

V. MAINTENANCE PROCEDURES

A. Engine: Perkins Diesel

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 twelve hours of operation, the engine should not be run at maximum RPM. At twelve 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 water (fuel strainer) 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 clamps.
- d. Drain and clean fuel tank.
- e. Change gearbox oil.

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A. Engine: Perkins Diesel (continued)

5. Every 2400 hours

- a. Have Perkins representative examine and service proprietary equipment such as starter, generator, etc.
- b. Adjust valve tip clearances.
- c. Service atomizers.

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 hose 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 two bleed screws on the injection pump (the head locking screw and the governor vent screw).
- h. Operate pump again until fuel flows freely with no 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. Twenty 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 re-charge battery.

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B. Drive Train

1. Engine Alignment

The propeller shaft of the 416 is $1\frac{1}{4}$ " diameter, Tobin bronze, supported by an intermediate bearing midway between the engine and the shaft log bearing.

During installation, the shaft 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, and the position of the intermediate bearing is adjusted. The coupling to the engine is checked again for alignment by the commissioning dealer or agent 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 boat 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 coupling should always be disconnected before the boat is lifted out of the water.

The coupling is a clamp-fit type, and is also secured by a square-head set screw into a recess in the shaft. It should not be necessary to disturb this fixture except in the event of a coupling or key failure.

Prior to adjusting engine alignment, it is advisable to release the intermediate bearing from its supporting bulkhead to allow the shaft to move freely in all directions. Remove the bolts entirely from the bearing mount flange and proceed with the engine alignment.

The alignment is considered acceptable if there is a gap less than .0005" per inch of face diameter of the coupling (.002 for a 4" coupling, .0025 for a 5" coupling). The feeler gage 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 which 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 gage, the alignment can be checked fairly accurately with a strip of paper. Insert the paper between the two halves

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B. Drive Train

1. Engine Alignment (continued)

of the outer flange and rotate both together 360 degrees. The paper should remain in place through the complete turn.

If the boat is equipped with a disc-type flex drive, check and adjust shaft alignment before installation. Do not depend on flex coupling to correct misalignment.

Upon completion of the engine alignment, replace the bearing mount bolts. Each bolt should fit in with a loose fit. To force any one bolt will cause the shaft to pull out of line. If the bolt will not pass through easily, re-drill the bulkhead holes. The purpose of the intermediate bearing is to prevent flexing or whipping of the shaft at higher RPM's.

2. Transmission

Hurth marine reversing gearbox units are equipped with helical gear sets and a mechanical friction clutch. They are designed for direct shifting at maximum engine rpm. Emergency reversing operations in the event of danger can thus be performed at full speed. Gear changing requires only little effort, making the transmissions suitable for single-lever remote control. The clutches are exactly rated to suit the engine torque, so that shock loads originating from the propeller will not affect the gearbox or engine.

The transmissions have oil bath lubrication. Rotation of the propeller shaft without load while the boat is sailing, being towed, or anchored in a river, as well as running of the engine while the propeller shaft is standing still, will have no detrimental effects on the gearbox. To lock prop shaft when sailing, move shift lever to "Reverse".

Maintenance of the transmission is restricted to oil level checks. Recommended lubricants: Type "A" automatic transmission fluid or SAE 20/30 HD engine oil.

Inspect the control cables for sharp bends and signs of damage, chafing or corrosion. Check the lock nuts at the adjustments for tightness at both ends. Lubricate the moving parts with a spray lubricant or light grease.

3. Intermediate Bearing

The intermediate bearing is equipped with a grease fitting. It should be lubricated each month or after 50 hours of operation.

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B. Drive Train (continued)

4. Stuffing Box

The stuffing box provides a seal for the propeller shaft at the inner end of the shaft log. It is connected to the shaft log with heavy wall hose, double clamped at each end. This flex hose allows the stuffing box to maintain alignment with the prop shaft without creating excess wear of the packing due to misalignment or vibration.

The packing used is wax impregnated 3/16" x 3/16" square flax.

When the shaft is turning, it is normal to have a slight leakage at the seal. This acts as a coolant, as well as a lubricant, to protect the seal and shaft surface. Should excessive leakage be apparent, release the lock nut and tighten the packing nut slightly and re-tighten the lock nut. Re-start engine and check again with shaft turning.

When it becomes necessary to replace the packing (boat must be hauled), loosen the lock nut, back off the packing gland nut, and slide it forward on the shaft. Remove all the old packing and replace it with three rings of new packing. Stagger the ends of each ring so as not to provide a path for water to leak through.

Do not wind one continuous strip spirally around prop shaft to make a seal.

Slide the packing gland back and tighten enough to create a heavy drag on the shaft. This will seat and form the packing.

Back off the packing nut until the shaft feels free and re-set the lock nut. Re-check for proper leakage when boat is returned to the water. Be sure the lock nut is secure, as operating the boat in reverse could cause the packing gland to screw off the stuffing box, allowing water into the boat.

5. Propeller Shaft Removal

The propeller shaft is designed with an offset to starboard for removal without disconnecting and dropping the rudder. See Section B, Item 4, stuffing box instructions in coordination with shaft removal.

If experiencing difficulty, remove propeller shaft strut bearing, which is held in place with set screws.

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C. Exhaust System

Check for leakage and proper supporting. The section of exhaust hose leading from the bulkhead to the aft thru-hull should be inspected for leakage at its connections. This hose should be supported to maintain a downward pitch aft to assure proper drainage. Look for physical damage to the hose, particularly at support points and/or bulkhead penetration.

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D. Steering System

1. Stuffing Box

The rudder stuffing box is packed with a wax impregnated flax packing. The cap nut is packed with three rings of packing and tightened down on the upper bearing tube to the point where no leakage occurs. This fixture has a tapered thread and will hold its position when properly tightened and packed. Should the fitting leak and further tightening is not practical, remove cap and re-pack with new packing, spacing each successive ring so that the ends are 180 degrees apart.

2. Gudgeon Assembly

Each time the yacht is hauled, carefully inspect the gudgeon assembly and all its fasteners for signs of physical damage and/or electrolysis.

3. Hydraulic Steering System *HYNAUTIC*

The steering system in your OI-41 is relatively maintenance free, except for visually checking it over for loss of fluid through leakage and an occasional lubrication of the pivot pin at the rudder tiller arm under the aft bunk. The reservoir, relief valve, and actuating cylinder are accessible through a drop-in panel under the aft bunk cushion.

The fluid used in the steering system is ML-H-5606 aircraft hydraulic fluid.

TEXACO HYDRAULIC FLUID # 15

Normal reservoir pressure should be maintained at approximately 20 psi. A thorough check of all mechanical linkages and support brackets should be made every 3 to 6 months or whenever any yard work has been done in an area that could affect the steering system.

Instructions for purging air from the system will be found in the Hynautic's owner manual. For your convenience, the instructions taken from the manual are repeated below:

"Remove the filler plug from the reservoir, taking care not to damage the gauge. Fill to within 3" of the top of the sight glass with aircraft ML-H-5606 hydraulic fluid, or Type "A" automatic transmission fluid may be substituted.

"Loosen the two valve screws on the relief valve by turning them counterclockwise (with a screwdriver or 9/16" wrench) until pressure is removed from spring. (Be careful not to unscrew it completely or the screw could become lost.)

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D. Steering System

3. Hydraulic Steering System (continued)

"With filler cap in place, pump the reservoir to 55 psi. Oil will start flowing into the lines, and the pressure and fluid level will drop. Keep pumping air into the system until the pressure holds fairly constant. Should the fluid level drop to approximately 2" from the bottom of the reservoir, refill the reservoir with fluid and re-pressurize. If the pressure and fluid levels are not holding fairly constant after a few minutes, it is better to check for leakage at all joints.

"Next, go to the helm at the highest level and turn 10 to 20 turns starboard, pumping the air out of the lines and back to the reservoir. In three to five minutes you should be able to feel and hear oil coming into the pumps.

"Again, the pressure and oil level should be checked. The fluid level should not drop below 2" level in the sightglass. If the fluid level is low, the reservoir should be filled to within 3" of the top before it is again pumped to 55 psi. Do not overfill, as the 3" capacity in volume of air is needed.

"If one station is involved, it should require only 5 minutes of purging. Since the sintered bronze filter extends up into the reservoir about 2", it is necessary to keep the oil level above the filter to prevent air from being pumped back into the system.

"Keep the air pressure at approximately 55 psi during this time and turn the wheel 20 turns each way.

"As a progress check, close the valve screws on the relief valve and see how many turns are required from hard over to hard over. It will likely be necessary to close and then to open a half turn on the valve screw at this time to make certain the cylinder is stroking to purge all the air from the cylinder.

"With the valve screws open 1/2 turn, pressure can be built up in the system which will cause the slave cylinder to stroke. If a second steering station is in the system, it will be necessary to purge it the same as the first. It should not require as much time since the lines and cylinder are now filled with oil. Several quarts of oil may be required for a large boat.

V. MAINTENANCE PROCEDURES

D. Steering System

3. Hydraulic Steering System (continued)

"Again, we should check for oil leaks. If a line needs to be disconnected for any reason, let the air pressure out of the reservoir before disconnecting the line. If it is now determined that the proper number of turns lock to lock have been obtained, we should re-check the oil level, and leave 20 psi of pressure on the system.

"Close the valve screws on the relief valve.

"When checking the number of turns, note that it is possible to pump over the relief valve (factory set is 750 psi). This provides a safety feature for expansion."

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E. Electrical System

1. Preventive Maintenance

Electrical systems are adversely affected by moisture and a salt air environment. Preventive maintenance consists of protecting the system from the elements and periodic inspection for damage created by the elements.

There are numerous aerosol spray products available for moisture-proofing terminals and connections. RTV Silicone can also be used. The silicone provides a more permanent seal, but is more difficult to remove should you wish to disconnect the wiring. If RTV Silicone is used, it should be a transparent grade so that the connection will be visible through the sealant.

Periodically, check all wire harnesses and connections for secure fastening, cleanliness, and any signs of physical damage or corrosion. All terminals should be clean and bright at their mating surfaces. A dirty or corroded contact area will cause resistance, and, depending on the load attempting to pass through, generate heat. This, in turn, increases resistance and will eventually burn the terminal with a resulting failure of the circuit. Battery drainage and possible electrolysis problems will occur prior to the circuit failure. Thus, it is extremely important that connections be kept clean. Correct any problems detected in the inspection.

Caution: Do not perform any maintenance or repair functions on a "live" circuit. Be certain that the battery switch is off when working on the 12 volt system, and the 110 volt main breaker is off when working on the 110 volt system. It is also a good practice to remove all metal jewelry (rings, watches, wristbands, etc.) when working near the batteries or on any electrical component.

2. Repair

Refer to the schematics shown in the last section of the Owner's Manual in trouble shooting and repairing electrical system problems.

V. MAINTENANCE PROCEDURES

E. Electrical System

2. Repair (continued)

The wiring is color coded to ABYC recommendations. The following list describes the color coding system used in your yacht.

12 v. D.C.

Interior Harness

Red	- All feed circuits (from source of power) - positive
Black	- All return circuits (ground) - negative
Green	- All bonding circuits (non-current carrying) - static ground
Gray	- Navigation lights
Blue	- Cabin lights
Brown	- Pumps
Orange	- Accessory circuits

Engine Harness

Purple	- Ignition and/or instrument feed
Tan	- Temperature gage
Blue	- Oil pressure gage
Yellow/Red	- Starter solenoid circuit
Gray	- Tachometer (electric)
Dark Blue	- Engine instrument lights
Orange	- Alternator output
Yellow	- Blower motor

Mast Harness

Red	- Masthead light
White	- Bow light
Green	- Spreader or foredeck light
Black	- Ground

120 v. A.C.

Black	- Hot - ungrounded power conductor
White	- Neutral - ungrounded return line
Green	- Ground - bonding - non-current carrying

V. MAINTENANCE PROCEDURES

E. Electrical System (continued)

3. GFCI Protection

The receptacles in the head and galley areas are equipped with ground-fault circuit interrupter devices. The GFCI receptacle is usually located in the galley, and other receptacles connected to this one will also be protected by this device. A test and re-set button is provided on the unit, and instructions for testing should be found adjacent to outlet or on main breaker panel.

The purpose of this device is to provide protection against the hazards of ground-fault currents that can cause loss of life. An example of ground fault current is the current that would flow through a person who is using an appliance with faulty insulation and at the same time is in contact with an electrical ground such as a plumbing fixture or wet floor.

Even with GFCI protection, an electric shock may be felt, but such shock will be less dangerous. The GFCI does not protect a person who contacts both the hot and neutral wire. There is no known device that can offer complete protection against electrical accidents under all conceivable conditions. There is no substitute for remembering that electricity is dangerous when handled carelessly or misused.

The GFCI is not an overload type of circuit breaker, but senses an unbalanced condition between the "hot" and neutral circuit and immediately interrupts the circuit.

When the GFCI circuit opens, all other receptacles down line from it will also be "off". Remove the appliance at fault and re-set the button on GFCI unit to restore service.

Test the circuit frequently as instructed by the manufacturer or at least every 30 days.

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F. Cathodic Protection

Cathodic protection is a means to control underwater galvanic corrosion. This is an owner's maintenance responsibility. Your local boat yard or commissioning dealer can provide you with the necessary zinc sacrificial anodes suitable for the area and type of water in which the boat will be operated and moored.

Generally speaking, most boats have dissimilar metals somewhere below the water line, and the sea water acts as an electrolyte. This causes a current to flow from one to the other, with the yielding structure gradually corroding and weakening. This is a natural situation; but, when a zinc anode is attached to the section under attack, the zinc will yield instead, giving itself up and preventing corrosion damage. The zinc anode must be securely attached and electrically grounded to the fixture it is intended to protect. For example:

"The boat is equipped with a bronze propeller and stainless steel rudder heel supports. The stainless steel is lower on the galvanic scale than bronze and would yield itself to the prop. A zinc anode, attached to the stainless steel plate, would protect it."

Periodic checks, to determine the rate of deterioration of the zinc and the need for replacement, must be made to determine the size anode necessary. This depends a lot on the area in which the boat is moored. For this reason, the factory does not install anodes, nor does it offer warranty against galvanic corrosion.

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G. Deck Hardware

All deck hardware should be rinsed off with fresh water after each outing and periodically washed with a soap or detergent solution. See section on finishes for additional information on care of deck hardware finishes. This section is concerned with lubrication and inspection of the deck hardware.

1. Winches

- a. Monthly: All winches should be lightly oiled and greased.
- b. Two or three times during season: All winches should be stripped, cleaned, inspected and re-lubricated.
- c. Start and end of season: Complete strip, clean, inspection and lubrication. Inspect mounting bolts for proper seal and tightness.

Follow detailed procedures given in the Lewmar Manual.

2. Blocks

- a. Inspect periodically for cracks, burrs, or other physical damage. Burrs can be removed with a file and emery paper. If the block is structurally damaged, replace it immediately.
- b. If the block is equipped with a removable sheave, remove and lubricate with Lubriplate Marine Lube "A". If not removable, oil shaft with SAE 30 oil.

3. Lifelines

Inspect lifelines, stanchions, and pulpits at least once a month. The following should be checked, with any needed corrections made immediately.

- a. Lifelines properly tensioned.
- b. Turnbuckles lubricated, pinned, and taped. All locking devices present.
- c. Plastic coating intact.
- d. Look for bulges or deformity in the plastic coating. This usually indicates rust or corrosion damage. Remove vinyl in this area and inspect wire. If wire is OK, wrap the wire with rigging tape.

V. MAINTENANCE PROCEDURES

G. Deck Hardware

3. Lifelines (continued)

- e. Inspect swage fittings. Look for cracks and/or corrosion damage on the fitting and wire.
- f. Check eyelets on pulpits for structural integrity.
- g. Check all set screws on pulpit and/or stanchion bases.
- h. Examine stanchions and pulpits for structural damage and secure attachment to the deck.

4. Deck Hardware Mounting

Periodically check the tightness of all bolts used to attach the toe rail and all deck hardware. In the process, inspect for proper hardware seating and look for signs of loose or missing bedding. If small sections of bedding are missing, silicone can often be applied locally. If the sealant problem is more extensive, remove, re-bed, and reinstall the piece of hardware.

While sailing, observe the individual pieces of hardware as stress is applied. Look for any signs of movement.

5. Roller Furling Gear

a. Schaefer

The standard Schaefer system requires only periodic oil at the swivel points.

Use SAE 30 oil. Check the entire system for signs of wear or physical damage at least once a month.

b. Optional Hyde Stream Stay

Once a year, or more frequently if you detect any binding, disassemble the unit to clean and lubricate with Lubriplate 1200-2-WBG or an equivalent non-fibrous wheel bearing grease. Follow the instructions in the Hyde Manual.

Inspect the entire system for signs of physical damage at least once a month.

V. MAINTENANCE PROCEDURES

G. Deck Hardware (continued)

6. Running Lights

Check that all lights operate before each outing.

At least once a month, carefully inspect the fixtures for cracks or obstructions in the lenses, any signs of failure of the sealing gasket, and any signs of corrosion on the bulb, bulb socket, electrical wires, or connectors. If the bulb is removed, spray the bulb base and socket with WD-40 or CRC 6-66 before reinstalling.

V. MAINTENANCE PROCEDURES

H. Spars and Rigging

Care and protection of finishes on the spars and rigging are discussed in the next sub-section. Listed below are inspections which should be made at least once a month during the active season.

1. Check fasteners for damage and tightness.
2. Insure blocks, tracks, sheaves, swivels, and pins are lubricated and operate freely.
3. Check sheaves and travelers for burrs. Emery paper and file will rid burrs.
4. Make sure sail tracks are straight.
5. Check fairleads and blocks for burrs and oxidation. File and emery paper will fix both conditions.
6. Check cleats for cracks and burrs -- if cracked, replace immediately.
7. Examine and carefully check main boom and mizzen boom gooseneck, pin, cotters, and welds. If welds are cracked, professional attention is required immediately.
8. Examine chainplates for damaged eyelet (egg shaped) or cracks and to be sure they fair in line with shrouds. If cracks or eyelet damage occurs, replace chainplate (professional attention).
9. Be sure that turnbuckles turn freely, cotters are OK, and threads are lubricated and undamaged.
10. Check shrouds and stays for broken wires, chafing, and fairleading to chainplates. Check end fittings for cracks, corrosion, and any signs of wire slippage. Defects found in any of these areas require professional attention and/or replacement of the defective part.
11. Check all sheets and halyards for fraying and/or burrs. For isolated burrs, cut the burr off and tape over section. If numerous burrs occur, replace halyard and determine why burrs occurred. Raveled or frayed sheet ends, etc., need only to be whipped and burned. Burning melts ends and prevents unraveling.
12. Treat the swage point (where the wire joins a fitting) with automotive-type paste wax to resist corrosion. Important: The standing rigging is designed with a 2.5:1 safety factor with the yacht heeled 30°. While this factor is significant, you must realize that corrosion, etc. of the

V. MAINTENANCE PROCEDURES

H. Spars and Rigging (continued)

wire rope and fittings will reduce that margin. A careful inspection of the swage points at least annually is recommended. Also, many marine surveyors recommend replacing all the standing rigging every 5 to 8 years, depending on the environment where the yacht is kept/used.

13. Examine all wire to rope splices to insure splice is intact. Professional attention is usually required to replace a wire to rope splice.

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I. Finishes

1. Fiberglass

The exterior surface of all of the fiberglass components on your yacht is polyester gelcoat. Morgan Yacht uses only the best grade marine gelcoats available. The base resin is isophthalic and/or NPG type which offers the best combination of initial gloss, resistance to weathering effects, and resistance to cracking and blistering. The pigments are carefully selected for color stability, color purity, and resistance to color float. All of the formulations include ultra-violet inhibitors and acrylic monomer which further reduce the effects of weathering.

Even the best gelcoats are not totally immune to the elements. As a general rule, you should treat the gelcoat surfaces of your yacht as you would your car's finish. The following procedures will maximize the useful life of the gelcoat:

- After every outing rinse off the deck and topsides with fresh water.
- At frequent intervals wash all fiberglass surfaces with a mild detergent or car wash solution. Use a sponge or towel on the high gloss areas. A brush may be used on non-skid areas. Always rinse thoroughly with fresh water.
- Apply wax to the glossy areas at least once a year and more frequently if the yacht is in southern waters. Do not apply wax to non-skid surface areas or the textured portions of the headliner. A good grade automotive wax specially formulated for fiberglass surfaces may be used. Follow the instructions on the can.

If the wax contains cleaners, extreme care must be taken if a power buffer is used. The cleaners are often abrasive which may remove some of the gel surface. Holding a power buffer too long in one spot, particularly on sharp radii, can result in "going through" the gel.

The preferred procedure is to use a wax with cleaners and to buff by hand with turkish towels. This method is a bit more work, but it results in removal of surface oxidation without risking excessive gelcoat removal.

If the surface becomes dull due to lack of routine care or aging, it can often be restored by hand buffing with an automotive rubbing compound such as Dupont Number 7 followed by a coat of wax. The compound will remove some of the gelcoat. Extreme care must be taken so as not to

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I. Finishes

1. Fiberglass (continued)

penetrate the gel layer. The factory applies gel at a thickness of 18 to 25 mils (paint films are generally 1 to 4 mils), and gelcoats normally provide full hiding power at thicknesses as low as 8 to 10 mils. Thus, there is some margin for gelcoat removal without adversely affecting the appearance of the surface.

If rubbing compound does not restore its gloss, the surface may be sanded with 320 grit paper, then sanded with 400 grit paper, polished with rubbing compound or polishing compound, and finally waxed. This procedure can result in substantial gel removal and requires extreme care. Generally, this remedy should be undertaken by a yard experienced in fiberglass repairs. Even then, you should be prepared for the possible need to paint if the operator goes too deep in some areas.

Fiberglass surfaces may be painted, and there are several types of paint specifically formulated for resurfacing gelcoated substrates. For the ultimate in gloss and weather resistance, we recommend a top quality two-part urethane (e.g., Dupont Imron available at paint stores). Two-part epoxies also provide glossy and durable finishes, but they may chalk with aging.

Scratches, nicks, or other surface damage which cuts deeply into the gel or penetrates to the laminate should generally be repaired by a competent yard. If you choose to do this work yourself, contact the factory for recommended procedures.

Caution: Gelcoats resist most chemicals, but they are not resistant to strong caustics, strong oxidizing compounds, or some halogenated compounds. Materials which should be kept away from gel surfaces include:

- NO*
- Paint remover containing sodium hydroxide or methylene chloride
 - Bleaches containing chlorine
 - Cleaners containing chlorine or hydroxides
 - Methylene chloride or carbon tetrachloride solvents
 - Chloro-bromomethane fire extinguishers

Caution: Abrasive cleaners should not be used for routine cleaning operations, since they result in gelcoat removal and may leave scratches.

V. MAINTENANCE PROCEDURES

1. Finishes (continued)

2. Vinyl Hull Liner and Bulkhead Covering

Vinyl liners used in your yacht are fire retardant, mildew resistant, and are selected for durability in marine environments. Other than occasional cleaning with a mild detergent, they are maintenance free.

The vinyl is applied at the factory with contact cement. Should a corner or edge come loose, it can be reattached with contact cement.

The vinyl will not withstand rubbing with strong abrasives or solvents such as acetone or methylene chloride. Mineral spirits may be used as a solvent if care is taken not to let it set on the surface.

3. High Pressure Laminate Surfaces

The mica surfaces require only occasional cleaning with a mild detergent. Household cleaner/waxes such as Pledge may be used and will mask small scratches that may occur. Do not use strong abrasive cleaners on mica, as they may dull the surface.

4. Upholstery Fabrics

The fabric in your yacht could be of various materials according to your selection of interior finishes and color coordination. The fabrics offered are varying in fiber content and cover an area from cotton to nylon and dacron. Take care that they are cleaned accordingly. Most are removable and may be cleaned with household upholstery shampoo (follow instructions by manufacturer) or by dry cleaning.

Care should be taken not to allow excessive liquid penetration into the foam. This would require an extensive amount of drying time.

V. MAINTENANCE PROCEDURES

I. Finishes (continued)

5. Spars

The spars on your yacht are finished by a glass bead peening process. This method is used in the aircraft industry but is unique to Morgan Yacht in our industry. The peening process provides a tempered surface on the aluminum and a very substantial increase in corrosion resistance. As a final step, the spars are waxed before they leave the plant.

To protect the finish on your spars, the following steps are recommended:

- Rinse off spars with fresh water after each outing.
- Tie the halyards away from the spar when not in use; not only does this prevent abrasion on the spar and halyards, but it eliminates the annoying slapping noise caused by the boat's movement.
- At least once a year, and more frequently in southern waters, wax the spars with a good grade automotive wax.

Morgan Yacht does not paint the spars because of the inherent problems of nicks, scratches, and the resultant increased maintenance effort required to assure color uniformity. The peening process does not affect the paintability of the spars, but the factory applied wax does. If you decide to paint the spars, be sure that the factory applied wax is completely removed first. We suggest two-part urethane (e.g. Dupont Imron or Awlgrip) for maximum durability. Be sure to follow the manufacturer's recommendation in prepping, priming, and painting aluminum surfaces. Shortcuts can result in poor paint adhesion.

6. Aluminum Hardware

Periodic cleaning and waxing with automotive type wax is the only surface maintenance required. If the surface becomes pitted, emery paper and polishing compound may be used to remove or reduce the prominence of pits. This will remove the anodized surface and it will be more important than ever to keep the polished surfaces well waxed.

Caution: Do not use emery paper or polishing compound on black anodized aluminum surfaces. Black paint will mask scratches in the anodized surface.

V. MAINTENANCE PROCEDURES

I. Finishes (continued)

7. Stainless Steel Rigging and Hardware

All of the stainless steel components and rigging are 304 or 316 grade which offers maximum corrosion and rust resistance in a salt water environment. To maintain the stainless steel surfaces, the following steps are recommended:

- After each outing, hose down the rigging and hardware with fresh water.
- Occasionally polish stainless steel surfaces with metal polish.
- At lay-up or before prolonged periods of disuse, apply automotive wax to stainless steel hardware. Wax should not be used on the wire rope rigging.

8. Chrome Plated Bronze Hardware

Rinse with fresh water after each outing and clean as needed with automotive chrome polish. Wax with automotive wax at least once a year, preferably before lay-up.

9. Boot and Sheer Stripe

The boot and sheer stripe are painted on with Amerflint two-part epoxy or Dupont Imron two-part polyurethane. Routine maintenance is identical to that of the gel surfaces. Minor scratches or nicks can be touched up with automotive enamel or lacquer. A complete re-spray, if needed, should be done with a two-part epoxy or two-part urethane for maximum adhesion and long life.

10. Bottom Paint

The selection of type and brand of bottom paint will depend on local water conditions and your personal preference. To allow you maximum flexibility, the yacht is delivered new to you with an unprimed and unsanded bottom.

The key to a good bottom job is close adherence to the instructions on the paint can. Do not short cut the cleaning or priming operations. Apply the recommended number of coats of paint and launch within the recommended time after painting. Because the materials are expensive and bottom preparation is hard and dirty work, there is always

V. MAINTENANCE PROCEDURES

I. Finishes

10. Bottom Paint (continued)

the temptation to do a little less than the paint manufacturer asks for. But remember, premature failure will require re-doing the job and the additional expense of a haul-out.

The expected life of anti-foulant will vary significantly with water temperature, water salinity, local harbor conditions, the relative amount of use the yacht gets, and the particular owner's definition of the amount of growth that constitutes a need for removal. Under average conditions you can expect to run six to twelve months between renewals.

Before repainting the bottom, it is necessary that all marine growth is removed, that the bottom is thoroughly sanded, and that the bottom is absolutely dry. At least twenty-four hours should be allowed after hauling to assure dryness. If, in scraping off the marine growth the paint is removed down to the gel, be sure the gel is thoroughly sanded so that all gloss is removed. If the gel itself is penetrated, seal with polyester resin or gelcoat before painting. If applying the paint, follow the instructions on the can.

Caution: The sanding dust from anti-foulant paint is toxic. A face mask, goggles, rubber gloves, and suitable protective clothing should be worn during sanding operations. After sanding, wash up thoroughly and clean dust from your tools.

It is also advisable to wear an organic vapor cartridge mask and goggles while applying the paint. Wash up thoroughly after painting.

11. Lexan and Plexiglass

All of the exterior glazing (portlights and hatches) are Lexan polycarbonate. Some of the sliding doors and mirrors below are Plexiglass. Both materials are extremely tough and have the advantage over glass of resistance to shattering if broken. However, both materials exhibit lower chemical resistance and abrasion resistance than glass. As a result, care is needed in cleaning these materials.

For general cleaning, a turkish towel dampened with a mild detergent solution is recommended. If the surface dirt is gritty, flush first with water. Never use acetone or other keytone solvents on either material. Never use abrasive cleaners on either material.

V. MAINTENANCE PROCEDURES

I. Finishes

11. Lexan and Plexiglass (continued)

Minor scratches can be removed by hand buffing with jewelers rouge or cleaners specifically formulated for plastics. (Aircraft or motor-cycle service centers are good sources for these cleaners.) Some scratches can be removed by hand buffing with toothpaste and water.

12. Teak Joinerwork

Teak is used for all exterior and interior trim. Teak veneer plywood is used for all woodgrain interior joinerwork panels and on the main cabin sole. All of the teak is hand rubbed and oiled before the yacht leaves the plant.

There are several options open to you on maintaining teak. Your choice will depend on your preference in the aesthetic appearance of the brightwork and the amount of time and/or money you are willing to devote to brightwork maintenance. Some of the alternatives are described below:

a. Leaving teak untreated:

Teak contains a natural oil which is one of the reasons it is so durable in a marine environment. As it ages, however, the oil exudes to the surface and disappears. (Direct sunlight speeds up the process.) When teak weathers, it takes on a silver grey color which many find attractive. The disadvantage of weathered teak is that the grain raises, and there is a tendency for the teak to check and split. Periodic cleaning with commercially available teak cleaners, such as Teak-Brite, will restore the original color and improve the aging characteristics of the teak.

b. Oiling teak

Periodic oiling of the teak will help maintain the golden brown teak color and greatly increase the resistance to checking and splitting by replenishing the natural oil in the teak. Special oils (e.g. Teak-Brite Sealer and Watco Teak Oil) have been formulated for finishing teak. These are generally preferred over boiled linseed oil, because they contain toxicants for mildew resistance and other additives. Boiled linseed oil may be used on teak, but more frequent cleaning and re-oiling may be required.

V. MAINTENANCE PROCEDURES

1. Finishes

12. Teak Joinerwork

b. Oiling teak (continued)

The general procedure is to clean the teak (see above) and sand if necessary, then apply oil liberally with a rag. Re-apply oil until it is no longer absorbed into the surface. Allow oil to penetrate for 15 to 30 minutes and then wipe off with turkish towel. Rub in the direction of the grain. Be sure to observe any special instructions on the can label.

c. Varnishing teak

A varnish finish provides the best protection for the teak, and most people agree that a varnish greatly enhances the appearance of the teak. The drawbacks to varnishing teak are the high initial cost (labor content) in obtaining a first rate job and the comparatively high maintenance effort needed. Exterior varnished teak will normally require a new coat of varnish every four months, and interior joinerwork will require re-coating at least every two years. If the varnish fails (peels, yellows, crazes, etc.) before re-coating, extensive sanding is required; and often the entire finish must be removed and re-done.

The main forces which work against a good varnish job on teak are dust, moisture, grain in the wood, and the natural oil in the teak. Their effects and avoidance techniques are discussed briefly below:

- (1) Dust -- Varnish must be sanded between coats, and the sanding dust must be removed before re-coating. Wipe all sanded surfaces with tack cloths, and then thoroughly vacuum the surrounding areas before varnishing. Brushes must be thoroughly cleaned, and the varnish should be strained before using. Varnish remaining in the can after completing a coat should be discarded. This eliminates dust accumulation in the can and eliminates the problems of surface skinning in the can. Varnishing must be done on a still day.
- (2) Moisture -- Moisture will cause varnish to blush and/or lift. Be sure all surfaces are absolutely dry before varnishing. Do not apply varnish when the humidity is high or rain is forecast within 16 hours after application.

V. MAINTENANCE PROCEDURES

I. Finishes

12. Teak Joinerwork

c. Varnishing teak (continued)

- (3) Grain -- Teak has a sharply defined grain which will telegraph through several coats of varnish if the preparation is incomplete. The teak should be block sanded to a 150 grit finish. Take care on the panel surfaces not to penetrate the veneer, but strive to obtain a smooth surface everywhere. For best results, a "paste wood filler" or "filler stain" (Pettit and Interlux both offer easy-to-use materials) should be used to fill the grain. Follow the instructions on the can to the letter.
- (4) Natural Oil in the Teak -- The natural oil in the teak exudes to the surface with aging. This helps protect unvarnished surfaces. It can destroy varnished surfaces by causing lifting. To minimize the risk of lifting, wash all teak surfaces to be varnished with acetone prior to the initial sanding.

Use plenty of acetone and change wiping rags frequently.

Caution: Acetone is extremely flammable. Be sure area is well ventilated and that all potential sources of spark or open flame are eliminated before using acetone. Do small areas at a time. Then allow the area to clear itself of vapors before continuing.

A thorough discussion of varnishing techniques is beyond the scope of this manual. Prior to tackling the job of varnishing your yacht, you should talk to experienced varnishers. Read the various publications issued by varnish manufacturers, and by all means follow the instructions on the can to the letter. Listed below are the steps that will be required to get a top quality finish. The listing is useful as a checklist of the major steps to be undertaken:

- Wash teak with acetone.
- Sand to 150 grit finish.
- Fill grain with filler stain.
- Apply sealer coat - sand lightly.
- Apply three to seven coats of varnish, sanding between coats with 150 grit paper.
- Apply last coat. If a satin finish is desired, use satin varnish for last coat or apply high gloss varnish and rub with pumice and boiled linseed oil.

V. MAINTENANCE PROCEDURES

J. Sail Care

To help you obtain the best continued service and longest useful life from your sails, we would like to offer this advice for sail care. Good sail care is not difficult or particularly time consuming. Over a period of years, a little conscientious care can save hundreds of dollars.

Sail care for synthetic sails consists of three basic elements: cleanliness, protection from unnecessary ultraviolet radiation, and proper usage.

1. First, your sails should be kept clean. Simple flushing with fresh water will normally do this job. Once a year, or more often if necessary, a thorough washing using a mild detergent will keep your sails white and free of salt that can cause abrasive damage to sail fibers over a period of time.

Sails may be spread on a smooth clean surface and scrubbed to remove imbedded dirt; but, simply soaking the sails in a detergent solution with occasional stirring is preferable since it avoids any chafing of the sail against a surface. In any case, do not put your sails in a washing machine. You will get your sails clean at the expense of a great deal of cloth damage from slides and snaps working against the cloth.

Occasionally your sails may be stained, in which case, there are several commercial stain removers that can be safely used; but, be certain that the instructions verify that the product is safe for dacron or nylon.

2. Secondly, the most destructive force to synthetic sails is ultraviolet radiation. The important thing to remember here is to keep your sails out of the sun except when in use. Use a mainsail cover if you leave the sail on the boom. Never leave your sails lying on a flat surface in direct exposure to the sun. One hour on the clubhouse lawn can have the same destructive effect as a weekend's racing.

After you have washed your sails, hang them up by the luff in the shade when possible. Put them under cover as soon as they are dry.

3. Finally, proper usage consists of protection from chafing, proper storage, and prevention of over-stretch.
 - a. Prevention of chafe is a common sense thing. Check spreader tips, turnbuckles, stanchions, pulpits, and other parts of the boat and rigging which may come in contact with the sails. Some fittings, such as spreader tips, can be taped or covered with leather. Others, such as screwheads, should be filed smooth. A periodic inspection of the sails will help pinpoint sources of chafe or sharp edges that may eventually tear a sail or cut the stitching.

V. MAINTENANCE PROCEDURES

J. Sail Care (continued)

- b. All sails should be stored dry. Dacron sails should be folded, but they don't have to be. Soft unfilled sail cloth suffers little from "stuffing", since there is no filler breakdown from the repeated creasing. However, even soft cloth enjoys a longer life with folding, since folding and rolling of sails will minimize creases and strains on the fibers. Folded sails also require less space for storage and set more smoothly in light airs. Long term storage should especially be in a folded condition and in a cool, dry place. Never leave the battens in the main when it is not being used. The cloth, elastic, and battens will all suffer.
- c. Finally, proper use involves using the sail in its proper conditions. Using a 4 oz., 170% genoa on the 40 footer in 18 knots is obviously going to strain the sail and distort the shape. Unfortunately, there are no standard tables indicating the exact wind velocity at which the headsails should be changed. Sea conditions, stability of the particular boat, cloth weight, and the sail shape are determining factors that all affect the decision to change sail.

While we can give you guidelines for any individual sail, ultimately your judgment is going to be called upon. Watch the sail for signs of strain or distortion of its airfoil shape. Remember that sails are made of cloth, and, while modern synthetics are extraordinarily strong, they do have limits. Sails can be ruined by carrying them in winds beyond that for which they were designed, stretching a leech over a spreader, stretching the foot over the shrouds or a lifeline, allowing leech flutter uncontrolled, and excessive luffing.

This is by no means a complete treatment of sail care. But, with common sense and the general care we have outlined, your sails will give you years of trouble-free service.