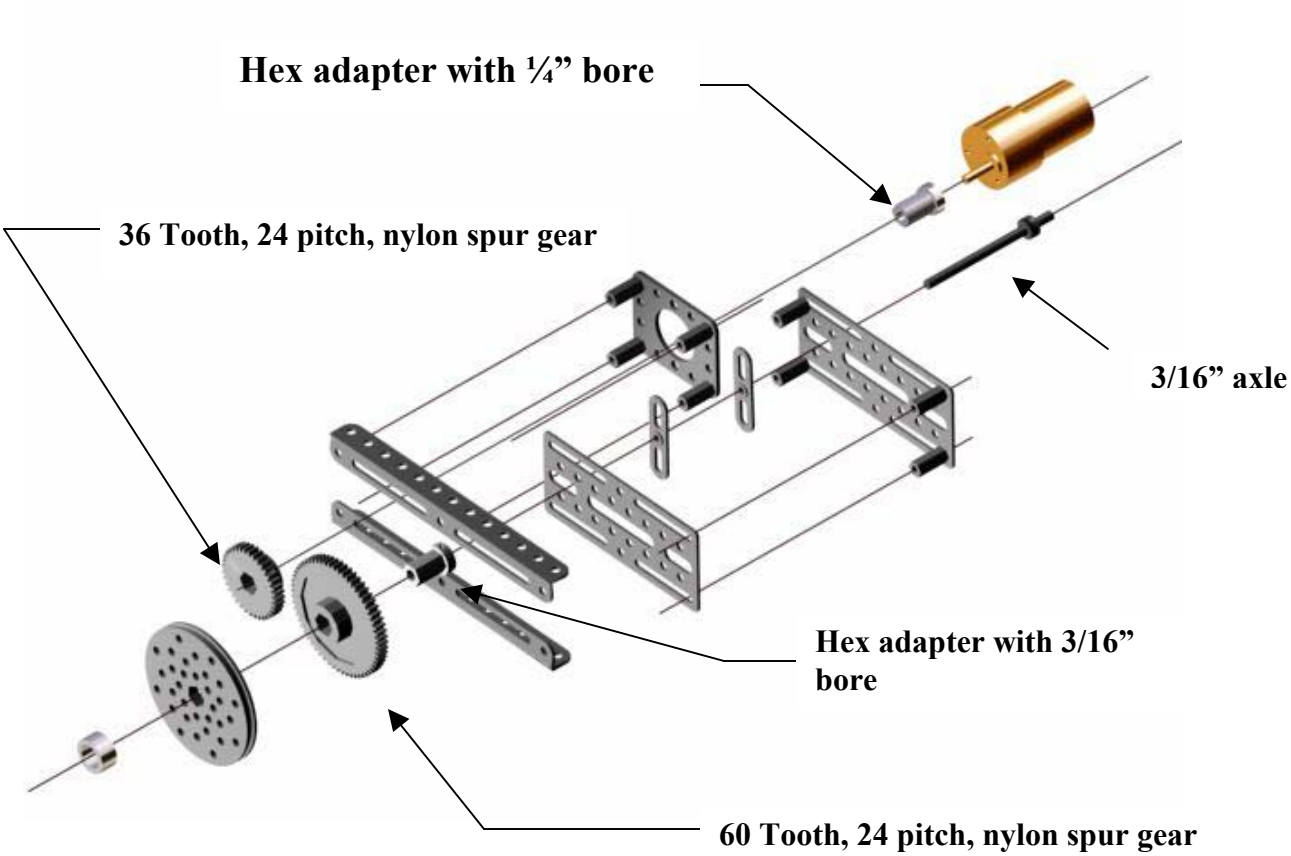
Gear Drive Assembly



Exploded view of a Gear Drive Module

The Gear drive assembly pictured above is based on the design of the GEARS-IDS chain drive system described in the GEARS Educational system document entitled **Build a Drive Train and Mobile Chassis.** (*This document can be found on the GEARS website at www.gearseds.com by going to the Support and then Documentation section.)*

Note: There are many ways to use the GEARS-IDS parts and components to configure a gear drive system. Use your creativity, imagination and experiment with different ways to power your mechanisms.

Required Tools

Safety Glasses
Phillips Head Screwdrivers
5/16" Combination Wrench *(For the Stand Offs)*
3/8" Combination Wrench
6" Needle Nose Pliers
Hack Saw *(For Cutting Axles)*
5/64, 6/32 Allen Wrenches or Hex Keys
File

Materials

Use the GEARS-IDS online catalog of parts and components to identify the following components.

Structural Components

2 13 Hole Angles GIDS-SC-10006
1 M15 Motor Mounts GIDS-SC-10009
2 Bearing/Shaft Plates GIDS-SC-10003
1 3" Hex Wheel GIDS-SC-10014
1 4" x 3/16 Axles GIDS-SC-10018
1 36 Tooth x # 24 Pitch Nylon Gear
1 60 Tooth x # 24 Pitch Nylon Gear
1 M13 Motor Mount GRDS-SC-10008
2 Bushing Brackets GIDS-SC-10010

Hardware

1 3/16" Shaft Collars
1 ½" Shaft collar
8 #10-24 x ¾" Stand Offs GIDS-SC-10015
8 #10-24 x 3/8" PH Machine Screws
6 #10-24 x ¾ PH Machine Screws
10+/- #10 Nuts and Lock washers
2 #10-32 x 3/8" machine screws to mount the motor to the motor mount plate

Electrical

1 2" Gear Head Motors GRDS-MC-10001

Directions

Note: These nylon gear sets have # 10-24 set screws. The setscrews are only need to prevent thrust loads from pushing the gears off the hex adapters. THE HEX ADAPTERS TAKE ALL THE TOURQUE LOADING. Therefore it is NOT NECESSARY to over tighten the setscrews on the nylon gears. Merely snug the setscrews against the face of the hex adapter using a light pressure on the hex key. (Approximately 6-8 inch lbs torque).

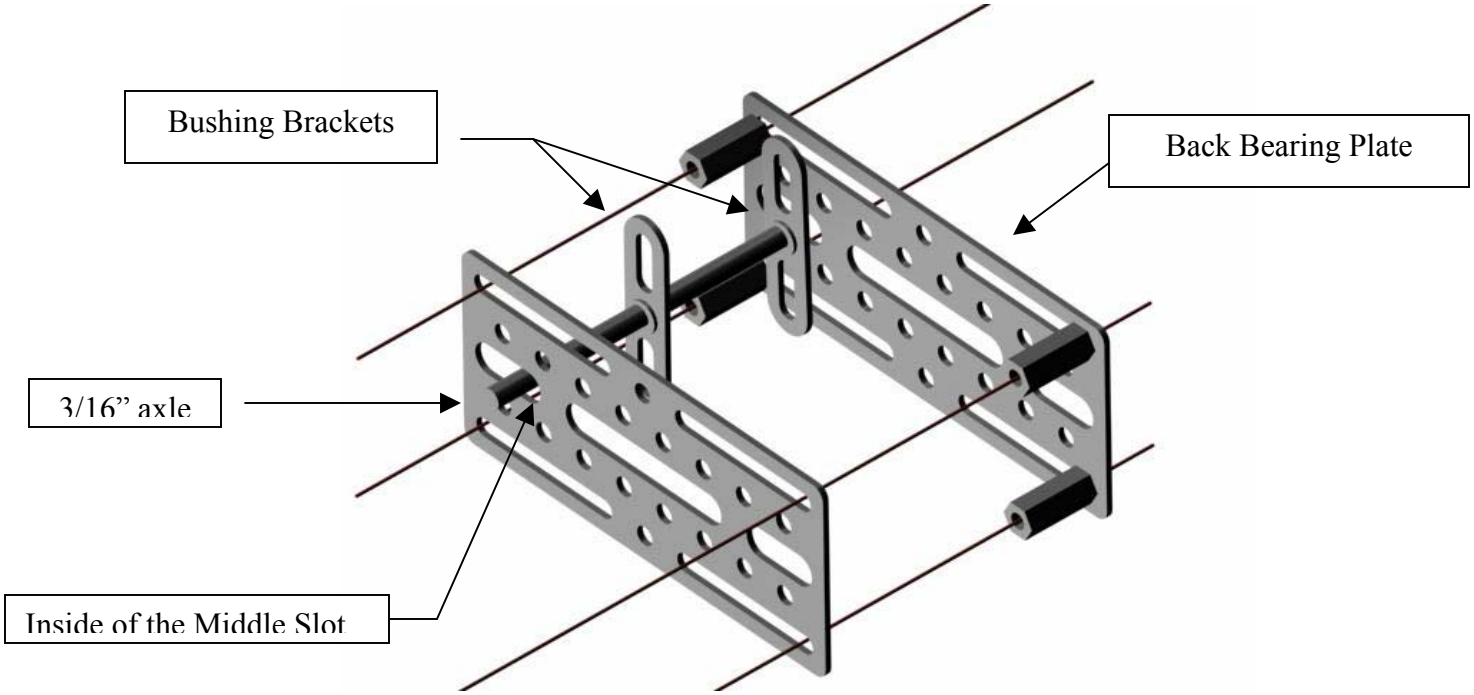
1.) Fasten the motor to the M15 motor mount using #10-32 x3/8" machine screws as shown. The motor mount threads are #10-32 tpi, all other machine screws are #10-24 tpi. #10-24 tpi threads WILL NOT FIT IN THE MOTOR MOUNTS. Fix the ¼" bore hex adapter onto the motor shaft. One of the set screws on the hex adapter should be tighten to the flat spot on the motor shaft. Tighten both hex adapter set screws firmly. (tpi means Threads per inch)

Note: Use lock washers under all hex nuts during assembly. It is always best practice to lightly tighten all fasteners during initial assembly. Firmly tighten all fasteners only AFTER the assembly is complete and the components are properly located and aligned. It is often necessary to assemble and disassemble components several times in order to properly position and align shafts, gears and hex adapters.

2.) Attach the four ¾" x #10-24 hexagonal stand offs to the four corners of the motor mount plate as shown.

3.) Attach the motor and motor mount assembly to the 13 hole angles as shown.

4.) Attach the Bushing Brackets to **the inside** of the Bearing Plates using 3/8" x #10-24 machine screws as shown. The bushing brackets will need to be carefully aligned so that the axle is perpendicular to the Bearing Plate and parallel to the motor shaft. This is important to insure that the gear teeth remain in proper mesh. If the gear teeth do not mesh in parallel, they will wear out prematurely. Insure a close alignment of the Bushing Brackets by fitting them tight to the end of the (middle) slot as shown below.



5.) Attack the ¾" x #10-24 hexagonal standoffs to the 4 corners of the back Bearing Plate as shown above. Hand tighten the machine screws, do not tighten firmly until the assembly is completed.

6.) Attach the 13 hole angle brackets to the front Bearing Plate by passing the 3/8" machine screws through the angle brackets, through the front Bearing

Plate and into the #10-24 stand offs. Keep all screws loose because it will be necessary to adjust the alignments and positions of all the components for the final assembly.

7.) Fit the axle through both bearing plates and attach the shaft collar to the back of the axle and the 3/16" hex adapter to the front of the axle. Keep some spare 3/16" washers on hand to make up space between the hex adapter and Bearing Plates as needed for proper gear alignment.

8.) Fit the 36 tooth gear to the hex adapter on the motor. Remember IT IS NOT NECESSARY OVERTIGHTEN THE SET SCREW IN THE NYLON GEAR.

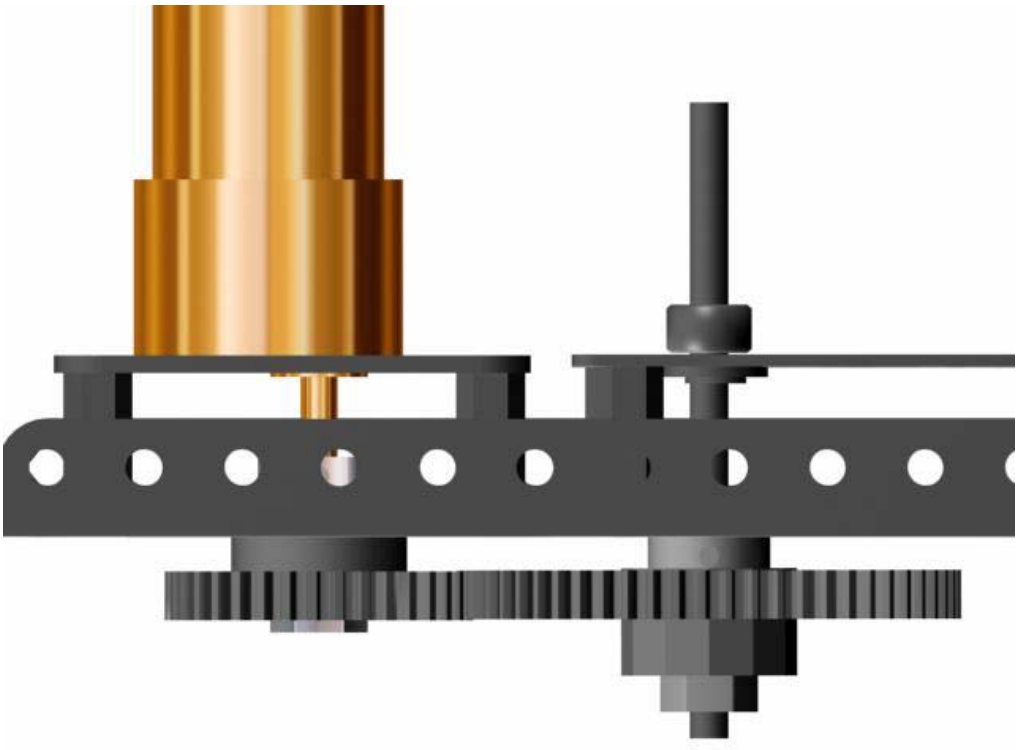
9.) Fit the 60 tooth gear to the hex adapter on the 2/16" axle.

10.) It will now be necessary to create a proper gear mesh. This will require consideration of several adjustments:

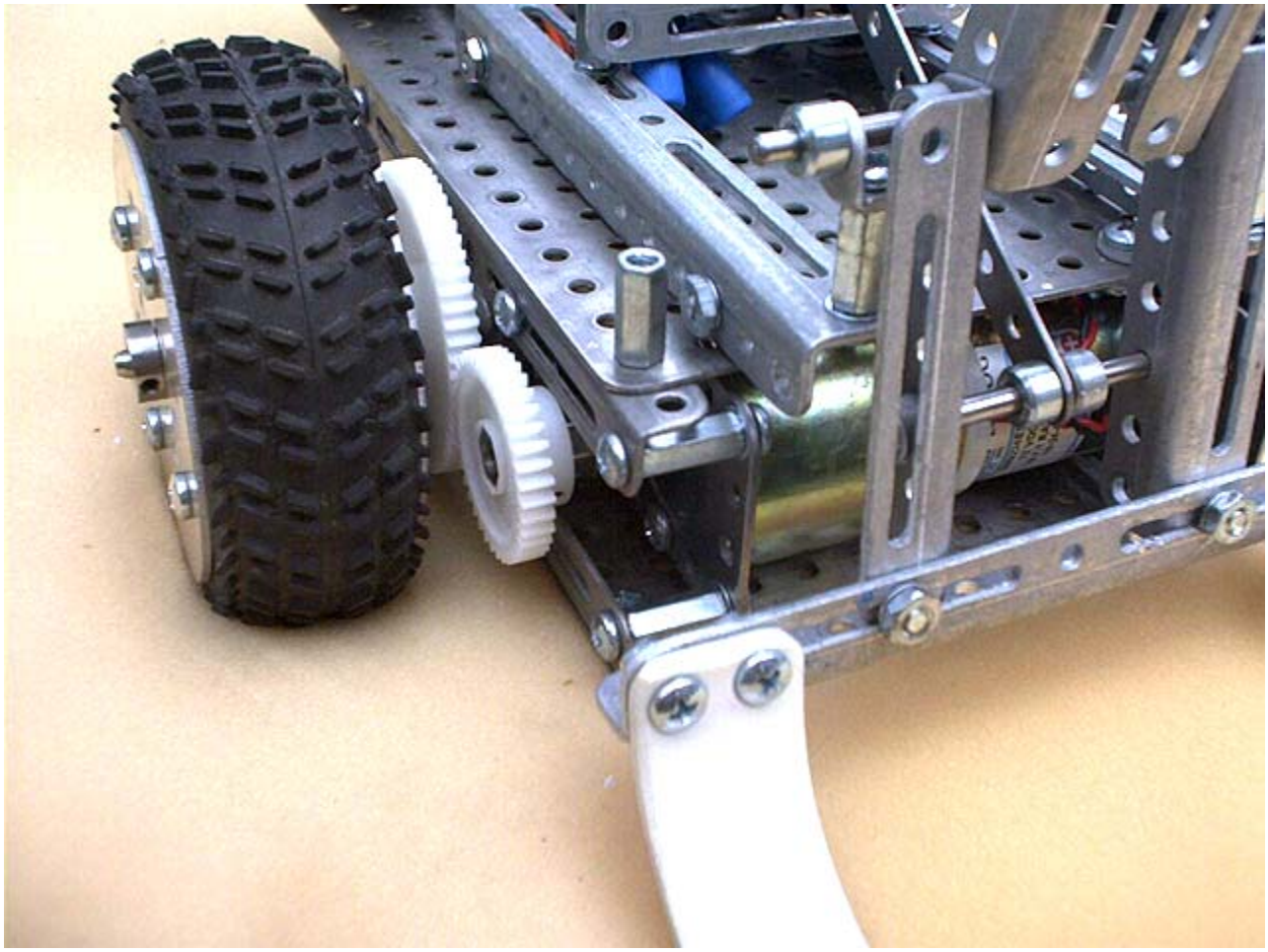
a. Gears must be co-planar. This is accomplished by sliding the attached position of the 3/16" hex adapter along the axle, or by sliding the attached position of the motor gear on the hex adapter, to ensure that the gear teeth mesh completely.

b. Radial alignment must be preserved. This is accomplished by keeping the axle perpendicular to the surface of the Bearing plates. Slight adjustments of the position of the Bushing Brackets can keep the axle perpendicular to the Bearing Plates.

c. Center to center distance must be maintained. If the gears are too close together they will bind. If they are too far apart, the gear teeth will skip and the teeth of the gear will shear off under loading. In order to best insure proper mesh it is best that the gears are kept in tight enough contact so they do not bind or resist turning but no looser.



Study the pictures below to see how other working Gear Drives have been fabricated. Remember, there are many different ways to construct a drive train using the GEARS-IDS components. This is just one of many ways to accomplish the same goal. Once the basics of drive train are understood, then you can construct efficient and effective drive systems by mixing similar components in a variety of creative ways.



Note: The GEARS-IDS kit 3/16” axles and Bushing Bracket components can be used with the Terra Tracker Tire and Wheel options but please be advised that the cantilevered Terra Tracker tires and wheels place severe stresses on the 3/16” axles and they can and will bend if the drive train assembly is driven hard. We strongly advise that you consider purchasing the ¼” Terra Tracker Axle and Bearing kit if you are considering driving your gear train in harsh or outdoor environments.

The nylon gear sets work particularly well with the stock GEARS-IDS tires and wheels.