

# How the Solar Bracket was Made

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## Rev A – Using Aluminum Brazing

The initial solar bracket was very crude and my first attempt at building anything out of aluminum. This was really more of a feasibility study to see how hard it would be to do something like this and what works best.



As can be seen above the finished bracket has a single linear actuator that allows the panel to rotate around its axis to follow the sun.

I learned the following from this project:

- It's incredibly tedious and difficult to braze thin aluminum because the torch flame will blow a hole in the molten metal if you leave it a split second too long.
- Using a simple shaft through holes in the aluminum is a crappy 'hinge' as it tends to bind and twist the assembly. Need to use some sort of bearing to provide smooth movement.

## Rev B – Using TIG Welded Aluminum

After a lengthy learning period, I was able to use my TIG welder to build a much better bracket as seen below.



This bracket supports two actuators: (1) the linear actuator used to tilt the panel to change the inclination based on the season of the year, and (2) the angular actuator used to rotate the panel around its axis to follow the sun during the day.

This bracket also uses ¼" rod end bearings to provide smooth motion in both axes.

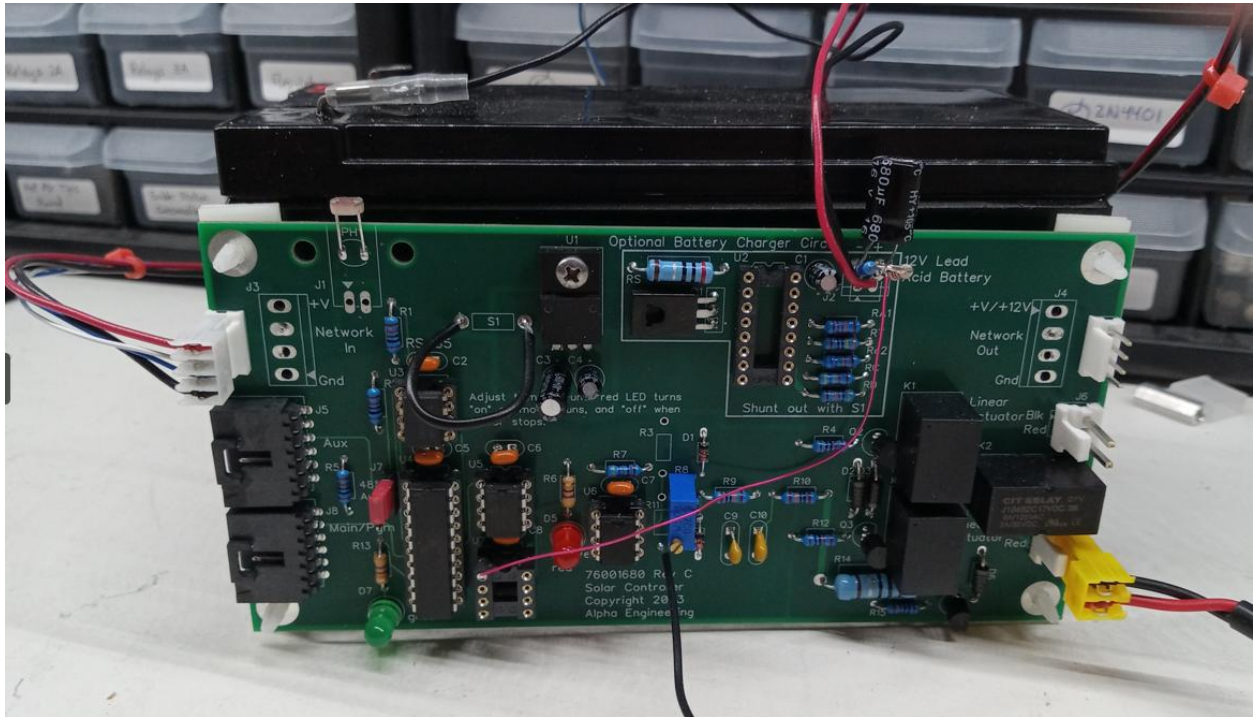
This bracket is a major improvement over the initial brazed bracket.

I learned the following from this project:

- Even the slowest angular actuator (3RPM) is too fast for accurate solar panel movement. I found a slower 0.5RPM actuator and have that on order now.
- The ¼" aluminum shaft is too soft and easily bends under almost the slightest torque. I probably need to use a harder alloy for production.
- I had drilled out the 6mm shaft coupler to fit over the ¼" shaft. This turned out to be a bad idea as the shaft ended up getting so wedged in the coupler that I had to saw the coupler in half to get the shaft out. In the future, grind the shaft to fit in the coupler.
- The bottom of the solar panel "rubbed" on the top of the rod end bearing causing friction while rotating. Simply putting a flat washer on the rod between the bearing and the panel solved the problem.

## The Electronics

The electronics (still under development) is shown below.



This provides the following features:

1. Controls up to two 12VDC actuators allowing the logic to detect end of travel as well as reverse the direction of travel.
2. Supports a light sensor that can be mounted the bracket to determine the level of light received.
3. Provides flash memory for configuration parameters.
4. Supports an optional keypad display to change configuration parameters.
5. Supports an RS485 multi-drop network to allow multiple of these controllers to be linked to a remote host computer.
6. Supports a lead acid battery charger to support remote operation without access to power.
7. Supports monitoring of the 12VDC level.

## Components Used

<p><a href="#">uxcell POSB4 Rod End Bearings 1/4-inch Bore Pre-Lubricated Bearings 1/4-28 Male Thread Right Hand 2pcs: Amazon.com: Industrial &amp; Scientific</a></p>		<p>\$5.00</p>
<p><a href="#">Greartisan DC 12V 3RPM Turbo Worm Geared Motor High Torque Turbine Worm Gear Box Reduction Motor 6mm Shaft JSX843-370 -- Amazon.com</a></p>		<p>\$14.99</p>
<p><a href="#">0.5 RPM Gear Motor: Amazon.com: Tools &amp; Home Improvement</a></p>		<p>\$34.99</p>
<p><a href="#">Xnrtop 6mm to 6mm Shaft Coupling 25mm Length 18mm Diameter Stepper Motor Coupler Aluminum Alloy Joint Connector for 3D Printer CNC Machine DIY Encoder (Pack of 2) : Amazon.com: Industrial &amp; Scientific</a></p>		<p>\$8.39</p>
<p><a href="#">Longdex 6-Pack Micro Limit Switch Snap Action Long Roller Lever Arm SPDT Momentary Micro Limit Switch Silver Contacts V-156-1C25: Amazon.com: Industrial &amp; Scientific</a></p>		<p>\$1.23</p>
<p><a href="#">ECO-WORTHY 12V 2 Inch Stroke Linear Actuator Max 330lbs Heavy Duty Durable Motor with Mounting Brackets (12VDC 2''): Amazon.com: Industrial &amp; Scientific</a></p>		<p>\$39.99</p>
<p><a href="#">DC HOUSE 1000N High Speed 14mm/s Black Actuator Motor 4 Inch 4" Stroke Linear Actuator DC12V with Mounting Brackets (Not Include Wiress Remote Controller): Amazon.com: Industrial &amp; Scientific</a></p>		<p>\$41.99</p>