Frequently Asked Questions

What is the ARID Reactor?
The ARID Reactor is an acronym for; **A**lgae **R**emediation **I**lluminated **D**evice. It is a specially designed life support system for use in aquariums and aquaculture.

What does the ARID do?
By harnessing photosynthesis the ARID biosorption system has the capability to drive down phosphate to levels required for vigorous SPS coral growth without the need to constantly buy and replace chemical media. This biological filtration system works on the principle of what Pax Bellum LLC likes to call "biological stoichiometry"; the balanced control of products and reactants in a biological system by use of a biological medium as a nutrient export, in this case algae and bio-film. Simply put, specific nutrient levels and ratios can be controlled with precision.
In addition, by running the ARID on a reverse daylight schedule to the display tank, pH and dissolved oxygen is kept at a higher level and stable over the 24hr cycle.
Being sealed from atmospheric gases the ARID is dependent on dissolved CO2, thereby keeping CO2 levels and organics to a minimum.

How is it any different from a refugium?
In the ARID system algae is the main nutrient export and to a lesser extent the bio-film forming on the algae surface. Twice a month the Chaetomorpha is vigorously rinsed of the bio-film clinging to its surface and up to 1/3 is harvested. In this way the ARID system differs from a refugium. Chaetomorpha is not viewed as a home for arthropods, copepods and the like it is simply used as biomass for the export of unwanted nutrients. The entire structure of the ARID reactor is geared to doing this task as efficiently as possible in the smallest footprint possible.
Even and rapid growth is all about the flow… In a refugium water flows around compacted masses of macro-algae, delivering nutrients only to the outer surface of the algae mass leaving dead zones within. Even worse flow is observed when Chaetomorpha is spun like in a pseudo-kriesel, where water velocity matches the spin velocity of the algae. Inevitably dead zones occur in the center of the mass.
In the ARID water and nutrients are forced through the interwoven macro-algae mass with a mixture of turbulent and laminar flow at constant velocity, eliminating dead zones and ensuring nutrient delivery and growth is even throughout the ARID reactor.
Illuminated from within, the ARID uses a coaxial LED lighting array, evenly delivering light to the entire mass of macro-algae by the most efficient means possible. Light is not reflected off a water surface like with a refugium. The light is contained by the ARID's chamber walls that act as reflectors bouncing any light that makes it through to the outer wall wall back into the algae.

How is this different from an Algae Turf Scrubber (ATS)?
Algae Turf Scrubbers (ATS's) come in all shapes and sizes. ATS's are usually rectangular acrylic boxes housing a vertically oriented screen or a plurality of screens and a LED array or other light source(s) that can evenly illuminate the entire grow surface of the mesh the turf algae grows upon. They grow turf algae, hair algae, aka Bryopsis species using a nutrient film technique.
The hair algae suspended in air on the mesh has unlimited access to atmospheric CO2, which does allow for rapid growth but much of the captured carbon it converts into sugars leaks into the system water, leading to organics buildup.
Their design is probably unintentionally similar to an evaporative cooler, aka swamp cooler, evaporating a good deal of aquarium system water daily. Most of the cooling effect is lost to the heat put in by the large array of lights. But they may contribute a cooling effect if you live in a dry hot climate. The trade off is making up more R/O water to replace the evaporation.
Any oxygen produced by the turf algae is mostly lost as it interacts with the water surface before returning to the system. Likewise effluent from a calcium reactor is not as easily attached to the intake of an ATS. And when is the last time a local fish store gave you money for hair algae? They often will for Chaetomorpha.

I use Granular Ferric Oxide (GFO), why should I switch to running the ARID?
Granular Ferric Oxide (GFO) is a chemical media used in a fluidized reactor used by aquarists to bind phosphate, and It does this job very well. GFO also binds other metals we call trace elements, necessary for healthy aquarium systems. GFO has its place in the aquarist tool box but like antibiotics shouldn't be used only when necessary.
GFO can be difficult to judge how much you need to bring down X amount of phosphate. Add too much and corals get stressed, or worse cause a crash. Ideally GFO is used in small amounts and changed out often, since the PO4 absorption curve is not linear. The aquarist becomes locked into a constant pursuit of PO4 readings. And really who wants to deal with this granular mess. Cost is another factor, constant expenditure on media adds up over time. The reactors are cheap for a reason, to get people hooked.
GFO also does nothing to control nitrate. Worse, by removing PO4, organisms in the tank are not able to uptake, or denitrify the NO3 as quickly.

I heard I don't necessarily need a skimmer when running the ARID?
Let your aquarium breathe easy, you don't need a skimmer to oxygenate your aquarium water. The ARID produces oxygen for your aquarium. A skimmer can only equilibrate the O2 and CO2 levels to that of the surrounding room, a room that is often much higher in CO2 levels than found above a natural reef. CO2 can be scrubbed out of the air being drawn into the skimmer with the use of chemical absorbents, but again that's another canister and media to deal with. While the ARID is capable of supersaturating the aquarium with O2 while absorbing CO2 much like phytoplankton does in the surface waters of the ocean. Algae', using photosynthesis splits water molecules to produce oxygen, and absorbs CO2 to produce stores of sugars for energy.

Let your aquarium harness this gas production and absorption bio-machinery by running the light cycle of the ARID reverse to your tank lighting. Running a reverse daylight cycle will balance the usual day/night pH swing by maintaining dissolved oxygen high, and CO_2 levels low throughout the night when your reef aquarium lights are switched off, and photosynthesis by corals has ceased.

How long will the LED's last?
The LEDs are rated by the manufacturer for 50k hours. We suggest replacement after 40k. Make sure your heat sink is able to radiate heat to room temperature air. LED life can be cut short by inadequate cooling. Placing the ARID inside a cabinet without ventilation will put unnecessary thermal stress on your light assembly, and reduce its service life. While LED's are much cooler to run than other light bulb technologies, they do still produce some heat and need room to expel that energy safely.

What voltage are the LEDs?
The LEDs are designed to run using only the 12VDC power supply provided with the ARID. Running the ARID on higher voltage will cause them to burn out.

How are the LED's cooled?
The LEDs are attached to a vapor heat pipe that carries the heat evenly away from the LEDs to the heat sink located above the lid where it is released into the air.

Will heat from the LEDs raise my tank water temperature?
LEDs waste about half of their input energy as heat. Therefore our smallest model the, "ARID N18" would give off approximately 7 watts as waste heat, of this at least 3 watts is taken away by the heat pipe, leaving at most 4 watts of heat to transfer into a 40-120 gallon system. Basically, an insignificant amount of heat is transferred into the aquarium.

Why is the light tube plastic and not glass?
The heat pipe in the ARID extracts heat so efficiently it allowed the use of high output LEDs and a plastic light tube that is impact and thermal cycling resistant. The heat pipe also cools the lights sufficiently that carbonates will not precipitate out of the saltwater and build up on the light tube, obstructing light transmission. The heat pipe will also protect the macro-algae from cooking should the pump supplying water to your reactor fail. Proper thermal management is necessary for optimal life expectancy of LEDs that are designed to be cooled from the underside.
Simply encasing LEDs inside a glass tube and submerging them in saltwater is not a good idea for the previously mentioned reasons. Glass also tends to break along thermal gradients, especially ones that rapidly change temperature, like the one found at the point the light tube passes through the lid. Glass sleeves work in UV sterilizers because they're always on. The temperature is relatively constant 24/7, and it's chosen because glass is UV stable. UV sterilizers are generally not opened up on a regular basis. This is not the case in an ARID macro-algae reactor.
Glass is not impact resistant or resistant to external forces placed on it especially when undergoing a rapid thermal change. If you have ever taken a hot glass aquarium heater out of your tank without letting it cool first and then accidentally tapped it on something you'll know the heater can shatter instantly.
Even if we used glass with our heat pipe cooling system we would be limited to the height the reactor due to the deflection strength of glass. Glass failure is also abrupt unlike plastics.

Why not place the LEDs on the outside of the chamber?
Efficiency is the main reason the ARID doesn't use LEDs on the outside of the chamber shining in. Many more LEDs are required to penetrate the algae mass when illuminated externally. The LEDs would also require the same intensity to penetrate the algae mass the same depth. This may work for a small reactor but scaled up it would be very cost prohibitive.
For this illumination strategy to work the transparent chamber wall will need to be kept free of any bioaccumulation to maintain light transmission, and would require frequent acid washing and scrubbing. After time the chamber will become scratched and light transmission will be degraded, resulting in the entire chamber needing to be replaced.
Heat is another issue, more LEDs means more heat. The entire chamber will be heated and transferring a good portion to the water, more so if the chamber wall is thin. Many transparent plastics have residual internal stresses from to rapid of cooling during production and are not able to take thermal cycling and will eventually crack. If the LEDs are to be cooled from the underside to avoid this problem, a heat sink the entire surface area of the chamber would need to be used.

What periodic maintenance should I perform on the reactor itself to keep it operating efficiently?
We recommend an acid wash of the chamber every 6 months to keep the chamber walls reflective. Either acetic acid (white vinegar) or hydrochloric acid (muriatic acid) can be used. This involves filling the unit with straight store bought white vinegar or making a dilute solution of 5% HCL acid and letting it sit for a few hours until all carbonate buildup is dislodged,or dissolved. Then drain and rinse with freshwater and put it back into operation. A white poly pad made for scrubbing plastics can be used to aid in dislodging any stubborn buildup.
The light tube should be replaced every 10-12 months due to aging and scratches that will accumulate from cleaning.
The flange seal may need replacing yearly due to dimensional changes from aging and compression set.
Wipe dust from the heat sink on a regular basis to keep it transferring heat efficiently.
Clean the gland that the flange seal seats into of any foreign material to ensure a proper seal.
Check plumbing fittings leading to, and on the reactor for blockages during routine algae harvests. Low flow is the number one reason for algae collapse.

How many hours should the reactor be on for?
Macro-algae needs to be acclimated to intense light just like corals do. When loading the ARID reactor for the first time with macro-algae start with as little as 4hrs of light. Unless you know the intensity of the light your algae came from start off with 4hrs of light. Raise the photoperiod by 1 to 2hrs a week until reaching a maximum of 16hrs of light. If you find PO_4 levels dropping below

0.02ppm reduce the number of hours the ARID lights are on until PO4 stabilizes around .02-.05ppm, or alternately buy more organisms and feed your aquarium more.
Do not run the ARID constantly with the lights on. Algae needs rest, and the recommended off cycle is 8hrs minimum. Running 24/7 will also negate the pH and oxygen stability of running a reverse daylight cycle.

How should I start and maintain the macro-algae growth?
We recommend starting with Chaetomorpha species of macro-algae in the beginning. When you become experience with how the ARID works by all means please experiment with other macro-algae. We will be very interested to hear your results. Until then, we have found Chaetomorpha is the easiest, fastest and most versatile species to grow.
Remove the light assembly by grasping the cool heat sink and pull and twist straight up. Place the light to the side in a safe place away from water or where it may be stepped on, or dropped. Open the lid of your reactor and lift the lid and armature assembly up and out of the chamber. The armature is comprised of the perforated discs (diffuser discs), spiral tube stretching between the discs, the rubber retainer rings and the light tube.
Start your reactor with at least 2-3 large handfuls of Chaetomorpha algae in each open segment of the Armature. Make sure the algae is evenly spread around the light tube. Use the spiral tube to wrap around bundles of algae to help retain the mass. Space the bundles to expose the algae evenly to light along the vertical axis of the light tube. Load the armature back into the chamber, fasten the lid, replace the light assembly into the light tube, and attach your water supply, and return hoses. The water inlet port is on the base of your reactor. The outlet port is on the lid. Turn the supply of water to the reactor on. Use the recommended flow for your model ARID. This information can be found in your models quick start guide.
From day one start dosing the Iron + Manganese solution that came with your ARID reactor. This should be dosed at a rate of 1drop per 100L (26.4 US gallons) daily. These elements are difficult to test for but necessary for algae growth. These elements also tend to precipitate out of seawater rapidly and should be dosed daily to ensure they are present.
The ARID is capable of targeting specific nutrient(s) for export by growing macro-algae. In the reef aquarium the main concern is balancing the nutrients N:P:K:C, with the goal of limiting phosphate (P). Usually never in short supply, Potassium (K) and carbon (C) are not usually dosed. However, Nitrogen (N) can become depleted by the growth of algae, causing its growth to stall. To keep the algae growing, the aquarist should dose the, “Nitrogen+Molybdenum” solution that that came with your ARID system, at a rate to maintaining the NO3 level at a minimum of 20:1 and ideally a 100:1 ratio to phosphate (example; 3ppm NO3 to 0.03ppm PO4). This will allow the Chaetomorpha or macro-algae of choice to continue to grow until phosphate levels are depleted.

The “Nitrogen + Molybdenum” solution should be dosed as needed. 1ml of this solution will raise 100L (26.4 us gallons) by approximately 0.5ppm NO3. Not all of the nitrogen is in the form of nitrate, for accurate nitrate readings, tests should be performed at least 6hrs after dosing. Do not raise your nitrate levels by more than 1ppm per day. Try to dose your system at the same time your ARID lights come on to maximize uptake by the algae. In the first month your ARID reactor should be opened weekly and growth checked. Shut down the feed pump and light and disconnect the effluent connection located at the top of the unit. This allows the unit to drain down. Remove the lid and light assembly and empty the Chaetomorpha into a 5 gallon bucket, add to this enough tank water to submerge the algae. If your chamber was full of Chaetomorpha you can harvest up to 1/3 of the mass. The remaining algae should be rinsed in the bucket of aquarium water by vigorously plunging the algae up and down through the water surface to dislodge any detritus and biofilm. Discard the biofilm laden water remaining in the bucket. Remove the algae from the bucket and stretch and expand the mass so that it fills the armature again. Exactly like when you started your ARID for the first time, make use of the spiral wrap to hold and distribute the algae evenly along the length of the light tube. This will maximize light coverage, and get your algae growth off to a good start again. Growth may slow after the first month as target nutrient(s) become depleted. At this point, the reactor can be serviced every other week. Even if growth is not sufficient to harvest, the Chaetomorpha should be rinsed, stretched, and placed back into the reactor. Remember the biofilm is a nutrient export mechanism and rinsing keeps the algae free of detritus and healthy. For more information on balancing nutrient ratios and maximizing your Chaetomorpha’s growth potential please refer to our “white paper”.

Does the ARID need to be placed in my sump?
All ARID models are watertight and were designed to operate outside the sump for easy maintenance. The ARID models can stand or hang in the case of the N18 on the rim of a sump. We don’t recommend placing them in a sump where they could be knocked over causing the electrical connection to come in contact with water. Please be safe around electricity and water, always use GFCI sockets and place drip loops on all power cords.

What is the purpose of the Calcium Injection Assembly?
The “Calcium Injection Assembly” allows the calcium reactor effluent to pass through the macro-algae in the ARID reactor where it is stripped of a large portion of excess CO2 and PO4 before entering the rest of the aquarium system. The assembly gets rid of the need for a dedicated supply pump for the calcium reactor. Instead, the ARID supply pump is used to send water to the calcium reactor.

How does the Calcium Injection Assembly work?
The “Calcium Injection Assembly” attaches to the ARID intake port. The assembly consists of a manifold with a high pressure and a low pressure side. This pressure differential is accomplished by having a user configurable restrictor placed between the two ports. The “restriction discs”, are washers with varied center holes that can be swapped out to tune the assembly to the ARID supply pump. The high pressure side port, found closest to the ARID supply pump sends water to the calcium reactor. The low pressure side port, found closest to the ARID inlet accepts effluent from the calcium reactor. Between the low pressure port and the calcium reactor is placed a drip counter so the flow rate of the calcium reactor effluent can be monitored as it enters the ARID.

How can I order replacement parts or additional supplements?
Please email use directly at sales@pax-bellum.com or by phone at 802-293-6213. You can also purchase any of our products by contact one of our distributors;

I noticed you came out with a new model, can my reactor be upgraded?
Most often the answer is yes. We try to make our upgrades and new reactors legacy compatible whenever possible. Please contact us with your model information, and we will try our best to keep your model current with the latest innovations.

Do I need the optional quick disconnect fittings?
If you have purchased an ARID C-series reactor your reactor came with quick disconnects, you do not need to buy any.If you purchased an ARID N-series reactor the quick disconnects are offered as an option. This was done to keep the price of the reactors down. Being smaller reactors than the C-series they can easily be moved around and don't necessarily need quick disconnects if the tubing leading from the lid to the sump or aquarium is short. If you have plumbed your N-series reactor into a manifold, or the tube leading out of the ARID to your system is long the quick disconnects make routing maintenance much faster, easier, and more likely to be done regularly.

What other filtration equipment does the ARID replace or isn't compatible with?
The ARID displaces the need for; GFO, Chemical absorbents, bio-pellet reactors, Zeo-vit, carbon dosing, de-nitrifiers, lanthanum dosing, refugiums (used as nutrient export), Algae Turf Scrubbers, and even Protein Skimmers.
We do not recommend the use of GFO, carbon dosing, bio-pellet reactors, Zeo-vit, de-nitrifiers, kalkwasser reactors, Lanthanum Chloride dosing, refugiums (used as nutrient export), Algae Turf Scrubbers or ozone in conjunction with the ARID system. Running these systems with the ARID can, and will cause problems. Skimmers and activated carbon are fine to use with the ARID system but not necessarily needed. UV sterilizers have been attached to the input port of ARID reactors and shown no negative effects.

The ARID macro-algae reactor system is patented. What does that mean?
"A patent for an invention is the grant of a property right to the inventor. Patents are granted for new, useful and non-obvious inventions for a period of 20 years from the filing date of a patent application, and provide the right to exclude others from exploiting the invention during that period. U.S. patents are issued by the United States Patent and Trademark Office. Generally, the term of a new patent is 20 years from the date on which the application for the patent was filed in the United States or, in special cases, from the date an earlier related application was filed, subject to the payment of maintenance fees. The right conferred by the patent grant is "the right to exclude others from making, using, offering for sale, or selling" the invention in the United States or "importing" the invention into the United States for a limited time in exchange for public disclosure of the invention when the patent is granted. Patents are territorial, meaning that one must apply for patent protection in each country where protection is sought. In other words, U.S. patent grants are effective only within the United States, U.S. territories, and U.S. possessions. The USPTO Inventors Assistance Center (IAC) provides patent information and services to the public. The IAC is staffed by former Supervisory Patent Examiners and experienced Primary Examiners who answer general questions concerning patent examining policy and procedure. The IAC can be reached by telephone at (800) 786-9199." **https://www.stopfakes.gov/article?id=What-is-a-Patent**

The ARID macro-algae reactor is a patented bioreactor in the USA and pending internationally under the following numbers:
U.S. Patents: 9,388,372; 9,695,389
International patents pending: WO 2016/073901

Please visit these links to learn more about patents, patent law, and the patents covering the ARID.
https://www.uspto.gov/patents-getting-started/general-information-concerning-patents
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