

Things to remember

When in doubt add more peat moss. The more you use the unit, the more moisture in the solids tank. Adding peat has a surprising drying effect.

The condition of solids material should resemble damp "crumbly" earth. Mixture should not look "muddy" or smell "swampy".

In rough waters or when boat is healing it is best that everyone sit. This is easier, safer and will maximize the efficiency of the separation system.

Avoid contamination by insects:

1. Keep fan running at all times (solar vents don't count).
2. Do not remove inline screen; this screen is very necessary.
3. Keep lid closed, in down position.
4. Replace liquids tank immediately upon emptying.
5. Keep emptied solids tank capped.
6. Avoid depositing raw fruit or vegetables.
7. Do not insert anything into solids tank that may contain mold.
8. Keep peat, liners and toilet paper in sealed containers or bags prior to and during use.

References

Jenkins, Joseph C. *The Humanure Handbook*. Grove City, PA, Jenkins Publishing, 1999.

NSF, Standard No. 41 for Wastewater Recycle/Reuse and Water Conservation Devices, National Sanitation Foundation, Ann Arbor, MI, December 1980.

Neale, Tom. "Problem Or Solution?" *Cruising World*, 5/98, (pp.56-64).

Center for Disease Control telephone inquiry.

*Round worm eggs: readily found in soil, as well as in pet feces.

AirHead Composting Toilet is a MSD type III in compliance with 33 CFR 159.12a

Five Year Warranty

During the first five years after the date of original purchase, Eos Design will repair or replace any parts that are defective in material workmanship due to normal use in accordance with the installation and user instructions supplied by Eos Design LLC. Returned parts must be sanitized before shipment and have prior authorization from Eos Design. Failure to install any components of the AirHead, notably the air system and insect screen, can void warranty.



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"Manufactured in the USA, using socially and environmentally conscious practices and philosophies."



What's in the box

- Solids base tank/agitator & handle
- Vented bowl & seat/lid assembly
- Liquids tank & cap
- 12 volt exhaust fan assembly
- Ventilation hose
- 1 Storage lid
- 50 bowl liners
- Threaded hose cuff
- 1 Coco pith brick (U.S.A. only)
- 1 Enzyme packet (U.S.A. only)
- 2 Stainless steel floor mounting brackets & screws
- Assembly and operating instructions
- Ventilation screen assembly



Installing the AirHead



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Securing the AirHead

Ensure the location for the unit is level or leaning forward slightly prior to installation. Place level gauge on the seat to check for lean (Fig. 1).

Check fit of toilet in desired position. Be sure seat is not obstructed when in up position (**Fig. 2**). Be sure any doors will open with toilet in place. Check that the crank will rotate. Reposition toilet as necessary.

If there is a raised platform where the toilet is located, a simple extension may be constructed which will also act as a footrest. At least the rear two inches of the liquids tank should sit on the platform or footrest (**Fig. 3, 4**).

Another option for tight spaces is to mount the AirHead on a rotating platform. The platform could be as simple as a piece of plywood with a center pin for use as the axle and holes for pegs to prevent rotation in the two desired positions.

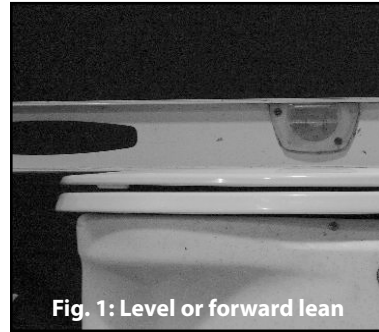


Fig. 1: Level or forward lean



Fig 2: Seat clearance



Fig. 3: Extension example



Fig. 4: Rear 2 inches supported

1. Health risks are minimal when healthy persons are using the AirHead. Diseases do not magically appear in human matter. Therefore one cannot catch diseases from one's own solids, (or liquids) that he or she doesn't already have.
2. In order to be exposed to diseases from human matter in the solids tank:
 - a. A person carrying a disease would have to use your toilet.
 - b. Pathogens, many of which do not survive for long outside of the human body would have to survive in an alien environment until step "c".
 - c. You would have to contact that infected section with broken skin or somehow ingest that section through hand to mouth transmission.
3. The hardest of disease causing pathogens are highly resistant to chemical treatments. To put this in perspective: you can expect that even standard municipal sanitation systems will not kill everything. Besides due to mutations, organisms are known to become resistant to chemicals. This also means that pathogens possibly occurring in the AirHead are also likely to exist in chemically treated holding tanks or portable toilets.
4. "All fecal microorganisms, including enteric viruses and roundworm eggs, will die if the temperature exceeds 46° C (114.80° F) for one week." (Franceys, quoted in Jenkins). Even the hardest of disease causing pathogens* will begin to die at 104° F, however the lower the temperature, the longer the destruction rate. At many latitudes we can reasonably expect temperatures above 104° F in a closed boat during the summer months. But since we don't expect our customers to perform ongoing temperature monitoring of the cabin of their vessel, we've devised a process having multiple safety factors, which should be followed. Still temperatures in the AirHead have been recorded at 125° F and above (at 68° F ambient temperature) with use of provided enzyme.

The above information suggests that temperature alone will destroy pathogens. But in a biological decomposition chamber like the AirHead, there is also bacterial action working at lower temperatures to destroy pathogens. This is why we recommend that the tank contents are held at least for three months prior to emptying, and suggest longer periods to allow microorganisms as much time as possible to work. Urine is generally regarded as sterile when it is expelled from the body.

Prevention:

The best way of preventing them is to keep the fan running to direct them to the screen and away from the unit and keeping the seat lid in down position and bottle connected to spout. Extremely wet conditions inside the solids tank combined with a poorly installed ventilation system may be particularly susceptible to invasion. If you can smell the head inside the bathroom it is time to check the ventilation system and monitor moisture in the solids tank.

A cup of cider vinegar and a drop of dish soap will attract and drown any curious flies. You can place this cup in a convenient location inside the head space or bathroom.

Ridding the AirHead of pests that have found their way in.

There are several remedies:

1. The best is to empty the unit, clean and dry entirely, pour boiling water over all internal surfaces including hose (or better yet submerge in very hot water) and restart.
2. If you cannot empty the unit use Diatomaceous Earth to mechanically cut and kill the buggers. Read the instructions that come with this material. After doing so, sprinkle liberally into the solids tank. Do not mix until necessary. Reapply every time the unit is used or the agitator is

turned. This is a natural product made from volcanic material. It is an effective means of suppression, but it is difficult to kill entire population without many repeated applications.

3. Solid insecticide. i.e: "No Pest Strip". This is a solid fly killer in bar form that uses a toxic chemical which is slowly released from the bar. Use these products with caution and in accordance with the manufacturer's instructions. Hang the bar in the solids tank and wrap the whole toilet into a plastic bag for a minimum of 24 hours. Repeat until flies do not appear. The breeding cycle is approximately 10 days so leaving the bar in for two weeks would be ideal. Vacate premises when using these products and make sure to follow insecticide manufacturer's instructions.

Insecticide sprays are not recommended as they only work topically and will not kill eggs far below the surface. Repeated sprayings may effect the biological action of the solids tank contents and dumping compost compromised with insecticide will pollute the area where it is emptied.

Sanitation and safety

We feel it is important to know the limits of risks involved so appropriate precautions may be taken. However, there is little risk in our opinion, here is why:

Position one hold-down bracket in its final location on the side of the solids tank. Mark the floor as necessary for drill hole location. Repeat with all four hold-down brackets (**Fig. 5**).

The female screw insert located near the bottom of solids tank (each side), must be centered vertically inside the circular cutout of the hold down bracket (**Fig. 5A**).

Use the provided wood screws (the larger of the two kinds of screws) to fasten the hold-down arms to the floor.

To secure solid tank to floor: Loosen thumbscrews about 1/8", slide tank straight down through slots and into circular end section. Tighten screws until AirHead is secure. Do not over tighten. Repeat to secure the liquids tank. During use, remove liquids tank by pulling D ring on on bottle bottom out first.

To remove solid tank from floor: Loosen thumbscrews about 1/8", pull tank toward you through slots.

Line up thumbscrew on seat/bowl section with matching slot on solids tank. Lower and twist clockwise. Tighten thumbscrews provided (**Fig. 6, 7**).

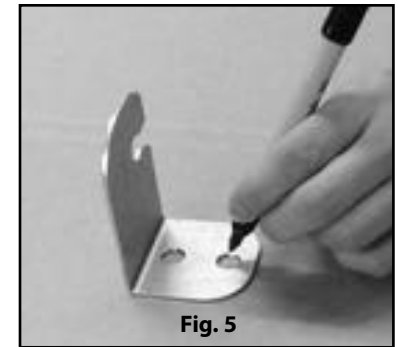


Fig. 5

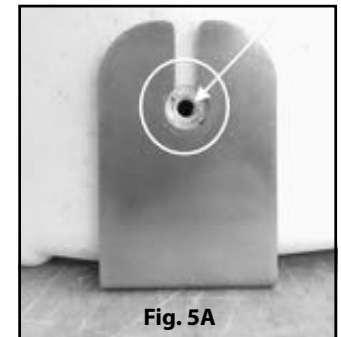


Fig. 5A

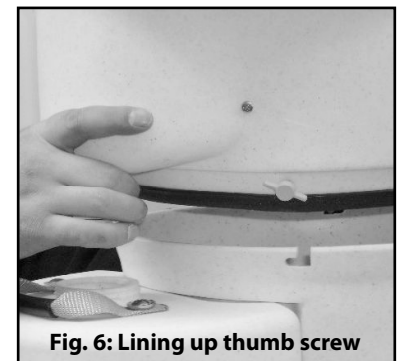


Fig. 6: Lining up thumb screw

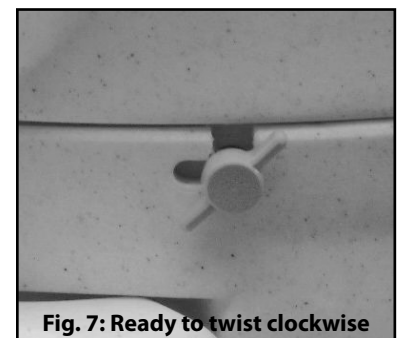


Fig. 7: Ready to twist clockwise

Venting

Determine a suitable location for the fan to vent to the outside (shorter with fewer bends in hose is better). To prevent musty odors from entering living space do not install vent in immediate vicinity of windows or forward of intake vents or hatches in boats. Drill a 2.5-inch minimum hole to the outside that will be protected from water splashing into the fan vent. Installations in RV's and elevated houses may vent downward, upward, or out the nearest wall. In all cases the fan must be protected from wind, rain and water splatter. For typical ceiling mount, see **Fig. 8**. For boats, consider using a dorade on the deck. Another possibility is venting to a chain locker. Be sure there is adequate onward ventilation from the locker to the outside (through scuppers, hawse pipes, etc.) and no leaks into the cabin. Other possible placements are horizontally out the side of the hull (or portlight) or transom, (**Fig. 9**) covering with a clamshell. An extra measure of protection in these installations would be a vertical loop in the hose prior to exit to force any incoming water to travel upwards.

Screw hose into fan housing before securing the housing to the final location (with provided screws), or alternatively if the fan is mounted first, check that the hose can turn freely to screw into it. **Note:** hose is reverse-threaded.

On the unit, select which side of the bowl section will get the hose and attach the grey threaded cuff. Secure threaded cuff using the provided retaining sleeve with plumbers PVC pipe primer and glue. (**Fig. 10**) Roll the O-ring into cavity between cuff and toilet body when glue has cured.



Fig. 8: Ceiling mount



Fig. 9: Hull mount with 2 shrouds



Fig. 10: Gluing exhaust

"Mr. Clean Magic Eraser" or green scrubby pads work very well (for EXTERIOR surfaces only).

A solution of equal parts vinegar and water (or straight vinegar) will dissolve urine in bowl and inside liquids tank. Wipe interior of bowl with non-abrasive polish such as "Armor All." **TIP:** You may easily wash down the bowl periodically if you have a hand held shower head. If cleaning the bowl with chemicals, be sure trap door is closed as chemicals will interfere with the aerobic action inside the solids tank.

It is not necessary to clean the solids tank contents after emptying. In fact it is best not to so that the aerobic process is not interrupted. Also, leaving some organic material inside the tank will eliminate the need to add as much peat moss.

To reduce odors in liquids tank, sanitize the interior by filling with a vinegar solution, shake occasionally and allow to sit until inner walls are clean. Empty tank then fill with boiling water. Loosely screw on cap and allow to cool.

CRITTERS: Avoidance and Riddance

The AirHead is specifically designed to prevent flying insects from invading the solids tank. There are conditions and environments, however, that are more susceptible to invasion. When the compost

is crumbly and moist there is the least potential for insect invasion. Inversely, when the toilet is too wet the increased odor is more likely to attract bugs. Regardless, as long as there is proper ventilation and the unit is properly sealed, insects generally will not find their way in. This is due to that fact that when the fan is running all flying insects will be attracted to the screen in the fan housing which will prevent them from going further, but the negative pressure will prevent them from detecting the toilet. In essence the AirHead will always be "downwind" from them. However, when fan is off, the flies may find the toilet. If you can smell the head from inside the bathroom so can the bugs.

Possible means of invasion:

1. Through toilet when fan is off or ventilation is reduced.
2. Through the seat lid when left up
3. Into bottle if not properly seated or left disconnected from spout for long period
4. Leaving open, uncleaned solid tank in open air
5. The exhaust hose screen has been compromised or never installed
6. From moldy materials placed into solids tank.

2. Remove AirHead bowl section. Then, cap the solids tank with lid provided.
3. Remove the solids tank from its hold down brackets as described on page 2.
4. Retain product inside the AirHead tank for a minimum of three summer months, longer in colder climates. (You may also transfer “the goods” to a secondary container such as a plastic bag or garbage can for the three-month minimum term). For your convenience, we can offer you a second AirHead solids tank so you can simply switch tanks when the first is full and use it for holding until the second tank becomes full.
5. Add water if needed to facilitate biological action and decomposition of paper. Contents should be consistently damp but not waterlogged.
6. Leave a gap for air to enter and escape, do not seal container.
7. After three months minimum retention time, trench into soil in areas designated for ornamentals rather than food-producing plants. Follow regulations, which may vary depending on location.
8. Use common sense hygienic practices such as wearing of gloves and washing hands afterward.

9. Reassemble. The solids tank may retain some peat in the very bottom of the tank. There is no need to scrape the tank out since there are (most likely) active bacteria of decomposition present in the bottom ready to go to back to work.

Emptying liquids

Empty tank when liquid level is still within view of gauge window. To disconnect liquids tank, pull bottle forward by its rubber pull. Bottle will drop away from spout. If the level is higher than window, liquid will spill when disconnecting bottle from base. To avoid this, remove screws from upper portion of AirHead and lift so spout clears bottle.

Empty bottle and immediately reconnect to AirHead unit to avoid contamination of compost by flying insects and accidental usage without bottle.

Cleaning and maintenance

Important: The fan screen should be cleaned upon emptying or at least once per season to maintain proper air flow. Unscrew the screened cuff from the hose and wash both sides in water until clear. Check to make sure screen is securely adhered to cuff. Re glue with 3M 5200® as needed.

Clean bowl and AirHead exterior with non-chlorine hard surface cleaner.

The cuff should be loose enough to turn in its seat, allowing easy threading of secured hose without twisting. Screw hose into toilet exhaust by turning grey cuff onto it. Plug remaining hole with screened breather (**Fig. 11**).



Fig. 11: Snap in screened breather

Following the hose outward from the toilet install the enclosed inline insect screen by first cutting the hose at an easy to access location. Referencing **Fig. 12**, the gray female cuff must be threaded onto and glued to the inboard end of the hose. **You must install the inline screen, it is very necessary.** The screened male gray cuff must be threaded onto but not glued to the outgoing hose. This arrangement will allow the cuff and screen to be easily removed and washed as necessary. **Note:** hose is reverse threaded.

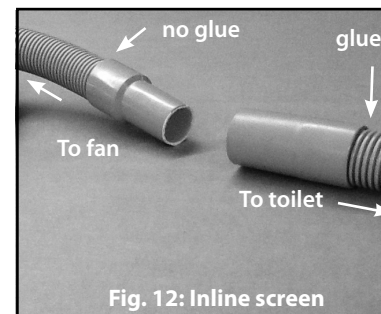


Fig. 12: Inline screen

Install exterior vent or cover (not included). Passive vents utilizing wind to create a vacuum are recommended (**Fig. 13**). Other options are Nicro Day/Night Solar Vent, where the AirHead fan is integrated with a switch and used only occasionally.



Fig. 13: Passive vent cap

We do not recommend use of any solar vent exclusively as all will at some point stop due to limited battery capacity. This may result in flying insects finding their way into the system by detecting the toilet itself.

A solar panel (minimum 5 watt) may be added to counter the battery drain caused by the AirHead fan. Where there is a possibility of green water overcoming these vents, it is highly recommended that a dorade be installed underneath.

Turn off boat power at main switch. Attach fan leads to any convenient 12 volt leads and test. If fan does not run, reverse wires.

Using the AirHead

AirHead startup

Prepare coco pith brick (approx. 80 cubic inches) by putting it in a bucket or plastic bag and adding 1 1/2 to 2 quarts of water. Use less water if toilet will be used more frequently. Allow to hydrate overnight. Break up hydrated brick by hand to a loose, moist sawdust-like consistency. If using peat moss, add just enough water to prevent dusting or dust may be created which will clog the fan screen. Whatever material you use, the solids tank must be about half full (as measured to top of tank, not to the opening) at start, and one inch above half full for live-a-boards.

The peat will gradually absorb the liquid from each use and the fan will carry water vapor out of the vent. Depending on the frequency of use the humidity moisture level of the pith/peat medium will be very dry to moist, but never waterlogged or soup-like. When conditions inside the solids tank are moist the conditions are excellent for decomposition of the solids into humus. Toilet paper and liners will be fully decomposed in a few months if kept moist.

Optional: Add two tablespoons of the supplied enzyme along with a cup of warm water to solids tank any time prior to emptying. Note: enzyme is available in hardware stores and is sold under the name “Drain Care”.

Optional: Add 1/4 cup of white vinegar and shake liquids tank to reduce odor of contents during emptying. Replace the vinegar after emptying.

Type “ONE” usage (liquids)

Women can use the AirHead like a standard toilet, except there is nothing to flush. Men may stand. Avoid targeting trap door and any holes directly, to avoid spatter. The best results are achieved with a banking shot, aiming for bullseye in **Fig 14**. DO NOT aim directly into any of the three holes! DO NOT aim directly into two forward holes!

Note: in rough weather or times of significant boat heel, all parties sitting will maximize separation efficiency.



Fig. 14: Aim for bullseye

Type “TWO” usage (solids)

1. Depress black lever to open trap door
2. Provide deposit (reunited with mother terra via gravity).
3. Place toilet paper in hole
4. Close trap door
5. Repeat as necessary
6. Drop lid when finished

Live-a-board (heavy usage) and rough weather option:

1. With trap door closed, place liner
2. Provide deposit
3. Depress black lever to open trap door
4. Gravity carries liner and deposit below

Then rotate crank handle 1/2 turn or as necessary to bury each fresh use. Moisture should be maintained so that papers are shred as agitator is turned. If papers wrap around agitator, add more water. **Note:** the addition of too much water will create odorous “swamp like” conditions that should be avoided. Product should resemble damp, crumbly earth.

The other option is to use the unit dry. Solids will dehydrate to an unnoticeable state. However, paper will not decompose. Moist conditions will mask exhaust odor better than dry.

For the occasional boater, the most realistic scenario is a wet/dry cycle where contents will dry during non-use and water can be added during boat occupancy.

The “harvest”

Emptying at sea: When outside of the US coastal waters boundary this is as simple as following steps 1-3 below and up ending over the side.

Land Emptying: The ideal scenario would be to use the AirHead for an entire season, allow the solids tank to sit through the winter, then begin the emptying cycle.

Note: The process below is essentially eliminated by emptying the AirHead solids tank into a composting toilet. These are found in many state parks and campsites. Liquids should be poured down a standard toilet.

Emptying solids

1. Empty AirHead when the solids contents are 2 inches from top of tank. You may find that upon leaving your boat the solids tank is full yet when returning after a few weeks the contents have shrunk in size. So don't be too anxious to perform this task, (we know it is the highlight of the tour).