are flush against the transmission plate – a snug fit, to hold the output shaft in place.



When you turn the motor shaft's pinion gear with your fingers, the 50 tooth and 60 tooth gears should turn easily, and the *BASIC GEARBOX and MOTOR ASSEMBLY* is complete.