Chapter V MAINTENANCE AND MAINTENANCE PROCEDURES

Few persons today are under any illusion that a fiberglass yacht is "maintenance free". As a matter of fact, from the standpoint of cosmetics alone, a fiberglass hull requires nearly as much time to take care of as a wooden hull of similar size. Washing, waxing, and touching up little nicks and scrapes are time consuming and demanding tasks which must be done consistently if the yacht is to retain its new look.

The advantages of fiberglass lies in areas other than cosmetics-strength, for example. Fiberglass reinforced plastics (FRP) are amongst the strongest boat building materials ever developed. Even a moderately well built FRP yacht will be stronger and more endurable than the best wooden built a few decades ago. In addition, fiberglass is impervious to most of the ills which can be disastrous in other materials -- it doesn't oxidize like steel; it isn't affected by electrolysis like aluminum: it doesn't rot like wood. While it can be damaged by physical impact and the resin will burn, neglect of surface damage generally does not result in more serious deterioration as it certainly would in a steel or wooden hull.

A. THE HULL-

Generally, SOUTHERN OFFSHORE YACHT recommends that their customers purchase a white hull. This means that little dings and scrapes do not show up, as they would on a colored hull, and one is not under as much pressure to make immediate repairs.

Normal periodic maintenance consists of waxing the hull with any of several good fiberglass or automobile waxes on the market today. Waxing should be done from the shear down to and including the waterline stripe. Wax should not be put over the bottom paint which may be at or above the normal trim waterline of the yacht.

Scrapes and scratches in white gelcoat are relatively easy to repair. There are several gelcoat repair kits on the market which will do a fine job if the directions are followed closely. Bigger gouges can be filled with either polyester or epoxy putties before the gelcoat repair system is used. Colored gelcoat presents the additional problem of color matching. Again, there are several systems on the market which will make it possible to match the original gelcoat color.

It is a good idea to inspect the bottom periodically. In areas such as the Chesapeake Bay, groundings are generally not serious. the muddy bottom is unlikely to.do any serious damage. groundings on rock or coral are a different

story. If possible, the hull should be inspected immediately after the hard grounding on one of these latter bottoms. If deep scrapes are found or if the fiberglass has actually been crushed or distorted, the yacht should be hauled at your earliest convenience and the damaged fiberglass repaired. While we do not wish to exaggerate the potential for water to soak into the damaged surface, the possibility is there and immediate repair will limit the area of potential water saturation. A good fiberglass repair kit is shown in the table.

Your TAYANA 37 comes with a heavy rub rail bolted and glued to the side. This is primarily to protect the sides, but it is also a thing of beauty when properly maintained. A wise investment is a stainless steel or bronze striker. This will take a great deal of the abuse which otherwise would have to be absorbed by the wood. The rub rail is very often neglected during cleaning. It should be cleaned, sanded, and oiled in the same manner as other teak on the yacht. (See discussion below).

B. THE DECK AND CABIN TOP

The deck of the TAYANA 37 is molded in essentially the same manner as the hull--in a one piece mold following the fiberglass schedule shown above. When the deck is removed from the mold, most of the teak trim is installed before the deck and hull are joined. Teak decks, teak facings on the cabin, and teak in the cockpit are all installed after the deck is joined to the hull.

The fiberglass of the deck and cabin are cleaned and maintained in the same manner as the hull. Any one of several good cleaners and waxes will tend to help keep colors bright and new looking. The big job will be teak maintenance. In the old days teak decks were maintained with a holystone and salt water. The holystone was a large piece of pumic rock which was rubbed across the deck to clean and polish wood. When done regularly, the teak was kept a beautiful, natural silvery color which was quite striking when contrasted with to painted surfaces and natural wood colors. The salt water helped keep the teak in good shape because salt would be left in the wood as the water evaporated. Because the salt was slightly hygroscopic (attracts moisture), the teak did not dry out rapidly. Of course, wetting and cleaning had to be done daily if the deck was to be kept in the best condition.

Not many people are going to holystone their teak daily in this day and age, although that is to be highly recommended. Most people seem to prefer the deep brown of newly oiled teak. There are several products on the market which make it possible to keep the beautiful brown of teak without a great deal of heavy labor. These products are strong and corrosive and must be used infrequently and with great care.

When you receive your yacht, the teak will have been cleaned and will be relatively dry. It should be cleaned with common washing soda that one can

obtain in the laundry section of any well-stocked grocery store. Washing soda is an excellent cleaner and has a tendency to bleach the wood somewhat. It will not damage paint or gelcoat, unlike some teak cleaning products, although it should be thoroughly cleaned off. Use about one cup of washing soda in a bucket of water (more soda if the deck is really dirty), and one of the many plastic scrubbing pads which are on the market. Scrub the teak with the soda solution until the wood is thoroughly cleaned. Then rinse thoroughly and let dry. Avoid using deck or scrub brushes, as these tend to damage the softer parts of the grain and leave the teak rough.

The number of teak oils on the market is virtually endless. We have found that the best are those which contain a minimum amount of varnish. Such oils do not leave quite as brilliant a finish, but they last almost as long, and they age more gracefully. If one wishes to maintain the brilliant teak brown, he will have to clean and reoil every four to six weeks in tropical areas; somewhat less frequently in higher latitudes.

The polysulfide products that are used to caulk the teak decks merit some special consideration. Certain of the more corrosive teak cleaners and at least one teak oil product can damage polysulfide. As mentioned above, corrosive teak cleaners should be used infrequently and the directions should be very carefully followed. These compounds should be washed off completely and as soon as the directions permit, even if the product is advertised as not hurting caulking compounds. On the other hand, teak oils that can soften polysulfide should never be used. One of these oils is reputed to be a widely advertised two part product.

The polysulfide caulking is relatively easy to maintain and repair. The most common problem is that the caulking pulls away from the teak and breaks the seal. When this happens, it does little good to try to fill the resulting space with more polysulfide because the new material will adhere neither to the old polysulfide nor to the teak. The old polysulfide should be completely removed and then the teak should be primed with the primer recommended by the manufacturer. Once the primer has dried, the space should be filled with fresh polysulfide--leave a bead which is higher than the surrounding wood. It will take several days for the polysulfide to cure. Note that moisture tends to increase the rate of curing, and it is a good idea to keep the caulking damp. Once cured, the caulking can be sanded off flush leaving a practically invisible repair.

C. INTERIOR WOODWORK

Interior woodwork is generally solid teak staving or teak faced plywood panel. Both of these are maintained in the same manner if they are unvarnished or natural. If you have ordered your yacht with natural wood which you wish to keep light, it is best to finish the teak with a light wax. The process is simple. The wood should be thoroughly cleaned--start with a vacuum cleaner and get all of the

saw dust and loose dirt; then use a damp cloth (no soap) and get all of the residual fine dust; follow this with a solvent wash to eliminate any excessive surface oils; then spread on the wax according to manufacturer's directions. Any of the light furniture waxes can be used for this application. Some people have had excellent results using bowling alley wax. This wax, which takes a longer time to apply, but it is tougher than most liquid waxes and requires less maintenance. If you want your interior teak to be a little darker and to take on the patina of fine furniture, one can use oils rather than wax. Cleaning should be accomplished as described above and then the wood should be covered with lemon oil or such commercial products as Liquid Gold or “Sheila Shine”. The latter two products have an oil base which soaks into the surface of the wood and a wax which fuses to the surface and provides a protective coating. The oil does darken the wood somewhat. If your yacht has a varnished interior, you will find that maintenance is much like keeping furniture looking nice. You will clean the surface with water and mild soap solutions and "dust" using one of the many dusting products available at the local supermarket.

The sole merits special consideration. Obviously one cannot use ordinary waxes--they would ruin footing. If the sole is left natural it should be cleaned as described above and covered with Liquid 601d or Sheila Shine. These products protect the surface but do not seem to leave the sole slippery when wet. If the sole is varnished with a satin coating it will be a little more slippery but may be all right. If it is too slippery when wet, it can be coated with polyurethane--this product is not at all slippery when wet. The directions for preparing the surface should be followed religiously as polyurethane is generally not compatible with other types of varnish.

Bronze presents a special cleaning problem. Ordinary metal cleaners will not clean or polish bronze. Brass cleaners, for example, will not touch the green corrosion that disfigures bronze ports. The best product we have found is Amway metal cleaner. The Amway is an excellent general metal and bronze cleaner to have aboard for both interior and exterior use. In the case of bronze, once the metal is cleaned and polished, it should be coated with a spray wax such as the Amway colorless shoe polish.

D. SPARS, RIGGING, AND SAILS

The primary means of propulsion is the sailing rig, yet it is sometimes the most neglected. This is probably because it is very reliable and because most people believe they have an intuitive understanding of it and neglect it through misplaced familiarity. However, maintenance is vital. Failure of your rig can be far more catastrophic than engine failure—one doesn't merely lose power; he may sustain damage to the yacht and injury to personnel.

1. Wood Spars

If you have wooden spars with your yacht you can be assured that you have some of the finest available. TaYang uses a very fine grade of spruce that has been well seasoned. All glues are epoxy and screws and fittings are stainless steel or marine bronze. The workers in TaYang's spar shop are among the yard's most experienced.
Probably the single most important maintenance item on a wooden mast is the condition of the bedding under the fittings. Normally fittings are bedded in polysulphide at the factory. This is done to keep water from gathering under the fitting and causing dryrot. The bedding of fittings should be checked at least once a year. If the bedding shows signs of deterioration, the fitting should be removed, all of the old bedding should be cleaned away, and new bedding applied.

Varnished spars are certainly the best looking, but they also require the most maintenance. This is particularly true if the yacht is operating in southern waters. The biggest enemy of varnish is the sun and the finish must be watched very carefully. The varnish job done by the factory is barely adequate. They use reasonably good varnish, but it does not contain ultraviolet shielding and insufficient coats are applied to insure long life.

We recommend to all owners with varnished spars, particularly those in the south, that at least five more coats of varnish be applied before the spars are installed on the yacht. These additional coats will insure that additional varnishing will probably not be required for about eighteen months.

Varnished exterior surfaces should be examined constantly. If deterioration or damage is spotted, it should be taken care of immediately. The damaged area should be sanded and new varnish applied to the area using four or five coats. A useful maintenance item is a spray can of spar varnish. If a varnished surface is damaged during a cruise or race and there is not time for a permanent repair, the area may be prayed to prevent further deterioration.

We recommend that owners who operate in southern waters with wooden spars paint them white or off-white. The paint is not susceptible to ultraviolet damage and they tend to reflect heat. A well painted wooden spar does not need to be repainted for at least 24 months if the finish has not been physically damaged. Bedding is just as important as with a varnished spar and should be checked regularly. One argument against painting has been the perception that paint might hide an area of rot and the resulting delay in discovering the problem could be serious. We have not found this to be the case. If painted spars are examined on a regular basis, rot and excess moisture will be readily apparent --paint will discolor and peel.

2. Aluminum Spars

The primary advantage of aluminum spars is the reduction in maintenance. One should not conclude, however, that aluminum spars are maintenance free. Like fiberglass, aluminum requires constant and conscientious care if its appearance is to be maintained. Again, as with fiberglass, if damage to finishes does occur, one is not quite so pressed to get a repair done because further deterioration is not likely.

The aluminum spars with a TAYANA 37 may be finished either by anodizing or painting. Anodizing is a process by which a protective coating is formed which is superior to paint. It is done in a special bath before any of the fittings have been installed. Anodizing cannot be renewed by the yacht owner. Painted spars are maintained in much the same way as painted wooden spars. Generally, the paint used is polyurethane, a very hard, color fast paint. Maintenance consists of watching for scrapes and gouges and repainting them when they occur. A small spray can of automobile finish is very handy for this purpose. Simply remove the damaged paint, then sand lightly with about a 300 grit wet or dry sandpaper, and spray on the new finish.

Aside from physical damage, owing to impact or scraping, the greatest cause for damage on an aluminum spar is galvanic corrosion. Any nonaluminum fitting that is bolted, screwed, or riveted to an aluminum spar must be bedded just as was the case with wood spars. The bedding, in this case, acts as an electrical insulator rather than as a means of keeping water from behind the fitting. If dissimilar metals are not isolated from the aluminum, one will soon find that the aluminum pits and forms a fine powder. This is nonreversible damage that must be avoided at all costs. If it is discovered, the fitting or fastener around the corroded area must be removed and reinsulated with a bedding compound or a sheet insulation such as neoprene or rubber. The pitted area may be filled with epoxy or polyester putty before repainting, but this is only cosmetic--the putty will not restore the lost strength in the damaged area.

One must consider that an aluminum mast that has been badly dented is no longer safe. Dents that are half an inch or more in depth and which have a diameter of a third or more of the spar constitute a serious weak point. If the spar is put under serious stress at that point, the chances are that the section will collapse. If you should find a dent that large, contact a professional yacht rigger for advice.

Mast spreaders are particularly critical to the health of your rig. They allow the long upper shrouds to take up the loads that are transmitted to the upper part of the mast during sailing. As a result, they are under tremendous compression. It is particularly critical that they be examined regularly to see

that there is no distortion or cracking. The outer tips of the spreaders should be raised above the spreader base so that the compression load is transmitted down the spreader to the mast and not at an angle which would tend to force the spreader to bend under load.

3. Standing Rigging

Standing rigging is made up of stainless steel cable with various attachment fittings of chromed bronze and stainless steel. The wire used is 1/4 or 5/16 inch lxl9 wire. Either size cable is sufficiently strong to bear the rig under winds of hurricane strength. The lxl9 refers to the winding of 19 single strands of wire to make the cable. This winding makes the cable stiff and strong, but it would be unsatisfactory if it were required to run through blocks or go around sharp corners.

Most TAYANA 37s are delivered with swaged fittings. Swaging is a process that actually squeezes a hollow cylinder onto the cable. The process was developed for the aircraft industry, and the strength of the joint is nearly as great as the tensile strength of the cable.

Some 37's have been delivered with the wedge type fittings that are most often known by the trade names Sta-Lok or Norseman. These fittings get their strength from a conical bronze core that is forced against the cable within the fitting. It too is stronger than the tensile strength of the cable. It has the added advantage that it can be installed by the owner with two common adjustable wrenches. It must be remembered, however, that the wedging cones are not reusable and extras should be carried at sea.

Turnbuckles are generally chromed-bronze cylindrical type. They are made to be set up with two wrenches – one to hold the cable and one to turn the turnbuckle itself.

Standing rigging should be inspected regularly. And remember, it does one no good to simply inspect the bottom fittings and ignore those up on the mast.

The most common failure is cracked swage fittings. All attachment fittings should be carefully examined at least once a month. Look at them closely. Sometimes the cracks are hard to see. If in doubt carefully spray the fitting with a can of red paint and then wipe the paint off with a hard cloth. If there is a crack, the paint will get into it and show up when the paint on the fitting is removed. (A better method is to use a spray can of special dye. The dye goes into the crack more readily and shows the crack more clearly. Such dyes are available at better equipped marine and industrial supply houses.) Any crack is bad but not a cause for panic. As a rule of thumb, if a crack is

longer than the wire diameter, the swage should be replaced immediately. If the crack is less than the wire diameter, the strength of the swage is probably not yet seriously compromised and replacement can be delayed—but watch it like a hawk.

4. Sails

Sails that are delivered with your yacht are very high quality and well cut. The subject of sails is worth a book in itself, so the discussion here will be short and sweet.

The greatest enemy of your sails is the ultraviolet in sunlight. You have sailcovers – use them religiously. Sails that are stored under cover will last three or four times longer than sails which are simply furled on the spars and exposed to the sun.

It is also important to inspect your sails regularly for broken stitching and tears. These should be repaired immediately because they can result in catastrophic sail damage in a short time.

Sails should not be cleaned in a commercial type washer. Rather, it **is** better to lay them out on a flat surface, like a lawn, and use a soft brush, mild washing detergent and cool water. Once the dirt is off, rinse with a hose and be sure to get the salt off at the same time. As a matter of fact, it isn't a bad idea to pull your sails up at the dock a few times a year and rinse them off with fresh water. Once in a while you may find some mildew on your sails. This can be cleaned off by a solution of chlorine bleach and water. For example, two or three caps of Clorox in a gallon of water will clean up most cases of mildew and if rinsing is done immediately no harm is done to the sails.

5. Running Rigging

TAYANA 37's are equipped with low stretch, dacron running rigging. While wire halyards do not stretch as much as dacron, they are more difficult to maintain and tend to damage the mast finish.

Running rigging is subject to three sources of deterioration--wear, chafing, and ultraviolet light. Care on the part of the owner can minimize these to the extent that the rigging should last three to five years without giving any trouble. Wear can be reduced by making sure that turning blocks and fairleads are kept clean and that the sheaves in blocks turn freely. It is also important that line be properly coiled and stowed so that crew members are not walking or sitting on it. Chafe requires that the line be protected at

chafing points. For example, it is not unusual for the jib sheets to chafe on the upper shrouds. If sheets are against wire for any period of time, cover the sheet at that point with some type of protection such as tape. It will pay off. Protecting the dacron line from ultraviolet is as important as protecting sails. Unfortunately, it is next to impossible to protect halyards very much, but sheets can be stowed under sail covers or they can be removed and stowed below.

6. Winches

Winches are among the most important and sophisticated devices aboard ship. Without them it would take ten big Swedes to operate a TAYANA 37; with them the yacht can be sailed anywhere by husband and wife. Winches are the most handy source of power aboard the yacht--you can set big sails, you can raise anchor, you can rescue a man overboard. You can lift an engine, all by using your winches properly. When you consider all the things you can do with these wonderful machines, think back on your high school physics classes. Mechanical advantage is the product of the mechanical advantage of the tackle and the mechanical advantage of the winch. Thus if you are lifting the 400 pound engine out of the yacht using your four part vang and you lead the vang to a winch with a mechanical advantage of 10, you can lift the engine with a force of only 10 pounds!

In spite of the importance of the winch to the proper operation of the yacht, it is one of the most neglected items aboard. The average sailor seldom takes his winches apart for lubrication and maintenance. Don't be one of these average sailors. Take your winch apart at least twice a year and lubricate it in accordance with the manual that has been supplied to you. And while you have it apart, check the mounting bolts; they should be tight and solid. If you find any sign of corrosion owing to galvanic action, renew the insulation material.

TAYANA 37s come with either Barlow or Lewmar winches. You will find diagrams and exploded views of both of these makes at ANNEX 1.

7. Blocks

The blocks which come with your yacht are very strong, well made with teak cheeks and roller bearings. Under normal sailing conditions they will last five to ten years. Maintenance is easy. They should be washed with fresh water a couple of times a year and the teak should get essentially the same treatment as teak elsewhere on the yacht. The ferrous chloride that tends to develop on the 304 stainless steel should be cleaned off with soap and a plastic scrub pad. Nothing else is required.

E. AUXILIARY ENGINES AND RELATED SYSTEMS

1. The Engine

Your TAYANA 37 is delivered with a standard Yanmar 3QM30F diesel engine, the new Yanmar 4JHE diesel, or with an optional Perkins 4-108 diesel. A very small percentage have some other make engine. The discussion that follows applies to any diesel auxiliary which you selected. Specific procedures for service and maintenance are found in your engine manufacturer's handbook, and they should be followed religiously.

Remember, your engine is like-a dog--it thrives on attention and dies quickly of neglect. A small diesel which is run regularly, serviced faithfully and cleaned consistently will last 10,000 hours before major maintenance is required. Think about that!! If you treat your engine right, you'll never have to buy a new one! Ignore your engine--think about it only when you need it--and you will find yourself spending about $5,000 every three years or so.

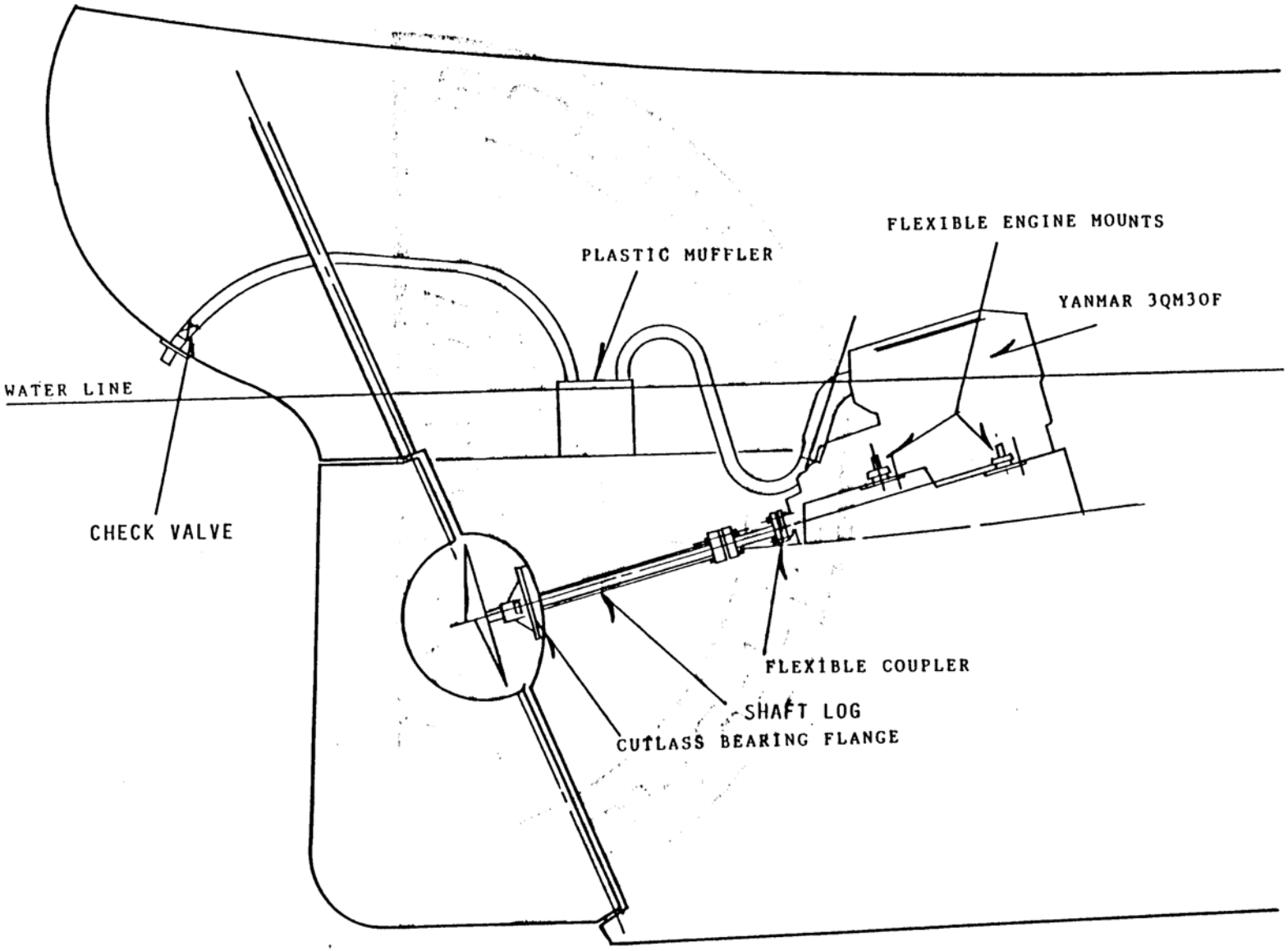
a. Installation

Your engine has been installed by highly experienced mechanics using the best materials. The mounts are bolted to a glassed foundation to provide stability and quiet operation. The engine mounts themselves are of the flexible type to help eliminate vibration in the hull. The propeller shaft is 1-1/4" stainless steel which is connected to the transmission by a flexible coupling. The shaft goes through a bronze shaft log and gland to a cutlass bearing mounted in a bronze casting outside of the hull. The standard propeller is a three bladed bronze wheel generally 18" in diameter with a 12" to 14" pitch.

The exhaust system is of the wet type--that is water is injected into the gas stream and ejected through a muffler and check valve. See figure V.-1. This system is common on sailing yachts because the water cools the exhaust fumes thus cutting down the heat radiated into the engine spaces and eliminating fire hazards. As can be seen in the figure, a siphoning break must be installed to prevent water from backing through the system and into the engine. Newer TAYANA 37s have exhaust systems made primarily from plastic (ABS) mufflers and neoprene reinforced hoses. Older yachts have stainless steel systems composed of an expansion (bellows) exhaust pipe, jacketed pipe, stainless steel water locks and

mufflers, neoprene hoses, and bronze check valve. These latter systems are quite satisfactory, but they are not as durable nor are they as easy to maintain as the new systems.

EXHAUST & ENGINE MOUNTING



The standard fuel tank is made of black iron, is baffled, and has a large manhole with bayonet gauge. A copper fuel line is taken to the engine's primary filter through a ball valve normally located right by the fuel tank. Depending on the type of engine, the fuel return line may inject fuel back into the fuel line at the engine filter or lead excess fuel all the way back to the fuel tank. It is a good idea to install at least one line filter/water separator and an electric pump into the fuel line before you undertake any long voyages. The electric pump will make it far easier to bleed the engine should that be necessary.

Raw water for cooling is taken in through a seacock generally located behind the engine. Note that this intake line has a large filter before the engine. Cooling water is led to the heat exchanger in the fresh water reservoir and then into the exhaust system to cool exhaust fumes.

b. Maintenance

Please consult your engine manual for detailed procedures. The engine manual must be followed exactly to obtain maximum engine life and to keep your warranty in effect. The following sections summarize the maintenance requirements described in the manual and are intended as general information only.

(1) Break-in Period

During the first fifty hours of operation, the engine should not be run at maximum rpm. At fifty hours, the following service should be performed:

(a) Change engine oil and filter.
(b) Tighten cylinder head nuts in correct sequence to correct torque.
(c) Re-set valve clearance and check oil feed to rockers.
(d) Check belt tension.
(e) Check all external nuts, set screws, etc., for tightness.
(f) Check shaft coupling alignment.
(g) Check fuel, oil and coolant levels and look for leaks.
(h) Adjust idle speed, if necessary.

(2) Before Each Outing

(a) Check coolant level.
(b) Check engine oil level
(c) Check transmission oil level.
(d) Look for evidence of leaks under engine.

(3) Every 150 hours or 3 months (whichever occurs first)

(a) Change engine oil and filter.
(b) Check drive belt tensions.
(c) Clean air intake.
(d) Clean motor trap.
(e) Look for evidence of leaks.

(4) Every 450 hours or 12 months (whichever occurs first)

(a) All steps under item (3) above.
(b) Change final fuel filter element.
(c) Check hoses and clips.
(d)Drain and clean fuel tank.
(e)Change gearbox oil.
(f) Service atomizers.

(5) Every 2400 hours

(a) Have an authorized engine mechanic examine and service proprietary equipment such as starter, generator, etc.
(b) Adjust valve tip clearances.

(6) Bleeding The Fuel System

(a) Check fuel tank shut-off to be “on".
(b) Check fuel filter for sediment or water by opening drain plug on bottom. Replace plug.
(c) Follow routing of hoses from fuel filter to engine lift pump, inspecting hoses as you go. On the engine pump, you will find a lever which allows you to manually operate the diaphragm inside, against spring tension. It may be necessary to turn the engine over with the starter slightly to allow the pump arm to relax against the camshaft. This allows more stroke with the manual lever you are operating.

(d) Follow the fuel line from the pump to the engine fuel filter and locate the vent plug on top. Loosen plug two or three turns.
(e) It is advisable to have some large rags on hand to catch oil that will be expelled from this point in the course of bleeding.
(f) Begin operating the manual lever. This may take several minutes as the filters will need to fill up (as well as the lines). Operate the manual lever until fuel flows freely from the filter plug with no signs of air bubbles.
(g) Loosen the bleed screws on the injection pump.
(h) Operate pump again until fuel flows freely with no air bubbles.
(i) Re-tighten the vents beginning with the lowest point (the filter, the head locking screw, and the governor vent screw).
(j) Wipe up any spills at this time.
(k) Slacken the union nut at the injection-nozzles.
(l) Move throttle to full rpm and check to see if the "stop" control is in "run" position.
(m) Crank engine with starter motor until fuel flows from each injector.

NOTE: Do not run starter motor continuously. It normally takes 30 to 60 seconds of cranking to completely bleed the injector lines. 20 seconds of cranking with about a two-minute rest between periods will be easier on the starter, motor, and battery than steady cranking.

(n) Re-tighten injector lines, wipe spills .
(o) Re-set throttle position and proceed with normal start-up.
(p) Allow sufficient running time to recharge battery.

* Hint: Very often the Yanmar 3QM30 engine can be bled simply by loosening the bleed screw on top of the engine oil filter and the bleed screw on top of the injection pump. Try it.

2. Drive Train

a. Engine Alignment

The propeller shaft of the TAYANA is 1-1/4" diameter stainless steel. The shaft is checked for accuracy initially at the factory during installation and is carefully aligned to the engine with the hull being properly supported and level. At this time, the shaft log and bearing is bonded to the hull penetration. The coupling to the engine is checked again for alignment by the commissioning team prior to delivery of the boat.

This alignment check should be made periodically, since the action of a rough sea could possibly change the shape of a bolt enough to disturb engine alignment. If, after the first rough water experience, the alignment has not changed, it is usually only necessary to make the check once per season.

The alignment is considered acceptable if there is a gap less than .005" per inch of face diameter of the coupling –(.002 for a 4" coupling, .0025 for a 5" coupling). The feeler gauge is inserted between the flanges at four points 90 degrees apart. Then check again keeping the engine coupling stationary and rotating the shaft coupling 90 degrees at a time. This checks the squareness of the coupling face to the shaft centerline. The engine alignment is adjusted by raising and lowering the adjusting nuts at each mount. To make lateral adjustment, loosen the mounting pad screws that anchor the engine to the bed. You will note there are slots in the mount pad which allow a reasonable amount of adjustment side-to-side.

After adjusting and re-tightening all mount screws and lock nuts, double check the alignment.

In the absence of a feeler gauge, the alignment can be checked fairly accurately with a strip of paper. Insert the paper between the two halves of the outer flange and rotate both together 360 degrees. The paper should remain in place through the complete turn.

b. Transmission

Periodically check the oil level in the transmission and inspect the control cables for signs of damage, chafing, corrosion or loose fasteners. Lubricate the moving parts with spray lubricant or light grease.

c. Stuffing Box

The gland (stuffing box) should be tightened at least once per month to see

that no more than one or two drops per minute flow in. If new packing is required, packing materials can be purchased at any marine supply. Repacking requires about 10 inches of 3/16 material. Remove the nuts from the two retaining bolts which hold the collar in place. Pull the collar up the shaft toward the engine. Water will flow in rather heavily, but it will be easily controlled by the electric bilge pump. Wrap the packing material around the shaft just in front of the gland. Pull the collar down the shaft so that it tends to push the new packing material into the gland. Using the nuts on the retaining bolts, force the packing material evenly into the gland and tighten until there is a water flow of only about one drop per minute. Then install and tighten the locking nuts.

d. Cutlass Bearing

The cutlass bearing is mounted in a bronze casting as shown in figure V.-1.. This casting is designed to allow full flow of water throughout the length of the bearing. This is important because the cutlass is water lubricated.

A cutlass bearing should last several years. When the bearing is new, the shaft will be tight and no lateral movement will be apparent when trying to push the shaft side to side. As the bearing wears, one can move the shaft slightly from side to side or up and down. Once that lateral movement is more than about 1/16", the bearing should be changed.

Changing the bearing is a major maintenance job and might be best left to the professional yacht mechanic. It requires that the boat be hauled. The shaft must be removed by loosening the coupling set screws and pulling the shaft back through the gland. The four nuts on the bearing casting retaining bolts are removed. The casting itself is threaded to the shaft log. Therefore, one must unscrew the shaft log from the casting. Once the casting is removed, it is a simple matter to drive out the cutlass.

It is not always necessary to remove the cutlass bearing casting. After the shaft is removed, the bearing can sometimes be drawn from the casting. One technique is to saw a small section out of the bearing so that it can be compressed and drawn. One must use an unframed hacksaw and be careful to saw only the bearing.

F. ELECTRICAL SYSTEMS

As mentioned in an earlier section. the TAYANA 37 has two standard electrical systems--a 12 volt system which gets its power from batteries and the engine alternator, and a 110 volt system which is powered through the shore power cable or with an on

board generator. A modern yacht is highly dependent on these systems and it is essential that they be maintained.

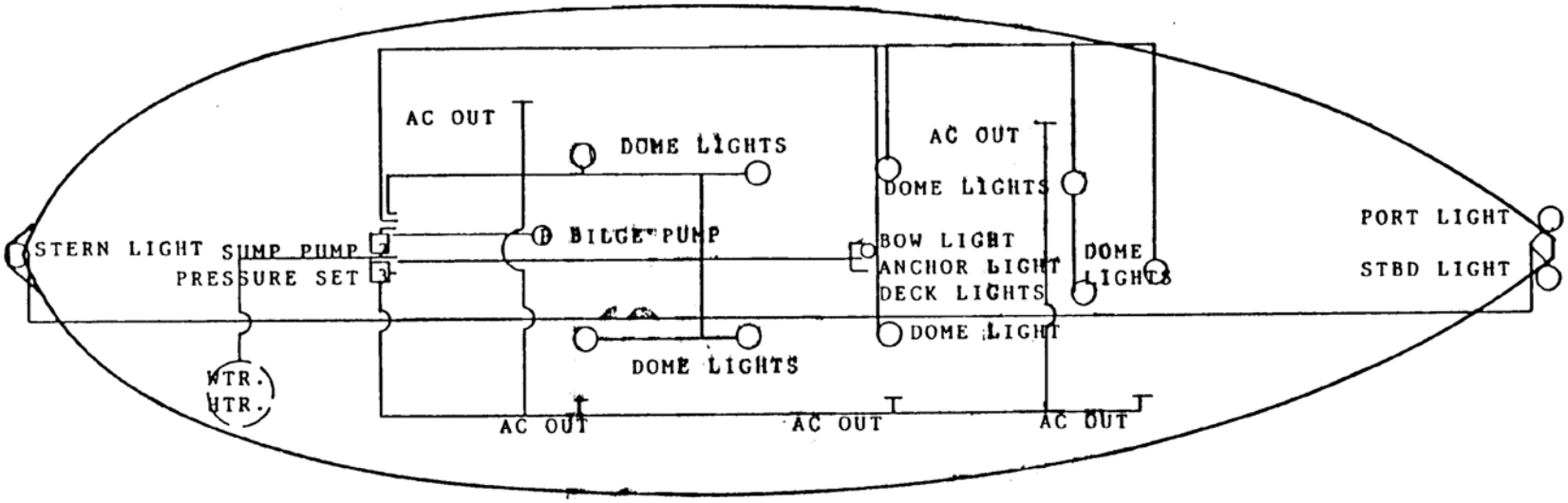
1. The 12 Volt D.C. System - Figure V.-2.)

The primary source of 12 volt power is the battery bank which comes with the yacht. The battery(s) are used both to start the engine and to provide power for the various electrical equipment on the yacht. The battery(s) are charged by the engine-mounted alternator or by a battery charger (converter) which is connected to a 110 volt power source.

Battery maintenance is simple but demanding - you should check your battery water at least once a month whether you have sailed the yacht or not. This is particularly important if you have a 110 volt converter or battery charger in operation. The electrolyte (acid) level should be maintained to cover the plates in the battery. It is best to use distilled water in your battery(s) but that is not totally necessary. Clean, drinkable water can be used if distilled water is not available. NEVER USE SALT WATER. Excessive need of water is an indication that the charging rate is too high. A check of the charging voltage should not read over 15 volts. Should you spill electrolyte from the battery, it should be neutralized with baking soda. Remember, battery electrolyte is sulfuric acid which is very corrosive. It will eat into your skin, wood, cloth, and some metals. Don't neglect a spill. If it gets on your skin, wash it off immediately with soap and water. One other battery maintenance point is the two poles. Make sure connections are clean and tight. A thin layer of grease will help keep battery connections clear of corrosion.

The use of a hydrometer is an inexpensive and accurate measure of the battery's condition. Specific gravity measurements of the electrolytes should read between 1.275 and 4.280 on a normally charged battery. All cells should read relatively equal; any one cell that has noticeably low reading is an indication of a bad cell, and the battery should be replaced.

FIGURE V.-2.



WIRING LAYOUT

a. The Electrical Panel

The electrical distribution panel controls all of the 12 volt electrical circuits in your yacht. You will note that it has both a battery condition meter and an ammeter. The battery condition meter tells you the measured state of the charge existing in your batteries; the ammeter tells you how many amperes are being used at any instant of time. The various circuits go through the circuit breakers on the board. These circuit breakers act as both a switch and as an overload protection device.

There is very little maintenance necessary on the panel. Open the door and look at the back of the panel. You will see colored wires, which go to the various electrical devices--the colors allow you to find the same wires throughout the yacht. The panel should be kept dry at all costs. If a circuit breaker trips and cuts the circuit, there is an overload condition. This is usually because there is a short circuit. Always attempt to discover what caused the circuit breaker to trip before depending on that circuit again.

SEE TABLE V-1.

TABLE V-1.

ELECTRIC WIRE NUMBER & COLOR CODES

12 V.D.C.

MAST LIGHT	#12 RED
BOW LIGHT	#12 BLUE
SPREADER LIGHTS	#12 YELLOW
STERN/SIDE LIGHTS	#14 WHITE
FORWARD CABIN LIGHTS	#12 BLUE
AFT CABIN LIGHTS	#12 LIGHT BLUE
ENGINE ROOM LIGHTS	#12 TAN
COMPASS LIGHT	#14 WHITE
SEARCH LIGHT	#12 BROWN
HORN	#14 YELLOW
WIPER	#12 RED
WATER PRESSURE PUMP	#12 WHITE
BILGE PUMP	#12 BROWN
SEA WATER PUMP	#12 PINK
SUMP PUMP	# 12 0RANGE
BLOWER	.#12 GREEN
ENGINE START	#10 WHITE
ENGINE STOP	#12 RED
ENGINE TO BATTERY	#00 (+) RED
	(-) BLACK
PANEL POWER	#08 RED
BONDING WIRE	#08 GREEN
ALL NEGATIVES	BLACK

110 Volt A.C.

* SHORE POWER (PLUG)	#10 RED (+)
*	#10 BLACK (-)
*	#10 GREEN (GROUND)
* SHIP OUTLET	#10 RED (+)
*	#10 BLACK (-)
	#10 WHITE (GROUND)
* REFRIGERATOR	#10 ORANGE
* WATER	#10 LIGHT BLUE
* BATTERY CHARGER	#10 YELLOW

b. Master Battery Switch

All TAYANA Yachts come with a two position battery switch. This switch allows you to put one battery at a time into the circuit or to use both batteries at once. It is a make before break switch so one can select batteries at will while the engine is running; however, you must not put the switch on "off" with the engine on as damage to the alternator may result. There is little that the owner can do to maintain the master battery switch other than to keep it clean.

c. Alternator, Engine Mounted

A critical point in the DC electrical system is the alternator. It's job is to maintain the battery's charge and cover the demands on the electrical system while the engine is running. The alternator converts mechanical energy into electrical energy, and the drive belt is its only link. This is normally the only periodic attention the alternator needs, maintenance-wise. With the engine stopped, the drive pulley on the alternator should not be able to be turned by hand. Belt tension may seem tight enough, but the pulley may still slip if the belt is glazed or oily. When checking or tightening the alternator and its connections, it is advisable to turn off the battery switch. This prevents accidental "shorting" of the output terminal which is "live" even when the engine is at rest.

d. Electrical Starter

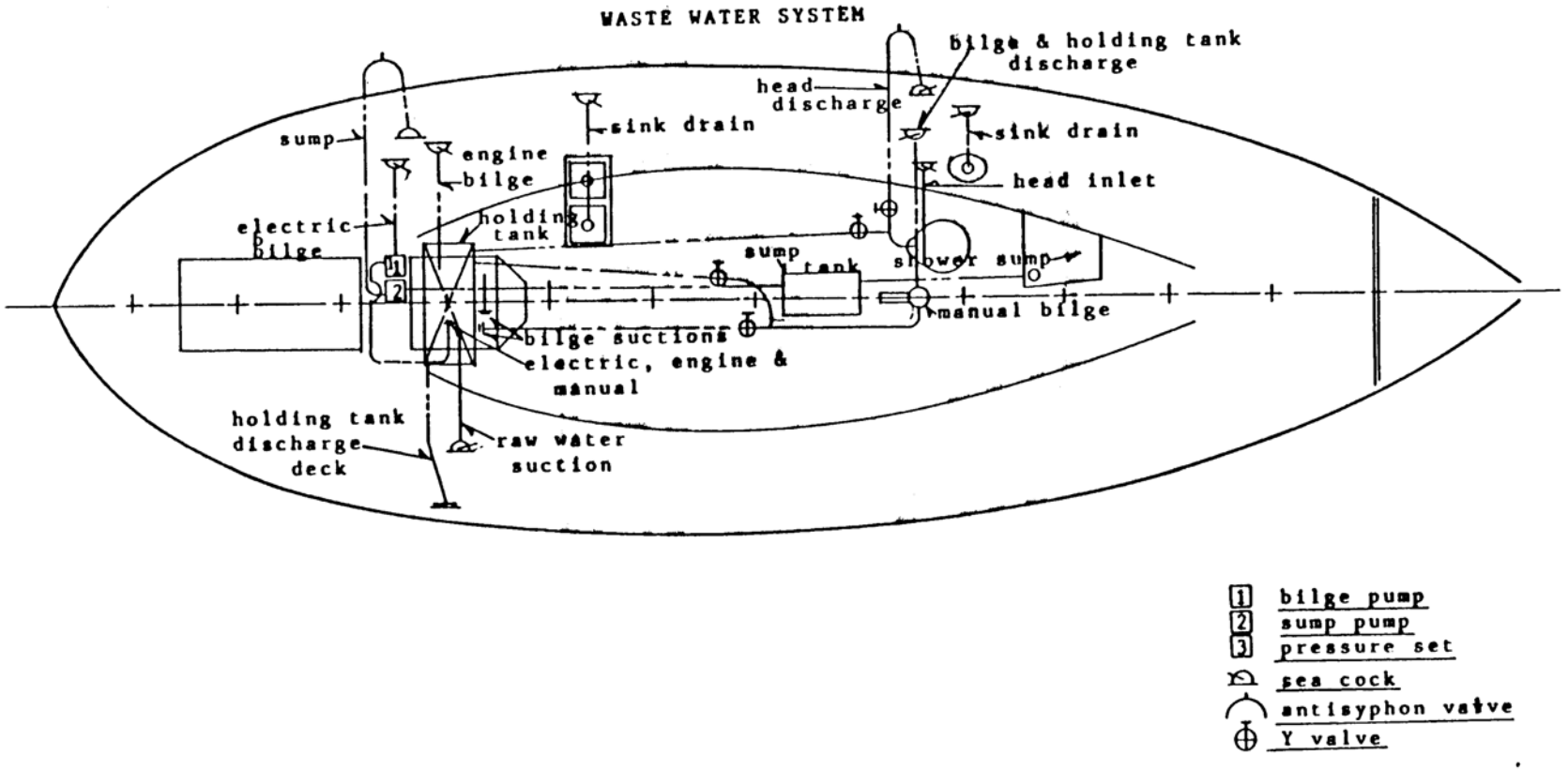
The engine starter motor is the most demanding load that will be placed on the electrical system and is not fused or protected by an overload device. Therefore, it is wise to make periodic checks on the connections at the starter and solenoid switch for tightness and cleanliness. Do not allow tools or other metal objects to come into contact with these connections while the battery is "on".

e. Wire Runs

Wiring in your yacht is generally carried through wiring conduits. These conduits protect the wires from wear or impact. The color code used is shown in Table V-1. Where wiring is exposed, it should be checked to see that it is clear of potential harm. Terminal blocks and other exposed wire termination points should be sprayed with WD40 or some similar

moisture eliminating product.

FIGURE V.-3.


WASTE WATER SYSTEM
bilge & holding tank discharge
head discharge
sink drain
sump
engine bilge
sink drain
head inlet
electric bilge
holding tank
sump tank
shower sump
manual bilge
bilge suctions electric, engine & manual
holding tank discharge deck
raw water suction
1 bilge pump
2 sump pump
3 pressure set
sea cock
antisyphon valve
Y valve

2. The 110 Volt AC System

The 110 volt AC electrical system is connected to the shore power system. Its functions are primarily water heat, battery charge, power outlets, and sometimes refrigeration and air conditioning. The service capacity is thirty amperes and the system is protected to that level. Maintenance wise there is little that the average owner should do. Whenever working on the back of the panel, it is wise to shut down 110 power. Remember, a yacht is a damp environment, and this tends to increase the dangers of electric power. The 110 volt system is grounded in the yacht and this ground should remain. SEE WIRE COLOR TABLE V.-1.

3. Protective System

a. Bonding

Your yacht is bonded to help prevent galvanic corrosion. All metal parts of the yacht which might come in contact with salt water are bonded by green electrical wires in order to provide a low resistance electrical path for stray currents. Thus, there is a reduced likelihood of current running through the salt water "electrolyte" and destroying the metal parts. The bonding system should be checked to make sure that all of the connections are good and clean.

b. Zincs

Sacrificial zincs are bolted onto your rudder and if commissioning is done by SOUTHERN OFFSHORE YACHTS, a shaft zinc has been installed. You should check zincs frequently at first to see how fast the metal is sacrificed. You will then have some idea of how often they must be replaced. It is not a bad idea to have a separate zinc clipped to a shroud and hung over the side while at the dock. This will save your installed zincs and offer some extra protection. To be effective, of course, it must be clipped to a metal part that is wired into the bonding system.

It might be well to note here that there are zincs in the cooling system of your engine. These also must be checked and replaced as they are sacrificed. Refer to the engine manual for their location.

G. PLUMBING AND SANITATION SYSTEMS

Plumbing and sanitation systems are generally very reliable and require relatively little maintenance. A program of inspections will usually prevent most problems from developing. The critical points in the systems are the pumps; everything else is pretty simple and reliable.

1. The Fresh Water System

The heart of the pressure water-system on the TAYANA 37 is the PAR medium duty diaphragm pump. This pump is generally located in a compartment aft of the companionway ladder along with the electric bilge pump and the shower sump pump (an option). It can be recognized by the pressure switch located on the side. You will find d manufacturer's parts list and a description of the pump among the papers delivered to you with the yacht.

These pumps are highly reliable and will operate a couple of years without any real maintenance requirement. If an occasion arises where a pump fails to operate, one should first check the pressure switch. This simple switch can accumulate dirt and not turn the pump on. If this should happen, turn off the power to the pressure water system, remove the pressure switch from the pump, and remove the switch housing. If the switch is dirty, carefully clean out the accumulation, reassemble the switch and try the system. If this does not solve the problem you probably have a defective switch and it should be replaced. Two other common faults can cause the pump to malfunction--a broken belt, which is immediately obvious, or defective diaphragms. To check the diaphragms, remove the four screws in the top of the pump housing and carefully lift the top off. You will see two diaphragms; examine each. If they are defective it will be obvious--they will have holes or they will be out of the diaphragm frame. Defective diaphragms should be replaced. PAR does produce rebuild kits for these pumps. While it is not a bad idea to have a rebuild kit, the most common requirement will be for a pressure Switch, diaphragms and belts.

Maintenance of the fresh water system requires little more than tightening the hose clamps to prevent leaks. If your pressure pump comes on at intervals when there is no demand there is almost certainly a leak which is allowing the pressure within the system to drop. Inspection will almost invariably show that there is a loose connection and air is getting into the lines. Again, tightening the clamps will normally solve the problem.

Your hot water system is based on a ten gallon hot water heater, usually made by American Appliance, Inc. It has both an electrical heating element and a heat exchanger which gets hot water from the engine. It requires very little maintenance beyond keeping it clean and all connections tight. The hot water

heater will last at least 5 years. The most likely failure is the electrical heating element. If this should happen, a new element may be obtained from almost any camper store and it is a simple matter to install.

2. Bilge Pumping Systems (SEE FIGURE V.-3.)

The TAYANA 37 is equipped with two bilge pumps--one electrical and one hand operated. Both of these pumps should be checked every day that the yacht is sailed.

The electrical bilge pump is by PAR and is located in the same compartment as the fresh water pump. The intake hose goes down past the engine and into the bilge sump below the engine. The pump outlet is just above the water line on the side of the yacht. The most common failure is a dirty pick-up screen. This may be cleaned simply by pulling the intake hose up from the sump and removing the dirt. A few failures because of dirt in the bilge will probably result in a greater effort to keep the bilges clean and sweet.

The hand bilge pump is generally located around the mast step. The hand bilge pump serves two purposes--it pumps the bilge and it pumps the holding tank. By following the intake line from the pump aft, one will come to a set of two valves. With one valve closed and the other open you can see that the pump clears the bilge. By reversing the closure of the valves, the pump clears the holding tank. A little experimenting will show you the proper valve operation.

There is generally a third bilge pump mounted on the engine Yanmar 3QM30). This pump is always operating when the engine is running. If your engine has such a pump it is important to remember that the bilge is constantly being cleared and a leak might not be apparent by simply looking into the bilge to see if there is water.

3. Sanitation Systems

a. Holding Tank

Your 37 has a holding tank system which is legal anywhere. The toilet may be pumped either into the holding tank or overboard directly. If the holding tank is used, it may be cleared either through an on-deck fitting or by the use of the bilge pump, as described above.

The holding tank is located under the engine. It should be kept clean by pumping clear water into it periodically. Detergent is useful if it has been used. The inlet to the tank may be reached by lifting the fresh water

tank and getting into the bilge.

b. The Toilet

The toilet is one of the standard U.S. makes using seawater for flushing. The normal maintenance is of the pump. Head manufacturers all produce pump rebuild kits and you should have one aboard at all times. Probably the dirtiest job afloat is cleaning a plugged head outlet line. The toilet outlet-becomes plugged because too much waste was allowed to accumulate and it cannot be forced around one of the sharp bends which is of necessity in the outlet line. There is little to do other than break the line at one of the joints and use a plumbers snake to clear the blockage. This type of blockage is best prevented by making the one who caused it clean the line.

c. Sinks

The galley and head sinks work the same. They are drained straight overboard through a check valve and through-hull. If the sinks refuse to drain it is generally because the check valve is stuck. Look at the drain hose and you will see a bronze cylinder with a hexagonal fitting on top. A sharp tap will usually free the valve. If this fails, remove the hex fitting and clear the valve.