

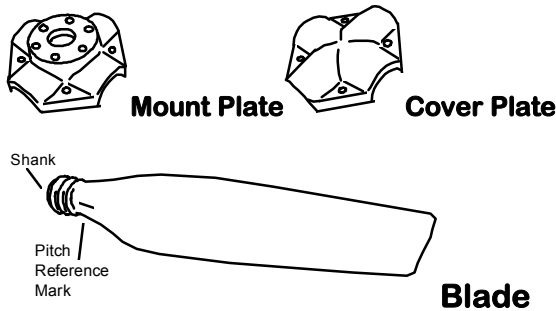
Maximus Series

Mounting Instructions for Ground Adjustable Hub and Propeller Blades 3 and/or 4 Blade Sets

In your final setting of pitch, your engine horsepower and crankshaft RPM should top out through your reduction unit at or near 2,200 RPM of this propeller set.

NOTICE:

In large horsepower airboat applications, say above 500 horsepower, there have been several destructive failures recorded of the engine, reduction unit, propeller and engine mounting structures as a combined assembly in airboats. A phenomenon known as "Whirl Mode" is possibly the cause of such failures. Whirl Mode is made possible by large soft engine mount bushings that lack the required *STIFFNESS* to prevent the onset of a gyroscopically induced Whirl Mode action that can rapidly increase to chaotically destructive forces. In layman's terms, "The whole thing gets to bouncing around until it breaks". The user must assure that the combined engine assembly that this propeller set is attached to is structurally able to prevent such forces and keep the propeller within a safe operating zone. The centrifugal and gyroscopic forces developed with this propeller with such HP input are huge.) The user is encouraged to do an Internet search of "Whirl Mode" to find engineering information on the subject.



Tools Needed:

- Large Rubber Mallet
- 3/4 " six point deep socket & Wrench
- Torque Wrench (up to 65 pounds)
- Various sockets and wrenches @ 7/8" & 13/16"

Mounting Instructions:

BEFORE YOU BEGIN:

- Please read these instructions carefully before mounting the propeller.
- Note and record for your records the numbers in the identification plate in inside of the shank of each blade. For accurate balance in 4-blade sets, it is essential that you arrange the blades in sequence by number around the hub, left or right is OK.

Attach Mount Plate

1. Clean the mount drive plate on the engine/ reduction unit and place the mount half of the hub onto it.
2. Attach the mount plate with the six grade eight, 1/2 " fine thread, hex head bolts & six "NordLoc" (brand) double layer serrated washers provided. Match the various lengths of these bolts so that they extend out the rear of the hub approximately the same amount. (about 5/8 " to 3/4"). On first-time installations, it may be necessary to shorten (cut off by hand with hack saw and dress with a flat file) the prop lugs to a maximum of 7/16" extension out from the drive plate of the reduction unit.
3. Tighten these six 1/2 " bolts to 45 ft-lbs torque. Use the six point 3/4" deep socket mentioned above with a socket set torque wrench to tighten. When installed, there must be

no space between the hub and drive plate. Check behind the mount plate for "no daylight" between and or use a .001" feeler gage to verify a tight fit to the drive plate. Note that if the above mentions prop lugs are still too long they will hold the hub away from a required tight fit.

Set Pitch of Blades

1. Notice the index mark on the round portion of the shank. This mark is referenced to the design pitch distribution. We recommend aligning them with the matching plane of the hub plates.
2. Align pitch marks with the center of the matching plane of the hub halves (adjust pitch as you think best, but we recommend trying this setting first). Set all blades to the same pitch angle. Later you will run the boat with this initial setting to determine if you are obtaining the desired propeller RPM. When you have found the best pitch setting for your engine configuration, place your own index marks on each blade for future convenience.

Mount Blades in Hub Ports

1. Press the shank of each blade into a socket of the mount plate. The face of the blade (push side) should show rearward. The shank will fit very tightly and will resist going all the way into the socket. There is a small amount of overstock in the shank to hold the blade from shifting position during use. Use the rubber mallet to drive the shank snugly into the mounted half of the socket. It will not yet seat completely due to its designed oversize. Tension of this overstock will help hold the blade in place while you mount the other blades. Someone to help hold the blades will ensure not dropping a blade and possibly damaging it. (After the bolts holding the cover plate have been started, the blades are loosely held in place for pitch adjustment.)
2. While pounding the shank in with the rubber mallet, make sure each blade is moving toward its pitch setting as desired. Some shifting may occur as you drive the blades into the ports. If the pitch alignment of any blade changes, remove it from the socket and insert again. When covered with the cover plate, the blades should seat without further rotation away from the desired pitch.

Mount Cover Plate

1. Place cover plate over propeller blades, aligning the concave socket halves over the shanks of the blades. Lightly use the rubber mallet as necessary. See that the cover plate alignment holes start over the internally threaded protruding inserts in the mount half of the hub. Next start the 9/16 inch X 2 ½ bolts and NordLock washers through the cover plate. Do not drive the hub cover plate tight until you have inserted and hand started the bolts and washers.
2. Begin to tighten the cover plate bolts into the threaded inserts drawing the cover plate down evenly so as not to bind the alignment inserts as they seat into the cover plate. This will close the gap on the propeller shanks. Tighten the bolts in sequence until the cover plate closes to the mount plate to within about 1/16" to 1/8" to the mount plate and slightly compress the propeller shanks to establish a tight fit. Watch the reference pitch marks to be sure that the blades seat without rotating out of alignment. Loosen the bolts again and re-tighten to 65 ft-lbs torque before running the engine and propeller.¹ Hand-rotate the propeller to check for alignment and pitch set.² If available, use a "digital smart level" at the tip end of each blade while at the horizontal position on the port side of the boat for pitch sameness to within 0.2 degrees for a smooth propeller set. After any pitch re-set, torque the hub bolts again to 65 foot pounds.
3. Run the propeller for a few minutes at about 1/2 power. Shut down and check the propeller for any signs of structural defects, mounting errors, and take all normal safety measures. Check the torque of the cover plate bolts again. If these factors check out, run the engine to power and determine the RPM. If you have begun to exceed 2,200 propeller RPM, increase pitch. Decrease if you are under your desired top RPM. Before disassembly, mark an advanced (or retarded, as appropriate) temporary index on each side of each blade to mount to on the next try, etc.
4. To disassemble, loosen nuts and washers, back mounting bolts partially out. Aggressively push and pull prop tips by hand to free the blade shanks in the ports. Then complete the disassembly, being careful not to drop the individual propeller blades.

Permanent Installation:

1. Before the permanent installation, try your propeller in most of your normal uses to be sure of your final pitch adjustment. Note that a higher pitch will give you a better cruise and more miles per gallon. A lower pitch will give you more push at no forward speed for getting "unstuck" or running dry ground but you will suffer at the cruise and top

end. You will find that optimum performance will occur if the propeller is pitched within a 4 degree band (within 1/8" of the circumference of the shank) on either side of the reference mark. When you are satisfied with your final pitch settings, run a very small bead of silicone as a moisture seal along the outside edge of the mount plate and around the propeller shank. Use a finger to silicone seal the outside of the blade shank to the hub port and along the edges of the matched hub halves. With continuing service, re-torque these cover plate bolts to 65 foot-pounds from time to time, frequently at first, until the shank has set to your conditions. You should now have a permanent installation.

2. If you decide to change the pitch or disassemble the propeller set, re-seal the hub as described above.

Field Balancing

Should you ever need to check the balance of your propeller set, we recommend the following process.

1. Disassemble the propeller blades from the hub and check carefully for any damage or deformations that would cause the propeller not to balance. If you see no defects, then the blade moment (tip weight) can easily be weighed on a small electronic scale (weight capacity of 4000 grams) accurate to a gram.
2. Use the first, largest ridge on the shank as a balance point. Place it on a smooth, hard, surface that is raised to a level slightly higher than the table of the scale. The blade should rest only on the outside point of the first, largest ridge of the shank. Lower the tip edge of the blade gently to the center of the scale table and read the moment to the closest gram. The shank ridge support must be just high enough that the end edge (and no more) of the tip rests on the center of the scale table. Weigh the blades with the airfoil side facing downward.
3. If you discover a variance from the weights recorded when the blades were new, moisture change will likely be its cause. If there is change of sameness between blades (out of balance), consider this simple solution. Lightly sand a surface near the tip of the lighter tip weight blade and spray some high grade clear epoxy (can be purchased in handy spray cans) on it to bring up its tip weight. If still more tip weight is needed, it will be necessary to send the blade back to Water Walker for internal weight balancing to the desired tip weight.
4. When the tip weights are equal, the prop will again be in fine balance. Other than direct damage, such as bending or other deformities, the hub set should never be out of balance. Should the aluminum hub set receive physical damage, it cannot easily be repaired or re-balanced, and thus should be replaced.

Water Walker LLC has spent several years and a large amount of research in developing this new computer controlled process to bring these advanced propellers to you. We hope you will receive many years of good performance from your extraordinary new propeller.

¹ This last process confirms that the bolts are not over-stressed for the operational condition and are able to support the normal operational stresses.

² In the case of an aircraft engine, make sure the magnetos are in the "off" position.