OWNER'S GUIDE & INSTALLATION INSTRUCTIONS

Retractable Underwater Camera
with Valve

Model CA500

U.S. Patent No. 5,186,050. 7,369,458 B2. Patent Pending on Camera Insert

10/08
17-456-01 rev. 01

IMPORTANT*:* Please read the instructions completely before proceeding with the installation. These instructions supersede any other instructions in your instrument manual if they differ.

WARNING: Always wear safety goggles and a dust mask to avoid personal injury when installing.

CAUTION: Never use solvents. Cleaners, fuel, sealants, paint, and other products may contain strong solvents, such as acetone, which attack many plastics, greatly reducing their strength.

Applications

- **Plastic housing recommended for fiberglass or metal hull only**. *Never* install a plastic housing in a wood hull since swelling of the wood may possibly fracture the plastic.
- **Bronze housing recommended for fiberglass or wood hull.** *Never* install a bronze housing in an aluminum hull, because electrolytic corrosion will occur.
- **Stainless steel housing compatible with all hull materials**. Recommended for aluminum hulls to prevent electrolytic corrosion *provided the stainless steel housing is isolated from the metal hull.*
- *Never* install a metal housing in a vessel with a positive ground system.

Tools & Materials

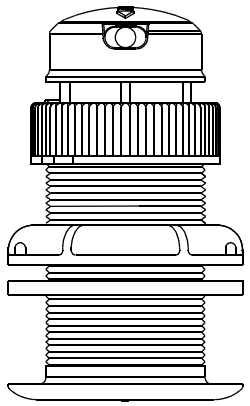
Water-based anti-fouling paint (**mandatory in salt water**)
Safety goggles
Dust mask
Electric drill with 10mm (3/8") or larger chuck capacity
Drill bit: 3mm *or* 1/8"
Hole saw: 51mm *or* 2"
57mm *or* 2-1/4" (stainless steel housing in a metal hull)
Sandpaper
Mild household detergent *or* weak solvent (such as alcohol)
File (installation in a metal hull)
Marine sealant (suitable for below waterline)
Additional washer [for aluminum hull less than 6mm (1/4") thick]
Slip-joint pliers (installing a metal housing)
Grommets (some installations)
Cable ties
Adaptor plug (some installations)
Installation in a cored fiberglass hull (see page 3):
Hole saw for hull interior: 60mm *or* 2-3/8"
Fiberglass cloth and resin
or Cylinder, wax, tape, and casting epoxy

Fairing

CAUTION: Never use a fairing with a plastic housing; the protruding camera would be vulnerable to damage from impact.

Record the information found on the cable tag for future reference.

Part No.:_____ Date_____



CA500
plastic
low profile
P617V housing

Pretest

Connect the camera's power cable to a 12 VDC power source. Plug the video connector into the video input port on the display. Check for a picture. If there is none, check the connections. If there are still no picture, return the product to the place of purchase.

Anti-fouling Paint

CAUTION: Anti-fouling paint is mandatory in salt-water.

CAUTION: Do not paint the recessed camera lens.

Aquatic growth can accumulate rapidly on the camera. Surfaces exposed to salt water must be coated with anti-fouling paint. Use **water-based** anti-fouling paint only. *Never* use ketone-based paint, since ketones can attack many plastics possibly damaging the camera.

It is easier to apply anti-fouling paint before installation, but allow sufficient drying time. Reapply paint every 6 months or at the beginning of each boating season. Paint the following surfaces (see Figure 1):

- Exposed end of the camera insert *Do not paint the lens*.
- Exterior lip of the housing
- Bore of the housing up 6mm (1/4")
- Exposed end of the blanking plug

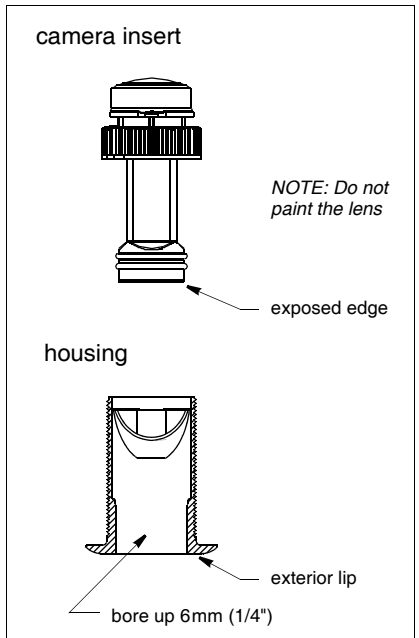


Figure 1. Anti-fouling paint

Mounting Location

- Choose an accessible spot inside the vessel with adequate headroom for the height of the housing, tightening the nuts, and removing the camera. Allow a minimum of 280mm (11").
- Choose a location away from interference caused by power and radiation sources such as: the propeller(s) and shaft(s), other machinery, other echosounders, and other cables.
- If the camera will be aimed at the bottom, choose a location with a minimum deadrise angle.
- If the camera will be used above headway speed, the water flowing under the hull must be smooth with a minimum of bubbles and turbulence. *Do not mount near water intake or discharge openings, or behind strakes, fittings, or hull irregularities.*

Installation

***Cored fiberglass hull**—Follow separate instructions on page 3.*

WARNING: Always wear safety goggles and a dust mask.

Hole Drilling

1. Drill a 3mm or 1/8" pilot hole from inside the hull. If there is a rib, strut or other hull irregularity near the selected mounting location, drill from the outside.
2. Using the appropriate size hole saw, cut a hole from outside the hull. Sand and clean the area around the hole, inside and outside, to ensure that the sealant will adhere properly to the hull. If there is any petroleum residue inside the hull, remove it with either mild household detergent or a weak solvent (alcohol) before sanding.
   Metal hull—Remove all burrs with a file and sandpaper.

Bedding

CAUTION: A stainless steel housing must be isolated from a metal hull to prevent electrolytic corrosion.

Apply a 2mm (1/16") thick layer of marine sealant around the lip of the housing that contacts the hull and up the sidewall of the housing (see Figure 2). *The sealant must extend 6mm (1/4") higher than the combined thickness of the hull, the washer(s), and the hull nut*. This will ensure there is sealant in the threads to seal the hull and to hold the hull nut securely in place.

Stainless steel housing in a metal hull—To isolate the stainless steel housing from the metal hull, slide the isolation bushing onto the housing. Apply *additional* sealant to the surfaces of the bushing that will contact the hull, filling any cavities in and around the bushing.

Installing

WARNING: The O-rings must be intact and well lubricated to make a watertight seal.

WARNING: Be sure the camera insert is fully inserted into the housing and the cap nut is screwed on completely to make a watertight seal.

WARNING: Always attach the safety wire to prevent the insert from backing out in the unlikely event that the cap nut fails or is screwed on incorrectly.

CAUTION: Never pull, carry, or hold the camera by the cable as this may sever internal connections.

1. From outside the hull, push the housing into the mounting hole using a twisting motion to squeeze out excess sealant (see Figure 2).
   ***NOTE**: Ignore any arrow on the housing.*
2. From inside the hull, slide the washer onto the housing.
   Aluminum hull less than 6mm (1/4") thick—Use an additional rubbery, fiberglass, or plastic washer. *Never* use bronze since electrolytic corrosion will occur. *Never* use wood since it will swell, possibly fracturing the plastic housing.
   Stainless steel housing in a metal hull—Be sure the washer contacts the hull. Do not tighten the hull nut with the washer against the isolation bushing, as the housing will not be firmly installed. If necessary, sand the isolation bushing until the washer rests against the hull.
3. Screw the hull nut in place.
   Plastic hull nut—Hand-tighten only. *Do not over-tighten*.
   Metal hull nut—Tighten with slip-joint pliers.
   Cored Fiberglass Hull—*Do not over-tighten*, crushing the hull.
   Wood hull—Allow for the wood to swell.
4. Remove any excess marine sealant on the outside of the hull to ensure smooth water flow over the camera.
5. After the marine sealant cures, inspect the O-rings on the camera insert (replace if necessary) and lubricate them with the silicone lubricant supplied. Also lubricate the interior bore of the housing above the lip of the valve.
6. Slide the camera insert into the housing. Note the arrow on the top of the insert (see Figure 3). *The direction that the arrow points will correspond to the top of the display screen.* Adjust the insert to point in the intended direction. (Most installations

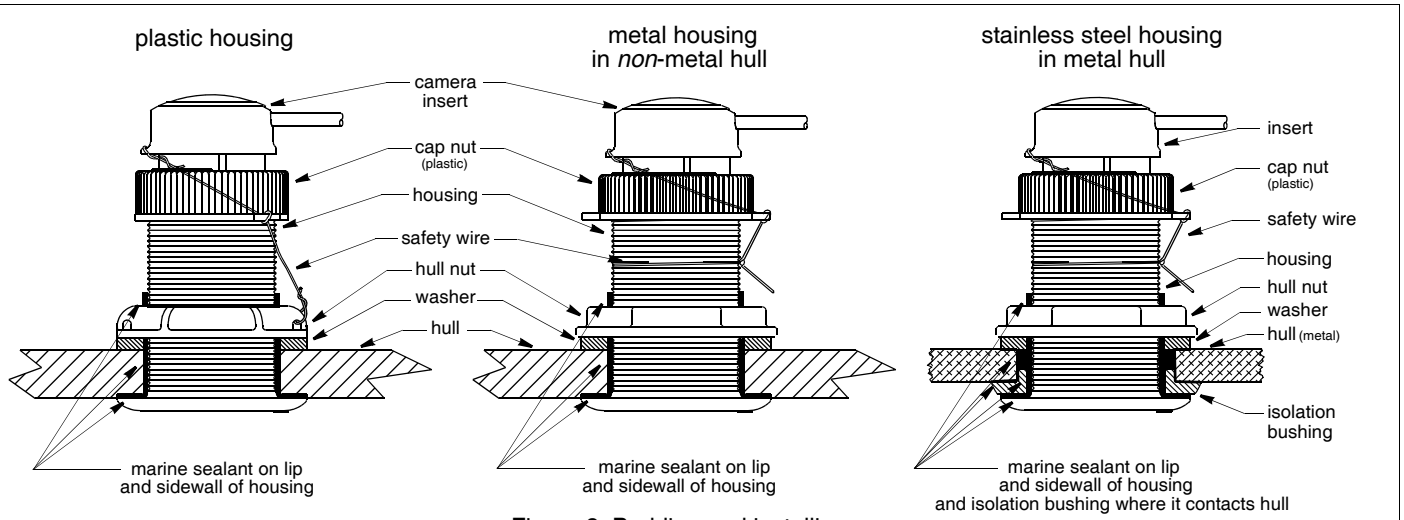


Figure 2. Bedding and installing

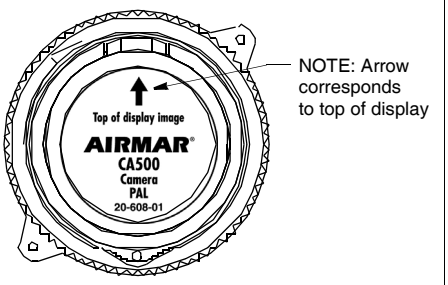


Figure 3. Top of insert

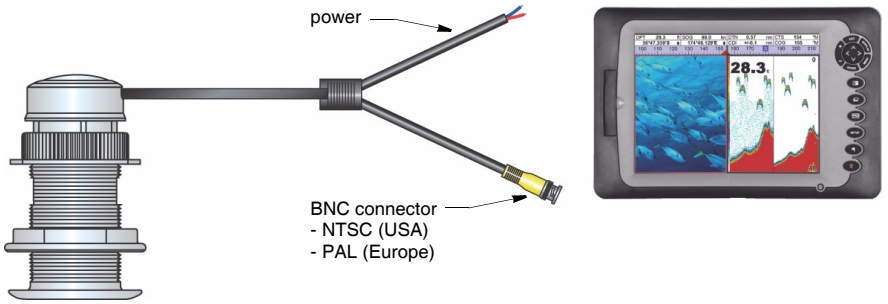


Figure 4. Connecting

will want the arrow to point forward.) Screw the cap nut several turns until the threads are engaged. Continue to tighten the cap nut. Be careful not to rotate the housing and disturb the sealant. **Hand-tighten only.** *Do not over tighten.*

7. Attach the safety wire (see Figure 3).
   Plastic housing—Attach the safety wire to one eye in the hull nut. Keeping the wire taut throughout, lead the wire in a counterclockwise direction and thread it through one eye in the cap nut. Thread the wire through the eye a second time. Then lead the wire through the eye in the insert. Twist the wire securely to itself.

   Metal housing—Wrap one end of the safety wire tightly around the housing and twist it together with the long end. Keeping the wire taut throughout, lead the wire straight up and through one eye in the cap nut. Thread the wire through the eye a second time. Then lead the wire counterclockwise and through the eye in the insert. Twist the wire securely to itself.

Cable Routing & Connecting

CAUTION: Do not shorten the cable or remove the connector to ease cable routing. If the cable is cut, the video signal will be significantly degraded.

1. Route the cable to the instrument. Use grommets to avoid tearing the cable jacket when passing it through the bulkhead(s) and other parts of the boat. To reduce electrical interference, separate the camera cable from other electrical wiring and the engine. Coil any excess cable and secure it in place with cable ties to prevent damage.
2. Connect the camera to the display at the video input port (see Figure 4). The camera has a BNC connector. Some installations will need an adaptor plug to connect to the display. These are available at audio/visual stores.
3. To connect the power leads, see the color code below.

Red	12 VDC+
Black	12 VDC-

Checking for Leaks

WARNING: Do not leave the boat in the water unchecked for several days.

When the boat is placed in the water, **immediately** check the thru-hull camera for leaks. Note that very small leaks may not be readily observed. *Do not to leave the boat in the water for more than 3 hours before checking it again.* If there is a small leak, there may be considerable bilge water accumulation after 24 hours. If a leak is observed, repeat “Bedding” and “Installing” **immediately** (see pages 2 and 3).

Installation in a Cored Fiberglass Hull

The core (wood or foam) *must* be cut and sealed carefully. The core *must* be protected from water seepage, and the hull *must* be reinforced to prevent it from crushing under the hull nut allowing the housing to become loose.

WARNING: Always wear safety goggles and a dust mask.

CAUTION: Completely seal the hull to prevent water seepage into the core.

1. Drill a 3mm or 1/8" pilot hole from inside the hull. If there is a rib, strut, or other hull irregularity near the selected mounting location, drill from the outside. (If the hole is drilled in the wrong location, drill a second hole in a better location. Apply masking tape to the outside of the hull over the incorrect hole and fill it with epoxy.)
2. Using a 51mm or 2" hole saw, cut the hole from outside the hull through the *outer* skin only (see Figure 5).
3. From inside the hull, use a 60mm or 2-3/8" hole saw to cut through the *inner* skin and most of the core. The core material can be very soft. Apply only light pressure to the hole saw after cutting through the inner skin to avoid accidentally cutting the *outer* skin.
4. Remove the plug of core material so the *inside* of the outer skin and the inner core of the hull are fully exposed. Sand and clean the inner skin, core, and the outer skin around the hole.
5. If you are skilled with fiberglass, saturate a layer of fiberglass cloth with a suitable resin and lay it inside the hole to seal and strengthen the core. Add layers until the hole is the correct diameter.

   Alternatively, a hollow or solid cylinder of the correct diameter can be coated with wax and taped in place. Fill the gap between the cylinder and hull with casting epoxy. After the epoxy has set, remove the cylinder.
6. Sand and clean the area around the hole, inside and outside, to ensure that the marine sealant will adhere properly to the hull. If there is any petroleum residue inside the hull, remove it with either mild household detergent or a weak solvent (alcohol) before sanding.
7. Proceed with “Bedding” and “Installing” (see pages 2 and 3).

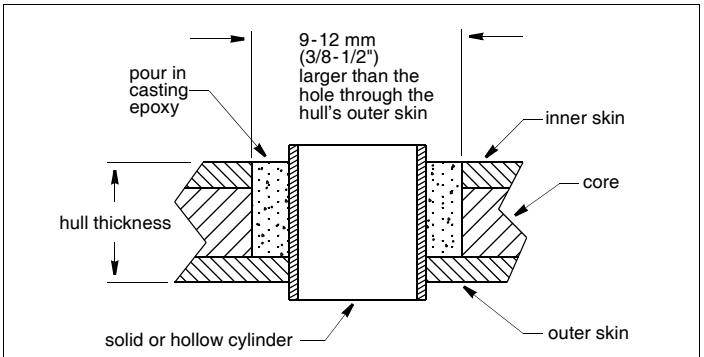


Figure 5. Preparing a cored fiberglass hull

Operation, Maintenance, & Parts

How the Valve Works

WARNING: THE VALVE IS NOT A WATERTIGHT SEAL!
Always use the insert or the blanking plug secured with the safety wire for a watertight seal.

The camera incorporates a self-closing valve which minimizes the flow of water into the boat when the insert is removed. The curved flap valve is activated by both a spring and water pressure. Water pushes the flap valve upward to block the opening, so there is no gush of water into the boat.

Using the Blanking Plug

To protect the camera, use the blanking plug when:

- The boat will be kept in salt water for more than a week.
- The boat will be removed from the water.
- Aquatic growth buildup on the camera lens is suspected due to poor images on the display.

WARNING: The O-rings must be intact and well lubricated to make a watertight seal.

WARNING: Be sure the blanking plug is fully inserted into the housing and the cap nut is screwed on completely to make a watertight seal.

WARNING: Always attach the safety wire to prevent the blanking plug from backing out in the unlikely event that the cap nut fails or is screwed on incorrectly.

1. On the blanking plug, inspect the O-rings (replace if necessary) and lubricate them with the silicone lubricant supplied or petroleum jelly (Vaseline®) (see Figure 6).
2. Remove the insert from the housing by removing the safety wire and unscrewing the cap nut (see Figure 2). This will jack out the insert.
3. Grasp the insert and remove it with a slow pulling motion. Slide the blanking plug into the housing.

   ***NOTE**: In the unlikely event that the valve breaks:*
   ***Plastic housing**—Replace the housing the next time the boat is hauled.*
   ***Stainless steel housing**—Replace the valve assembly the next time the boat is hauled.*
4. Screw the cap nut several turns until the threads are engaged. Continue to tighten the cap nut. **Hand-tighten only**. *Do not over-tighten*.
5. Reattach the safety wire.

Winterizing

After the boat has been hauled for winter storage, remove the blanking plug to let the water drain away before reinserting it. This will prevent any water from freezing around the blanking plug and possibly cracking it.

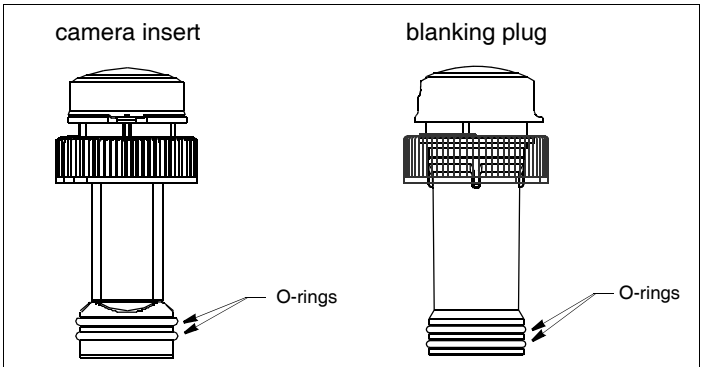


Figure 6. Replacing the O-rings

Cleaning the Insert

Aquatic growth can accumulate rapidly on the camera's surface reducing performance within weeks. Clean the insert with a Scotch-Brite® scour pad and mild household detergent, being careful to avoid scratching the lens.

Replacing the O-rings

WARNING: The O-rings must be the correct size, intact, and well lubricated to make a watertight seal.

O-rings must be free of abrasions and cuts to ensure a watertight seal. Replacement O-rings are available. Install two O-rings on the camera insert and two O-rings on the blanking plug (see Figure 6).

Replacement Parts

Lost, broken, or worn parts should be replaced immediately. If you have purchased a plastic housing and have a wood hull or desire greater strength, purchase a stainless steel housing.

Blanking plug	33-538-01
O-rings	09-146
Plastic hull nut	04-004
Washer	09-452
Plastic housing kit (P617V)	33-510-01
Stainless steel hull nut	02-570-01
Isolation bushing	04-186-1
Stainless steel housing kit (SS617V)	33-617-01

Obtain parts from your instrument manufacturer or marine dealer.

Gemeco (USA)	Tel:	843.210.7000
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