

Starting Assumptions

1. You have used our Propeller Assembly Instructions or a Propeller Manual to mount your propeller to your engine/gearbox with the propeller-mounting-bolts and blade-clamping-bolts loose enough to allow the blades to still rotate in the hub.
2. You have standard hand tools and are using a **calibrated torque wrench**.

Protractor Description

Outer Scale: Located on the main body of the protractor (gray). Marked in 1° increments.

Inner Scale: Located on the movable inner wheel (white). Marked in 5 second increments.

White Clamp: Contacts the curved-side of the blade when the Wing Nuts are tightened.

- The white clamp is designed to bend as you tighten the wing nuts.

Lock Knob: Can be tightened to prevent the inner wheel from rotating.

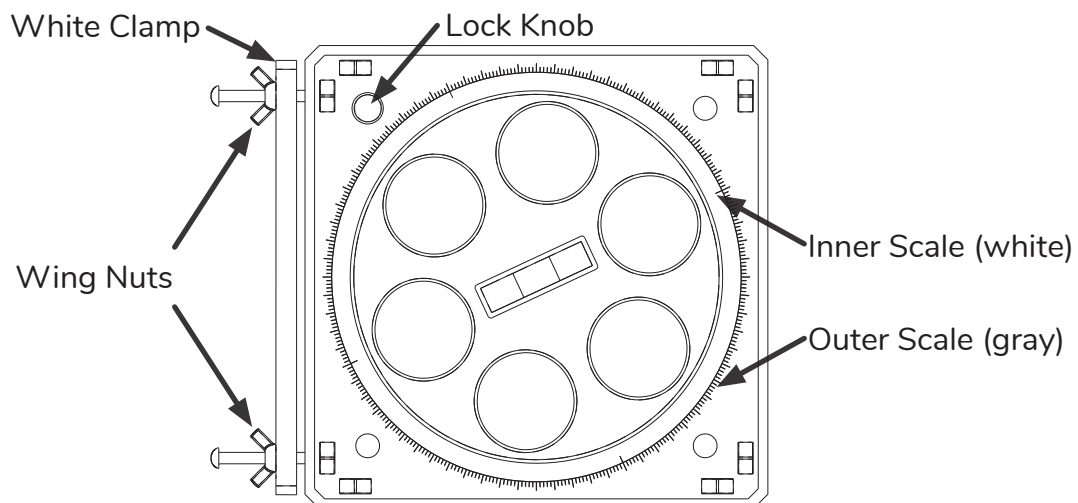


Figure A: Protractor

How Warp Drive References Pitch

The pitch of a Warp Drive propeller is referenced in degrees.

Pitch (degrees) = The difference between the hub angle and the blade tip angle.

Terminology

The tips of two different propeller blades are shown in Figure B below, the one on the left is for a left-hand rotation propeller and the one on the right is for a right-hand rotation propeller. Look at the tip of one of your propeller blades and compare what you see with Figure B to determine if you have a right- or left-hand propeller.

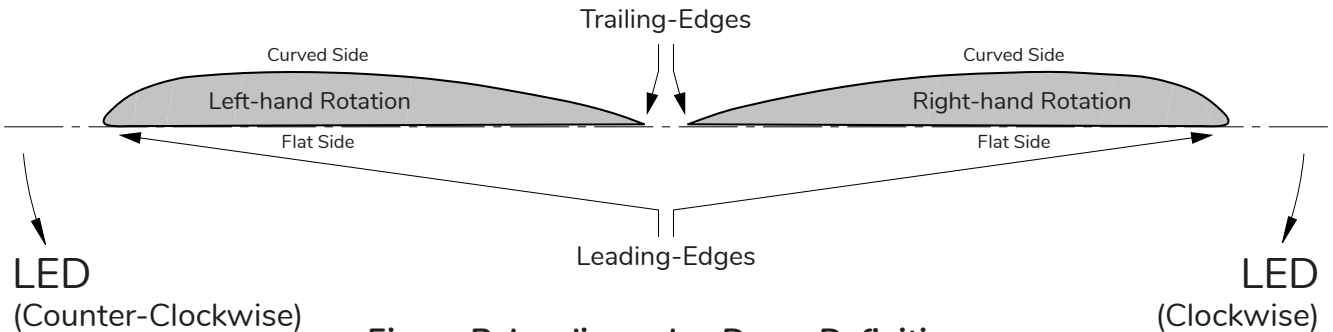


Figure B: Leading-edge Down Definition

The leading-edge down (LED) direction can be either clockwise (CW) or counter-clockwise (CCW) depending on whether you have a left-hand-rotation or right-hand-rotation propeller.

Instructions

1. Rotate each blade in the hub so that the curved side of the blade is pointing forward.
 - “Forward” = the direction your vehicle will travel.
2. Pick one side (left or right) of your vehicle to stand on.
 - Stay on this side when you set the pitch of each blade. You will rotate the entire propeller so that each blade comes around to where you are standing.
3. Spin the propeller so that one of the blades is horizontal to the ground and in front of you.
 - It doesn't have to be perfectly level but be consistent for each blade.
4. Measure the hub angle as shown in Figure C below. With the white clamp facing away from the hub, hold the protractor against the hub and rotate the center wheel until the bubble is level. Make note of which outer scale mark the zero on the inner scale aligns with, that is your hub angle.
 - There are multiple zeros on the inner scale, pick one to use.

Setting Propeller Blade Pitch

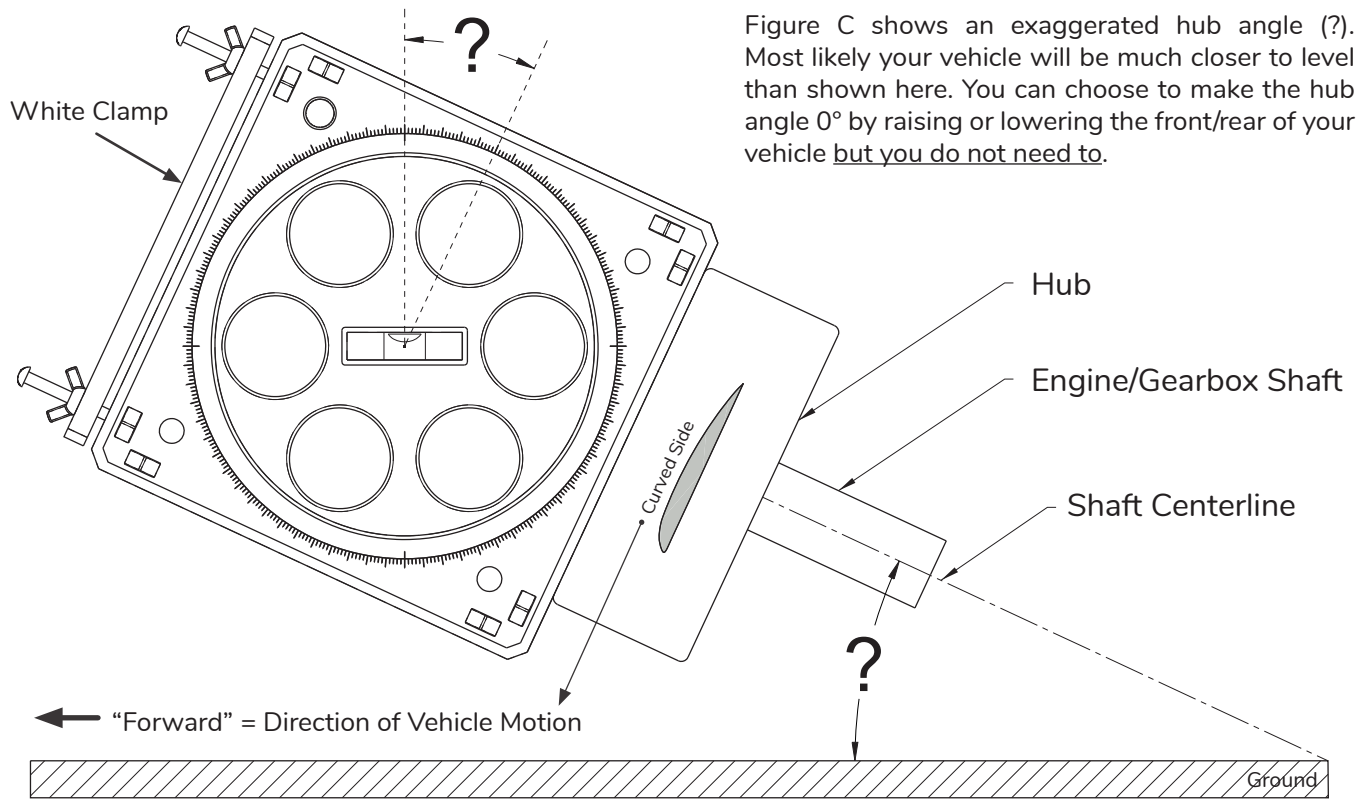


Figure C shows an exaggerated hub angle (?). Most likely your vehicle will be much closer to level than shown here. You can choose to make the hub angle 0° by raising or lowering the front/rear of your vehicle but you do not need to.

Figure C: Hub Angle Measurement

- Using the same zero on the inner scale that you used in Step 4 as a reference, rotate the inner wheel in the Leading-Edge Down (LED) direction as many degrees as you would like in your propeller.
 - Review Figure B shown above. Example: If you have a right-hand rotation propeller and you want 10° of pitch then rotate the center wheel 10° clockwise.
- Tighten the lock knob.

Skip to Step 8 if your vehicle is in a tractor (propeller at the front) configuration.



The white clamp on the protractor must sit on the curved side of the blade therefore you cannot simply move the protractor straight out from the hub to the blade tip, you have to “flip” it.

How to Flip: The white clamp must switch sides (Left-to-Right or Right-to-Left, depending on which side of the aircraft you are standing on) in a way that prevents the lock knob from changing the way it faces (toward or away from you).

- Perform “The Flip” as described above if you have a pusher. Go to Step 9.
- Move the protractor straight out from the hub to the blade tip.

- Don't turn it, flip it, rotate it, or spin it.

9. Clamp the protractor to the blade tip by tightening the wing nuts.
 - The white clamp should be on the curved-side of the blade.
10. Pull out (away from the hub) on the blade to seat the blade root into the hub.
11. Rotate the blade in the hub until the bubble on the protractor is level.
12. Partially tighten the propeller clamping bolts for the blade in front of you.
 - Use a criss-cross pattern. Double check the bubble is still level while/after tightening.
13. Remove the protractor from the blade. Do not loosen the lock knob.
14. Rotate the propeller so that the next blade comes around and becomes horizontal on the side of the vehicle where you've chosen to stand.
15. Repeat steps 9-13 for each blade.
16. Torque the blade clamping-bolts to the proper specifications in 2-ft-lb increments.
17. Check each blade pitch again to ensure the pitch didn't change during torquing.
18. Torque the propeller mounting-bolts to proper specifications in 5-ft-lb increments.

Example: Tractor, Standing on Left Side, Left-hand Rotation Blades

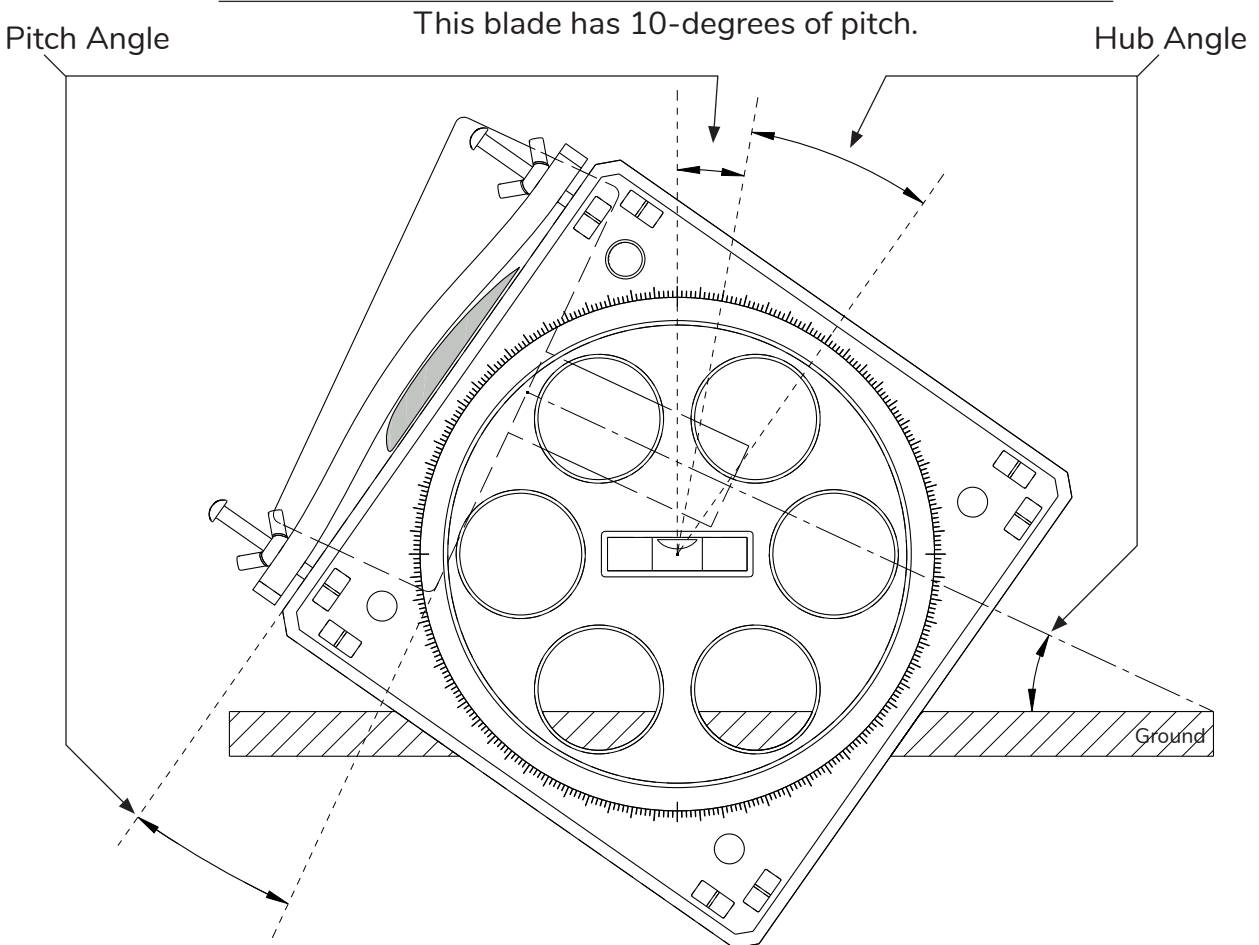


Figure D: 10-deg Example