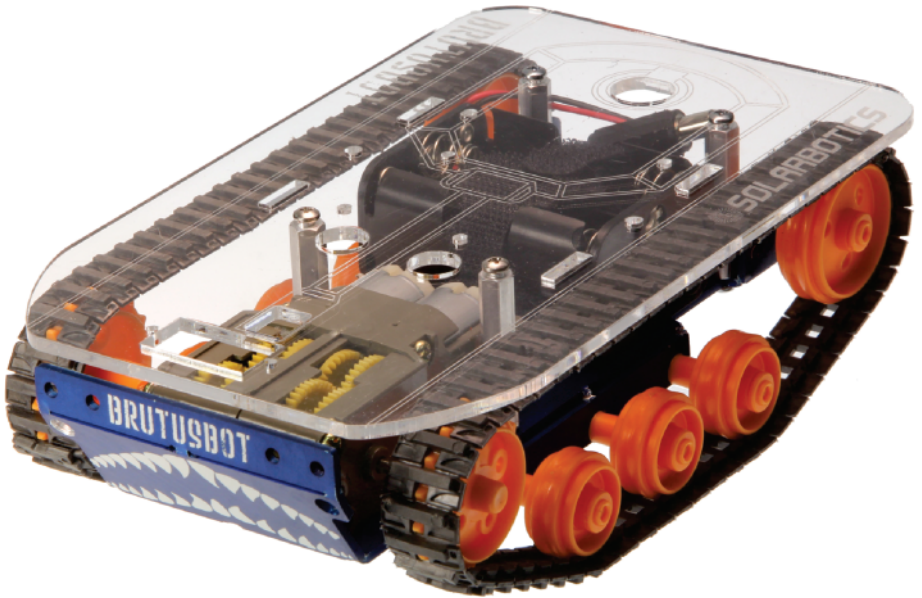


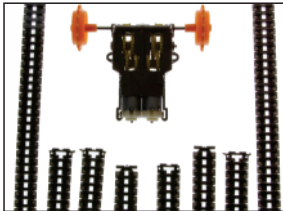
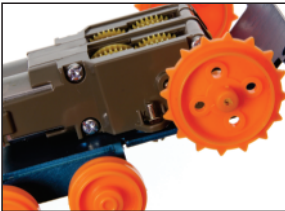
# BrutusBot

Mobile Tank Platform



## Get TANKED!

If you're looking for an inexpensive, *strong* robot platform, you'll do well by the Tamiya Gearbox & Tread set and our custom Aluminum base and Acrylic Top-Plate. It's also Arduino-template compatible!



**SOLARBOTICS**<sup>®</sup>  
Ltd

[www.solarbotics.com](http://www.solarbotics.com)  
1-866-276-2687

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## THE BRUTUSBOT

The Brutusbot is an affordable, customizable mobile tank platform base. Being just a motorized base, you can add any controller platform you desire, from something as simple as a analog modified “Herbie” brain (yup, been done!) to as complex as wireless Synapse networking modules. The Acrylic shell is designed to mount any Arduino-compatible footprint microcontroller development platform, such as the standard Arduino family, Freeduino, PICAXE-28 Project Board, and EZ-B.

### **Features Include:**

- Rugged anodized aluminum chassis with skid plate
- Grippy Tamiya rubber treads for excellent traction
- Tamiya twin motor gearbox configurable for high-speed (indoor / smooth environment) or high-torque (outdoor / rough environments)
- Acrylic top-plate with cutouts for a sensor-sweeping servo and pass-through wiring ports
- Acrylic top-plate works with Solarbotics S.A.F.E. (Solarbotics Arduino Freeduino Enclosure) enclosure to protect your electronics in off-road environments
- 6-cell 'AA' Battery Pack provides 9V to motors when using 1.5V alkalines (7.2V using NiMH/NiCd)

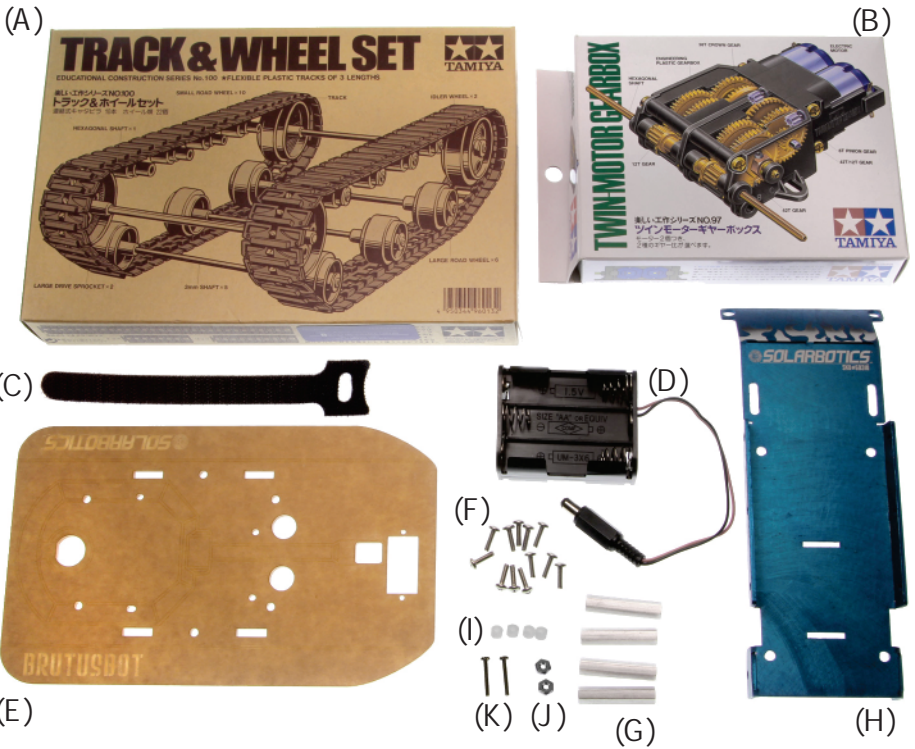
#### Disclaimer of Liability

Solarbotics Ltd. is not responsible for any special, incidental, or consequential damages resulting from any breach of warranty, or under any legal theory, including lost profits, downtime, good-will, damage to or replacement of equipment or property, and any costs or recovering of any material or goods associated with the assembly or use of this product. Solarbotics Ltd. reserves the right to make substitutions and changes to this product without prior notice.

# BRUTUSBOT

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## PARTS LIST



- (A) 1 - Tamiya Track and Wheel Set
- (B) 1 - Tamiya Twin motor gearbox
- (C) 1 - Velcro strap
- (D) 1 - 6 cell 'AA' battery pack with 2.1mm male barrel jack
- (E) 1 - Clear Acrylic top plate with cutouts
- (F) 12 - 4-40 x 3/8" Panhead Philips Bolts
- (G) 4 - 4-40 x 1 1/4" Hex Aluminum Standoffs
- (H) 1 - Anodized blue aluminum chassis
- (I) 4 - #4 x 3/16" Spacers
- (J) 2 - #4-40 Hex nuts
- (K) 2 - #2-56 x 5/8" Phillips 18-8 S/S Pan Head Machine Screw

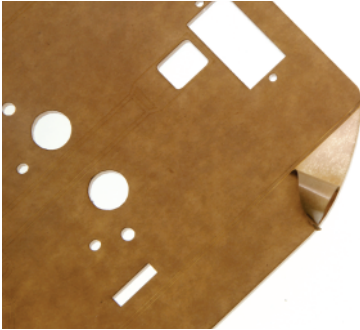
### TOOLS:

Assembly is quite straightforward, but you'll still need:

- Soldering equipment (for wiring up)
- Wire cutters/strippers
- Philips #1 Screwdriver
- Needle-nose pliers

## ASSEMBLY - THE TOP PLATE

**Important! There is protective brown paper on the acrylic.** Before you peel it off, read this page first!

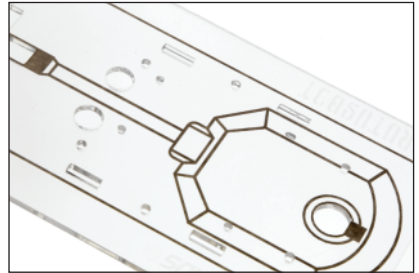


Step 1 - Prepare the Top Plate: So before you go willy-nilly and start peeling paper, think about if you wish to paint and customize your BrutusBot.

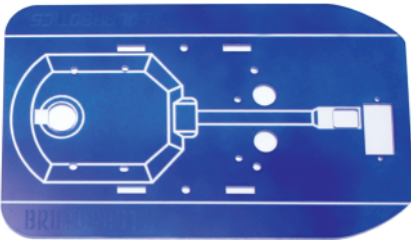
Yes? Read on!  
No? Ok, peel away!

Painting acrylic is easy, especially when using a Krylon plastic paint spray-bomb.

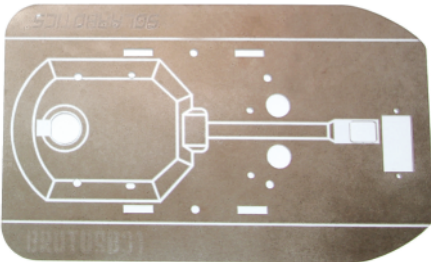
Peel off the larger portions and leave the outline of the turret, then spray two or three light coats (let dry between coats). Or reverse the effect by stripping off just the fine lines.



*All but lines stripped*



Here are a pair of top-plates prepared with blue and tan spray-paint. These were prepared by leaving the turret outline papered during painting.



LED lights mounted underside project the turret's outline onto the ceiling.

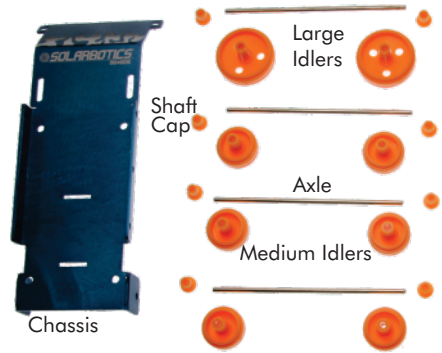
*Blue and Tan paintjobs*

## ASSEMBLY - THE CHASSIS

Step 2 - Chassis Parts: From the Tamiya Tread kit, find:

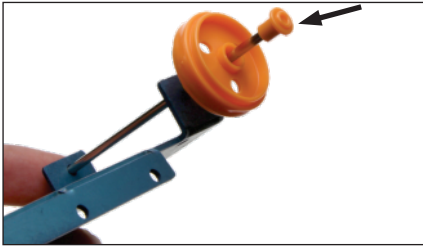
- 2 large idler wheels
- 6 medium sized idler wheels
- 4 idler axles
- 8 small idler shaft caps

Also have the chassis on hand - it the key part!

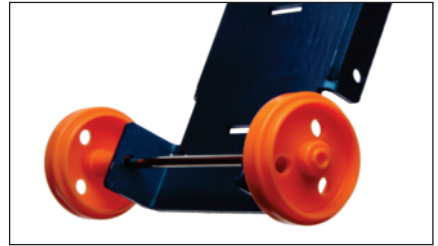


Step 3 - Large Idler Installation: Make sure your large idlers *don't* have teeth - those are different parts!

Slide an axle through the holes at the far back of the chassis, away from the logo / skid plate. Install one large idler, then push an shaft-cap onto the axle until it stops moving. Then place the other large idler on the other side and push on another shaft-cap.



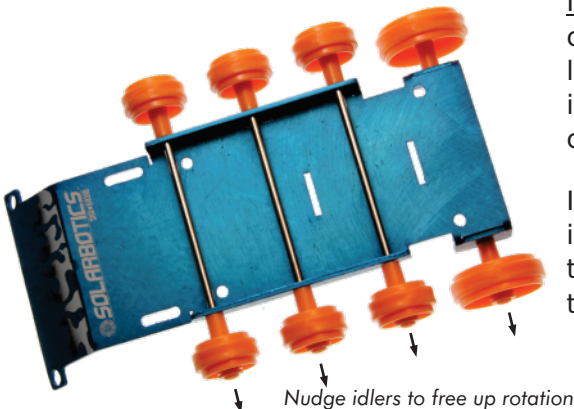
Shaft-cap inserted onto axle



Final Large-idler installation

Note: Sometimes the end-caps can get pushed on a little *too* tight, and the idlers rub against the chassis.

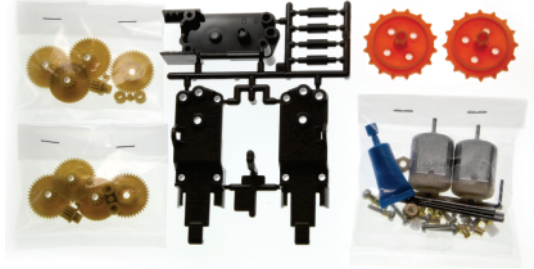
If this is the case, give the idlers on one side a *gentle* tug to free up the idlers so they can spin freely.



## ASSEMBLY - THE GEARBOX

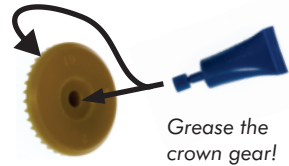
Step 4 - Gearbox Assembly: Make a decision now if you want a fast but weak, or slow and strong BrutusBot, because it's time to build the gearbox! Converting it later *is* possible, but not that easy.

Want fast/weak? Built the Tamiya gearbox in 'A' (58:1 gear ratio) configuration. Want slow/strong? Build 'C' (203:1 gear ratio) configuration. Look at the Tamiya twin motor gearbox instruction manual for details.



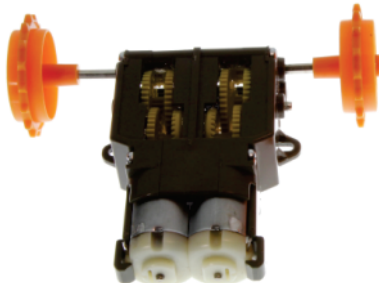
**Note:** The little blue tube that comes with the Tamiya twin motor gearbox is a *tube of grease*. This is vital for stopping high-pitched squealing from the gearbox!

Apply the grease in the locations shown in the Tamiya instruction diagrams (darker shaded spots on the gears & housing), and especially to both sides of the *inner hub* of the crown gear.



Step 5 - Spur Gear installation: We prefer to use the **large spur gear**, and designed the chassis to fit the treads using it. If you *really want* to use the small spur gear, be our guest, but we can't guarantee the fit of the treads.

Push the spur gears onto your gearbox output axles until they don't travel any further (requires some force).



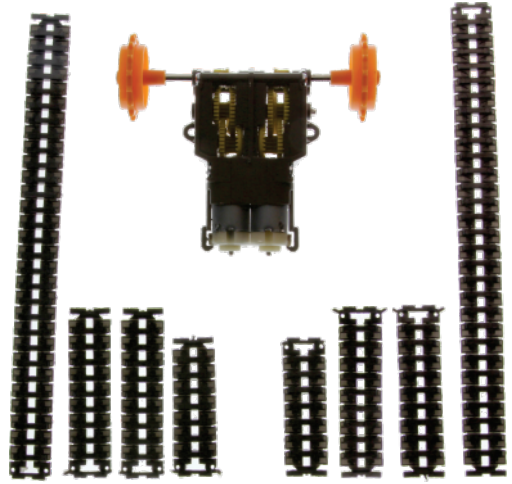


## ASSEMBLY - THE TANK TREADS

### Step 6 - Tread Assembly:

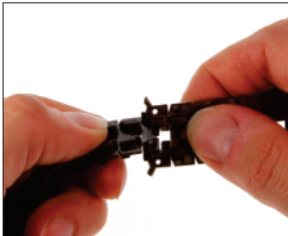
Each tread configuration requires:

- 1 long tank tread segment
- 2 medium sized segments
- 1 single short segment



Assemble the tracks as shown in section 3 in the Tamiya Track & Wheel Set assembly instructions.

Tip: Having troubles linking the sections? After you get the first side of the tread 'T' in place, fold the other side of the 'T' in half and pass it through the hole



6a: Take the 'T' shaped end of a tread segment and place one side of it through the hole of the next segment.



6b: Place the nub from the 'T' and slide it into the link position.



6c: Use your thumb to fold the *other side* of the 'T' in half, and pass it through the hole in the other segment.

Now just finish placing the second nub in place and repeat this process for the rest of the segments you need.

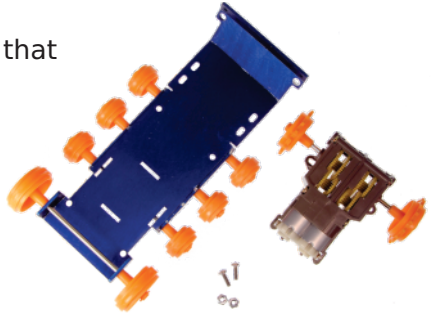


## ASSEMBLY - MOUNT THE PARTS

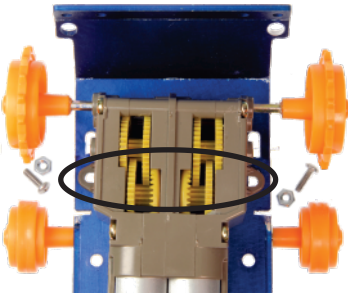
### Step 7 - Gather the Hardware:

Find the bag of parts and hardware that came with the Tamiya twin motor gearbox, and locate the two #4-40 gearbox-mounting screws.

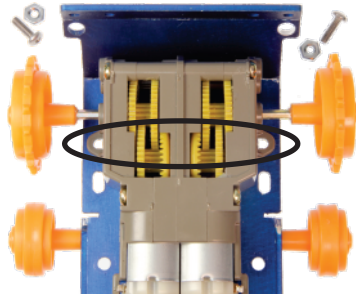
Use the Solarbotics-provided #4-40 nuts (they're bigger and stronger).



Step 8 - Mounting the Motor: If your motor is 'A' configuration (speedy), use the rear slots. 'C' configuration (torque) uses the front slots.



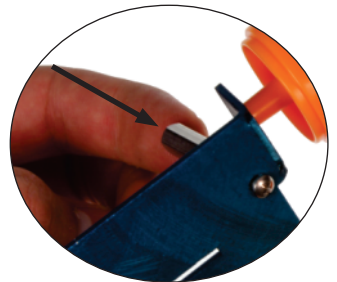
'A' Configuration uses REAR slots



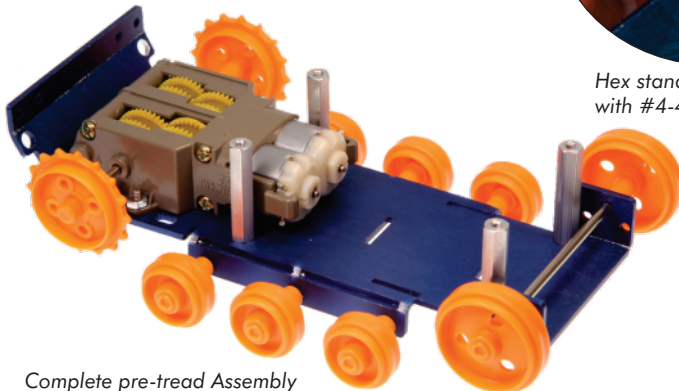
'C' Configuration uses FRONT slots

### Step 9 - Installing the Stand-offs:

The four 1-1/4" aluminum hex stand-offs are bolted to the frame with the #4-40 x 3/8" screws.



Hex stand-offs are mounted with #4-40 x 3/8" bolts



Complete pre-tread Assembly



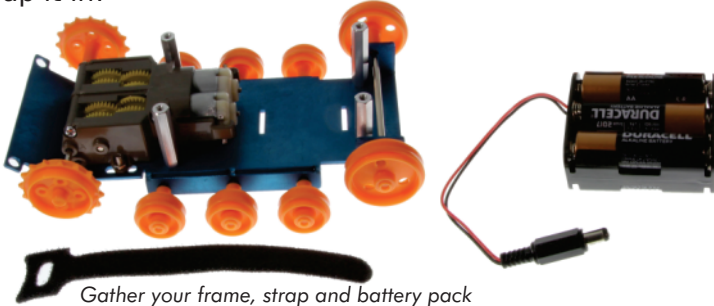
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## ASSEMBLY - INSTALL MORE PARTS

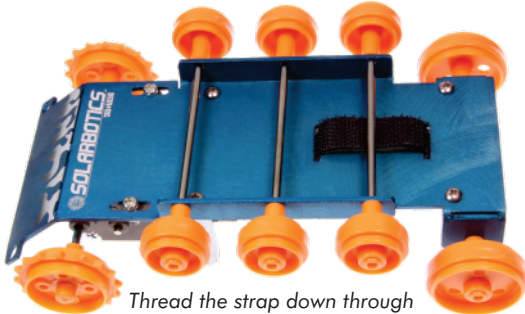
Step 10 - The Battery Pack & Strap: Before it gets too snug, it's a good time to install the battery pack and strap.

The strap installs from the top through one slot, underneath (snug against the frame, not the going over the axles), and back up the other slot.

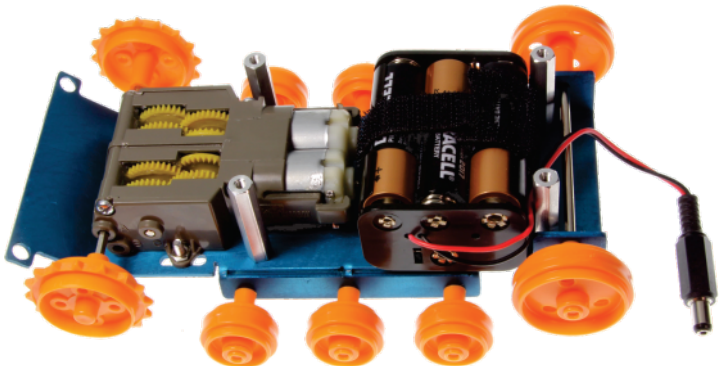
Power up your battery pack with batteries, place it on the chassis, and strap it in!



*Gather your frame, strap and battery pack*



*Thread the strap down through the slot, and back up through the other*



*Secure battery pack down. Make sure battery wires tuck behind the stand-off!*

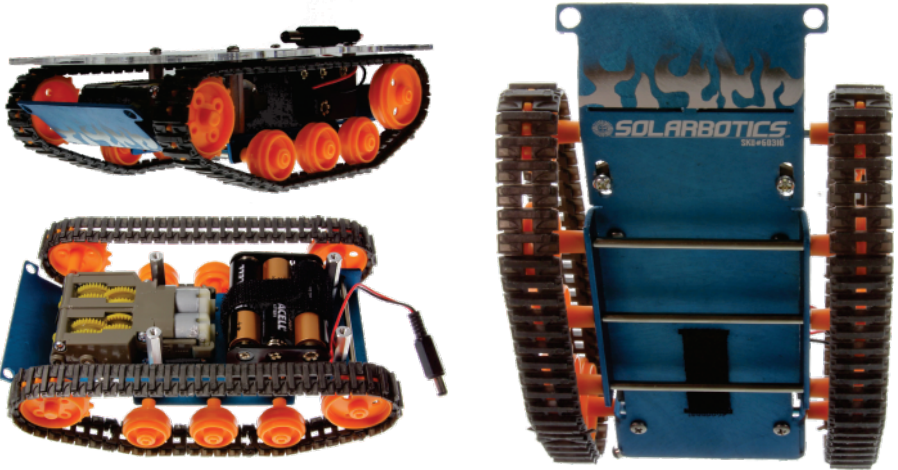
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## ASSEMBLY - THE FINAL COUNTDOWN

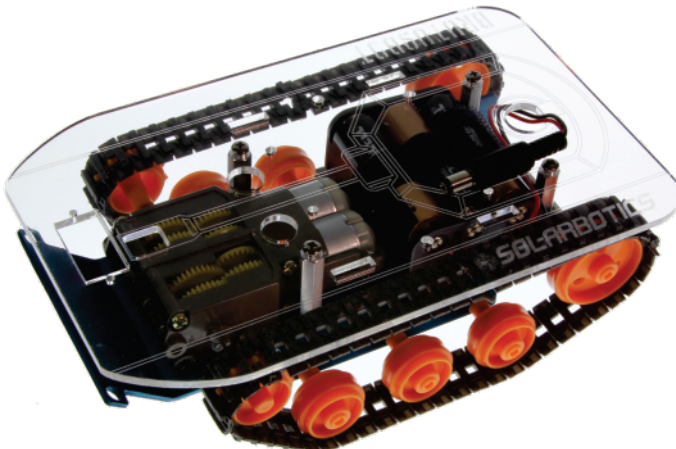
Step 11 - Install the tank treads: Let's make this look like a *tank*. Slip the tank treads over each set of toothed spur gear and idlers.

Pull the twin motor gearbox forward, stretching the treads a bit, and then let the gearbox pull itself back into place.

Shift the gearbox ahead ~ 1/8" (2mm) to keep some tension on the treads, and then tighten up the gearbox mounting bolts. The treads can't dangle below the idlers - they have to sit tight, under tension!



Step 12 - Adding the top plate: Use your remaining #4-40 x 3/8 bolts to mount the acrylic top plate. Done! Let's see it in action!

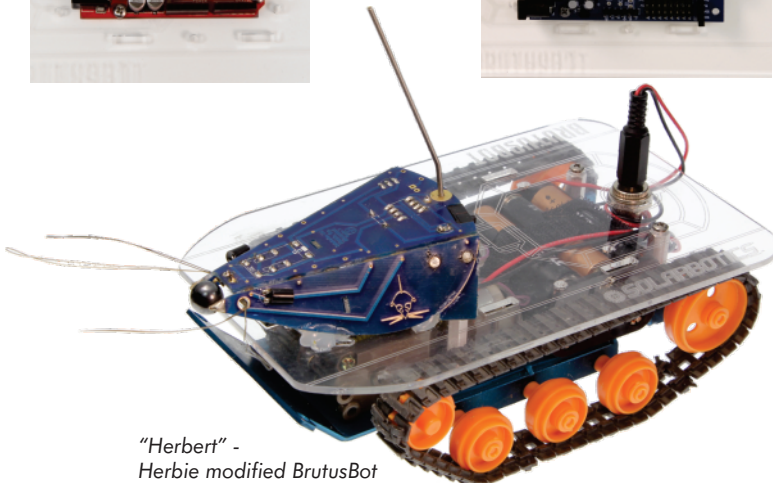
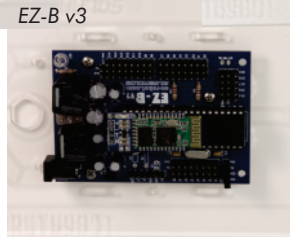


## CHOOSE YOUR DESTINY

Step 13 - Installing your controller: The acrylic top plate has a footprint for the classic Arduino hole pattern which matches the Arduino UNO, Freeduino, PICAXE-28 project board or EZ-B. You can attach the board via the extra [4] #4-40 x 3/8 bolts and nylon spacers.

If you wish to use something else, use double sided sticky tape or drill some holes. Acrylic *is fragile* and may crack when drilled with regular high-speed bits, so try to use *plastic-drilling* drills at slow speed (on a wood back-support), or a diamond-bit. We've even resorted to using hot-glue for some projects (see "Herbert" below).

We've also included some #2-56 x 5/8" screws that can be used in conjunction with the acrylic spacers to mount the servo up a little higher when the twin motor gear box is in "C" configuration.



"Herbert" -  
Herbie modified BrutusBot

## TROUBLESHOOTING & WRAP UP

Hopefully, your Brutusbot is now up & running and happily causing mayhem! If not, try these troubleshooting tips:

**Brutusbot has a hard time moving:** Low batteries, or it could be that the end caps on the axles are installed too tightly.

**Treads slipping off:** Remember you need some tension in the treads added by adjusting the position of the gearbox. Grippy (carpet) surfaces also peel them off under lots of power. Adjust your code to avoid spinning in place.

**Gearbox is very noisy:** More grease! Apply even more grease to your gearbox, especially the faces of the gears that are near the housing of the gearbox.

**Funny behavior:** Motor noise can cause problems. Add slight motor delays to your code to compensate for electrical noise generated by the motors. Also try adding 0.1 $\mu$ F filter capacitors on the motors themselves between the motor leads, and from each lead to the metal motor can (needs 3 capacitors per motor).

**Can't navigate tall grass:** Be aware of the possibility of gear teeth breaking if you place too much torque on the Brutusbot when the twin motor gearbox is in the High speed 'A' configuration. Please do not attempt off-road surfaces in high speed mode - it's best to use the 'C' configuration for more torque.

As with most kits, we encourage hacking and customizing the original design and we look forward to seeing what you come up with!

Visit us online for more info and cool stuff:

[www.solarbotics.com](http://www.solarbotics.com)

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