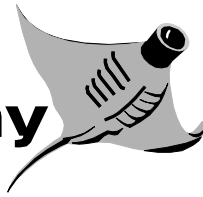


VideoRay Tech Note



For additional information contact:
www.videoray.com

ID	VRTN-2
Title	Counter-rotating Propellers for Horizontal Thrusters
Date	30-Apr-04
Author	Tom Glebas
Keywords	Counter-rotating, Propeller, Pro CPU Upgrade, Horizontal Thrusters
Type	Hardware
Sub-type	
Model(s)	Optional upgrade on Pro and Pro II; standard Pro III and Deep Blue
Serial number(s)	Various (see Applicability / Assessment to determine applicability)
Warranty impact	None
Summary	Counter-rotating propellers are available for use on Pro and Deep Blue. This Tech Note provides some details about counter-rotating propellers and their use.
Applicability / Assessment	Any Pro or Pro II models that have had their ICB PCU upgraded to version 3.1 or greater. All Pro III and Deep Blue models.
Required parts	Counter-rotating ("Left handed") propeller
Required tools	7 mm wrench
Required consumables	None
Authorized personnel	User
Experience required	Beginner
Approximate time required	15 minutes
Safety Concerns	Possible risk of cuts from sharp edges of the propeller. Use gloves when handling propellers for removal or installation.

Counter Rotating Propellers

Counter-rotating propellers offer increased performance over like-rotating propellers by eliminating torque steer or the tendency of the submersible to roll or "pull" to one side.

Counter-rotating propellers are standard on Pro III and Deep Blue models, and are required for any Pro or Pro II that has been upgraded to version 3.1 or greater of the ICB CPU board software chip.

On models that are configured for counter-rotating propellers, there are right-handed and left-handed versions of the propellers and each must be installed on the proper thruster.

Identifying Propeller type

To identify the type of propeller, it should be viewed from the rear (as if it was installed on the submersible and you are viewing the submersible from the rear).

The blades on left-rotating propellers appear to curve, or spiral, to the left when viewed from the rear.

The blades on right-rotating propellers appear to curve, or spiral, to the right when view from the rear.

Figure 1 shows a left-handed propeller on the left and a right-handed propeller on the right.

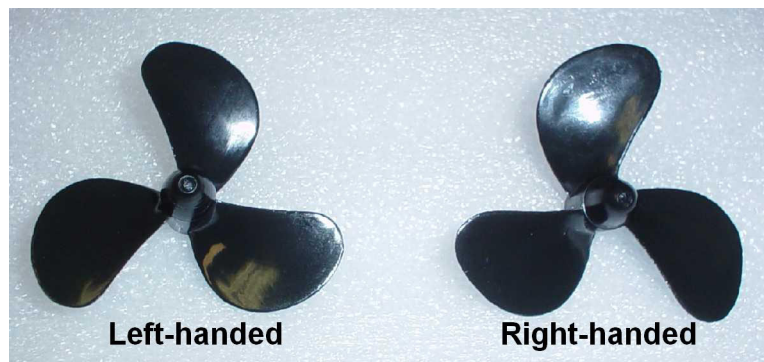


Figure 1 - Both propellers are shown from the rear

Removing / Installing Propellers

There are no extraordinary procedures for installing counter-rotating propellers other than ensuring that the correct propeller is installed on the correct thruster. The left-handed propeller must be installed on the left (port) thruster (when viewed from the rear of the submersible). The right-handed propeller must be installed on the right (starboard) thruster.

To remove a propeller:

1. Remove the thruster guard by unscrewing it.
2. Use gloves and grip the propeller.
3. Loosen the locking nut.
4. Unscrew the propeller.

To install a propeller:

1. Install a locking nut on the shaft, if not already installed.
2. Use gloves and screw the propeller onto the shaft.
3. While holding the propeller, tighten the locking nut against it.
4. When tightened, the locking nut should be approximately 1 mm (0.05 inches) away from the thruster seal.
5. Install the thruster guard by screwing it on the thruster.

Additional Notes

Pro and Pro II ICBs that have been upgraded to version 3.1 of the ICB CPU board software chip require the use of counter-rotating propellers.

PC Pilot software allows user selection of counter-rotating propellers or not.

Counter rotating propellers are not available for the Scout, Explorer, 2000 and 2002 models.

Right-handed two bladed propellers are used on models that are not counter rotating.

Right-handed two bladed propellers are used on the vertical thruster.

The counter-rotating propellers come in two sizes 50 mm and 60 mm. 50 mm propellers are two bladed. 60 mm propellers are three bladed.

Even though counter-rotating propellers are designed as left-handed and right-handed, the screw threads on the thruster shafts are always right-handed.