

# Fish System Check List

## **CULTURE TANK STAND PARTS (STEEL)**

- \_\_\_\_\_ (A) 6 semi-circular pieces
- \_\_\_\_\_ (B) 6 triangular pieces
- \_\_\_\_\_ (C) 1 small center ring
- \_\_\_\_\_ (D) 3 small legs
- \_\_\_\_\_ (E) 6 long legs
- \_\_\_\_\_ (F) 6 long leg supports
- \_\_\_\_\_ (G) 3 small leg supports

## **FISH SYSTEM PARTS**

- \_\_\_\_\_ 650 gallon conical bottom tank
- \_\_\_\_\_ 50 gallon settling tank
- \_\_\_\_\_ 60 gallon biofilter
- \_\_\_\_\_ (P1) 54" of 1" pvc - standpipe for culture tank with 5/16" holes
- \_\_\_\_\_ (P2) 26" of 1" pvc - standpipe for settling tank with 5/16" holes
- \_\_\_\_\_ (P3) 8" of 1" pvc with cap and holes with 5/16" holes
- \_\_\_\_\_ (A) 3-1/2" pvc(1"), 1" elbow
- \_\_\_\_\_ (B) 46" pvc(1"), 1" ball valve, 3-1/2" pvc(1")
- \_\_\_\_\_ (C) 1" tee, 3-1/2" pvc(1"), 1" ball valve, 3-1/2" pvc(1")
- \_\_\_\_\_ (D) 2" pvc(1"), 1" el, 1-1/2" pvc(1"), 1" ball valve, 1-1/2" pvc(1")
- \_\_\_\_\_ (E) 1" 4-way cross(4 9" pcs. of 1")
- \_\_\_\_\_ (E1) 21-1/2" circular piece of plastic and filter material
- \_\_\_\_\_ (F) 3" pvc(1"), 1" 45 degree el
- \_\_\_\_\_ (G) 31" pvc(1"), 1" 45 degree el
- \_\_\_\_\_ (H) 13-1/2" pvc(1"), 1" tee, 12" pvc(1") with 1" cap, 4 1/2" of pipe
- \_\_\_\_\_ (I) 3/4" blkhd, 21" pvc(3/4"), 3/4" el, 1-1/2" pvc(3/4"), 3/4" ball valve
- \_\_\_\_\_ (J) 60" pvc(3/4"), 3/4" el
- \_\_\_\_\_ (K) 36-1/2" pvc(3/4"), with cap, holes drilled in one side
- \_\_\_\_\_ (L) 12" clear tubing (1/2") brushing reducer 3/4" to 1/2"
- \_\_\_\_\_ (M) Rotating spinner bar assembly
- \_\_\_\_\_ 1 water pump

## **AIR ASSEMBLY**

### **PARTS**

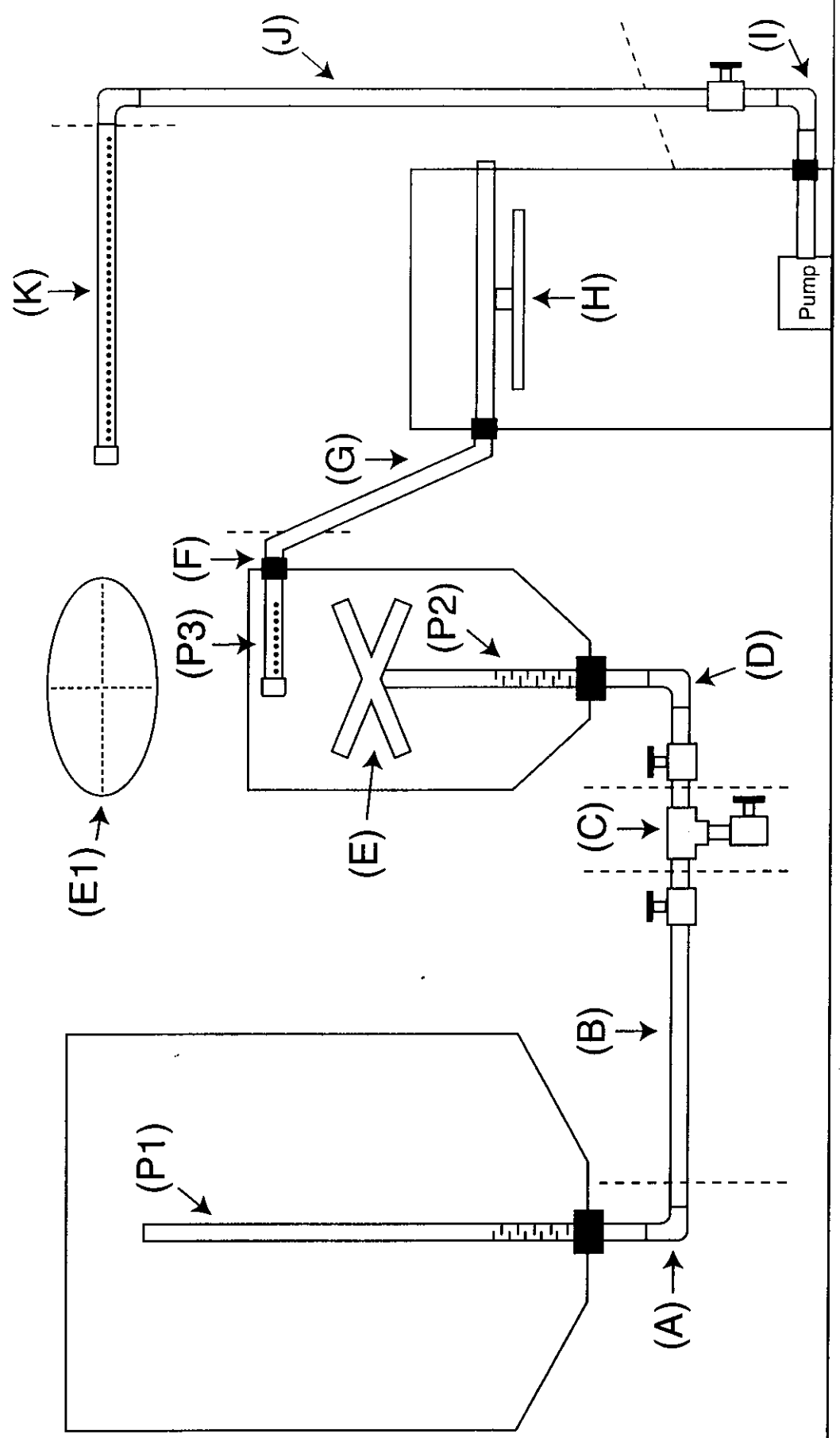
- \_\_\_\_\_ 5 51" pieces 1/2" I.D. black poly tubing
- \_\_\_\_\_ 5 1/2" x 1/2" x 1/2" tees
- \_\_\_\_\_ 4 1/2" npt x 1/4" barb
- \_\_\_\_\_ 1 1/2" npt x 3/8" barb
- \_\_\_\_\_ 1 LC1 air pump assembly
- \_\_\_\_\_ 4 30" pieces 1/4" clear vinyl tubing
- \_\_\_\_\_ 1 7' piece of 3/8" tubing
- \_\_\_\_\_ 4 air stones
- \_\_\_\_\_ 1 pack of cable
- \_\_\_\_\_ 10 stainless steel hose clamps
- \_\_\_\_\_ 1 Set of Instructions

\_\_\_\_\_  
**Signature**

\_\_\_\_\_  
**Date**

(E1) = is wrapped in blue filter floss and sits on top of (E).

(J & K) = go into culture tank to complete water recirculating system



Culture Tank

Settling Tank

Bio Filter

## **INTRODUCTION**

The Fish Systems from Aquacenter are newly designed closed systems ideal for the hobbyist, educator, researcher, or commercial grower. With a Fish System you can be part of the multi billion dollar industry known as aquaculture.

Aquaculture is a booming industry with fish production at its highest yet. In the United States, aquaculture is growing at a tremendous rate. This type of farming includes the production of everything from algae to alligator and spans the entire globe. Aquaculture is used for the production of food fish, tropical aquarium fish, organisms for biomedical research, and endangered and game species for restocking purposes.

## **RECIRCULATING SYSTEMS**

The Fish Systems are recirculating systems. A recirculating aquaculture system is a unique water reuse technique which involves the cycling of water through a culture system and various filtering components. Recirculating or closed systems have become more prevalent among aquaculturists for many reasons: the need for conservation, better control over water quality, and the ability to grow any species in any climate. These are just a few factors which have all contributed to the success of recirculating systems.

The idea of recirculating systems is not new. It utilizes the technique of water reuse, familiar to the waste water treatment industry and even aquarium hobbyists. In most cases a recirculating system is composed of a culture tank(s), a solids removal device(s), and a biofiltration unit.

The biofilter is probably the most important component of the recirculating system. It is here that beneficial bacteria are concentrated to help break down some of the toxic compounds that build up in a closed system. Ammonia is a waste product of protein metabolism in aquatic species. It can also accumulate as a result of uneaten food. Ammonia is present in both ionized and unionized forms, with the latter being most toxic. The bacteria turn toxic unionized ammonia into less toxic nitrite and then to nitrate through a process called nitrification. The biofilter should contain some type of medium for the bacteria to grow on. At best this material should have a high surface area. The media should constantly be exposed to water and oxygen because nitrification is an aerobic (oxygen requiring) process.

## **ABOUT YOUR FISH SYSTEM**

Your Fish System includes a 650 gallon culture tank, a 50 gallon settling tank, and a 60 gallon biofilter tank. The Fish System can be used to grow up to 150 pounds of warm water fish, utilizing less energy than a light bulb. Everything you need to set up your Fish System is provided. All that is required is the water and the fish.

The Fish System is an excellent tool for the classroom. It offers the study of engineering, physics, biology, business, mathematics and chemistry all in a "hands on" environment. Planning and designing experiments to be used with the Fish System can only add to the learning experience.

This system also makes an excellent learning tool for the novice grower and offers an efficient set-up for the small scale commercial grower. Channel catfish, trout, tilapia, pacu, redfish, striped bass, baitfish, koi, red claw, and tropical fish are just a few species which can be raised in the Fish System.

## **SET-UP TIPS - READ COMPLETELY BEFORE ASSEMBLING FISH SYSTEM**

\* You will need the following tools: crescent wrench, socket set, PVC glue, silicone (safe for aquarium use only-included), channel lock pliers, and a hand drill.

\* Bulkhead fittings cannot withstand intense heat. If you are not planning to set up your system right away, remove them from packaging and store in a cool place. It is advised that you store the entire set-up out of direct sun and heat.

\*Lay all the pieces of the Fish System out and go through an inventory check to be sure everything is present. This will also give you an opportunity to see what you are working with.

\* Put all of the pieces together before gluing. It is a good idea to add a new silicone seal around your window in case of shifting during shipment.

\* It is suggested that you place the air compressor at the level of or higher than the culture tank. This will eliminate the chance of any water flowing into your compressor.

\* In the case of a Fish System placed indoors it is advised to connect a drainage pipe (pvc) or hose to the drain under the settling tank to drain the solids outside.

\* If unchlorinated water is not available, a reserve of dechlorinated water should be present in the case of an emergency.

\* Care should be taken in the site you choose for the Fish System. If placed in direct sunlight, algal blooms are sure to occur thereby causing fluctuations in your pH and oxygen levels. A shade cloth is recommended for greenhouses or an area with intense sunlight.

\* Careful thought should be given to gluing pieces together. If they are ever to be moved or cleaned or taken apart again, do not glue them.

\* Take care to check the size of the fish you are stocking to make sure they are compatible with the size of the slats in the standpipe of the culture system. For example, small fry may be small enough to escape the culture tank by way of the bottom drain. In a case such as this you may want to use nylon mesh screening to prevent any loss.

\* An extra bulkhead has been added to the biofilter assembly. This can be piped out to your drain area. In case of a power outage this will be your emergency overflow outlet.

\* The water level in the settling tank should be 2 inches below that of the culture tank. Adjustments may need to be made to the settling tank stand by way of the screws in the bottom of the stand. The biofilter should hold just enough water to keep the pump submerged (8-10 inches).

\* Use the extra cable tie provided to strap pipe (J) to the tank. Drill two holes into the tank lip for this purpose.

## **OPERATING TIPS**

When starting up your Fish System, you may want to consider a few options such as: nets, water test kits, Fritz-Zyme water conditioner, chlorine remover, sodium bicarbonate, etc. (see options list page). It is advised to consider purchasing Fritz-Zyme water conditioner with your system. This liquid contains the beneficial bacteria needed for your biofilter to detoxify the ammonia and nitrite naturally produced by fish. Natural bacterial accumulation may take as many as 30 days and can result in fish mortality if not done properly.

Daily maintenance and monitoring will be required for proper care of the Fish System. Depending on the densities and feeding rates, the settling tank may need frequent draining. When draining the settling tank be sure to unplug the water pump. To clean the filter, remove the plastic disk and thoroughly rinse the material around it (the material can be wrung out). The provided filter material for the biofilter will also need rinsing occasionally. Monitoring the pH, ammonia, temperature, alkalinity, dissolved oxygen and feeding rate regularly is advised. We suggest that you keep a good log book of all your test results and daily observations. This will enable you to begin to recognize trends in parameter changes and may help you to troubleshoot some of your own problems.

It is important to determine an accurate feeding rate. Left over feed could indicate a problem in the tank or that you are simply overfeeding. Excess feed will end up in the settling tank and begin to decompose. This process steals valuable oxygen from your fish and also creates a mess. Small fish will normally consume up to 6% of their body weight, while larger fish will only eat 2-3%. It is recom-

mended that fish be fed several times over the course of the day instead of all at once. Floating feed is often preferred to allow the grower to see their fish while feeding at the surface.

Occasionally, the spinner bars may become clogged and need cleaning. This can be done with a hose or test tube brush. It is also important to keep the spinner bars level so that they will turn properly. Make sure that the spinner bars are turned at slightly opposite angles so that they spin correctly (counter clockwise).

The airstones will last a very long time, however; if you start to see a decline in the amount of bubbles being produced it may be time to clean them. This can be done by soaking them in a 5% solution muriatic acid overnight and then rinsing them with fresh water for about 10 minutes. This is followed by soaking them in fresh water for a 24 hour period.

### **CULTURE TANK STAND PARTS (STEEL)**

- (A) 6 semi-circular pieces
- (B) 6 triangular pieces
- (C) 1 small center ring
- (D) 3 small legs
- (E) 6 long legs
- (F) 6 long leg supports
- (G) 3 small leg supports

Bolts and Nuts - \*NOTE: 12 bolts are 1/4" longer than the others. These are for attaching the long legs.

### **FISH SYSTEM PARTS**

650 gallon conical bottom tank

50 gallon settling tank

60 gallon biofilter

- (P1) 54" of 1" pvc - standpipe for culture tank
- (P2) 26" of 1" pvc - standpipe for settling tank
- (P3) 8" of 1" pvc with cap and holes drilled in one side
- (A) 3-1/2" pvc(1"), 1" elbow
- (B) 46" pvc(1"), 1" ball valve, 1-1/2" pvc(1")
- (C) 1" tee, 1-1/2" pvc(1"), 1" ball valve, 1-1/2" pvc(1")
- (D) 1" el, 1-1/2" pvc(1"), 1" ball valve, 1-1/2" pvc(1")
- (E) 1" 4-way cross(4 9" pcs. of 1")
- (E1) 21-1/2" circular piece of plastic and filter material
- (F) 1-1/2" pvc(1"), 1" 45 degree el
- (G) 31" pvc(1"), 1" 45 degree el
- (H) 14-1/2" pvc(1"), 1" tee, 13-1/2" pvc(1") with 1" cap
- (I) 3/4" blkhd, 8" pvc(3/4"), 3/4" el, 1-1/2" pvc(3/4"), 3/4" ball valve
- (J) 60" pvc(3/4"), 3/4" el
- (K) 36-1/2" pvc(3/4"), with cap, holes drilled in one side

1 water pump assembly which includes pump, clear tubing, male adapter and bushing reducer

\* All bulkheads are pictured where they should be installed with the exception of the bulkhead in the bottom of the culture tank. Always install with the smooth side and gasket on the inside or water side of the tank.

\* Part (E1) should be totally enveloped in the filter material around all edges of the circle. This acts as your filter, stopping any solids from coming up through the water column in your settling tank.

## **ASSEMBLING YOUR FISH SYSTEM**

Lay out all parts of culture tank stand and Fish System. Each piece is lettered for more efficient assembly. If parts are missing or broken contact us immediately at 800-748-8921 for a replacement.

### *CULTURE TANK STAND ASSEMBLY*

\*The stand will be put together upside down.

- 1) Bolt six semi-circular pieces (A) together overlapping one another to form a ring.
- 2) Bolt 6 triangular pieces (B) to the large round ring (A).
- 3) Bolt small ring (C) in the center of the 6 triangular pieces (B).
- 4) Mount the small legs (D) to the outside of the small ring (C) using the vertical holes.
- 5) The small supports (G) are positioned in the lower holes of the small legs (D).
- 6) Position the large exterior legs (E) to the outside of the large ring. They should attach to the outside of the large ring using the vertical holes in the center of the large triangular pieces (\*NOTE: there are 12 bolts included that are 1/4" longer than the others. These are used for attaching the long legs (E). These legs also have threaded vertical holes so that nuts are not needed on the bolts.
- 7) Attach the long leg supports (F) horizontally between the long legs.
- 8) Turn stand upright and make sure all pieces fit flush before tightening bolts.
- 9) After everything is tightened use the included can of white spray paint to make any necessary touch-ups.

### **FISH SYSTEM ASSEMBLY**

*\*PREASSEMBLE EVERYTHING BEFORE GLUING*

- 1) Be sure and position culture tank on stand so that window is facing desired direction before any assembly is begun.
- 2) Next position settling tank and stand even with hole in lip of culture tank. Biofilter should be positioned next to the settling tank.
- 3) Insert 1" bulkhead fittings in the bottom of culture tank and settling tank, and also into the sides of the biofilter (4 total). Insert the 3/4" bulkhead at the lower side of the biofilter. \*NOTE: make sure that the bulkheads are installed with the smooth side and gasket on the inside/water side of tanks. Use silicone sealant when you are certain everything is in place. The two top holes in the biofilter need no bulkheads.
- 4) After bulkheads are in place and the tanks are positioned where they will remain, you can begin plumbing the system by inserting (A) into the bottom of the culture tank.
- 5) Next insert (D) into the bulkhead fitting in the bottom of the settling tank with the elbow pointed toward the culture tank.
- 6) Insert (C) into elbow in the lower end of (D) with valve pointed toward viewing window in culture tank.
- 7) Insert long end of (B) pipe into elbow under the culture tank with the valve end inserted into tee on (C).

8) (P1) is inserted with holes down into bulkhead fitting inside bottom of culture tank.

#### *INSIDE THE SETTLING TANK*

9) Insert the non-perforated end of (P2) into (E). Insert (P2) assembly with perforated end into bulkhead fitting into center of settling tank.

10) Next wrap the blue filter material around (E1) both ways so that all edges are covered and place on top of (P2) assembly.

11) Insert (P3) into bulkhead fitting in the inside top of settling tank.

12) Lay water pump assembly on the bottom of the biofilter. Plug end of clear hose assembly into bulkhead fitting. \*NOTE: This is a submersible pump. Always use a ground fault interrupter. Also make sure before you plug the pump in that it is submersed under water, just enough to cover the pump (6-8").

13) Put 2 cubic feet of bioribbon on top of pump assembly. Next place blue filter material on top of bioribbon. This should be enough total filter media to fill to just below the holes at the top of the biofilter.

14) Next insert (F) into outside of bulkhead fitting in side of the settling tank with the elbow facing down.

15) Insert (G) into (F) with elbow at lower end. Then insert (H) through holes in the biofilter with tee facing up. Insert open end into elbow on (G).

16) Fit the two small spray bars into the blue spinner mechanism and place on top of (H) - make sure that the holes in each bar are turned opposite directions so that it will spin properly (counter clockwise).

17) Insert (I) into the 3/4" bulkhead fitting at the bottom of the biofilter with elbow facing up. Insert (J) into (I). This pipe should run vertically beside the culture tank.

18) Insert (J) onto (I). (I) should be shortened so that (J) rests on the lip of the culture tank. (J) should not be glued into elbow so that it may be flushed out if it becomes clogged.

#### **AIR ASSEMBLY**

##### *PARTS*

5 51" pieces 1/2" I.D. black poly tubing

5 1/2" x 1/2" x 1/2" tees

4 1/2" npt x 1/4" barb

1 1/2" npt x 3/8" barb

1 LC1 air pump assembly

4 30" pieces 1/4" clear vinyl tubing

1) Insert the gray tees in the black poly pipe to form a circle. You may need to cut off a few inches for a snug fit. One of these tees needs to face out. This is the one that the 3/8" barb fits into.

2) Screw a male adapter into each of the tees. Insert the 3/8" barb adapter into the hole in the lip of the culture tank. \*NOTE: you may heat hose slightly if you have any difficulty getting the barbs to slide in.

3) Secure each of the fittings with the provided hose clamp and then strap in place with the enclosed cable ties. You will need to drill holes in the lip of the culture tank to run the cable ties through.

4) With the four 30" pieces of 1/4" tubing connect one end to the male adapter and the other end to the cubical air stone. This will hang down into the tank.

5) Hook the air pump to the air lines by connecting the 3/8" tubing. \*CAUTION: place the air pump off ground to keep water from getting in.

## **WATER QUALITY**

Ammonia, as mentioned earlier, is usually measured in the ionized form as total ammonia. From this reading, a simple calculation will give you the measure of the unionized (toxic) ammonia concentration, usually in mg/l. The unionized ammonia concentration is dependent on pH and temperature. It becomes more toxic as pH and temperature rise. Unionized ammonia is stressful to warm water fish when it reaches concentrations of .1 mg/l and can be lethal at concentrations greater than .5 mg/l. Should you run into a problem with ammonia, the problem may stem from a crash in your biofilter, an overloaded system, or improper cleaning maintenance. A quick fix would involve a simple water change. Zeolite is another option. This material will cause the ammonia to bond to the zeolite, pulling it out of the water. Fritz-Zyme contains the bacteria needed in your biofilter and following a crash, can help replenish their populations. Fish show signs of ammonia stress by exhibiting erratic swimming behavior and/or gasping at the surface.

pH is the measure of hydrogen ions in the water. This number will read between 0 and 14 with 0-6 being considered acidic, 7 is neutral, and 8-14 being alkaline. For fresh water, the pH should not go far below 6.5 or above 9.5. The bacteria in your biofilter prefer a pH from 7-8. In recirculating systems, there is a trend for the pH to slowly drop over time as the bacteria produce acid as a by-product of nitrification. Carbon dioxide can also lower the pH, with the formation of carbonic acid. A pH problem can be remedied with the addition of a buffer (see alkalinity).

Alkalinity is the measure of alkaline substances in the water. This parameter offers a buffer to sudden fluctuations in the pH. The alkalinity can be maintained by the addition of carbonates and bicarbonates. Sodium bicarbonate (baking soda) is commonly used. A concentration of at least 150 mg/l should be maintained.

The temperature of your tank should reflect the optimal temperature for the growth of your fish. For example, tilapia grow best at temperatures of 79-90 degrees. They will normally stop eating at temperatures less than 70 degrees and will die at temperatures less than 50 degrees. In this case, the use of a heater or heated building is recommended for the colder months. If using a heater, be sure to allow the recommended heat-up time. Trout, on the other hand, require temperatures normally 50-69 degrees. So, in this application a chiller may be required.

Oxygen is being constantly supplied to your fish by way of a small linear compressor. The Fish System is capable of handling the respiration of up to 150 pounds of warm water fish. However, should you experience algal blooms and very warm temperatures it may be wise to monitor oxygen levels. Most fish require a concentration of at least 3 mg/l oxygen and the bacteria in the biofilter require at least 2 mg/l. Fish show signs of oxygen stress by gasping at the surface of the water. As fish metabolize feed, they consume more oxygen so if an oxygen problem should occur, discontinue feeding until corrected.

## **DAILY FISH SYSTEM MAINTENANCE**

Feed fish - no more than they can eat in 2-3 minutes. DO NOT OVERFEED.

Drain solids removal tank - scrub entire inside to remove accumulated algae on the sides.

- 1) shut off valve from culture tank
- 2) remove plastic disk with filter material
- 3) remove standpipe
- 4) open drain valve
- 5) open valve on bottom of settling tank

Hose off filter material in the solids tank.

Unplug the water pump while draining.

Squirt hose through drain pipe from solids tank to biofilter.

Remove and clean spinner bar.

Clean pipe which sprays water back into the tank.

Observe fish behavior - look for abnormal behavior.

Water quality testing is required.

Contact your local extension agent to help you find a source for your fish.

## OPTIONS

As an owner of the Fish System there are a few options which are available to you.

Bead filters were perfected by Louisiana State University in the 1980's and now are one of the most effective means of filtration available. These patented filters provide both solids removal and biofiltration (ammonia removal) in a single unit with easy cleaning. The dense layer of beads within the filter traps solids and also provides a tremendous amount of surface area for nitrifying bacteria (*Nitrosomonas and Nitrobacter*) which remove toxic ammonia. These bacteria grow and thrive on the entire surface of the beads. By adding a bead filter to your Fish System you can increase the efficacy of solids removal thereby improving on your water quality.

Fish waste is rich in nitrogenous compounds and nutrients. Because of this, it has been used as a source for irrigation and more recently has been looked into for hydroponics. Hydroponics is soilless farming, an industry which is spreading widely across the country. Cucumber, herbs, tomatoes and lettuce are among the most popular crops grown. There are many different styles and methods, all using some inert substance as a growing medium. Aquacenter has recognized the potential in what we would normally call "waste" and developed a system for growing lettuce, the most widely cultivated crop, in conjunction with our Fish Systems. We offer the materials required in the form of a kit which includes everything you will need to get started to produce a crop of lettuce: Air pump, airline, airstones, growing trays with covers, net pots, and growth media cubes. Call for more information.

Where fish are concerned, dechlorinated water is a must. Not everyone has the benefit of dechlorinated water at their disposal. In this case, a reserve of water would be required for regular water exchanges or in the event of an emergency. Aquacenter offers an array of storage tanks made of the same rugged polyethylene as our Fish System tanks. Please inquire.

## ORDER THESE FISH SYSTEM PACKAGES FOR CONVENIENCE AND SAVINGS

### COLD WATER FISH SYSTEM PACKAGE

Includes everything you will need to grow cold water fishes. The 1hp chiller has a 20° cooling capacity. To figure your needs estimate the highest ambient air temp and subtract the desired temperature. (Eg. your room temp is 70, the chiller will chill down to 50%)

#### YOU GET:

- \* 1 HP CHILLER 230 VOLT W/DIGITAL DISPLAY
- \* SODIUM BICARBONATE
- \* (2) GALLONS FRITZ-ZYME#7
- \* CHLORINE REMOVER
- \* (2) 270-12 NETS
- \* 9 TEST KIT
- \* 44 LBS. FLOATING TROUT FEED

Part#FSCW.....302 lbs. \$2251.60

### WARM WATER FISH SYSTEM PACKAGE

Includes everything you will need to grow warm water animals. The 1800 watt heating unit is capable of warming for a 25° temperature difference. Figure: the lowest ambient air temperature subtract it from the desired temperature (should be less than or equal to 25°). Eg. your lowest temperature is 50°F. The heater will warm water to 75°.

#### YOU GET: For catfish

- \* (2) GALLONS FRITZ-ZYME#7
- \* 1800 WATT HEATER UNIT
- \* SODIUM BICARBONATE
- \* (1) GALLON CHLORINE REMOVER
- \* 28030 FINGERLING NET
- \* 9 TEST KIT
- \* 50 LBS. FLOATING CATFISH FEED

Part#FSWW-C.....159 lbs. \$533.75

#### YOU GET: For Tilapia

- \* (2) GALLONS FRITZ-ZYME#7
- \* 1800 WATT HEATER UNIT
- \* SODIUM BICARBONATE
- \* (1) GALLON CHLORINE REMOVER
- \* (2) 270-12 FISH NETS
- \* 9 TEST KIT
- \* 50 LBS. FLOATING TILAPIA FEED

Part#FSWW-T..... 159 lbs. \$539.93

## FISH SYSTEM OPTIONS

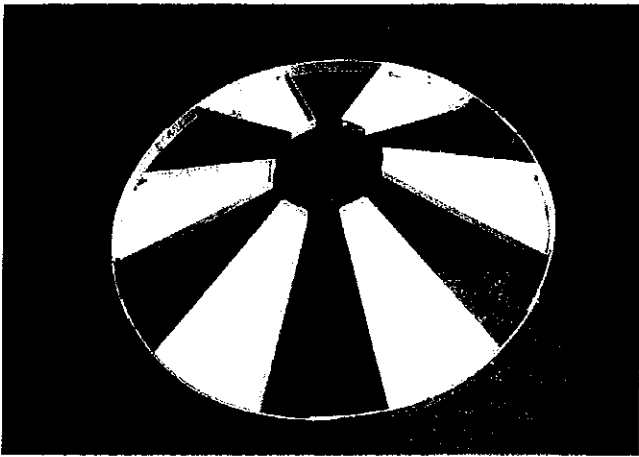
This option list is not meant to be all inclusive does it mean you need to purchase everything on it. It is presented as an aid to help our select available optional equipment. If you need assistance please do not hesitate to contact one of our technical staff members.

<b>PART #</b>	<b>Description</b>	<b>Purpose</b>	<b>PRICE</b>
<b>FSH</b>	Hydroponics option	Lettuce production	<b>\$85.00</b>
<b>shade 1</b>	Shade cloth 12' x 10'	Shade fish, prevent algae growth	<b>36.00</b>
<b>GH15</b>	Greenhouse 12' x 15'	Shelter, insulation, horticulture	<b>1360.00</b>
<b>various</b>	Books and videos	Education	<b>inquire</b>
<b>10950</b>	Sodium Thiosulfate 50#	Chlorine remover	<b>34.90</b>
<b>10890</b>	Sodium Bicarbonate 50#	pH Buffer	<b>19.00</b>
<b>various</b>	Chillers	Water Cooldown	<b>inquire</b>
<b>F5115</b>	Feeders	Fish Feeder	<b>119.00</b>
<b>5TT</b>	Timer	Timer for Feeder	<b>28.00</b>
<b>80195</b>	Zeolite	Ammonia Removal (quick fix)	<b>29.75</b>
<b>CM</b>	Magnetic Glass Cleaner	Clean viewing window	<b>6.50</b>
<b>369-80223</b>	Fritz-Zyme	Bacteria for Biofilter	<b>19.05</b>
<b>various</b>	U.V. Sterilizer	Sterilize water	<b>inquire</b>
<b>various</b>	Ozone Generator	Filtration, oxidant and disinfectant	<b>inquire</b>
<b>GFI-1</b>	Ground Fault Interrupter	shock prevention in case of leak or elec. current	<b>49.95</b>
<b>TA4</b>	Telephone Alarm	Notifies you of system failure	<b>390.00</b>
<b>20630</b>	Fish Handling Basket	Harvesting, moving fish	<b>14.00</b>
<b>various</b>	Heaters	Heats tank water	<b>inquire</b>
<b>various</b>	Labware	Pitcher, beakers, test tubes, etc.	<b>inquire</b>
<b>14080</b>	pH Pen	Measure pH	<b>42.00</b>
<b>Mel 20</b>	Microscope	Microscopic viewing	<b>225.00</b>
<b>62-1115</b>	Dissecting Kit	Dissecting Fish	<b>16.75</b>
<b>270-12</b>	Dip Net	Moving Fish	<b>18.25</b>
<b>LS2000</b>	2000 Gram Scale	Weigh chemicals and fish	<b>99.00</b>
<b>various</b>	Thermometers	Tank water Temp	<b>inquire</b>
<b>L363302</b>	9-Test Water Quality Kit	Measure tank water quality parameters	<b>199.00</b>
<b>various</b>	Nylon Mesh Screening	Screen for small fish loss through pipes	<b>0.00</b>

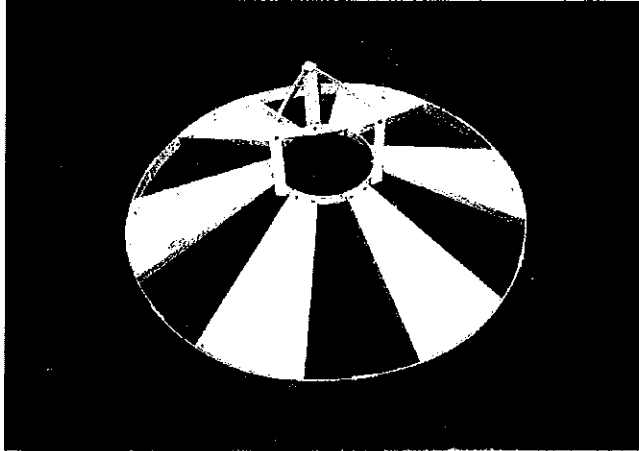
Use this chart to record your daily water quality analysis. The ionized ammonia is usually measured with your test kit. From this, the unionized ammonia (toxic) can be calculated. Recording the amount of feed that is eaten will better help you determine the growth rates of your fish.

Day	Ionized Ammonia	Unionized Ammonia	pH	Temp	Alkalinity	D.O.	Feed
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

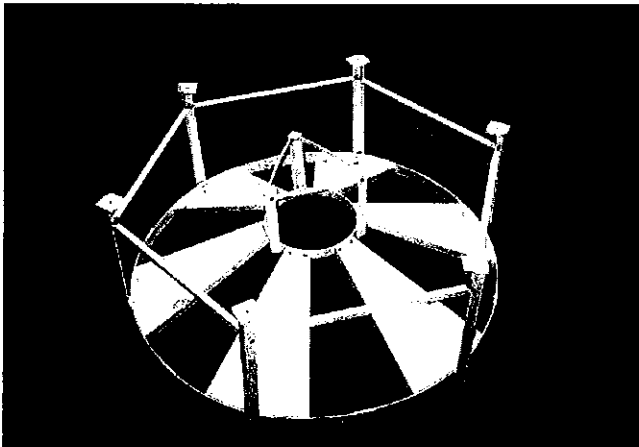
***CULTURE TANK STAND  
ASSEMBLY***



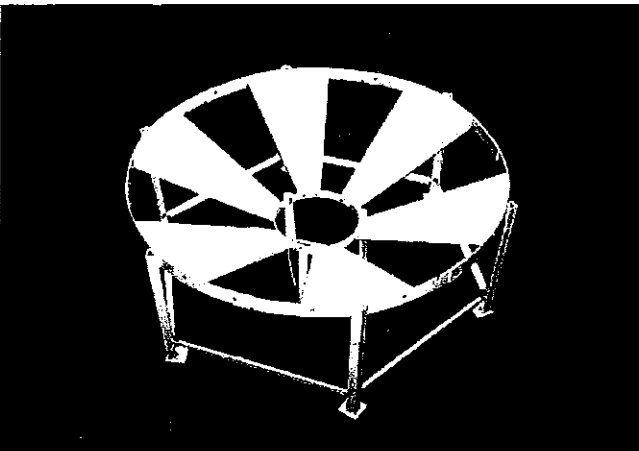
**see steps 1 & 2**



**see steps 3 & 4 & 5**

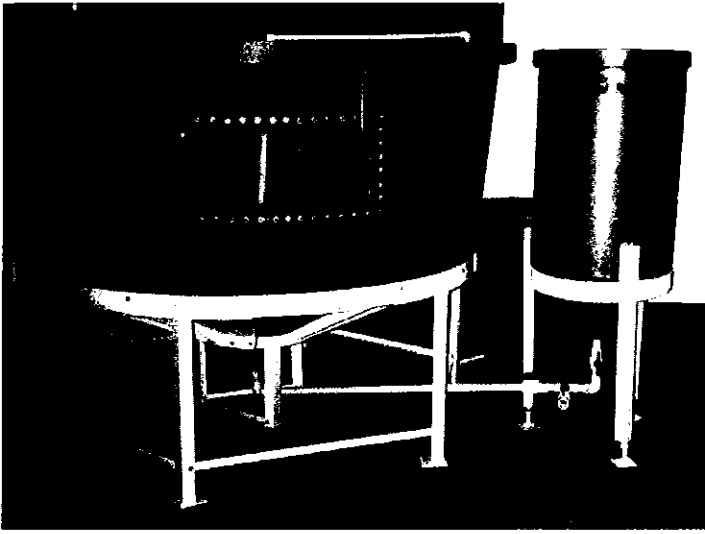


**see steps 6 & 7**

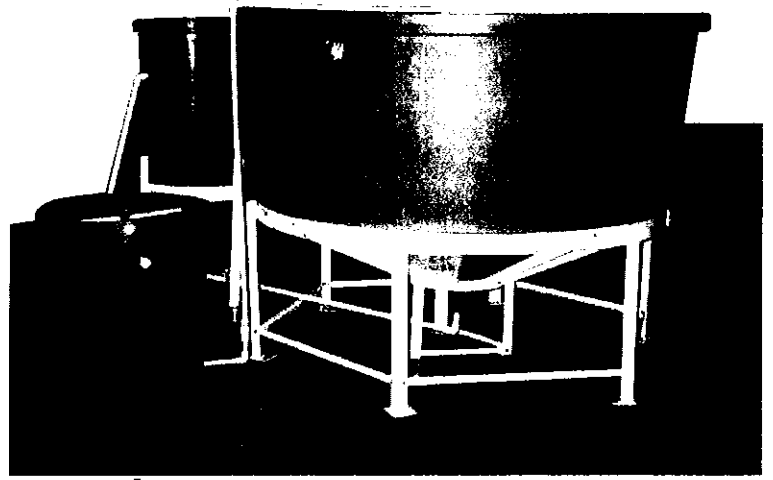


**see steps 8**

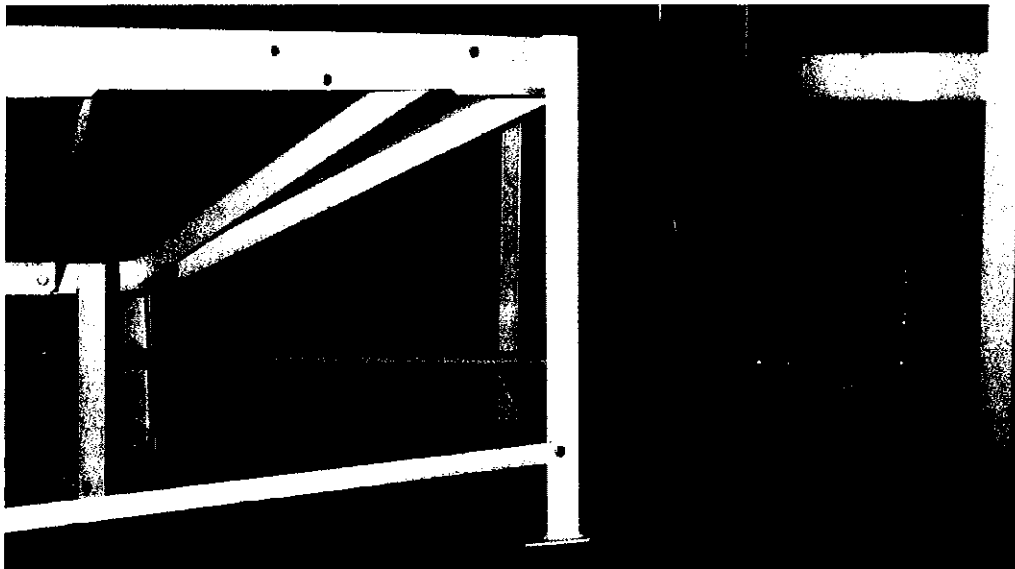
# ***FISH SYSTEM ASSEMBLY***



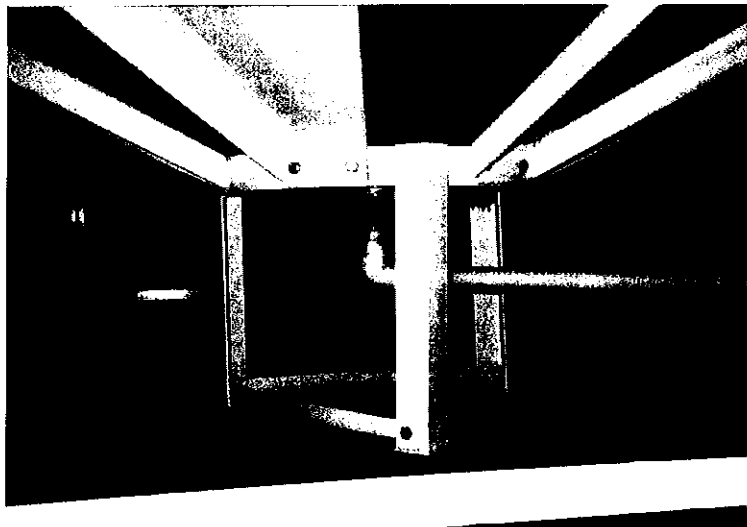
**front view**



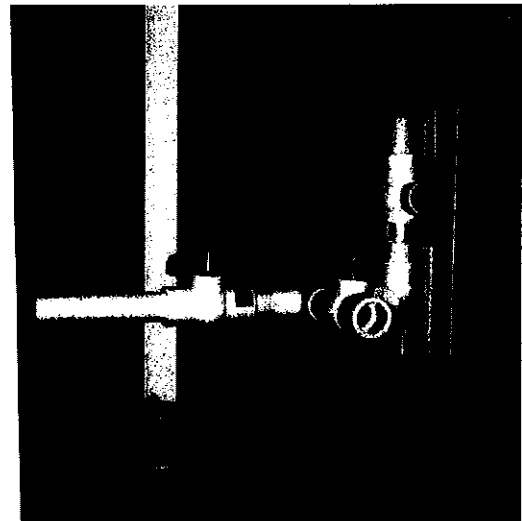
**rear view**



**see steps 4, 5, 6, & 7 (connecting culture tank to settling tank)**

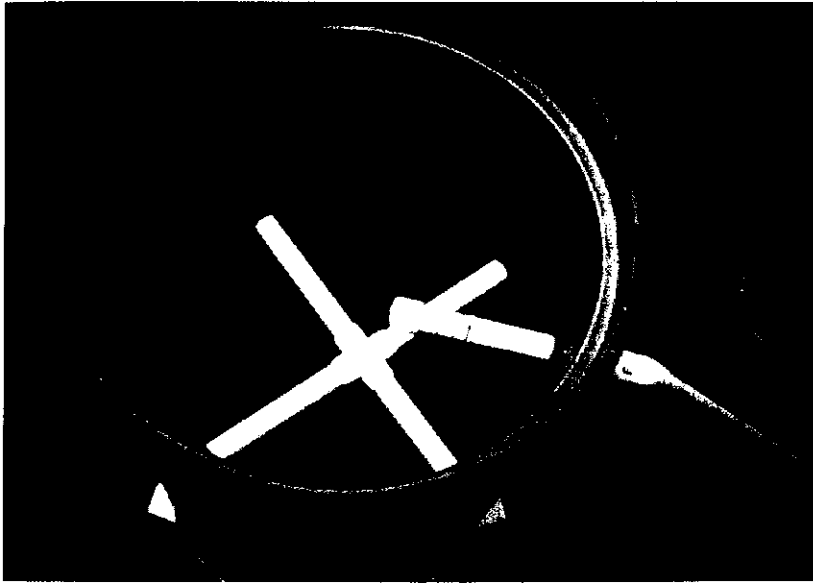


**see step 4 (how A is positioned under culture tank)**



**see step 5, 6, & 7 (how valves position from A into settling tank)**

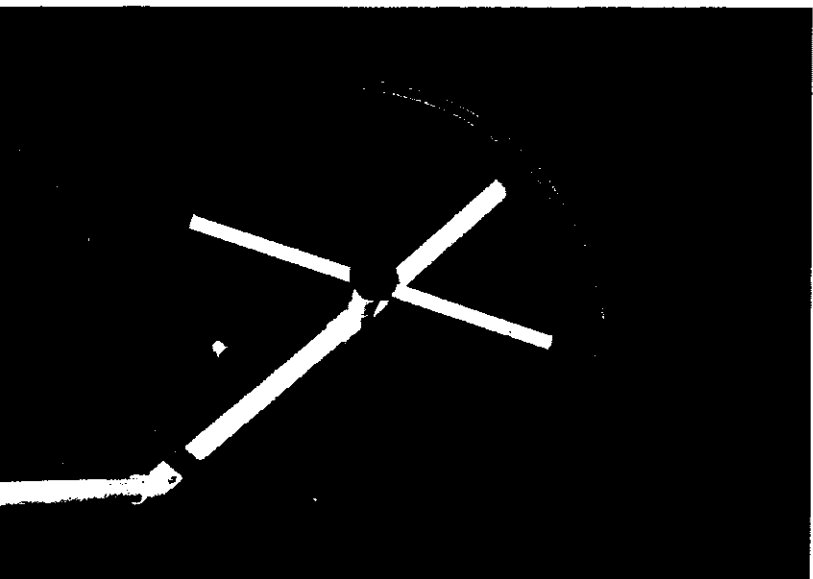
**FISH SYSTEM ASSEMBLY (continued)**



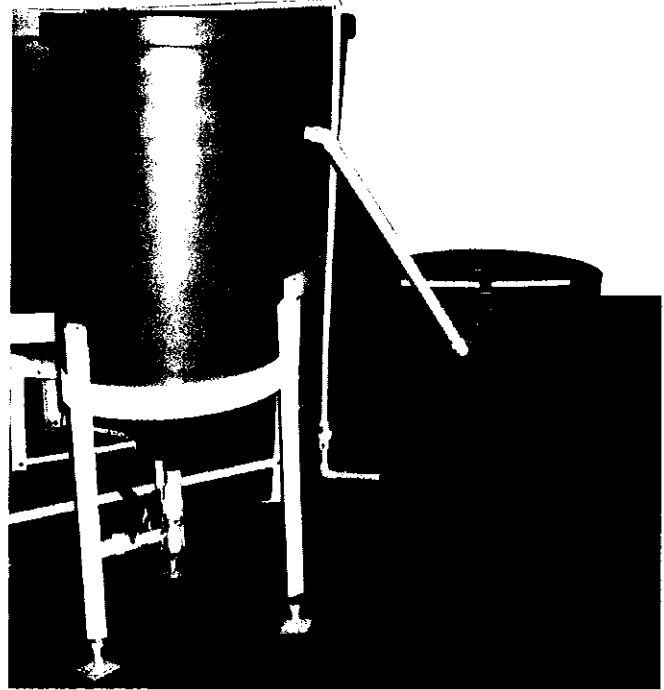
**inside the settling tank see steps 8 & 9**



**inside the settling tank see steps 10 & 11**



**inside the biofilter see steps 12, 13, 15 & 16**



**see steps 14, 15, 17 & 18**