

# ***Gemini 105Mc***

## ***Owner's Manual***

Boat Name: \_\_\_\_\_

Hull Number: \_\_\_\_\_

Owner: \_\_\_\_\_

Address: \_\_\_\_\_

Sail Number: \_\_\_\_\_

Engine Number: \_\_\_\_\_

Registration Number: \_\_\_\_\_

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**C**ongratulations on the purchase of your new Gemini 105Mc cruising catamaran and welcome to the Gemini family. There are over 800 Gemini catamarans cruising all over the world, and we're pleased to include you as a member of this select group of discriminating sailors who appreciate performance, value, form, and function. To better your appreciation of the Gemini's qualities, we encourage you to thoroughly read through the entire manual before getting underway on your new boat.

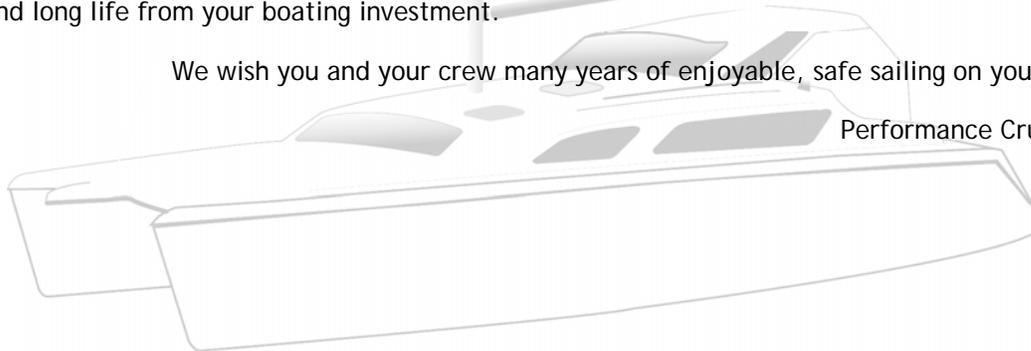
This manual covers the proper operation and maintenance of all the aspects and systems aboard the Gemini 105Mc. If a particular topic isn't covered in enough detail, let us know via e-mail. We regularly update the manual and make new versions available through the Performance Cruising Owner InfoCenter website (<http://www.mypci.net>). The InfoCenter website also hosts an owners' technical forum that addresses specific questions with correct and safe answers as well as advice from the factory or even other Gemini owners.

Whether this is your first boat or your first multihull, we encourage you to obtain handling and operating experience before assuming command of the boat. Your dealer or the factory can recommend local sailing schools and/or competent instructors.

Be sure to keep this manual onboard for quick reference. You can always download and print an extra copy from the website. The manual will help you get better, more trouble-free performance and long life from your boating investment.

We wish you and your crew many years of enjoyable, safe sailing on your Gemini.

Performance Cruising Inc.



Note: Third-party items on the boat are individually warranted. Where such items are discussed in the manual, a  symbol appears to indicate that further contact information is available on the contact page at the end of the manual.

<u>Topic</u>	<u>Page</u>	<u>Topic</u>	<u>Page</u>
<b>Quick Start</b>	<b>4</b>	<b>Engine</b>	<b>24</b>
Batteries and Switch	4	Cooling Water	24
Engine	4	Gear Lever / Throttle	24
Electric Panel	4	Fuel Tanks/Gauges	24
Shore Power	4	Hot Water / Cabin Heater	24
Water	5	Sonic Drive Leg	24
Propane	5	<b>Centerboards and Rudders</b>	<b>26</b>
Stove	5	Operation	26
Refrigerator	5	Maintenance	26
Hot Water Heater	6	Illustrations	27
Toilet	6	Performance and Use	28
Centerboards	6	Motoring / Winds / Offshore	28
Rudders	7	Rudders	28
Sails	8	<b>Construction</b>	<b>30</b>
<b>Plumbing, Head, and Fresh Water</b>	<b>8</b>	Deck & Hull Construction	30
Water Fill	8	Stress & Movement	30
Water Tank Selection	8	Constructions Differences	31
Pressure Pump	8	Design Considerations	32
Galley Tip Toe Pump	8	Interior Molds	32
Shower/Sump	8	Buoyancy Tanks	32
Toilet	8	Leaks	32
Hoses / Clamps	9	<b>Sails and Sailing</b>	<b>33</b>
Cockpit Shower	9	Sailing Rig Types	33
Holding Tank	9	Main Sail & Reefing	33
Mains Adapter	9	Headsail & Reefing	33
Water Maker	9	Spinnaker s	34
Saltwater Pump	9	Heavy Weather	35
System Overview	11	Offshore Cruising	36
<b>Propane</b>	<b>12</b>	Notes on Sailing a New Boat	37
Safety	12	Coast Guard Kit	38
Xintec Control Panel	12	Offshore Sailing Kit	38
Tanks	12	<b>Anchoring</b>	<b>39</b>
Junction and Solenoid	12	Setting the Anchor	39
Copper and Fittings	13	Retrieving the Anchor	40
Checking for Leaks	13	<b>Docking &amp; Mooring</b>	<b>41</b>
Stove	13	Heaving Lines	41
Refrigerator	13	Picking up a Mooring	41
Refrigerator on 110v	14	Sea Anchors	42
<b>Shore Power</b>	<b>15</b>	Effects of Lightning	42
<b>Air Conditioning</b>	<b>16</b>	<b>Maintenance</b>	<b>43</b>
<b>12 Volt Power</b>	<b>17</b>	Cleaning and Care of Fiberglass	43
Batteries	17	Bottom Paint	43
Battery Switch	17	Blisters	43
25 Amp Fuse	18	Teak Cleaning	44
Wiring Code	19	Window Care & Maintenance	44
Switch Panel	19	<b>Hauling and Trucking</b>	<b>45</b>
VHF	19	<b>Winterizing</b>	<b>46</b>
AM/FM Stereo	19	<b>Operational Checklists</b>	<b>47</b>
Cabin Lights	19	<b>Contact Information</b>	<b>48</b>
Bulbs	19	<b>Addendums</b>	<b>53</b>
Mast Wires	20	<b>Westerbeke 30B Quick Notes</b>	<b>58</b>
Mast Wiring Diagram	21	<b>Bottom Paint FAQ</b>	<b>60</b>
<b>Mast and Rigging</b>	<b>22</b>		
Bridge Clearance	22		
Rig Tensioning	22		
Boom	23		

### Batteries and Battery Switch

The Gemini comes with three (3) number 24 deep cycle marine batteries. These are located under the navigation table in the port hull with the main battery switch just above them. There is room for an additional battery in the compartment.

To turn the batteries "On", turn switch to position '1' (which includes (2) two batteries). Everything on the boat will go through battery '1' including engine start.

Switch position '2' includes (1) one battery. Never leave the switch in the "Both" position as there is no reserve battery. When switching from position '1' to position '2', move the switch through the "Both" position, not "Off."

Failure to do so while the engine is operating can result in damage to the alternator.



### Westerbeke Diesel Engine

Before starting the engine, always make sure that the cooling water will reach the engine by turning the engine seacock lever to the allow water from the sea to flow. The engine seacock is under starboard aft bunk towards the front. The seacock has three positions:

1. In from the sea
2. Closed
3. Fresh Water Intake (for winterizing)

Placing the handle all the way up brings seawater in to cool the engine if the hose is facing aft. (With the hose facing forward, the handle needs to be down for open) With the handle pointing straight out away from the hull the seacock is closed and with the handle all the way down, a fresh-water hose can be hooked up to the seacock to flush fresh water into the engine for winterizing. (Handle up if hose faces forward).

There is also an inline water strainer. The strainer reservoir should be full of water.

Regarding fuel; inside the center top hatch on the stern are two (2) valves to select the fuel from either the port or starboard 18-gallon tank. These two valves must point the same way. One is fuel feed the other is return. These valves simply point to starboard or port. The short, pointy end of the handle indicates which tank is in use.

To lower the sonic drive leg turn the red stopcock lever in the starboard cockpit locker inline with the hydraulic line and then loosen the black valve on the

red hydraulic oil reservoir. The leg will begin to drop and then lock into position with a loud click. Once in position, re-tighten the black knob.

To start the engine, make sure gear lever is in neutral. With the lever vertical, use both hands, and with the left hand pull the throttle lever 1/4" outward while the right hand pushes the lever forward to an angle of 45°. With the throttle in the "out" position, the gears are not engaged.

Next, turn the ignition key to run and the buzzer will sound. First, press the preheat button for approximately 15 seconds then, while still pressing preheat, press the start button to turn the engine over. Following starting, you should always check that cooling water is coming out of the exhaust on the transom beside the drive leg. If no cooling water is coming from the exhaust, the engine seacock is in the incorrect position or clogged in which case you should turn off the engine and correct the problem.

To engage the gears and propeller, move the gear lever back and the lever will set into position. Push the handle forward for forward movement and backward for reverse.

To stop the engine, first return the throttle to neutral. Next, lift the silver knob on the right above the instrument panel, which stops fuel from getting to the engine. Turning the key to the "off" position will not turn the engine off. Following turning the engine off, turn the key to the "off" position to stop the buzzer. Turning the key to the "off" position with the engine running can result in damage to the alternator. Remember to push the silver "kill" knob back down, otherwise the engine will not re-start.

To raise the leg following motoring make sure the black knob is tightened on the hydraulic oil reservoir. Pull out the chrome knob in the back of the locker to release the reverse lock, and then pump the red handle. The first pump will be hard and then it should be possible to feel the leg slip out of reverse lock and start to come up. At that point, let the chrome knob go and continue pumping. Once the unit is up, turn the red stopcock vertical to stop any fluid loss through the pump so that the leg will stay up.

### Electric Panel

There are 2 - 12-volt electric panels with circuit breakers for the following:

- Compass Light
- Masthead Lights
- Running Lights
- Anchor Light
- Instruments
- Fans
- Shower Pump

## ***Gemini 105Mc Owner's Manual***

- Cabin Lights
- VHF Radio
- Deck Lights
- Gas Valve (for Propane Monitor)
- Stereo / Television
- Spare

Both 12-volt outlets located next to the panel and above the refrigerator run from the cabin lights circuit breaker.

There is a 25-amp fuse (with spare) located under the battery switch protecting the switch panel. This fuse handles all 12 volt appliances.

### **Shore Power**

The Gemini shore power inlet is rated for 30 amps (24 amps continuously) and is run with 10 gauge wire. The switches on the 110v panel are all circuit breakers.

The top two are linked together as the main breaker. In the "ON" position, a green light indicates proper operation while a red light indicates a bad connection or possibly a badly wired marina.

Under the main breaker are circuit breakers for the port outlets, starboard outlets, refrigerator, water heater, and spare (usually used for air conditioning).

The 110v panel has a slide to prevent using the refrigerator, water heater, and air conditioner all at the same time. Two of the three can be operated at the same time, however, all three would require an excess of 24 amps.

The optional microwave operates on the starboard outlet breaker.

### **Water**

The Gemini has two translucent 30-gal tanks under the port and starboard aft bunks. The tanks are filled individually from the water intakes on either side of the mainsheet track.

Only one tank is used at a time and is selected using a 'Y' valve to select water draw from either the port or starboard tank. Turning the valve (which is mounted on the wall in the port aft cabin) clockwise selects the starboard tank. Turning it counter-clockwise selects the port tank.

There is an electric 12-volt pump for pressure water to each sink, the shower, and the hot water heater. There is a dedicated pressure water switch on the 12 volt panel.

There is a foot pump in the galley to manually pump water from the selected tank if the pressure water

## ***Gemini Quick Start Guide***

pump is not on.

**Important:** Be sure to have the cold-water faucet open in the galley when using the foot pump. Failure to do so can result in breakage.

### **Propane**

In the starboard aft cockpit locker there are two, 20 lb. vertical propane tanks with overfill protection.

Only one tank can be connected to the propane system at a time. The propane comes from the tank via a regulator and rubber hose to a junction box. From the rubber hose the propane can either go through the solenoid or through the by-pass.

From the back of the junction box are 2 copper hoses going to each appliance.

The propane monitor is switched on at the 12 volt switch panel. The solenoid opens and closes with an audible "click." The solenoid requires one (1) amp per hour to remain in the open position. With such a relatively high power requirement, there is a by-pass valve intended for use while sailing. To use the by-pass, move the connection lever so that it is inline with the bypass copper pipe and turn off the solenoid on the propane panel.

**Caution:** If the boat is unattended and connected to shore power, it is highly advisable to turn the solenoid on along with a battery charger to avoid depleting the batteries.

### **Stove**

The Gemini comes standard with a two burner, broiler and oven unit.

To operate burners on top of unit, as well as in broiler and oven, push knobs in to override flame failure safety cut off device. Turn to 'on' position, and apply a flame. Hold knob in for a few seconds then set knob to desired setting.

The oven has a thermostat. Turning the knob on the front of the unit sets thermostat up to 480°.

### **Refrigerator**

The refrigerator operates on 110v (shore power) or propane. Before lighting the refrigerator on propane or turning on with 110v, make sure the refrigerator vent (located under the wheel in the cockpit) is removed and the 12V refrigerator fan is on. The switch for the fan is inside the shelf unit at the side of the refrigerator. Be sure to turn on the "Refrigerator" switch on the 12v panel.

The refrigerator operates automatically when con-

connected to either shore power or propane. The unit will *prefer* electric power if connected. Otherwise, the refrigerator will use propane and light itself automatically. To use the refrigerator on shore power, turn the refrigerator breaker on the shore power panel to "On". Also, turn the Refrigerator breaker on the 12 volt panel to "On". The 12 volt breaker operates the cooling fan and lighter. To use the refrigerator on propane, turn the shore power refrigerator breaker to "Off" and select "Propane" on the refrigerator control panel. You may hear the unit click several times as it attempts to light itself. Be sure that the propane bottle is open and that propane is getting to the unit. If the refrigerator is not successful in lighting itself, the "Check" light indicator will come on. In most cases, turning the unit "Off" and then back on will reinitiate the automatic lighting procedure and the unit will operate normally.

As the refrigerator operates completely silently, the means by which to tell if it is operating correctly (besides the interior getting cold) is to feel the chimney flashing on the back of the refrigerator. The chimney is accessible through the refrigerator ventilation hatch in the cockpit.

### Hot Water Heater

The hot water heater is a six-gallon tank stored in front of the water tank under the bunk in the port aft cabin.

When the engine is running, a heat exchanger coil coming from the engine heats the water in the heater tank. There is a red handled valve in the front end of the engine compartment that is used to shut off the hot water going to the water heater tank. When the handle is pointing down, the engine is not heating the water. When the handle is horizontal, the water in the tank is being heated.

When on shore power, a switch on the main 110V panel turns on a 110V electric element in the tank, which heats the water.

**Caution:** Do not operate the hot water heater on 110v without water in the heater tank—otherwise you will likely burn out the heating element. To fill the heater tank, turn on a hot water faucet until water comes out, indicating the tank is full. Just as important is to make sure you do not run out of water in your 30 gallon tanks resulting in an empty hot water tank.

### Toilet

There is a 3/4" inlet and a 1 1/2" outlet seacock behind and below the toilet. With the handle to the left, the 3/4" inlet seacock is allowing water in from the sea. With it coming straight out it is closed and with the handle pointing to the right it is allowing fresh water to be pumped into the toilet from the

sink. Pumping fresh water into the toilet is to prevent odor from the bacteria in seawater when the toilet is left for any length of time.

There is a 3-way seacock located in a cabinet just outside the head, opposite the navigation station. This seacock controls the drain from the sink and has three positions: Off, Overboard, and "Fresh Water Flush." In order to pump fresh water from the sink into the toilet: fill the sink with water, turn the seacock to "fresh water flush," and pump the toilet flush handle until all the water from the sink has been sent through the system. You can add a small amount of bleach to the water to further clean the lines out.

The Y valves behind the toilet directs the toilet water either overboard or into the holding tank. (The long end of the handle points to the hose in use; i.e. pointing right pumps overboard and pointing left pumps into the 18 gallon holding tank).

Turn the dial on top of toilet counterclockwise to flush the toilet or clockwise to close the incoming water and pump the toilet dry.

**Caution:** When sailing in rough weather, close this dial to stop water from flooding back into the toilet and flooding the boat.

The deck pump out is on the side of the foredeck next to the sail locker.

### Centerboards

The centerboards are located within a case in each hull. A winch handle in the socket lowers and raises the centerboard. The centerboard is locked into position with a wing nut going over the 3/4" nut.

Releasing the wing nut and turning the socket approximately two turns counterclockwise will fully lower the centerboard (it should not be lowered too much). Tightening the wing nut will lock the board down.

Raising the board is simply reversing the procedure. Turn clockwise two turns until the board comes in contact with the top of the case. Be careful when unlocking the board from the down position as the board is very buoyant and will begin to lift up quickly. The board will float if left unlocked in the up position but the back of the board will still be hanging 9" down out of the hull if not locked up. Therefore, after raising the board, be sure to tighten the wing nut with the board fully raised.

The boards are designed to push up if run aground.

The boards are only necessary for windward work or when close maneuvering in a marina. Only the leeward board is necessary but it is acceptable if both are used. If traversing a narrow area, put both down 1

1/4 turns.

2nd reef in main and storm jib      Gale

**Caution:** The boards are designed to only be in the down position when necessary. Do not leave the boards in the down position for an extended period as there is a small tolerance between the board and the centerboard case. If barnacles and growth build up on a board left in the down position, it will be difficult to impossible to raise the board without first scraping it clean.

If using the main alone in winds over 30 knots, a single reef will suffice.

**Rudders**

The Gemini's rudder system is mechanically joined through the steering system and will steer the boat in 3' of water in the down position or 18" of water in the up position.

To raise the rudder, simply pull the control lines on the transom. One line pulls the rudder up, while the other pulls the rudder down.

The sheet stoppers/jammers are used for holding the rudders in both the up and down positions. When locked in the down position, it's important not to lock the jammers down completely as the rudders are designed to kick-up if run aground. Locking the jammers down completely will prevent the sheet from coming loose. However, lightly closing the jammers down will provide enough stopping power to keep the rudders in the down position as the boat moves forward.

Lower the rudders when leaving the boat—especially if the boat is kept in deep or choppy water. This relieves the tension on the rudder 'up' line.

The engine is connected to the tillers on the top of the rudders and will steer whatever the depth of the rudder.

**Sails**

Sail	Square Footage
Genoa	350 sq. ft.
Jib	220 sq. ft.
Main	340 sq. ft.
Screacher	420 sq. ft.

**Reefing Recommendations:**

As a general rule, reduce sails when heeling at or over 7° and/or according to the following wind strengths:

Sails	Wind
Full Main and full genoa	Up to 18 knots
Full Main and jib or reefed genoas	22 knots
1st reef in main and jib	26 knots
1st reef in main and storm jib	30 knots

### Fresh Water System

The Gemini has (2) two 30 gallon fresh water polypropylene tanks located under each of the aft cabin bunks. There are (2) two 1 ½" fresh water fills on the aft coaming for each tank. Each fill also has a ½" tank vent built into the cap. When filling the tanks, the fill line is located just under the vent line. Take care not to overfill the tanks. If the tanks are overfilled, they will leak through the inspection port on top of the tanks. If when filling the tanks you discover the water backing up in the fill line, it's likely there's water in the vent line. To clear the vent line, detach the vent tube from the tank (loosen hose clamp and work hose off barb), and blow air through the line to clear it.

When using these water fills, push a hose all the way into the hole to avoid spraying water into the vent at the top of the fill. A 1' section of garden hose with a stopcock on one end makes filling the tanks an easy job. Insert the flexible end into the fill and the connect the stopcock end to the water hose.

Cold Water System: Coming from each tank is a draw hose which meet at the tank selector "Y" valve located in the port aft cabin. Continuing from the "Y" valve, the water travels back under the aft port bunk through to a strainer and then to the Flojet pump. The pressure pump is primarily used for showering and has a non-return valve inside the pump to maintain pressure in the system. From the pump, the water travels to (2) two "T" connectors. The first "T" connects to the cold water line for the head. The second "T" connects to the galley cold water line and the (6) six gallon water heater.

The cold water line to the galley travels through a tiptoe foot pump located on the floor beneath the sink and then to the faucet. Caution: When using the foot pump, make sure that the cold water knob on the faucet is in the "open" position to avoid undue pressure in the line which could damage the pump and/or faucet.

The water tanks are constructed of ABS plastic, and the hoses are designed as taste free. Theoretically these materials do not impart a taste into the water. Additives are available to help reduce the taste of plastic in the water. After water is stored for long periods, chlorine may be necessary to make the water useable. For occasional use, bottled water is good for drinking and the tank water will do for washing.

Hot Water System: The (6) six gallon hot water heater is heated from the engine cooling water or from the 110 volt electric water heater. Hot water travels out of the heater to a "T" connector which

splits the line to both the head and galley. The pressure pump must be "on" to use hot water.

There is a red handled valve in the front end of the engine compartment that is used to shut off the hot water going to the water heater tank. When the handle is pointing down, the engine is not heating the water. When the handle is horizontal, the water in the tank is being heated.

When on shore power, a switch on the main 110V panel turns on a 110V electric element in the tank, which heats the water.

Caution: Do not operate the hot water heater on 110v without water in the heater tank—otherwise you will likely burn out the heating element. To fill the heater tank, turn on a hot water faucet until water comes out, indicating the tank is full. Just as important is to make sure you do not run out of water in your 30 gallon tanks resulting in an empty hot water tank.

### Pressure Water Pump

The water pressure pump is situated under the port aft bunk. Gemini comes with a Flojet pressure pump for fresh water. The main reason for pressure water is to use the shower and hot water. The pressure pump has a non-return valve that keeps the pressure in the line. The pump has a pressure switch that switches the pump on when the pressure drops to 15 psi and off when the pressure reaches 25 psi. If the pump cycles on and off every few seconds, first check for a leak in the system. It also could be that for some reason the non-return valve in the pump is not holding pressure. If so, disassemble the pump and clean the debris out of the valves.

The pressure pump should be turned off when not needed because even in a perfect system it will come on and off periodically wasting battery power.

### Galley Toe Tip Pump

There is a Whale foot pump in the floor beside the galley. This pump does not have a diaphragm. Instead, the pump is like a bicycle type pump that can take pressure. This pump is in the line direct from the pressure pump to the cold faucet in the galley. This pump can only be used when the pressure pump is not in use. The purpose of this pump is to conserve battery power and water and to be able to get water from the tanks if the pressure pump does not work. Turn 90° and press to lock in the down position. Reverse the procedure to enable the pump.

**Shower Sump Pump**

The shower in the Gemini is mounted to the wall with a door that can be opened to close off a separate area for showering and leave a dry area for clothes and towels.

The shower water collects in the sump which is capable of holding (6) six gallons. To empty the sump press the switch on the wall below the sink. The pump is a Gulper 220 under the floor of the navigation station. This pump is self-priming and drains the grey water directly overboard. The pump is powerful enough to serve as a auxiliary bilge pump. Simply disconnect the shower hose and connect a second hose.

**Toilet**

The toilet is a Raritan PHII, (Practical Sailor recommended). This is a marine toilet with a lever handle that gives a mechanical advantage making pumping the toilet easier. An electric motor can be added to pump the toilet; however this is not an option from the factory.

The pump has a dial, which is turned counterclockwise to flush the toilet and clockwise to close the incoming water to pump the toilet dry. **Caution:** When sailing and pitching in rough water, always close this dial on the top of the toilet pump to stop water flooding back into the toilet and flooding the boat.

A 3/4" inlet seacock and 1 1/2" outlet seacock are behind and below the toilet. With the handle to the left the 3/4" inlet seacock is allowing water in from the sea. With it coming straight out it is closed and with the handle pointing to the right it is allowing fresh water to be pumped into the toilet from the sink. Pumping fresh water into the toilet is to prevent odor from the bacteria in seawater when the toilet is left for a long period of time.

To use the fresh water flush, set the 3-way seacock located in a cabinet just outside the head, opposite the navigation station, to "Fresh Water Flush." This seacock controls the drain from the sink and has three positions: Off, Overboard, and "Fresh Water Flush." In order to pump fresh water from the sink into the toilet: fill the sink with water, turn the sink seacock to "Fresh Water Flush," turn the 3/4" toilet seacock to the right, and pump the toilet flush handle until all the water from the sink has been sent through the system. You can add a small amount of bleach to the water to further clean the lines out.

The Y valve behind the toilet directs the toilet water either overboard or into the holding tank. (The long end of the handle points to the hose in use; i.e.

pointing right pumps overboard and pointing left pumps into the holding tank.) Below are all the possible valve configurations for the toilet:



Overboard



Into Holding Tank



Gravity Drain Holding Tank

\* See overview illustration on page 11

**Holding Tank**

The holding tank is located directly behind the toilet and is on the same level as the sail locker base. The holding tank is 18 gallons with a 1 1/2" inlet at the top against the outside of the hull. The 1 1/2" outlet is at the bottom against the outside hull. The vent is on the same side with a 1/2" hose going across the tank to a through hull fitting under the sink. The holding tank can be inspected visually through the Plexiglas bulkhead in the sail locker. It may be necessary to shine a flashlight behind the toilet from the other side of the tank to illuminate the fluid at the same time.

In the top of the tank is a 4" inspection cover. The tank can be inspected by unscrewing the top shelf in the sail locker. The tank can be removed through the sail locker by cutting the marine sealant tabbing that holds the vertical Plexiglas wall below the shelf in the sail locker.

**Combination Shower Pump / Bilge Pump System**

Your new Gemini 105Mc comes with an upgraded

## ***Gemini 105Mc Owner's Manual***

shower and bilge pump system which enables you to get "double-duty" out of the Gulper 220 pump. This powerful pump is capable of pumping 12' of head, can be run dry without damage, and transfers about 1 gallon of water per minute.

The pump is located under the port dinette and is accessible from the cabinet door closest to the head. Through the use of the two diverter handles located on the outside of the cabinet, you can convert the pump to act either as a shower bilge pump, or as a port or starboard bilge pump. There are two 6' section of hoses housed in the same cabinet as the pump (on the port side) and in the corresponding cabinet on the starboard side. You can move the end of these hoses to the area of the boat you would like to pump out and even add a hose extension to reach the cockpit lockers.

Configurations:

The two-way diverter handles enable the following selections:

Diverter 1 - one end of handle always points to Diverter

1. Pump from Starboard Bilge
2. Pump from Port Bilge

Diverter 2 - one end of handle always points to Pump:

1. Pump from Shower
2. Pump from Bilge (Port or Starboard)

### **Mains Water Adapter**

It is possible to fit a Mains water adapter on the aft deck and run a hose to just after the pressure pump. However, if this is done the mains pressure must be reduced to prevent damage to the ships hoses. This option is not available from the factory.

### **Water Makers**

Provision has been made for the installation of a modular water maker around the starboard aft water tank under the starboard aft bed. The water intake can be easily installed under the aft bed.

### **Hoses and Hose Clamps**

The water hoses used are reinforced plastic, suitable for drinking water and to take hot water.

The hoses are secured with clamps to the various attachments. These clamps may need tightening periodically, particularly if the boat was built in the

## ***Plumbing, Head, & Water Systems***

winter when the hoses were stiff. They can be tightened with a screwdriver or 5/16 wrenches.

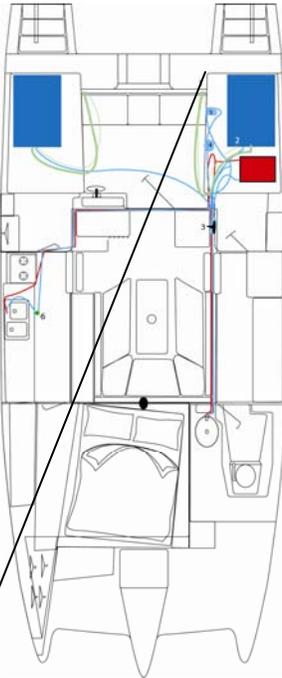
### **Cockpit Shower**

It is possible to tap into the cold-water hose just after the pressure pump and run a hose to the aft deck for a shower.

### **Salt Water Pumps**

A flipper-type pump that is compatible with salt water can be installed in the galley counter. A 1/2" through hull can be installed below the starboard aft bunk.

Figure A



1. 1 1/2" Water Fill Hose and 1/2" Vent Tube
2. Water Draw from Tank
3. "Y" Valve Tank Selector Knob
4. Particulate Water Filter
5. FloJet Water Pressure Pump

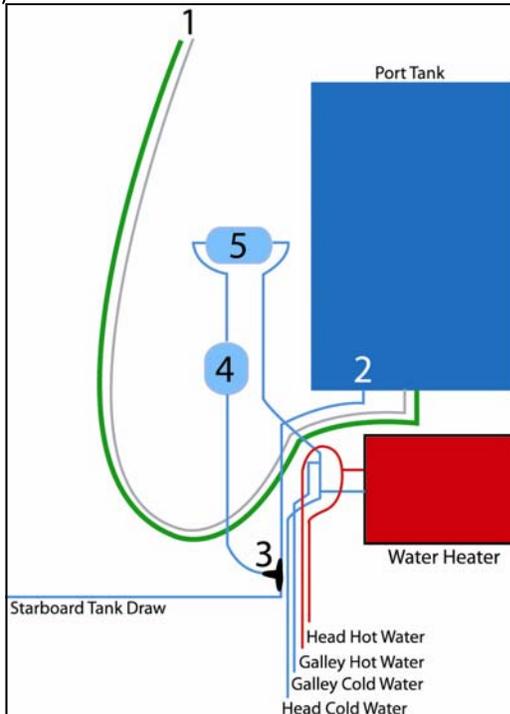
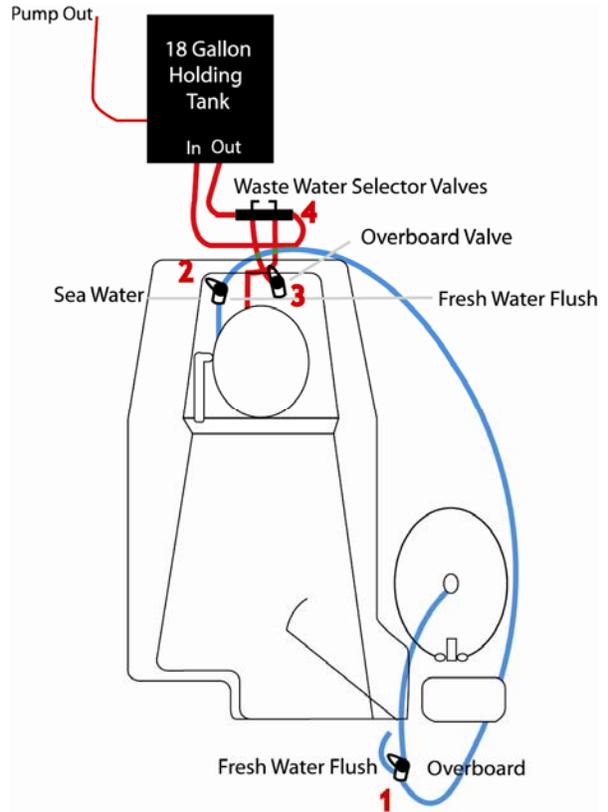


Figure B



1. Sink Water Valve: Controls where the sink water drains to. Turning the lever to the right drains overboard. Turning the lever straight up closes the valve. Turning the lever to the left drains the sink to the fresh water flush line.
2. Seawater Valve: Controls toilet water intake. With the lever to the left, the seacock is open to the sea for flushing with sea water. Turning the lever upright is the closed position. Turning the lever to the right opens to the fresh water line for flushing with fresh water.
3. Toilet Exhaust: Controls the toilet discharge. Turning the lever upright (inline with the hose) opens the seacock. Turning the lever down closes the seacock.
4. Waste Water Selector Valves: Controls the destination of toilet water discharge. See photos and explanation on previous page for possible configurations.

## Propane System

Propane is recognized by most yachtsmen, as well as the Coast Guard, as the best fuel for use on boats. It is the easiest to obtain, economical, and has more heating per pound than natural gas. In terms of safety, propane will only explode if there is a ratio of between 12,000 and 65,000 parts per million of propane and air. There are three major built-in safety systems to minimize any risks associated with the propane system:

- Flame Failure Overrides
- Xintec Propane Detector and Solenoid
- Propane Pressure Gauge

Although propane is odorless, an identifying odor (mercaptan) is added so the gas can be readily detected. Should a propane leak ever occur, the odor is easily detectable at very low levels and overwhelming at just 600 parts per million. Each propane bottle contains 20 pounds of propane and takes a long time to escape from a bottle in the event of a broken pipe. This is unlike gasoline which, with a small spill, instantly evaporates to an explosive mixture.

Always store the propane bottles in the cockpit locker on the bridge. The locker contains ventilation ports down through the bridge deck.

The pressure gauge is an essential safety feature and is the first thing connected to the valve on the bottle. The gauge does not indicate the level of the gas in the tank; weighing the tank determines the amount of propane in the bottle. The pressure gauge provides easy and frequent leak testing of the LPG system. After using the system and turning off both the refrigerator and stove, and turning off the gas at the bottle, the system should hold the same pressure for at least 10 minutes. The pressure reading will vary depending on the ambient temperature. Warmer temperatures will cause the pressure reading to increase while colder temperatures will lessen the system pressure.

There is a separate and continuous copper line from the propane junction to both the stove and the refrigerator. There are no joints in the lines except at the appliance.

Each appliance has a flame failure cut out. In the event the flame is extinguished on either the stove or the refrigerator while the unit is still in the "on" position, the cut out system stops the propane from flowing to the appliance.

## Xintec Propane Control Panel

The Xintec Propane Fume Detector and Control System consist of two detectors located in the aft cabin of each hull, the Control Panel mounted on the switch panel, and the solenoid in the propane locker.

When the 12-volt Xintec Detector 'Gas Valve' breaker is first turned on, the propane detector goes through a checking system and stabilizes with a green light over the number of each sensor on the control panel. The Xintec detector requires 200 milliamps to operate. Pressing the left hand end button on the Xintec control panel marked 'Solenoid', switches the solenoid open. There is a loud click in the propane locker when the solenoid opens.

In the event the detectors determine the existence of 3000 parts per million of propane fumes (25% of the lower explosion point), the control panel will sound an alarm and automatically close the solenoid which cuts off the propane to the entire boat.

The Xintec owner's manual has complete instructions on system use and maintenance.

## Propane Tanks

There are two (2) 20 lb. vertical bottles with a 5 year rust protection and overfill protection. **Note:** New, unfilled tanks are delivered with compressed air and must be purged the first time they are used.

A rubber tube connects to the fitting that has a pressure regulator. There is a special left-hand thread that is first screwed into the bottle to connect the tube and regulator.

## Propane Junction And Solenoid

The rubber hose coming from the regulator is connected to the solenoid and solenoid by-pass. The solenoid bypass is intended for use when sailing with no method of charging the batteries. The solenoid, which takes (1) one amp per hour to keep open, can be turned off. This system enables using the solenoid when the boat is on shore power and when there is the likelihood that the boat may be unattended. If the propane is turned on, which would be the case for a live aboard, and there were to be a leak, the propane detector would shut off the solenoid. When sailing, the boat is attended and therefore any leak would be detected by either the odor and/or the Xintec alarm and the propane could be turned off manually at the tank. The bypass is opened by turning the lever in line with the pipe that is bypassing the solenoid.

**Carbon Monoxide**

When propane burns with a blue flame, only carbon dioxide and water vapor are produced. **However, a yellow flame is an indication that carbon monoxide is being produced.** Carbon monoxide can also be produced if there is a 5% depletion of oxygen in the cabin while propane is burning.

All internal combustion engines produce carbon monoxide. A gas engine is worse than a diesel engine. The largest cause of carbon monoxide poisoning is from gasoline-powered generators because they are left running for long periods of time.

Propane units, if properly maintained, will not produce carbon monoxide. Proper maintenance includes keeping the system clean and maintaining good airflow. If you are at all nervous, you can try a carbon monoxide detector, but unfortunately these detectors are not 100% reliable and can be affected by atmospheric conditions. In addition, carbon monoxide detectors have to measure the time exposure as well as the amount of carbon monoxide. Thorough ventilation is the best safeguard against a build-up of carbon monoxide.

**Copper and Fittings**

The copper in use is 3/8", K type. Most of the copper fittings are connected to the various appliances with 3/8" flare fittings.

**Checking for Leaks**

To check for propane leaks all the line connections should be tested. With the propane on, use a small paintbrush and liberally coat the joints with a mixture of dishwashing soap and water. A leak is identified by bubbles in the solution generated from the escaping propane.

**Stove** 

The stove is an English unit with 2 burners, a broiler, and an oven. The unit includes a flame failure device to each burner so that if the flame were to blow out, after about 10 seconds the heat sensor beside each burner will cool down and the propane will automatically cut off.

To light each unit there is a flame failure override procedure. In the case of the stove turning the knob counterclockwise to full "ON" and pressing the knob in allows propane to flow. Light the propane and hold the knob in for a few seconds This warms up the heat sensor and the unit will continue to run. Completely turning the knob counterclockwise turns the flame up. To turn the flame down or off, turn the knob clockwise.

Oven Setting	Fahrenheit
1	230°
2	266°
3	302°
4	338°
5	374°
6	410°
7	446°
8	482°

**Refrigerator** 

The refrigerator provides 4 cubic feet of storage space and a freezer compartment in the top. The refrigerator is completely silent when operating. The refrigerant uses ammonia, water and hydrogen and operates through an absorption process. The application of heat acts like a pump and starts the process. Heat applied by a small propane flame or an electric heating probe boils ammonia out of the solution of ammonia and water. Air circulating over the fins of the condenser removes heat from the ammonia vapor to cause it to condense to liquid ammonia from where it flows into the evaporator. After taking heat from the refrigerator, the ammonia returns to the reservoir near the bottom of the refrigerator, mixing with the water.

This system is especially suitable to the Gemini as there is minimal heeling so the reservoir stays at the same level as the point where the ammonia is boiled out of the solution. With excessive heeling, the ammonia would not cycle through the system. This type of unit is very reliable and efficient. Any failure is normally associated with switches or the thermostat.

**Running the Refrigerator**

Press the AUTO button to the "Down" position which illuminates the "Auto" light indicator. If shore power is available, the unit will select A/C operation. If shore power is not available, the unit will automatically switch to propane operation. Within 45 seconds, the burner should ignite and operate normally.

If the "Check" indicator light comes on, the control has failed to light the burner on propane. To reset when the "Check" light comes on, press the main power button to the "Off" position and then "On" again which re-initiates the automatic lighting procedure.

On the initial start-up, after switching propane bottles, or if the refrigerator has not been used in a

long time, it may take several attempts for the refrigerator to prime itself with propane and light correctly. You may reset the unit as many as four times to purge the air from the propane lines and light the burner. This is normal.

To shut down the refrigerator, press on the "On" button so that it is in the "Up" position—which is "Off".

The refrigerator temperature is controlled by a factory preset and cannot be adjusted manually.

While waiting for the interior of the refrigerator to cool, the only way to know if the unit is correctly working is to feel the chimney flashing on the back of the unit. The chimney flashing is accessible through the ventilation hatch in the cockpit. The flashing will be warm to touch when the refrigerator is correctly operating.

**\* For an in-depth description of how a propane refrigerator works, turn to the back of this manual.**

#### **Running the Refrigerator on 110v**

To run the refrigerator on 110 volt,

**IMPORTANT:** When leaving the boat, turn the refrigerator to the "OFF" position first then turn the propane off at the bottle. Reversing these steps, while not a problem, will burn out the propane in the line and make re-lighting the refrigerator an unnecessarily long process as the gas line will need to re-prime.

The refrigerator is vented to the cockpit. Fresh air comes in through the hatch near the cockpit floor. The hot air is then vented out through openings above the steering wheel. An additional chimney vents to the top of the canopy and can be opened or closed with the included cap.

The refrigerator operates most efficiently with a thorough through-flow of air. Always keep the ventilation hatch open and turn the 12-volt refrigerator fan on when the refrigerator is running.

When leaving the boat for long periods of time, re-insert the refrigerator air intake hatch cover.

**Shore Power**

The Gemini is wired for 110-volt shore power with a 30 amp current rating. The female plug on the combing behind the mainsheet traveler is 30 amps. We suggest the use of a 50 foot shore power cable. Take care to keep the cable clean, dry, and in good working order to avoid arcing between the plug prongs.

**Caution: While rated for 30 amps, the shore power plug should not have more than 24 amps running through it continuously.**

The color codes of the wires are:

- Black: Live
- White: Neutral
- Green: Ground

The 110v circuit panel with breaker is just inside the main door to port. The top of the panel has a green light to indicate power coming into the boat. A red light is located just below the green light and will light if the external power source is incorrectly wired. If the red light comes on, unplug from the shore power outlet and try another outlet.

The top 2 switches are the main inlet switches rated to 30 amp.

The switches under the main switches have different ratings up to 20 amps.

Switch	Rating
Port Outlets (2)	10 amps
Starboard Outlets (4)	15 amps
Refrigerator	20 amps
Water Heater	15 amps
Air Conditioner / Spare	20 amps

There are duplex outlets in the head, master cabin, galley, refrigerator area (close to main door), and navigation area. The outlet by the navigation area is ideally suited to plug in a battery charger.

The outlet in the navigation station and master bedroom are GFI outlets. The navigation station outlet protects the head outlet while the master bedroom outlet protects the outlet in the galley.

Before connecting the shore power cord, always turn the AC circuit breaker "Off." Once connected, switch the breaker "On." Similarly, always remember to turn "Off" the AC circuit breaker before disconnecting the shore power cable.

**Power Inverters**

Power inverters transform battery supplied power known as direct current (DC) into Alternating Current (AC). An inverter is not available as a factory-installed option but can be installed by a trained marine electrician.

An inverter/battery charger must not be used when the boat is connected to shore power. Today's inverter is designed to take the shore power into it so that it can sense if the shore power is on. Today's inverter is so quick that if there were to be a failure on the incoming shore power the inverter would switch over to battery without a computer failing. If a high demand shore power item is installed such as air conditioning that would take more power than the inverter is capable of supplying, then a separate line from the inlet should go to that appliance by-passing the inverter. This is because the inverter would try and supply the power necessary to run that appliance if there were to be a shore power failure and would keep over heating and shutting down.

When testing electronic equipment, be careful that stray fields from the shore power cables do not influence sensitive equipment.

The wire used is 3-core, 10 gauge, 600° stranded marine-grade cable.

**Air Conditioning** 

Power Requirements:	110 Only
Starting:	24 Amps
Running:	15 Amps

The Gemini has an optional Mermaid 16,500 BTU air conditioner with reverse cycle for use on shore power only. The unit is installed in the seat housing below the switch panel. The Mermaid air conditioner fan is set to a fixed speed and cannot be adjusted.

The air conditioner cooling water lines and strainer must be primed with water prior to turning the unit on. By opening up the seacock to let water in, the system may prime itself. If the lines and water strainer do not fill entirely with water, it is necessary to complete the prime by opening the strainer lid slightly until the strainer fills with water. Remember to tightly close the strainer lid after it fills with water.

When turning the unit "ON", switch the thermostat to "COOL" and then press and hold the "down" button on the thermostat to change the thermostat setting to a temperature below the ambient temperature. Next, turn on the air conditioner by flipping the breaker "On." After the unit starts, the first thing to check for is the sound of the cooling water exhaust coming from below the bridge deck. The sound is audible from the back steps on the transom. If you do not hear the water exhaust, turn the unit "OFF" and correct any problems before restarting.

Most problems associated with the air conditioner are the result of an insufficient prime, a clogged strainer, or a kink in the water lines. To clean the strainer, simply unscrew the strainer lid, then take out the strainer and clean it thoroughly. Don't forget to replace the strainer before restarting the unit. Kinks in the cooling lines are possible following working on the water, heating, or air conditioning systems. Take care to see that all lines are free of obstructions or kinks.

**Caution:** If the system is insufficiently primed and cooling water is not running through the system there is the risk of freezing the air conditioning coils. Should this happen, wait until the coils have thawed before you again attempt to prime the lines.

Alternatively, the system can be primed by turning on the pump alone - without turning on the air conditioning unit. To accomplish this, you will need a 110v extension line to plug in to. Unplug the water pump from the air conditioner and connect to the extension line to prime the lines. Once the system is primed, return the pump plug to the air condi-

tioning unit and operate as usual.

Yet another means of priming the system is to disconnect the cooling water "in" line from the air conditioner and turn the system on. Wait until the pump primes itself and a small "geyser" of water comes from the hose, then quickly reconnect the hose to the "In" line on the air conditioner.

The air conditioning condensation pan is located under the unit and drains along with the system's cooling water.

To avoid losing the system's prime while sailing, we recommend closing the three-way seacock before sailing.

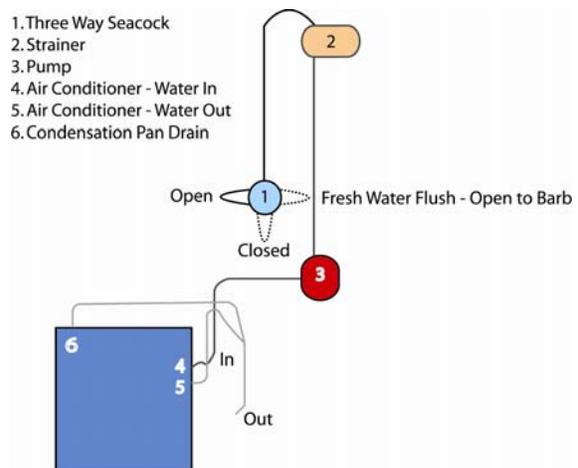
**Reverse Cycle—Heat**

During colder weather, the air conditioning unit can be used in reverse cycle for heating. To engage the reverse cycle, switch the thermostat to "Heat" and turn up the temperature setting higher than the ambient temperature. Read the owner's manual for a complete description.

**Winterizing the Air Conditioning System**

The air conditioning unit should be included in the winterizing process by filling the lines with a 50/50 mixture of fresh water and coolant. Simply place one end of a standard hose into a one-gallon bucket containing the mixture and connect the other hose end to the flushing seacock. Next turn the seacock to the flush position. Prime the system with the coolant mixture by unplugging the pump from the air conditioner and connecting to a 110v extension cord. The system will use the entire gallon of the coolant mixture.

**Air Conditioning System Overview**



**Batteries**

The Gemini comes with (3) three batteries #24 Deka Deep Cycle Marine Batteries. There is room for (1) one additional battery.

The batteries are number 24, deep cycle with a capacity of 85 amps each. On the battery switch, "Battery One" refers to two batteries connected together while "Battery Two" refers to the singular battery.

A Note on Deep Cycle Batteries: Unlike conventional car batteries, deep cycle batteries hold a charge better and retain an almost constant voltage until just before the battery dies. However, in retaining an almost constant voltage, it is difficult to tell how much charge is left in the battery. The only accurate way is with the use of a hydrometer to check the acidity of the battery fluid. Battery managers that measure the flow of current into and out of the battery are good for continuous use but do not work well if the boat is left for long periods of time without use. Batteries lose charge by internal degradation at the rate of as much as 1/8 ampere an hour. As batteries are used, the distilled water changes to sulfuric acid and eventually the formation of sulfate crystals coats the plates in the battery and the capacity of the battery is reduced. For example, if the battery is left at 60% charge for long periods of time, then the battery will not accept a charge of more than 60% while charging. It is possible to tell when the battery is near dead when it can be fully charged in a short time.

Solar power is an efficient way to keep batteries in good condition as solar power puts out low current at high voltage. The solar panel, available as an option, charge at up to 10 amps per hour.

A battery can be charged to 80% easily but the last 20% of charge requires a lot of time so that the battery is not overheated. That is why running the engine to charge the batteries is not efficient no matter what capacity alternator is in use.

The new smart chargers require a thermometer on the battery.

Gel cell batteries are expensive and can be damaged by over heating and theoretically can only be charged and discharged one quarter as many times as deep cycle batteries.

**Checking Battery Levels**

Deka recommends checking the electrolyte fluid in your batteries weekly and/or before any prolonged battery charging, such as extensive motoring. Checking the batter level simply means ensuring the electrolyte is filled to the indicator line on the battery case (which covers the plates). If the bat-

tery needs fluid, use only distilled water. To go a step further, you can use a hydrometer to test for a specific gravity of 1265 following a charge. Start with the cell closest to the (+) terminal. The specific gravity reading should be between 1.100 and 1.300 (Specifically 1.265).

Be sure to keep the battery connections clean as this will help ensure longer battery life.

**Battery Monitors**

Battery monitors measure everything that goes in and out of a battery through the negative side. This is a highly effective way of keeping track of available power. A voltmeter is not accurate enough as it will not tell you what state of charge your battery is in.

**Battery Switch**

The battery switch is located above the batteries.



**Caution:** Never switch from position "1" to position "2" through "OFF" - especially when the engine is running as damage to the alternator could occur. Always switch through the "BOTH" position.

With Battery "1" selected on the battery switch, all 12 volt power is coming from the first set of batteries and only the first set of batteries are receiving a charge from the alternator with the engine running. Battery "2" is not in use. When battery "2" is selected all 12 volt power is coming from the single battery and the single battery is receiving a charge from the alternator with the engine running.

If battery "1" is used and left fully charged before switching to battery "2", then there will always be a full spare battery and vice versa.

The Gemini does not make use of a designated engine starter battery as the smaller Westerbeke engine does not require a large amount of current to start. In addition, a designated starter battery requires the use of an automatic switch. With an automatic switch, once the engine is started, first the engine battery is fully charged and once it reaches 13.8 volts then the other ship's batteries are charged. The problem with this system, as discussed earlier, is that it is easier to charge a flat battery

than a fully charged battery. A yachtsman who does not use the engine for an appreciable amount of time may never put any charge into the ship's battery and of course there is some degree of inefficiency in the switch.

**25 Amp Fuse**

There is a 25-amp fuse between the live red 8-gauge wire going up to the switch panel and the battery. This fuse with a spare is down beside the battery.

There is no fuse between the battery and the engine because in the event of a short at the engine the battery cables are so large that the battery will quickly die before the cables over heat and cause a fire.

Individual components are fused as necessary.

**Solar Panel (Optional)**

**Wiring Code**

The standard code for 12-volt is red positive and black negative. Unfortunately the boat cable supplied sometimes comes red and black and sometimes white and black. We have chosen:

**BLACK = NEGATIVE**  
**RED OR WHITE = POSITIVE**

Note that the color coding is different to shore power where black is live and white neutral.

The European system is different and electronic equipment that comes from Europe has the code:

**BROWN = POSITIVE**  
**BLUE = NEGATIVE**

**Switch Panel**

The switches on the two 12-volt panels are also circuit breakers and vary from 5 amp to 20 amp. See table below.

**VHF Radio**

The VHF is recessed into the switch panel above the 12-volt panel. Consult the included owner's manual for information on operation.

**Stereo AM/FM/CD**

The Gemini 105Mc now comes standard with an AM/FM stereo CD player with two speakers mounted on the main bulkhead. Consult the included owner's manual for information on operation.

**Cabin Lights**

The Gemini has three (3) fluorescent lights in the main cabin over the galley, navigation station, and saloon table. The fluorescent bulbs take an extremely low power draw and are intended as task lighting. Each light draws 1/3 amps. Note that fluorescent lighting is known to sometimes interfere with VHF reception. Turning off the light corrects VHF reception issues.

There are also six (6) 12-volt incandescent dome lights, each located in the head, master bedroom, each aft cabin, over the refrigerator and in the cockpit. Each light draws 1 amps. Red bulbs can be installed to maintain good night-vision.

**Replacing Light Bulbs**

Individual bulb specifications are subject to change. When replacing a bulb, always remember to have the original bulb with you when buying a replacement.

**Related Topics:**

See Mast Wiring on following page.

Switch	Rating (amps)	Purpose
Compass Light	5	Red light to illuminate compass at night
Masthead Lights	10	For sailing at night— 25 watt tri-color masthead light
Anchor Light	5	For anchoring—10 watt masthead light
Instruments	5	Backlight for TriData, AutoHeml, and instrument panel
Fans	15	Optional Fans — Includes through-flow refrigerator fan
Shower Pump	15	Also operates port and starboard bilge pumps
Deck Lights	10	
Cabin Lights	20	Includes both fluorescent and incandescent
VHF	15	
Gas Valve	20	Turns power on/off to Xintec Propane Monitor
Stereo/TV	15	Turns power on/off to AM/FM Radio / CD Player
Spare	20	
Heater	20	Optional heater
Running Lights	5	For motoring at night

**Mast Wiring**

After the mast is erected, the wires in the mast are routed through a 2-inch tube. These wires terminate in the roof of the master cabin and are accessible behind a removable panel.

Mast wires connect as follows:

The coaxial cable for the VHF is screwed to the coaxial cable that terminates at the radio by the switch panel.

The wire from the electronic equipment is connected color to color either side of the connecting block supplied. The ground wire is a few unshielded strands of wire that should not be ignored, but attached to connecting block as shown in the illustration.

There are 3 twin core wires coming from the switch panel one labeled 'steaming' and the other labeled 'tricolor and spare'. These are attached to the connecting strip.

The twin core wire labeled 'steaming' has its individual wires labeled:

*White:*  
Steaming

*Black:*  
Ground or negative for all three lights up the mast.

The twin core wire labeled tricolor has its individual wires labeled:

*White:* Tricolor

*Black:* Anchor (this is the only time a black wire is live supplying power to the anchor light)

The twin core labeled spare only uses white for deck light. (The black is spare)

From the mast there are two sets of wires:

1. Brown and blue from the steaming light partway up the mast. The brown is the positive to the steaming light and the blue is the negative.

2. Brown, blue and strip yellow from the combination tricolor and anchor light at the top of the mast. The blue is the negative to both anchor and tricolor, with the brown being the positive to the anchor and the yellow being the positive to the tricolor.

3. Brown and blue from the deck light. Brown is positive and blue is negative.

The wires from the Autohelm wind are connected to the instruments through the connecting block.

Match the wires to their partners based on color through the connecting block. Do not forget to group together and connect the ground wire strands.

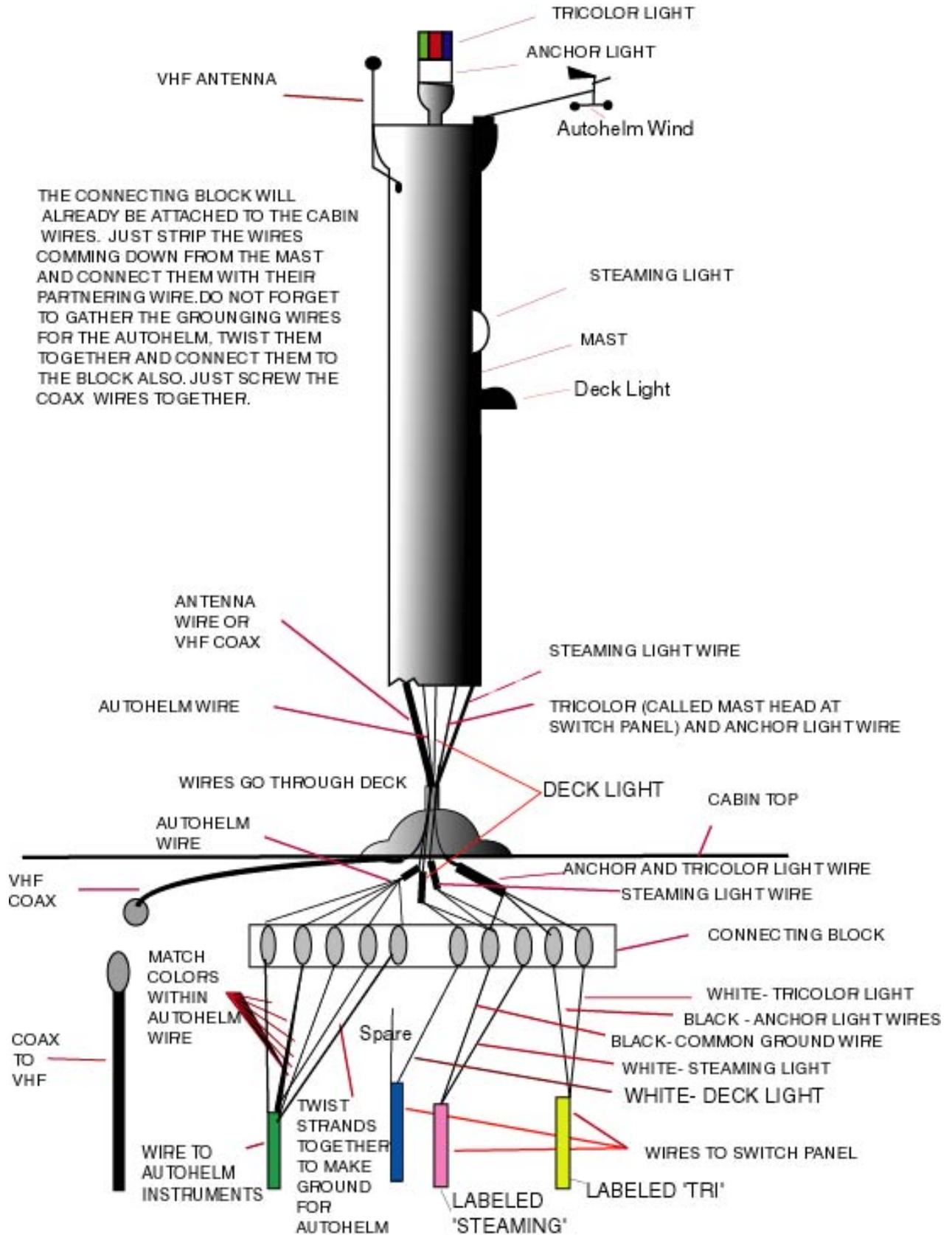
Most of the 12-volt wires in the coax are under the roof molding. There is little chance of failure with the wiring except for the connections to the various pieces of equipment. All the connections are accessible.

The 12-volt wire used is 16 gauge 600° boat cable wire (The 110 volt wires are 3 core and mainly under the dinette).

**Masthead Lights**

The masthead lights are supplied with the mast from Selden Masts. Selden has been known to change the make of the masthead lights without warning. At present (2004), the light is an Aqua Signal masthead light. The bulb specifications are as follows:

Anchor Light: 10 Watt (Part SW40)  
Masthead Light: 25 Watt (Part TDH40)



**Mast and Rigging** 

The Gemini 105Mc mast is 39' off the deck and the bridge clearance is 46'

The mast is deck stepped and sits on the main bulkhead. The main bulkhead is 3/4" teak ply, increased to 2 1/4" thick under the mast.

The mast is a double spreader rig with the shrouds coming down to the main bulkhead. The chain plates are slotted through the deck and bolted to the main bulkhead. There are steel straps that transmit the load down to the bridge-deck.

The slotting of the chain plates through the deck is the strongest system but requires periodic maintenance. As the chain plates take load and stretch, the seal can break. There is a stainless cap that is loaded with silicone sealant. Simply re-caulking the chain plate will solve any leak problems.

Like most modern sailboats, the Gemini's mast is relatively light to reduce pitching and improve performance. When a light section is used it is necessary to use double or triple spreaders. Most race boats will use running backstays to keep the mast straight. With Gemini, in place of running backstays there are permanently mounted check stays and a baby stay to the lower spreaders

The cap and lower shrouds are 7mm (9/32"). The intermediate, baby, check, and back stays are 6mm (7/16"). The 7mm stays use a 1/2" turnbuckle while the 6mm stays use a 7/16" turnbuckle.

The backstay is a single 6mm stay (33.36' from center pin to Delta plate), with a 15 foot 7/32" bridle going to each transom. The tensioning device slides down the lower bridle pulling the bridles together, tensioning the backstay.

Tensioning the backstay tensions the headstay which is needed for windward work.

**Caution:** Leaving the backstay under permanent tension would damage the boat. Slack off the backstay when not in use for upwind work.

**Tensioning the Rigging**

If the Gemini 105Mc is commissioned at the Performance Cruising factory, all the rigging is tensioned before handover and should not need adjustment until such time as the tension has been altered through extended use. Typically, the rigging tension should be checked as part of the 6 month maintenance schedule.

We recommend the use of a tensioning gauge for adjustments to the rigging. Both sets of cap, intermediate, and bottom stays are initially tightened by

checking the number of threads visible at the base of each stay. Following initial tightening, the following details, in order, the tensioning on each of the stays. It is important to adjust the stays in order:

Stays (In order of tensioning)	Tension in Kilograms	Tension in Pounds
Back Stays (6mm)	*	*
Cap/Top Stays (7mm)	440	970
Intermediate Stays (6mm)	320	705.2
Lower Stays (7mm)	440	970
Baby Stay (6mm)	*	*
Check Stays (6mm)	*	*

\* The back stay should be tightened to the point where all slack is eliminated but with no bow or bend in the mast. The check stays are present only to eliminate mast pumping and are tightened to the point where there is just a small amount of slack. The baby stay should be tight enough to put a small pre-bend in the mast so that when the Genoa pulls forward in heavy wind, the mast straightens up.

The halyards are low stretch ropes with shackles. The rope is 3/8" or 7/16". The halyards are internal for the main, jib and topping lift.

There is provision for a second internal jib halyard and a crane for an external spinnaker halyard. To use a spinnaker there needs to be a lower halyard to support the spinnaker pole, and a pad eye to fix the spinnaker to the mast approximately 2' up from the base.

The masts are delivered with a combination anchor \ tricolor light on the top of the mast, a steaming light 2/3 of the way up the mast, a deck light 2/3 of the way up the mast, coax for a VHF antenna and an aluminum tube in the mast with a feeder line to pull through the wires for the mast head instruments. The masthead unit of the wind instruments is drilled and tapped to the top plate, facing forward.

On the side of the mast at the base are pads at the right angle and position for bolting on two single speed winches, one for main and the other for the jib.

The gooseneck is riveted to the mast 24" up, with hooks on either side for slab reefing.

When setting up the rigging, the most important point is for the mast to be straight with all the side shrouds set to the same tension. Beside a tension gauge, the best way to test for equal tension is to pull the shroud 6' up. With about 40 lbs. of pull the

shrouds should move about 2".

The checkstays do not need to be tight at all because they only serve to stop the mast from pumping when beating to windward. For racing, the clevis pin securing the turnbuckle to the pad eye can be replaced with a quick release 3/8 pin, for down wind disconnection.

The mast is normally set vertical. Moving the mast does not seem to affect the helm.

With the Gemini 105Mc the mast is raised 1', includes a 1' crane on the top, and the boom is extended 1' compared to older Gemini models. (The older masts were 38' off the deck; the 105Mc mast is 39' off the deck)

The forestay meets the mast at the 38-foot mark leaving a foot above it for the optional "roller screacher", which is basically a roller-furling drifter. This is an excellent option for the cruiser that doesn't want to bother with a spinnaker in light airs. The screacher option includes supporting hardware consisting of a mounted track that curves from one bow to the other across the bowsprit. The base of the sail can travel over the track and be brought to windward.

The main sail has also changed with this 105Mc mast. The crane provides for a much larger mainsail and helps in obtaining maximum drive out of the top of the sail. With this crane we can have a large roach mainsail. However, so the sail doesn't get caught up in between the backstays, there is a single backstay with a tensioner about 15' up. The backstays only need to be tensioned during up wind work and should be slack at the dock.

### **Boom**

The boom is 15ft. long and is secured to the mast at the gooseneck with a clevis pin. The boom has three pulleys at the stern end and three jam cleats at the underside of the boom at the gooseneck end.

The starboard pulley and jam is for the first slab reef. The second pulley is for the out-haul. The third pulley is for the second reef. The sail that comes with Gemini has slides on the foot so that the end of the slab reefing line can be tied around the boom.

The first slab reef is between the second and third slider from the end while the second slab reef is between the fourth and fifth slider from the end.

The main sheet goes to a triple block shackled to the under side of the boom. On the mainsheet track on the combing is a slider with a triple block, becket and jammer. The main sheet runs to the triple block with the becket and jammer on the center pulley,

there is no means of feeding the lines without them crossing.

The boat comes standard with lazy-jacks. On the underside of the boom are two padeyes at 5-foot increments. A 12-foot line goes between these padeyes either side of the boom and is attached to a line that goes to a pulley 5 foot below the upper spreader on the mast. These single lines go back down to cleats by the boom. With this configuration, the lazy-jacks can be tensioned by the cleat or removed when sailing.

## Gemini 105Mc Owner's Manual

### Engine

The standard Gemini 105Mc engine is the Westerbeke 27 horsepower, Model 30B. The 27-hp diesel is linked to a sonic outdrive leg and provides excellent fuel economy and battery charging from the 55-amp alternator.

The use of diesel is safe and can be used for other appliances on the boat such as heaters and generators. This engine weighs about 400 lbs. The fuel economy will range from 6 to 12 miles to the gallon depending on speed and conditions.

The Westerbeke engine is mounted on the bridge deck under the center cockpit hatch. The gearbox at the back of the engine is connected through a flexible coupling to the Sillette sonic out-drive leg. The engine is accessible through all three cockpit lockers and aft deck hatches.

The oil dipstick, oil filter, and water pump are located behind the starboard side breakaway panel. Access to the port side is by unscrewing the side panel. *Please refer to your Westerbeke manual for oil change information and specific operating instructions including service periods.*

The 30B engine uses about 3 1/8 quart of SAE 10W-30 weight oil. The transmission uses about 7/8 quart of the same type oil.

Refer to the back of the manual for an addendum and for how to contact your closest authorized Westerbeke Service Center.

### Cooling Water

The cooling water for the engine comes into the ship through a seacock under the starboard aft bed. The seacock has (3) positions: In from the sea, closed, and a third position which enables connecting a hose to the open barb on the seacock for winterizing. There is a water filter by this seacock. The engine is a freshwater-cooled engine with salt water-cooling the freshwater in a heat exchanger. There is a fresh water header tank on the wall above the engine.

### Gear Lever / Throttle

The Gemini 105Mc comes with a single lever throttle and gear control (UFlex B73 Single Lever Top Mount Engine Control) located on the starboard side of the wheel. With the lever in the neutral position, the handle can be pulled out 1/4" to disengage the gears so the throttle can be operated without moving the boat.

Once the lever drops back to the neutral position, which is vertical, the gears are engaged. Pushing the lever forward 45° engages forward. The rest of the

## Engine, Drive Leg, Fuel

movement increases the engine speed. Moving the lever back engages reverse.

### Fuel Tanks / Gauges

The Gemini 105Mc has (2) two 18 gallon fuel tanks, each located either side of the engine under the aft deck. The fuel gauges are located on the instrument panel. There are (2) two fuel selector valves located under the engine hatch on the center stern. One is fuel supply to the engine. The other is the return valve returning the unused diesel fuel back to the tank. The valves simply point to the tank in use. Both valves should point to the same tank.

Following the fuel valves is a glass Racor fuel filter on the rear wall. Following the fuel filter, the fuel goes to the engine electric pump and then to another fuel filter. The Westerbeke uses an electric pump and is self-priming.

Diesel fuel in tanks can grow a fungus, akin to a black sooty deposit. This deposit can block the hoses, filters, pumps and injectors. Even a filter will not help resolve the problem as the hoses leading to the filter can get blocked. To stop this potential problem, a diesel additive can be added to the fuel. Diesel fuel is also subject to water condensation. It is advisable to leave the tanks full to reduce the occurrence of water condensation.

### Hot Water and Cabin Heater

Just inside the engine compartment are (2) two 3/8" black hoses that connect to a brass junction with a valve. Continuing from the brass junction are two (2) 5/8" hoses. Each hose connects to the hot water heater and the optional cabin heater.

With the valve at the junction in the horizontal position, fresh water from the engine is heating the water in the water heater. With the junction valve vertically down, the water supply is shut off.

With the optional cabin heater there is an additional valve in the port aft cabin under the bed. This valve can open the engine hot water to the cabin heater as well. The optional heater is the Heater Craft 500H unit capable of 28,000 BTU.

### Sillette Sonic Drive Leg

Please read through the Sillette manual thoroughly. The sonic drive leg will provide many years of dependable service if used correctly and properly maintained. Improper use can result in breakage. Slamming the leg down into forward with the full throttle before the leg has locked into place can cause damage. Always bring the leg down in a slow and controlled manner and do not throw the throttle completely forward until the leg clicks into place. If

## ***Gemini 105Mc Owner's Manual***

the boat is in particularly choppy water, take care to lower the leg slowly as there may not be enough water to fully cushion the leg when dropping into place.

The sonic drive leg includes a metal claw that goes over the thrust bar. The claw is held down by an inverted "L" shaped lever and allows the engine to reverse without coming up. A knob in the starboard cockpit locker pulls the "L" lever forward. Once this lever is moved forward the claw can move up off the thrust bar and the whole drive leg can be raised out of the water.

In lowering the leg to prepare for use, the claw pushes the spring loaded inverted "L" lever out of the way so that the claw can go over the 7/16" thrust bar. The spring loaded "L" lever then clips back over the claw preventing the sonic drive leg from rising while in use.

As part of the standard maintenance schedule, be sure to keep the claw and "L" lever well coated with marine-grade grease for proper operation. Should there ever be a problem raising the drive leg, the lock claw can be opened manually by pressing down on the lever with a boat hook and then raising the leg as usual. Be sure to then thoroughly grease the claw to regain proper operation.

### **Raising the Leg**

1. Place the small red lever next to pump handle in the horizontal position, in line with the flow of hydraulic oil.
2. The black knob must be tightened or closed.
3. Pull out silver reverse lock knob on back wall of locker.
4. Pump handle to begin raising the leg - you may release the silver lock knob after leg begins to rise.
5. Turn the small red lever vertical - this will lock the leg up in case of a leak in the pump seal.

### **Lowering the Leg**

1. Turn the small red lever to the horizontal position, in line with the hydraulic line.
2. Loosen the black knob on the pump and the leg will drop into place. You should hear it lock into place.
3. If the boat is still moving forward as the leg is lowered, it likely will not lock into position as

## ***Engine and Drive Leg***

it drags through the water. In this case, with the engine running slowly move the throttle forward and out of neutral. As the prop engages, you will hear the "click" as the leg locks into place.

### **Steering the Drive Leg**

With the drive leg in the "down" position, lines from the 8-inch tiller on the rudders go tight to the pad eye on the top of the drive leg. The drive leg is then steered in line with the rudders. With this configuration, you are directing the thrust in the same direction as your rudders which provides for a very responsive, maneuverable boat.

Specific instructions for how to remove and replace the oil drain plug on the leg are included in the addendum of this manual—refer to the back of this manual.

MK II Cat Spare Kit Available for Order from Performance Cruising includes:

\$186.00 + Shipping (Check Only)

- (1) CVJ gaiter
- (2) Pair Prop Seals
- (1) Transom Oil Seal
- (1) 17-spline tab washer
- (1) 3/4 x 3/4 DU bush
- (2) 3/4 x 1/2 DU bush
- (1) Grease Nipple
- (1) Latch Spring
- (2) 7/16 A2 washers
- (1) Drain Plug
- (1) Transom Anode
- (1) Prop Shaft Anode
- (2) 1/8 split pin
- (2) 3/32 split pin
- (2) 1/4 UNC x 1/2 SKT cap
- (2) 1/4 UNC x 3/4 SKT cap
- (2) 1/4 UNC x 1" SKT cap
- (2) 5/16 UNC x 3/4" SKT set
- (1) Loctite and Instant Gasket
- (1) Keenol Grease
- (1) Spare Parts Price List
- (1) Sheet of Reminders for Gemini Owners

Send check or money order with a reference to the Drive Leg Spare Parts Kit to:

**Performance Cruising Inc.**  
7364 Edgewood Road  
Annapolis MD 21403

### **Propeller Specifications**

15" Diameter / 11" Pitch  
17 Spline Drive  
3 Blade Aluminum— Left Hand

### Centerboards

In terms of performance, the centerboards are Gemini's secret weapon. Fixed keels, which are used in most cruising catamarans, are a detriment to windward ability, down-wind speed, and draft, which dangerously lowers the center of buoyancy and affects their offshore ability and storm survival. In addition, fixed keels that increase the draft to 3' have to be engineered to take striking an unseen rock without sinking the boat whereas centerboards, with their pivot at the front, simply push up when they strike a rock. Daggerboards are the most efficient, but, are not a cruising option because when they hit something they have to break.

On the Gemini, there is a centerboard in each hull. The centerboards are on the outside of each hull 7" off center to give foot room in the hull and to keep the centerboard slot to one side of the keel so that stones are not forced into the slot when grounding. The top of the centerboard case is level with the working surface in the galley and navigation station. The centerboard winch handle socket is in the wall of the galley and navigation station.

The Gemini 105Mc has asymmetric foam cored fiberglass centerboards as opposed to the older wooden boards. These boards yield remarkable performance and are incredibly strong. Unfortunately, for best performance using asymmetric centerboards, only the leeward board should be used. This necessitates continuously changing the board when tacking.

The drawbacks to centerboards are that they need a long slot. As this slot is narrow, the boards must also be narrow. The narrowness of the boards has a tendency to create turbulence on the low-pressure side of the board. Designing a centerboard shape to overcome this tendency is a challenge.

With experienced design, Gemini's centerboards create minimal turbulence and do not affect the interior accommodation. They are less accident prone than any other cruising catamarans with vulnerable fixed keels, and because they can be used one at a time, getting rid of the parasitic drag of the windward keel, they are dramatically more efficient than low aspect ratio fixed keels.

### Operating the Centerboards

The centerboards are 7' long with the pivot 6" back from the front of the case in line with the main bulkhead and level with the floor. When the centerboards are fully down the leading edge is approximately 45° back and the exposed centerboard is in the shape of a quadrant or fin coming out of the bottom of the hull. Most of the slot is still filled with centerboard; this prevents turbulence and gives a

strong bearing surface. The centerboards go down 4' below the keel.

There is a 3 1/2" solid PVC drum inside the case up at the top, 2' back from the front of the case. 3/8" rope is connected to the top front of the centerboard. The rope then comes back across the top of the centerboard under a bolt and then up to the drum. When the centerboard is up, the rope goes approximately one turn round the drum on the outboard side, through the drum to the inboard side (where it is secured) then round the drum an additional 3 turns. From the drum it then goes under the bolt and back to pad eyes on the top of the centerboard.

Inserting a winch handle in the socket and turning the drum counterclockwise approximately 1 3/4 turns lowers the centerboard. Turning clockwise raises the centerboard. You will know the board is completely up when raising once you hear the board bump against the top of the case.

The centerboard is held in position by sliding a 1 1/4" wing nut over a 3/4" nut behind the winch handle socket. Clockwise turning of the wing nut jams the drum to the side and prevents the board from moving. The direction of rotation is such that if the centerboard was down and it struck bottom it would push up and simply undo the locking nut.

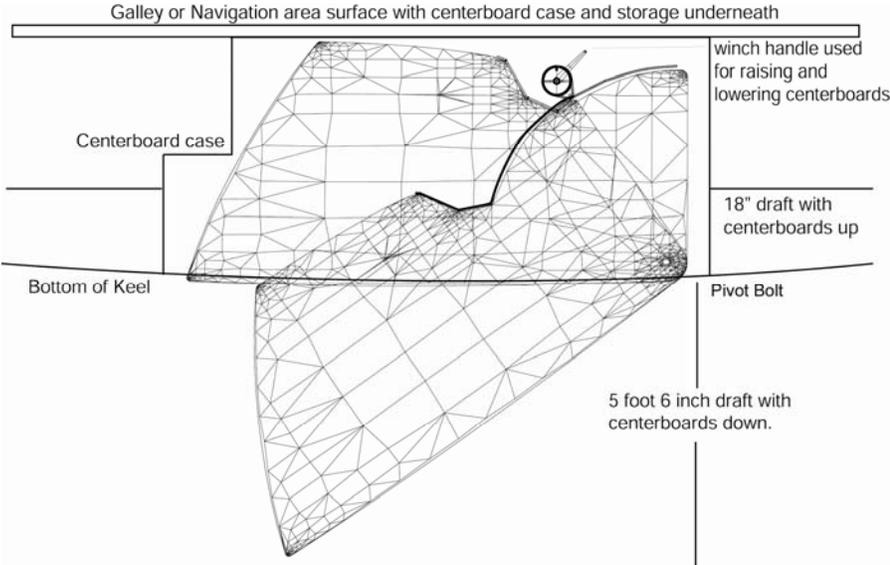
### Centerboard Maintenance

The Gemini's design calls for very little tolerance between the centerboard and the centerboard case. As such, the boards are designed to be in the water only when necessary. When not necessary, raise and lock the boards in the "Up" position. If the boards are left in the water for prolonged periods, growth will occur on the board's surface and make raising impossible until the board has been cleaned.

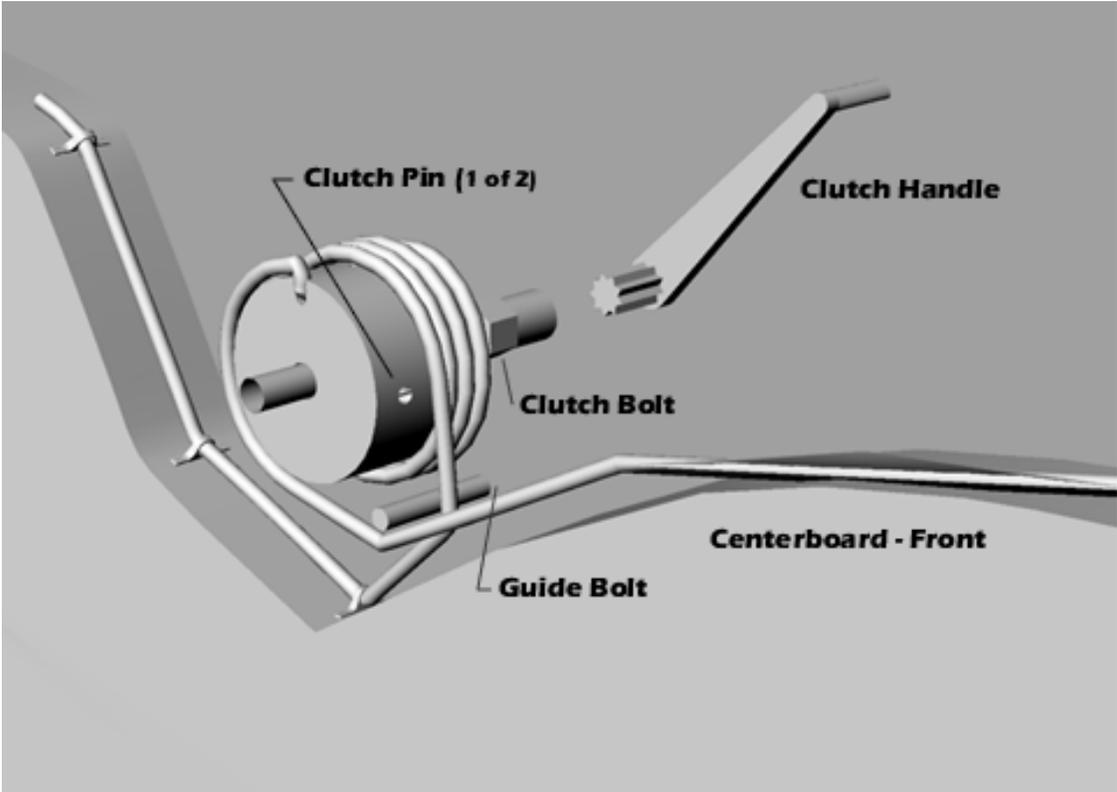
The centerboard pivot is visible on the floor side and accessible from behind the case. In the event of a leak the pivot can be tightened a little. 3M 5200 is liberally used to seal around the pivot and at worst can be resealed. The boat should be taken out of the water to do this. In over 800 boats we have found that pivot leaks are rare.

The mechanism in the case at the top can be reached by unscrewing the cap. The rare problems that can happen are for the rope to slip off the drum. This is near impossible because bolts hold the case together around the drum leaving nowhere for the rope to go. It is very rare for the rope to break. This rope can be changed with the boat in the water. The winch socket, shaft, and drum can also be changed with the boat in the water.

**Centerboard Design**



**Centerboard Clutch Assembly**



## Gemini 105Mc Owner's Manual

### Performance and Use of the Centerboards

The centerboards are only needed when sailing to windward with apparent winds closer than 70°. From experience we have found that only the leeward board is necessary. In fact the boat is ½ knot faster with only the leeward board down. The rationale is that the leeward hull is the hull doing all the work, whereas the windward hull is parasitic drag. Having the keel down on the windward hull will simply increase the drag of that hull. Having discovered this it was necessary to increase the size of the centerboards so that only one had sufficient area to prevent leeway.

For leisurely sailing use both boards 1¼ turns down. However, if the boards are down, and they do not need to be, then the lack of side pressure may cause the boards to rattle in the slot. Simply raising them eliminates any rattling. The boat will sail at any angle with no boards. However tacking is more difficult and the boat will slip sideways when sailing close to windward.

In light air, it is more difficult to sail without the centerboards in the "Down" position. In heavy airs the leeward hull makes a good keel as it is pushed down into the water. In fact, in rough conditions it is advisable to slightly raise the centerboard to take some stress off it when punching to windward.

The technique to changing the boards for maximum efficiency when beating is to lower the windward centerboard before the tack when the hull is slightly raised, and the leeward centerboard takes the side pressure. After the tack when the sails are set then raise the new windward centerboard.

### Motoring and Docking with Centerboards

When motoring, the centerboards are not needed and, in fact will cause drag. However, in preparation for docking or maneuvering in tight harbors, the boat is much more maneuverable at slower speeds with the centerboards in the "down" position. When docking, especially with strong crosswinds, it is advisable to place both boards in the "Down" position to stop the boat being blown.

### Strong Winds and the Use of Centerboards

When reaching with winds above 25 knots the use of the leeward centerboard ¾ turn down will steer the boat straight, reducing the load on the rudders. With strong winds there are big seas and it is these seas that can cause a problem as the boat tries to broach when the leeward bow digs in. Of course with the boards up on a broad reach the boat will travel perhaps 14 knots, which is also putting stress on the rudders. Lowering the leeward centerboards part way reduces the top speed perhaps to 12 knots but

## Centerboards and Rudders

the reduction of stress on the helmsman is worth it as the boat is much more responsive.

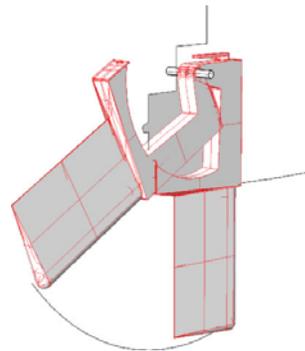
### Offshore Use of the Centerboards

Offshore with larger waves the centerboards can be used less. In fact, offshore it is possible to sail up to 50° without the use of the centerboards.

In survival conditions raising the centerboards will allow the boat to slip sideways away from breaking waves.

### Rudders

Like the centerboards, the Gemini's rudder system has uniquely beneficial engineering. The rudders on Gemini are a spade rudder glassed to a 1 ½" solid rudderstock, with a permanently fixed 8" tiller that faces aft. There are two split rudder-bearing molds that are riveted around the rudderstock. These bearings are filled and faired, then painted.



There is a ¾" hole in the back top of the rudder bearing and the rudder recess also at the top back. After the rudder and bearing assembly is inserted into the rudder case recess, a ¾" stainless tube is inserted in the ¾" hole. This ¾" tube is part of the Uflex steering system.

The Uflex steering system has a double head with two individual cables. The port steering cable is 19' while the starboard steering cable is 14'.

The outer ends of the inner cable have a stainless rod that passes through the 7/8" tube at the rudders. The outer cable is secured to the 7/8" tube. The 7/8" tube is threaded with 1 5/16" nuts to lock it either side of the rudder case. The stainless rods are connected to the tiller by means of a link arm. In this way, as the wheel is turned one rod *pushes* one tiller while the other rod *pulls* the other tiller. This is a totally balanced system, better than a single cable going to one rudder that is not good in compression but good in tension.

### Rudder Usage

The rudders should always be all the way down even in light airs. Part way up, the slot is opened and that will cause drag. The sheet stoppers that hold the rudders down only need the minimum of force just to hold them down. Too much force will cause the rudders to stick and not kick up quick enough if the rudder touches bottom.

Depending on the amount of usage, eventually it is necessary to replace the steering cables. Performance Cruising offers step-by-step instructions on replacing the steering cables on the Owners' Info Center website. (<http://www.mypci.net>)

The rudders are raised and lowered by a double purchase rope pulley system. The operation of the system is such that the rudders will steer at any position - up, down, or in between. There is no increase in tiller loads as the rudders are raised, unlike most other systems.

The ropes that lower the rudders go through a sheet stopper. The sheet stopper is made inefficient by the addition of another rope so that if the rudder hits an under water obstruction it will kick up. When not moving forward the rudders will stay down, but when moving forward the rudders tend to kick up. The sheet stopper prevents the rudders from raising. However, do not over tension the stopper as the lines could jam and cause breakage in the rudder system.

Be sure to lower the rudders when leaving the boat, particularly in deep or choppy water. Leaving the rudders in the up position for long periods of time causes unnecessary strain on the up rope.

There are no holes drilled below the water line so that even if the whole rudder were to be ripped from the back of the boat there would be no holes in the boat unlike any other system.

Access to the rudder mechanism is through the hatch in the second transom step.

The drive leg is steered by ropes connected to the end of the tillers that exit the transom by the bridge deck and are then connected to the drive leg.

For emergency steering another pad eye can be fixed to the outside of the hull. With ropes to each side of the tiller and then the ropes connected together, a tiller can be connected to the two ropes that will steer the boat by moving one rope one way and the other rope the other way.

**Hull Construction**

The hull of Gemini is produced using a large, one-piece mold with no secondary seams or joints. Similarly, the deck is produced from a single mold with no removable or add-on parts. The centerboard and rudder cases are each integral to the mold and have an elaborate air blowing release system. In this way, the centerboard case and rudder case are all molded in at the same time as the hull is molded. This gives a dimensionally accurate, leak free and strong structure.

The hulls have a high quality Cooks marine gel coat (953WA411) with a 20mm veil and vinylester barrier coat. The main lay-up is all done at once, with no chance of weakness as a result of interlaminar bonds. The main lay-up is comprised of layers of 24 oz stitched bi-directional woven, alternating with high stiffness 1 ½ ounce mat. The overlap in layers increases the strength in strategic places such as the keel. The keel is strong enough to support the boat on a point load, and ends up with fiberglass totaling 5/8" thick with additional wood reinforcing.

The bridge deck has the same lay-up as the hull but balsa core is also integrated into all flat surfaces. The reason for using Balsa is because the bridge deck is flat and subject to heavy pounding loads. Reinforcing to the hull is by strategic use of bulkheads and interior molds.

**Deck Construction**

The deck is a one-piece mold with all the horizontal surfaces balsa cored. The balsa core provides a solid, stable foundation underneath all walking surfaces. In the case of all deck fittings, the Balsa is replaced with extra glass and plywood to avoid the possibility of water infiltrating into the balsa core.

The use or non-use of backing plates is often misunderstood by customers and even some boat builders. An item bolted on that takes sheer such as a chain plate must not have a backing plate.

The most important design consideration is to have the materials of such a thickness that they have the same percentage elongation under the same load so that the bolts are uniformly loaded. A backing plate would change the situation and put the entire load on the first bolt.

Most items on the deck of a sailboat are subjected to torsion such as the stanchions. The most important design consideration is to transmit the load over a large area. This is most easily accomplished by molding in plywood; again simply making the fiberglass thick also helps transmit the load. Backing plates are academic because a failure would almost certainly be a large chunk of deck being

ripped out, much larger than the actual backing plate. The only time there is a good reason to have a backing plate is for items that are being pulled at right angles to deck or hull, such as rudder gudgeons. A backing plate would stop the bolts pulling through the hull. Unfortunately consideration should be given as to whether it would be better to have, for instance, four bolt size holes in the event of a sudden unexpected load like running aground or a large hole if backing plates are used. The small holes can be stopped up easily while a large hole might sink the ship.

**Stress and Movement in Catamarans**

A monohull, which is basically a tube, is automatically stiff enough to take the mast and rigging loads. Of course, the Achilles heel of a monohull is the enormous point load of the narrow keel, which is almost half the weight of the boat.

A particularly wide catamaran requires cross arms to connect the hulls together. These cross arms have high point loads at connections, particularly when the boat is subject to twisting.

Gemini is a narrow catamaran and can be considered as an upside down channel with the flat of the channel being the bridgedeck and the inside hulls being the walls of the channel. The rest of the outer hulls just keep the water out. The narrow catamaran with full cabin is like a box and easily resists the twisting forces.

As the mast pushes down on the center of the channel, the headstay and backstay pull up the ends. A channel subjected to high loads can only bend if the sidewalls deflect out. With Gemini the only signs of deflection are the side hulls moving up perhaps ¼". This movement is impossible to eliminate and is definitely a result of headstay and backstay loads and not side shroud loads. The side shrouds are all connected to the bridgedeck and not the outer hulls. With the centerboard down this movement is only on the windward hull because the side push of the centerboard counteracts the outward movement of the channel side. The windward hull when lifted out of the water should be assumed to bend down, not up. This is further proof that the upward movement of the outer hull is induced by the backstay and headstay loads.

As a result of this upward movement it is not advisable to keep the backstay tight for a prolonged of time. For racing there does not appear to be any damage if the backstays are tightened to the maximum just for the duration of the windward leg and then released, provided that the upward movement of ¼" of the hulls does not damage the door jamb of the main bulkhead.

**How Gemini's Construction Differs from a Monohull**

A 34' monohull has a hull area of 350 square feet and a deck area of 250 square feet. Gemini's hull area is 770 square feet and the deck is 600 square ft. The monohull has only one bow and transom and is normally glassed in a mold that can be tipped for easier rolling out of the fiberglass. With a tipped mold, gravity helps hold the fiberglass to the now horizontal hull side, and the excess resin can easily be squeezed out. The whole main lay-up of a monohull is quicker to apply reducing the places where the fiberglass hardens that can cause air blisters as additional fiberglass is applied over the ridge.

Gemini's hull mold is comparatively huge and cannot be tipped. Not only are there two bows, two transoms, two centerboard cases, and two rudder cases, but also a bridge deck with many corners. The problems associated with a large, non-tipping mold are that the hull sides are molded vertically making it difficult to apply a good quantity of resin without it running down the hull sides into the keel. This excess resin is difficult to remove. Reaching all the places on the bridge deck and around the keels and rudders without air voids and obtaining a perfect resin\glass ratio is difficult.

The deck is large and it would be difficult to apply two-tone gelcoat. Gemini's deck has a large non-skid pattern molded in. This pattern not only gives a good non-skid surface but also because of the shadows and texture does the same job as adding another color to the deck.

The molds to build Gemini are also three times more expensive than a monohull of the same size. The extra surface area of Gemini means that if Gemini is built with the same lay-up as the monohull, then Gemini will be a lot heavier than the monohull, even with the keel on the monohull taken into consideration. Fortunately, Gemini does not have to be strong enough to take the high point loads of a keel, so can be of lighter construction. However, the lighter construction and large surface area as well as the flexible nature of the fiberglass make the deck difficult to handle during construction.



A monohull is normally built with most of the interior fitted out before the deck is put on. The deck is also trimmed out with the various fittings installed before it is bonded to the hull. Gemini with large light moldings has to be bonded together first to stabilize the shape. The hull must have numerous interior moldings and bulkheads bonded in before it is released from the mold. This also slows down the process. The unbonded deck is so flexible that it is left in the mold while the entire mold and deck are turned over, then placed in position over the hull and released. Once the hull and deck are bonded together then the boat is ready for the assembly shop. Unfortunately, the whole boat has to be finished with workers carrying everything through the main door.

The structure of Gemini is second to none. Any cosmetic problems such as small blisters or stress cracks could be solved with different manufacturing techniques but the structural integrity of the boat would be compromised. For example the hulls could be molded separately like a monohull but then there would be a suspect joint where the parts are joined. Cheap low aspect ratio keels could be bolted on reducing the cost of centerboards and cases. Cheaper fixed rudders could be used. But those are compromises we are not willing to make.

### Design Considerations

In comparison to any other cruising sailboat with the same accommodation, the Gemini is faster, lighter, has less sail area, draws less water, and sails more upright. Performance Cruising has built more than 800 Gemini's and is constantly refining the product and manufacturing techniques. As such, Performance Cruising builds a 34' catamaran more cost effectively than any other sailboat factory can build a sailboat of similar accommodation.

The conventional monohull has a fixed keel, fixed rudders, and fixed inboard diesel. This simplicity makes the boat easier to build and less expensive. The cheap cast iron keel is the low cost solution to turning an unstable single hull into a sailboat with a mast and sails that are trying to tip it over. The draw back to this keel is deep draft and weight. A heavy boat needs more sail and a larger engine. Most people think the keel is a weight hanging under the boat trying to pull it upright. Unfortunately, with the keel weighing, say 5,000 lbs., and the loaded hull weighing 11,000 lb., the point at which all this weight can be assumed to act to bring the boat upright (the center of gravity), is near the water line and not several feet under the boat. This makes for a boat that will tip easily and is very uncomfortable.

The modern fast monohull has a very deep keel with a bulb, a high-tech light hull, and wide beam.

### Interior Molds

The Gemini 105Mc advanced construction includes a single interior mold encompassing the area from stem to stern and port to starboard. This interior mold is unique to the entire multihull industry and provides a multitude of benefits including enormous weight savings as well as incredible strength. The interior mold is built with a wiring harness which includes 110 volt wires, hoses, and conduit for electronics glassed in before it is structurally glassed in to the hull. There are also several small accent molds.

The roof mold is rather light and has 12 volt wire glassed into position before it is glassed to the deck. This mold has cutouts to facilitate bolting on genoa tracks, winches and cabin lights. This mold also has a glassed in flange to take the main bulkhead.

The refrigerator mold is 7' wide and high and covers the main cockpit bulkhead. This mold has a box to enclose the refrigerator and another box for storage or an air conditioner. This mold is glassed into position and ensures that the refrigerator vents to the outside. This mold also has the grooves for the

### Sails and Sailing

window slider.

The aft cabin walls are large molds that stand vertical to separate the aft cabin. They are bolted into place after the hull and deck have been bonded.

### Buoyancy Tanks

The Gemini has (4) four buoyancy tanks situated in each corner of the boat. These buoyancy tanks are not designed to float the whole boat but to stop a holed hull from going down too far and allowing water to flood across to the other hull and capsize the boat.

These buoyancy tanks are air filled tanks, but are not guaranteed as fully airtight. They should be inspected periodically to make sure they are dry. Each tank has an opening inspection port. In the head, the port is located directly behind the toilet plumbing. In the aft cabins, the port is located on the aft cabin stern wall. In the master cabin, the port is located under the carpeting in the large forward storage locker.

For offshore use, it is advisable to fill the tanks with either airtight plastic bottles or Styrofoam chips contained in netting (to make removal easier). The inside of the tank should be accessible to test for leaks. As such, it is not advisable to fill the tanks with permanent foam or any material that cannot be easily removed.

### Leaks

If a leak is detected, first taste the water to see if it is salty. If it is fresh, the leak is either water from the water tanks or a topside leak from rain. If it is salty then it is a hull leak.

The best way to find a hull leak is to completely dry the bilge and look for telltale trickles of water. It may be necessary to dry the bilge repeatedly because the first telltale trickle could be from water trapped behind a bulkhead. The leaks are almost certainly from a through-hull fitting, so be sure to check

- Speedo
- Depth sounder
- Toilet through hulls
- Centerboard pivot
- Engine water inlet
- Air Conditioning inlet

A boat in rough seas could have a leak from up high such, as the gunwale joint, sail locker, anchor locker, or deck fittings.

## ***Gemini 105Mc Owner's Manual***

### **Sails and Sailing**

There are three types of sailing rigs: **Masthead**, **fractional**, and **rotating**.

The **rotating rig** is the most efficient with the mast being supported by a single large shackle on the front of the mast, with the base sitting on a ball. The mast, which is normally wing-shaped, can then rotate in line with the wind. The main sail has a large roach and full battens. The jib is fractional. As there are no backstays with a rotating rig, it is not possible to carry a large headsail. The power from this rig comes from the main sail, which can be large. The single side shroud must go to a wide base, which is why it cannot be used on a narrow monohull. The wide shroud base and lack of headsail loads gives a low load system but unfortunately the whole mast is supported at only one position. The large fully roached main is very efficient.

The **fractional rig** is the next most efficient rig. The side supports to this mast can be any system but the headstay presents a problem. A permanent backstay can only be attached to the masthead and will bend the mast when the backstay is tensioned to support the headstay. Monohull fractional rig boats will have a crane at the top of the mast to push the backstay back as much as possible to allow the main to be as big as possible. Running backstays are necessary to support the headstay and to prevent the mast bending. Large Genoas are not possible. Multihulls, with their wide beam, are normally set up like the rotating mast, but fixed. The main sail is large with the small genoa. Fractional rig boats have a high mast failure rate.

The Gemini 105Mc uses the **masthead rig**. The masthead rig is the strongest because of the amount of shrouds that support the mast.

With the rig on the Gemini, we have found a way to retain the strength of the masthead rig but reduce the windage and get drive from the top of the sail. This new technology big head main sail works very well. The backstays are moved back on a 12" crane at the top of the mast. The main sail (7 ½ oz cloth weight) has an elaborate headboard and a fully battened main that goes behind the single backstay. This rig gives more power and can be used in higher winds because of the reduced windage and lower heeling moment.

There is a newly promoted type of rig called the **Cabospar**. This is an un-stayed mast with the boom being continuous around the mast, going forward to the tack of the jib. The jib is self-tacking, being less than a 100% jib. Without shrouds to keep the mast

## ***Sails and Sailing***

up, there are a lot of localized forces at cabin top. None of the un-stayed mast boats produced to date have been promoted as offshore boats.

From experience, once there starts to be any movement in an ocean going situation, this small movement rapidly expands to a serious problem. The Cabospar rig requires the same effort to set and reef as a normal rig. This rig will require the same effort as a normal rig with a self tacking jib when sailing to windward, will be less efficient on a reach (unless the sheets are eased like normal rig with a self tacking jib), but will be easier down wind when the rig can be rotated to be at right angles to the wind easily. Unfortunately, the rig is grossly under-canvased and spinnakers cannot be used. The rig has a few unique advantages such as backing up. This rig is ideal for a Pro.

### **Main Sail and Reefing**

The standard main sail is fully battened and two reef points. Lazy jacks are included. These sails cannot be raised or lowered unless the boat is pointing into the wind. Gemini's pilothouse and the lack of heeling with wide flat decks makes sail handling easy.

Your 340 sq. ft. main sail is made of 7.3 oz. Dimension Dacron in a relatively soft finish for easier furling. The sail has a large roach and extends beyond the backstay giving additional area which contributes to greater speed and pointing angle. The sail has three full-length battens which support the roach. These battens are tightened by turning an adjustment screw in the batten-end fittings at the luff of the sail. The batten should be made tight enough so that there are no vertical wrinkles across the battened area of the sail. To remove the batten from the sail, the adjustment screw must be completely loosened.

The lazy jacks installed on the Gemini mast collect the main as it is lowered. It is not necessary to neatly flake the main when storing it. Your main will come with simple 3' line sections for sail ties. There are a number of additional sail tie options available for purchase at your local marine supply store. The included sail cover will minimize damaging sunlight and keep your sail in good condition for years to come.

Should your sail get dirty, you can clean the sail with standard clothes detergent - making sure to completely rinse the sail afterwards. In the case of grease, we have found gasoline to be the most effective means of breaking down the grease. The sail can then be further cleaned with detergent.

**Reefing the Main**

To reef the main, let the mainsheet go and slack off the jib just a little. Leave the rudder turned as if to tack the boat. The boat will then stop and remain at about an apparent wind angle of 50°. Hook the topping lift over the winch and down to the cleat to temporarily raise the boom about 18". Release the main halyard to lower the main sail until the eyelet at the front of the first reef point is in line with the gooseneck. Hook the eyelet over the hook on the gooseneck and re-tension the main halyard. Pull the reefing line (blue or red) under the boom until the back of the sail is pulled down to the boom, and cleat. Release the topping lift (the reason for raising the boom is to make it easier to pull the back of the reefing line to the boom.)

**Genoa**

Your 320 sq. ft. genoa is made of 5.5 oz. Contender Dacron. This is an exceptionally tight-weave fabric and is also a soft-finish cloth making the sail durable, resistant to stretching, and lessens the tendency to develop wrinkles as a result of roller furling. As an aid to reefing the genoa, the mid section of the luff of the sail is padded with a foam insert which helps keep the sail flat as it is rolled in. The sail has a strip of Sunbrella cloth on the leach and foot of the sail which is the longest-lasting sun protection material available. Reefing the genoa is a simple matter of pulling on the roller furling line after having let loose or eased the genoa sheets. Regarding the furling drum: it is highly advised to leave a small amount of tension on the furling line (by hand) to ease the sail out. This ensures that the line will wrap correctly around the furling drum without any tendency to foul.

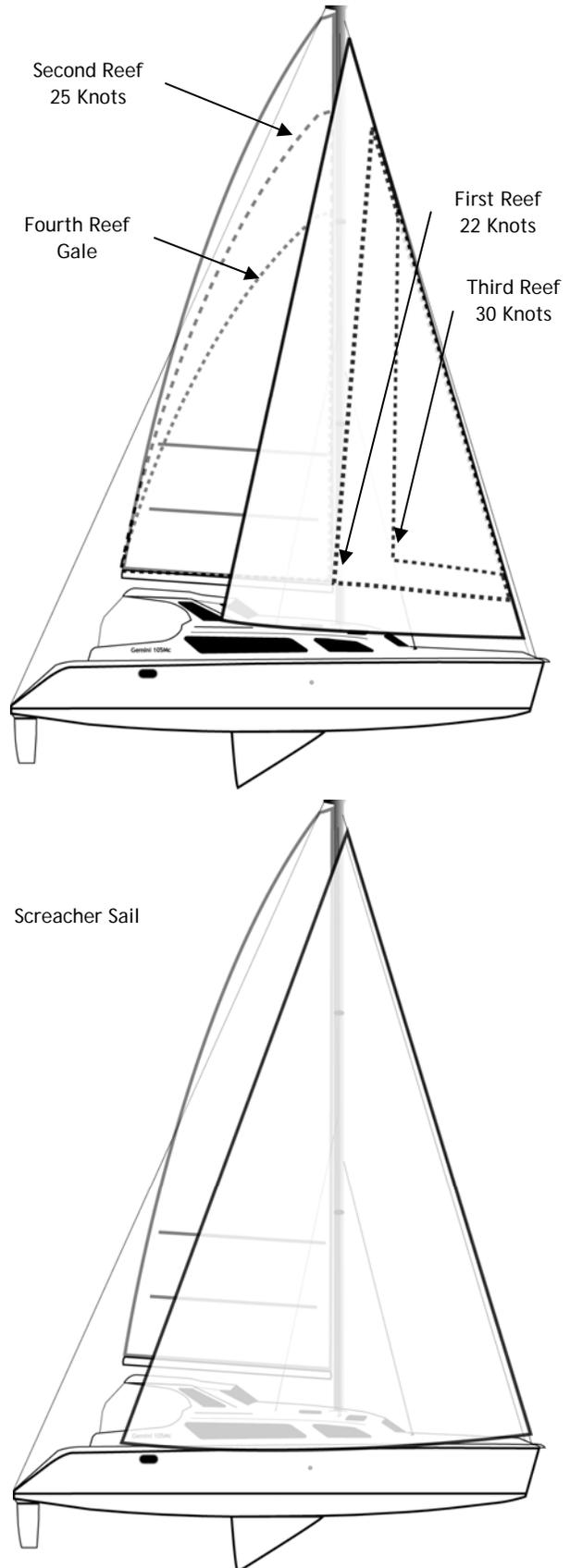
**Spinnaker**

For down wind, a spinnaker is essential for racing. A spinnaker's lightweight and shape enable the sail to be blown into a position which captures the maximum drive from the wind with the use of a spinnaker pole which positions the sail away from the wind shadow of the main. The spinnaker's huge size gives spectacular down-wind speed. Gemini's performance also increases with the lift created by a spinnaker or full screacher sail.

A single luff spinnaker, which has many names, is designed for use without a pole. It is tacked to the base of the headstay like the Genoa, and has one set of sheets.

**Screacher Sail**

The optional screacher sail (Dimension Dacron cloth weight 4 oz) is a 420 square foot roller drifter (200%) fitted in front of the genoa. The sail is designed



with a lose luff and permanent curve. This sail works well on a reach and close to the wind. The base of the sail is mounted on a curved track traveling between both hulls. For downwind use, the base of the sail can be moved to windward, lessening the main sail's wind shadow and increasing power. For upwind work in light air, the base of the sail can be positioned amidships.

The screacher lines connect through two snatch blocks on either side (at the base of the stanchions) and then to the pad eye on the back of the combing. The snatch blocks enable fine tuning the sail's roach for upwind or downwind performance.

To correctly tension the screacher halyard, first loosen the backstay with the backstay adjuster (if not already loose). Hand-tighten the screacher halyard, then re-tighten the backstay. Keep in mind, the screacher sail has a permanent curve built in and is not intended to be completely straightened. Do not attempt to tighten the screacher halyard using the winch.

The sail is protected from the sun with tedlar film which is light-weight and offers good UV protection. However, the tedlar film lacks durability so it is advisable to lower and stow the screacher if you don't plan on using it for a long stretch of time (more than 2 weeks). The sail furls on its own luff wire and it must be furled in the direction that tightens the lay of the luff wire. Furling the sail in the wrong direction will unlay the wire and possibly kink and break the wire. To be sure the sail is furled correctly, check to see that the clear tedlar film is on the outside of the furled sail.

To lower the sail, center the furling, un-cleat the halyard at the base of the mast and free the halyard stopper located about 5' up from the base of the mast. Slack the sail enough so that you can easily pull the quick-release pin from the base of the sail - being careful not to loose the pin overboard. Place the base of the sail into the sail locker and continue lowering the sail using the halyard.

**Reefing**

The roller genoa in the full out position has the genoa sheet going down at approximately 45° to the slider which is near the back of the track. As the sail is rolled in, it is necessary to move the slider forward. The approximate slider position, when the tack of the genoa is in line with the shroud, is with the slider level with the checkstay eye. The reason for the correct position of the slider is to put roughly equal tension on the leach and the foot of the sail. This position will change in different wind strengths. In lighter winds the slider is further aft

putting less tension on the leach, allowing the leach to fall away and not rub on the shrouds or close up the slot. In stronger winds the slider is forward to put more tension on the leach which is being blown out with the stronger winds.

Suggested wind strength before reefing:

Main	Headsail	Roller Genoa	Wind Strength—Apparent
Full Main	Drifter	Full	15 knots
Full Main	Genoa	Full	18 knots
Full Main	Jib	First Reef	22 knots
Main - 1 <sup>st</sup> Reef	Jib	First Reef	25 knots
Main - 1 <sup>st</sup> Reef	Storm Jib	Second Reef	30 knots
Main - 2 <sup>nd</sup> Reef	Storm Jib	Second Reef	Gale

To use the above guide, when the boat has a roller genoa, simply reduce the sail as indicated above. The roller genoa is reduced to a jib when the tack is level with the shrouds and then can be further reduced to storm jib when in line with the baby stay on the front deck.

As a rule of thumb, consider reefing whenever the boat heels to 7° or more. An inclinometer will assist in determining the degree of heel.

**Heavy Weather**

For offshore use, the catamaran is the safest choice of boat. The trimaran is the worst followed by the monohull. To understand what happens in rough conditions and large waves it is necessary to understand the motion of water in a wave.

In the crest of a wave, water particles are moving in the direction of the wave with say a speed of 12 knots. In the trough, the water particles are moving backwards at 12 knots. The water particles move in a circular motion. Although these waves appear to be moving, in fact nothing moves, there is just this circular motion of water. Otherwise the whole of the Atlantic would end up in Europe in a Gale.

All boats will lay beam to the waves and wind with no sails up.

In heavy weather, a monohull's keel can by its own worst enemy. In the trough of a wave when laying beam to, the deep keel is in static water, while the hull is on the surface where the water particles are moving towards the wave. This starts a pendulum motion with the boat rocking towards the wave. As the pulsation of the wave moves on the hull, it is

then in a water particle moving with the wave. With the keel still in fixed water the boat will now rock the other way. This pendulum motion on the side of a huge wave can cause the boat to drop off the side of the wave and invert, rolling over 180°.

The catamaran with high buoyancy hulls will not dig a hull into the trough like a trimaran. The catamaran is also much narrower than the trimaran and does not have a hull in the middle, which can cause considerable heeling when punched by a wave. If a wave punches the windward hull of a catamaran upwards, because it is nowhere near the center of gravity, it can only have half the power, and because the boat is narrow, the wave quickly reaches the leeward hull and pushes that up.

The catamaran does not have the keel of a monohull and will not trip over it when falling sideways of a wave. The fixed keel catamaran is not as well off as the centerboard catamaran with the centerboard up. However, because the fixed, low aspect ratio keel does not work, this type of catamaran is still better than a monohull for surviving a storm offshore.

### **Offshore Cruising and the Gemini**

The sea can be a very rough environment. Punching to windward in 25-knot winds and 15-ft seas for hundreds of miles is very uncomfortable. When beating to windward, 2.5 knots is the best any boat can expect to make to windward. Even if the boat is sailing at 7 knots, 40 Deg off the wind. At 2.5 knots, with 10 hours of daylight, it is only reasonable to expect covering roughly 25 miles. In these conditions, eating sleeping and cooking is difficult. A lot of people will suffer from seasickness. To add insult to injury, most boats after several hours of this type of grueling punishment will need attention. 25 knots of wind is not the worst but is deceptively rough and can go on for days. A gale is normally short lived even though the conditions can be bad. Pulling the sails down will make a gale easy to cope with. Unfortunately, most people are trying to get somewhere and do not have time to pull the sails down in 25-knot winds that last for days. That is why 25-knot winds on the nose can be the worst condition.

Because of the horrendous conditions that can exist offshore and the fact that there is no one around to help, it is up to the skipper to make sure the boat is up to the condition that they intend to sail in. There is no boat built that is suitable to go straight from the factory into these rough conditions. All boats should be tested thoroughly in progressively worsening conditions. If and when problems occur during the testing, they should be rectified and made stronger. This is not the responsibility

of the boat builder, unless the boat was sold specifically as suitable for offshore racing.

With today's high tech sailboat, incorrect sailing techniques will easily break the boat. Running backstays have to be correctly set up along with the rigging; otherwise the mast can easily fail. Today's mast is much thinner, which is why boats are faster. Severe pounding on today's flat bottom boat will break them up. Even 65 footers recommend slowing down when pounding to windward to prevent structural damage. Catamarans with a bridge deck can be damaged if the boat is recklessly overloaded and pounded to windward.

Gemini is a boat that is suitable for many uses. Gemini is built to a price so that the average buyer who has dreamed of going cruising can follow his dreams in an affordable package. In addition, Gemini's design is fully capable for offshore racing. In fact, the Gemini 105Mc is CE certified for trans-ocean use. However, Gemini is not built specifically for offshore racing or around the world cruising. If an owner wants to cruise offshore extensively, then the recommendation is to take a standard Gemini and thoroughly test her, and then reinforce the parts that seemed inadequate during the testing. It must also be remembered that a boat cannot be suitable for all conditions. An around-the-world boat will be a disaster in the light airs of the Chesapeake Bay; she will have too short a mast and too heavy a sail. An around the world boat will have few hatches for safety. This boat will be unbearably hot in the sometimes windless conditions of the Chesapeake Bay.

For racing, Gemini is kept light and will perform well racing to Bermuda with three people and only the food and water necessary for the trip. No matter how rough the conditions, Gemini will not pound the bridge deck. However, if this same Gemini were to be loaded for a two year cruise of the Caribbean, then do not expect to sail to windward in rough seas and strong wind without experiencing bad bridgedeck pounding. Overloading the boat does not make it unsafe. In fact, the boat is probably safer. The only problem with overloading is bridgedeck pounding. In this respect, Gemini is no different to any other cruising catamaran. Catamarans are designed to go over the waves. If they are overloaded then they try to go through waves, and no matter how high the bridgedeck, they will pound.

There are three factors that should be considered for sailing across oceans, and the potential ocean sailor must have at least one of them. The three factors are: A large, specially built, ocean going boat, considerable experience, and/or strength and fitness. In other words, with the proper boat, an older, less experienced skipper might make it across the Atlantic. An experienced delivery skipper can

## ***Gemini 105Mc Owner's Manual***

probably nurse any boat across the Atlantic. Three young, very strong men, by virtue of their strength, can power their way through most problems, and cross the Atlantic.

### **Notes on Sailing a New Boat**

When sailing on a new boat, particularly in rough weather, never just sit in the cockpit. Force yourself to walk around outside and inside to look for possible sources of trouble. Thoroughly inspect the rigging by looking for loose cotter-pins or shackles, problems with the rivets in the mast, and any other hardware issues. Inside the boat, periodically check under the floorboards for leaks. If a small puddle of water is discovered, it is possible to find the source by tracing back the flow of water. If this leak is left until the whole area below the floorboards is full, it is impossible to find the source, particularly in a pitching seaway.

Regarding the break-in period associated with the engine and drive leg; Sillette-Sonic Marine suggests running the engine up to about 1/2 the engine RPM for the first 20 hours of operation. This equates to 1500 RPM on the Westerbeke diesel.

***Coast Guard Kit***

Gemini is delivered with a Danforth anchor, fenders, mooring lines, and a compass. As most sailors already have some boat gear, Performance Cruising does not provide a Coast Guard kit. The recommended items for minimal use are listed below.

- Charts and Reeds Almanac
- Dividers
- Fire Extinguishers (two mounted, one in each hull)
- Flare Kit
- Flash Lights
- Fog Horn or Bell
- Life Jackets for each Person Onboard
- Spare Anchor, Chain, and Line
- Throw float / cushion

***Offshore Kit***

To follow is a list of additional equipment for offshore cruising:

- Radar Reflector
- Solas Flares; red, white and orange
- Safety Harness
- Bilge Pumps
- GPS
- Single Sideband
- Life raft
- Emergency Water and Food in Containers
- Water Maker
- Solar Power
- Storm Sails
- Charts and Reeds Almanac and other local pilots
- Navigation Equipment such as Dividers
- Ships Log
- Hand Bearing Compass
- First Aid Gear
- EPIRB
- Life Sling (man overboard recovery, complete w/ pulley block system to raise man overboard)
- Man Overboard Equipment such as a MOM8, plus life ring for less serious man overboard situations
- Captains Chair (secured to the floor)
- Foul Weather Gear
- Tool Set
- Spare Parts (including sealants and fiberglass paste)
- Sail Repair Equipment
- Emergency Steering
- Binoculars
- Flash Lights and High Beam Spot Lights
- Bosun's Chair
- Set Flags
- Bucket

**Anchoring**

The Gemini 105Mc is outfitted with a 22lb Danforth anchor supplying 1600lb of holding power. There is a stowing anchor roller through the bowsprit and an anchor locker just behind the bowsprit.

Cautionary Notes on Using the Danforth: The Danforth anchor has the highest straight line holding power but will not take a wind shift. The anchor can be capsized and released and when loaded with mud can be difficult to reset if the boat is being blown fast. The flukes of the Danforth can also be loaded with grass or kelp and then not hold.

The 22lb Bruce anchor is the strongest but can develop a ball of mud between the blades and not hold. The flukes of the Bruce will probably get a hold in rocks and are strong enough to withstand breaking.

The 25lb CQR or Harbor Fast from Simpson Lawrence will plow a circle in the sea bottom in the event of a wind change. The CQR is a strong forged anchor but is expensive, whereas the Harbor Fast is fabricated.

There are other anchors similar to the three above with different features: The Aluminum Fortress anchor is like the Danforth but has a high blade area with light weight. This anchor will hold well, but because of its light weight will skid across the seabed if the boat is being blown backwards. The lighter 13lb Hi-Tensile Danforth has a higher holding power of 2200lb. This anchor theoretically will hold more than the standard anchor once it gets a grip and digs in, but of course, does not have the weight to hold on a rock or if it gets loaded with weed. This is a good anchor for racing where weight is a consideration when sailing.

**Setting the Anchor**

The standard boat comes with a short length of chain and 100' of 1/2" nylon rope. This is adequate for normal anchoring in sand or mud. The nylon will stretch to absorb the shock loads of rough sea. The chain helps to keep the stock down to make the anchor plough in. For anchoring in coral where the anchor line can rub across the coral and get cut, it is recommended that all chain be used. Chain will not absorb shock like nylon so it is not recommended for other uses. A compromise is to only use chain that will rub on the seabed.

While the anchor roller on the Gemini is flared and rounded at the edges, we still recommend using some form of chafe guard while at anchor—especially in rough conditions. The simplest, least expensive chaffing guard is to simply cut open a 3' section of garden hose and wrap the hose around the anchor line going through the roller. Be sure to also tie off the section of hose so that it does not simply slip down the anchor line.

There are numerous theories on anchoring. It is advisable to check into these theories but do not automatically assume that in a bad storm two anchors are better than one. Unfortunately in a storm there will almost certainly be a change in the wind direction, at which point the two anchors will wrap together and pull out.

There are several systems for anchoring in confined spaces to prevent the boat moving down onto other boats when there is a change in the wind direction. Anchoring fore and aft is one way. Another way is to set two anchors facing one another 150 ft or so apart, and then connecting them together in the center with a swivel on the sea bed. Finally, take a line from the swivel up to the boat. In this system the anchors will not pull out in the case of a wind shear. Unfortunately, this system will need considerable skill and time to set and retrieve.

Danforth Anchor



Bruce Anchor



CQR Anchor



Gemini only draws 18" and therefore can be anchored in much shallower places than most other sailboats. Anchoring in shallow water needs a lot less line and is therefore much easier to retrieve.

Normally the scope of the anchor is 7 to 1. In other words 10 ft of depth will need 70 ft of anchor line. A useful tip is to thread small colored line through the anchor line at 10-ft intervals.

#### **Retrieving the Anchor**

The solid bridge deck of the Gemini provides a stable platform for easily raising the anchor. Have the helmsman drive the boat slowly towards the anchor with the person raising the anchor giving directions toward the anchor. The person raising the anchor only has to flake the loose line into the anchor locker. As soon as the anchor line goes vertical, cleat the anchor line and let the forward inertia of the boat capsize the anchor releasing it from the seabed. Then simply raise the anchor. Once the anchor is visible, re-cleat it and let the forward motion of the boat wash the anchor.

**Docking**

To secure a boat to the dock, a line from the bow and stern will keep the boat in. A spring line from the bow running down the side of the boat to the dock, and another from the stern also running along the side of the boat going forward to the dock, will stop the boat moving backward or forwards. The lines to the bow and stern holding the boat in should go to the hull away from the dock so that these lines are long and can accommodate any rise or fall of the tide. The stanchion bases are through-bolted and can be used for additional mooring cleats.

When coming into the marina, have two lines secured to the bow and stern ready to either give to a bystander or to be ready to take ashore. When the boat is in position, reverse the lines leaving the ends tied to the dock with the slack left on board. This stops people stealing the excess, tripping over them, or tying another boat with them.

Always make sure that the lines are removable from one end even if the lines are under tension. Do not pass the loop of the lines through the cleat. If the boat is tied to the dock and the tide goes down, the mooring line needs to be able to be untied slowly lowering the boat down the wall. At night if the boat is moving, it is a good idea to be able to retie the boat while still on the boat, without having to go onto the dock, which could be dangerous in the dark.

**Heaving Lines**

Novice sailors sometimes panic as the boat is coming in to the dock and are often unsuccessful in attempting to throw a line to a dock attendant. The best method of throwing a line is to simply coil it up, split the coil and throw half of the split coil. Hold onto the end of the other half. The weight of the half

being thrown uncoils the half still being held. The momentum of the half being thrown will then uncoil that half once the first half has been uncoiled.

**Picking up a Mooring**

Always approach an open mooring at a slow speed and note how other boats are positioned relative to their buoys. The boats will be pointing into the wind or with the current. Always stay well clear of others' mooring lines so as not to cut or foul the lines. In the event that there are no other boats by which to gauge an approach, pass by the intended mooring once to gauge the effects of current and wind so that your approach will be correct.

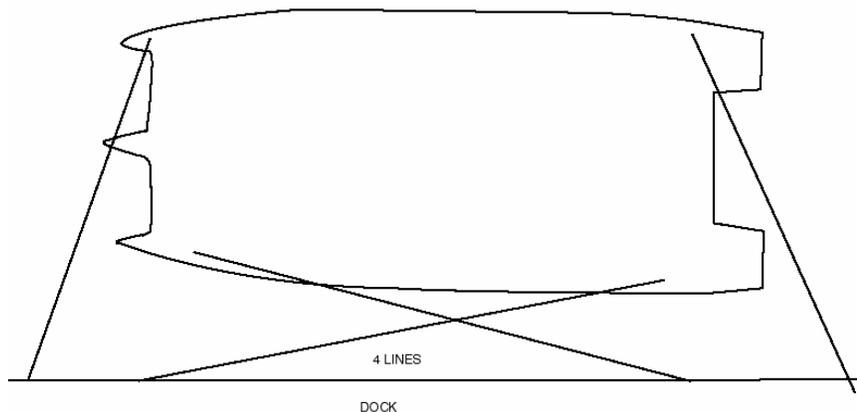
As you motor up to pick up the mooring, shift into neutral when the boat has enough forward momentum to reach the mooring.

Have a crew person stand on the bowsprit ready to pick up the pennant float with a boat hook. Communication between the captain and crew is essential. It is beneficial to agree on a set of hand signals rather than yelling back and forth. Do not expect the person on the bowsprit to be able to hold the boat in position once in contact with the pennant float.

If you expect the boat will overshoot the mooring, shift into reverse or, inversely, shift into forward to gain enough forward momentum to reach the mooring. Keep the engine running and ready until you are sure that the pennant eye has been secured to the anchor cleat. Even after securing the pennant eye, be careful not to scrape against the buoy.

If you do under or over-shoot the buoy, calmly fall off and get clear for another try.

SUGGESTED MOORING TECHNIQUES: THIS TECHNIQUE WILL PREVENT THE BOAT FROM MOVING SIDE TO SIDE AND FRONT TO BACK, AND SEEMS TO BE THE SAFEST. REMEMBER TO TAKE UP THE EXTRA LINE ONTO THE BOAT AND NOT THE DOCK. ALSO TIE THE LINE AROUND THE CLEAT CORRECTLY, NOT WITH THE LOOP THROUGH THE HOLE AND OVER THE CLEAT



**Sea Anchors**

A sea anchor is without doubt a good addition to a cruising boat's inventory. When weather conditions have deteriorated to the point where you just want to stop, then a sea anchor will keep the boat where it is. For survival there are certain types of boats that must have them but for others, the need is marginal. The boats that race around the world do not use them. Sailing through a storm is still the best defense. There are enormous forces in the anchor line if a sea anchor is deployed in a storm.

Racing trimarans will use a sea anchor to keep the bow of the windward hull down. The cruising trimaran will use the sea anchor off the bow or stern like a monohull.

The monohull will use the sea anchor to turn the boat so that the keel faces the on-coming waves, so that the boat will not trip over the keel.

One of the biggest problems concerning the use of a sea anchor is the effect on the boat's rudders. The enormous force of a breaking wave over the bow will force the boat down onto the rudder. If the rudder turns sideways it is likely to get damaged or ripped off. Anchoring by the stern will protect the rudder. Unfortunately the stern is not designed to take breaking waves and the hatches are now exposed.

The sea anchor is normally set so that the anchor is one wavelength away so that the anchor and boat are in the same water particle movements.

Gemini, in survival conditions, is best just left without a sea anchor. Pull the sails down, pull the centerboards up, and turn the wheel so that the boat will be turning into the waves. If you prefer, a sea anchor is acceptable if you just want to stop and do not want to be blown to leeward.

**Lightning**

The effects of lightning on a boat can vary wildly. If a boat is going to be completely grounded, everything on the deck must be connected together and connected to a 12" square steel plate, with 3/4" bolts. All the equipment used must be capable of handling 100 million volts, 100,000 amps of current, and temperatures up to 10,000° centigrade.

Lightning does not travel in straight lines. If it strikes the boat at the shroud, it will jump to the next metal object before it will follow the shortest path through wires to the ground plate. If there is no grounding on the next metal part, the lightning will go through the hull to the water. Grounded

boats are struck more often than ungrounded boats. The main purpose for grounding is to protect people. The height of the mast gives a cone of protection with the base the same diameter as the height of the mast.

In over 800 Geminis, only a very few have been hit by lightning. People inside one boat reported a loud bang, all fuses being blown, everything magnetic demagnetized, some electronics lost, and for the next year reported strange problems - however there was no evidence of the actual lightning strike. Another Gemini showed obvious signs of a strike coming down the backstay and jumping to the rudders. Another had electronic problems and magnetic problems. None showed severe signs of a lightning strike. In an ungrounded boat, if a Gemini is in the vicinity of a lightning strike, there will still be a magnetic pulse induced in metal conductors that will destroy electronics and demagnetize magnets.

Lightning is normally cloud-to-cloud but occasionally there is a discharge to the ground. When lightning starts from a cloud, instantaneously there are feeders sent up from all high points on the ground. The lightning will connect with one of the feeders and that will be where the lightning strikes. These feeders need to be a better conductor of electricity than air. A lightning rod is normally metal, well grounded to earth with metal strap.

The worst thing to do is to have a badly grounded boat that will start the feeder lines, but will not be capable of handling the huge return current. Hanging starter cables off the backstay into the water is one example of bad grounding.

If you suspect a storm is coming, turn the radio to an AM station to listen for static associated with lightning strikes. Listen to the weather reports for the latest forecast. Watch for distant lightning. Listen for distant thunder. You may hear the thunder before you can see the lightning on a bright day. Seldom will you hear thunder more than five miles from its source. That thunder was caused by lightning 25 seconds earlier. The sound of thunder travels at one mile per five seconds. The best advice when faced with a lightning storm is to get to shore as soon as is possible.

**Care and Cleaning of Fiberglass**

For general cleaning, we have found a cup of Tide clothes detergent and hot water an effective cleaner. On average, it takes two buckets of hot water to clean the boat, each with a cup of Tide. Spray Clorox is also a good cleaner. Acetone may be necessary to remove resins, glue, or sealers used to manufacture the boat. Keep acetone away from vinyl, paint, and the windows. Older gelcoat may de-

## ***Gemini 105Mc Owner's Manual***

velop a chalky appearance. Waxes may reduce this but it is only cosmetic. The gelcoat used on the Gemini are "buff-back" and can be compounded to bring the color back. Commercial cleaners are available for removing oil, fuel, and metal stains on the hulls. Once the stain is removed, the cleaner should be washed off.

### **Bottom Paint**

Gemini is delivered with bottom paint (Interlux BottomKote Black 779). However, the problem with new boats is that the fiberglass is new and still releasing Styrene. It is difficult to get bottom paint to stick, even with coarse sanding. The procedure we follow is recommended by Interlux. We use Solvent Wash 202 to remove traces of the mold wax. This is done using many rags and taking care not to simply dilute the wax and smear it over the bottom. No-sand primer is then painted on the bottom. As soon as the no-sand primer is dry we paint on Fiberglass Bottom Kote. The bottom is not sanded as that will damage the gelcoat.

There are two types of bottom paint. Paint with copper in it at various percentages and a paint that slowly washes off called an ablative paint. The copper-type paint works well for the first 6 weeks because the copper is at the surface. As the surface copper dissolves the bottom paint starts to lose its efficiency. Unfortunately, applying numerous coats is a waste of time. This loss of efficiency is true of all bottom paints, even popular paints such as Trinidad.

The ablative bottom paints like Interlux CSC work well because as the paint is worn off new copper is exposed. The more coats that are applied the longer the paint will last. These types of paint will last many years. We recommend Interlux Micron Extra 5693 Black for the Chesapeake Bay area.

Because Trinidad and Interlux CSC are soft paints they will fall off easily if the hull is new and still releasing styrene.

The system applied to Gemini from new will start to lose its efficiency in the first few months and will need repainting in 9 months. At 9 months, there is no need to remove the original paint. Simply remove the barnacles and any growth, power wash, and allow to dry. If any voids are discovered below the water line, fill with epoxy. If any voids are discovered above the water line, fill with gelcoat paste. If necessary, lightly hand-sand any white areas and paint on Interlux CFC right on top of the existing bottom paint. Paint the centerboards and rudders in the same manner as the hulls.

We highly recommend keeping up with scheduled bottom cleaning and painting.

## ***Care and Cleaning of Fiberglass***

For more information on bottom painting—see the bottom paint FAQ on page 59 of this manual.

### **Blisters**

Many years ago blisters were probably caused by inferior, perhaps filled resins. A few years ago a new problem started. With the explosion of the small powerboat market, resin and gelcoat manufacturers started to reformulate their resin for rapid cure. With these resins a small hull could be gel coated in the morning and be ready for release in the evening. Unfortunately, a larger, more complex hull could take several hours to just gelcoat. The skin-coat could also take several hours and the skin-coat could not be applied until all the gelcoat was cured. The main lay-up would comprise several layers. Normally all these layers are applied at once. With these newly formulated rapid cure resins, the molecular interlaminar bond between the gelcoat and the skin-coat and then the main lay-up was not as good as it could be. However, because the main lay-up was all applied at once, there would be no suspect interlaminar bond in the main lay-up. If there were any problems with these boats the problem would be obvious within two years. Coating with epoxy was a good cure. It was not advisable to use sand blasting. Simply removing any loose surface was suitable.

Recently, resin manufacturers have developed premium gelcoats, vinylester resins, and fine fiberglass veils. Vinylester resins are the most waterproof. Gemini has a 20-mm veil with vinylester resin applied just behind the gel coat and has not experienced any major problems with blistering.

However, it must be understood is that there is no such thing as a totally waterproof resin. Eventually water will penetrate all fiberglass hulls. It is possible that as the water penetrates the hull, any impurities can be dissolved, forming a thick liquid that will expand to form a blister. If this should happen it will be isolated and should simply be ground out and the void filled with low-shrink waterproof putty.

As described in the Construction portion of this manual, the Gemini is a difficult boat to build. Only the best materials are used. Applying the fiberglass to vertical surfaces from several feet away using a 6' pole on a roller, can produce a situation where there are air voids between the main lay-up and the skin or gelcoat. When the boat comes out of the water for storage or repainting, if there are any air voids under the gelcoat they will be noticeable as a blister. These blisters should simply be ground out and the void filled with low-shrink putty. The boat can then be bottom painted. These blisters are almost certainly not structural and can be easily fixed.

**Blisters on the Deck or Interior**

It is possible that with use, small parts of the gelcoat on the deck or interior may chip away like an eggshell, exposing a dark void below the skin. These are not structural and go with the territory of a hand made fiberglass product. The surface area of Gemini is 600 square feet with every inch hand-rolled. When the polyester resin is applied over the fiberglass mat, because of the initial stiffness of fiberglass mat, air is trapped below the mat. The mat is saturated with polyester resin and rolled with a small metal roller into all the corners. The air is rolled out from under the mat. If in places the air is not detected and is left under the mat, the trapped air is a void that will expand or break out at some time in the future. There is no way these voids can be produced with time. All the voids are there to begin with.

Any voids should be opened out completely and ground. The surrounding gelcoat should be sanded with 120-grit paper in a ring 3/4" around the void. The void can then be filled with a catalyzed Cabosil/Gelcoat paste. The paste is catalyzed with 2 to 5 % of MEKP liquid catalyst and trowled into the void. Cabosil is a very fine powder of fumed silica that magnetically holds together when mixed into gelcoat. The resulting non-drip paste is very fine so the cured paste can be polished just like the original gelcoat.

Unfortunately, as the paste cures it shrinks slightly; so either excess paste is applied or the void is filled level three times after hardening. This paste, because it shrinks when curing, is not advisable below the water. The water can enter through the void left between the shrinking paste as it cures, and the side of the void. The cured paste is sanded almost level using 120 grit paper (80 grit is acceptable providing this paper is only used to remove excess and then 120 paper is used to bring down close to level. 180 then 360 paper is used to level and finely sand the repair. The repair is then compounded to gloss the repair like the surrounding gelcoat. The reason for sanding 3/4" around the void before applying the paste is to blend the repair into the surrounding gelcoat.

**Care of Cleaning of Teak**

All interior teak on the Gemini is covered with several coats of Tip Top teak oil. The teak oil is applied with a rag and simply wiped over the teak. The surrounding surfaces are wiped with a clean rag to remove the excess teak oil.

Mat varnish is another possible treatment for the teak. This is a time consuming process as all the teak has to be masked and the surface must be sanded between coats. At least 3 coats must be

applied. The factory does not provide the option of varnishing the interior teak wood.

**Window Care and Treatment**

The windows around the cabin are made of Lexan® polycarbonate MR10 with a chemical and scratch resistant surface. These windows should be washed with **only warm soapy water**. The pilothouse window is clear while the other windows are a grey-smoked color (Color #2074). Should you ever want to replace a window, Lexan sheets can be purchased from your local plastics supplier.

If the film on the polycarbonate is broken, chemicals will degrade the polycarbonate. Polycarbonate will expand 1/16" per foot. Therefore an 8' window will expand 1/2". Fortunately, the surrounding surface will also expand a little. The expansion can make maintaining a proper seal around the window difficult. The Gemini's windows are sealed with a GE or Dow Corning silicone. The secret to the success of this material is to get the silicone at least 1/8" thick between the window and the cabin sides. This is achieved by creating a silicone dam on the insides of the screws. Liberal amounts of silicone are applied between the dam and the edge of the window under the window. The excess silicone is wiped off, and previously applied masking tape is removed leaving a straight line with the silicone tapering out from the window.

**Lexan MR10 Do's and Don'ts**

- Don't clean with gasoline, Benzene, acetone, or carbon
- Don't clean with abrasives or highly alkaline cleaners
- Don't ever attempt to clean by scraping with squeegees, metal, or a razor
- Don't clean in direct sunlight or highly elevated temperatures
- Do clean with Joy, Top Job, Windex with Ammonia D, Palmolive Liquid
- If necessary, do remove stickers with kerosene

No maintenance is required for the window seal.

**Hauling and Trucking the Gemini**

With the Gemini's straight keels, hauling the boat is a relatively easy procedure. The straps of the lift will go right under both hulls and since the straps do not stretch there is no tendency for them to crush the hulls.

Once the boat is out of the water it can simply be placed on top of four piles of cinderblocks with four blocks in each pile; making a square pile. The blocks should be 16' apart front to back. Place the front two piles of bricks under the bulkhead at the back of the buoyancy tanks in the bow. The correct placement is parallel with a line 4" forward of the toilet through hull on the port side.

Place the rear two piles under the front edge of the aft bed. The correct placement is a parallel line 1' ahead of the outside aft cabin window which is inline with the bulkhead in front of the aft bunk.

Place a piece of 1" thick plywood about 18" square (a 2 x 12 cut to 30" running for and aft would be even better) between the blocks and the hull. Be sure to bring the bow of the boat down first (until the straps are loose) and then the stern. When the stern is about 1" away from the blocks, insert shims so that each hull is an equal distance from the blocks. The aim is to distribute the boats weight over the four blocks evenly. Wedge under the wood so that the plywood follows the angle of the bottom of the hull. It is important to evenly distribute the load over as large an area as possible so as not to place a point load on the hull.

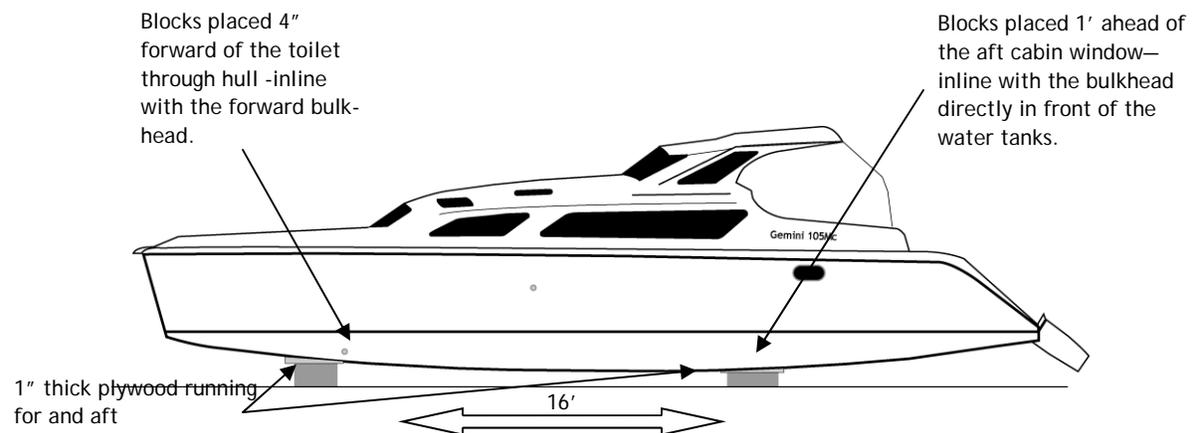
**Trucking the Gemini**

At 14' wide, the Gemini can be trucked anywhere far easier and for less expense than any other cruising catamaran. However, the transom and rudders must be lifted above the rear wheels of the truck.

The flat bed of the truck is normally 8' wide but the keels of each hull are 10' apart. This requires two large timbers placed on the flat bed for the boat to sit on. These timbers should be 10" x 12" x 14' long. They are placed 16' apart on the flat bed. The front timber will be directly under the bulkhead at the back of the forward buoyancy tanks. (roughly 6' back from the bow) The rear timber will be under the bulkhead in front of the aft bunks. (located at the same places as the cinderblocks when storing the boat) Then a series of wedges about 4" high must be nailed to the timbers at the sides of the hull to give additional side support and stop the boat from moving. Place carpet between the hulls and these timbers and wedges to prevent any scratching of the gelcoat.

Once the boat is in place, use a chainsaw to remove as much excess wood from the ends of the timbers as possible. Tie the boat down with lines going from the four corner cleats diagonally down and back to the flat bed. This will prevent movement up and down as well as back to front. The timbers must also be chained to the truck. Also, to stop the centerboards from hitting the road should they fall down, take a line from the stanchion above the centerboards down under the hulls to the truck.

**Blocking the Gemini**



**Winterizing the Gemini**

Winterizing the Gemini involves taking down all the sails and making sure each of the water lines in the boat won't freeze.

To winterize the engine and air conditioner you will need:

- 3' section of garden hose with a male fitting
- 4 Quart bucket
- Antifreeze
- Fresh Water

This job is most easily accomplished by two persons. One person will start and stop the engine while the second person handles the coolant intake. You can attach a closing stopcock male connector to the hose end as a backup to the seacock. Fill the bucket with a 50/50 mixture of fresh water and antifreeze. Attach the hose with the male fitting to the female receptacle on the three-way engine cooling water seacock. Turn the seacock handle to the middle position which will draw from the hose. Place the unattached end of the hose in the bucket. Starting the engine will immediately start drawing the coolant mixture into the engine lines. As soon as the bucket is empty, turn off the engine by raising the silver kill-switch.

**Winterizing the Air Conditioner**

Winterizing the air conditioner is much the same as winterizing the engine. Instructions are the same as those covered in the Air Conditioning section of the manual—with the exception of drawing from a 50/50 mixture of water and engine coolant.

The following operational checklists are for reference only and may not include all possible actions. We suggest using these lists as an example to which you can add your own items.

**Before Getting Underway**

- Make sure your registration certificate is visible or documentation is onboard and available.
- Make sure you have charts of the area and compass on board. Check marine weather forecast.
- Coast Guard Safety Kit (see page 36) and all safety equipment onboard in working order.
- Make sure engine cooling water seacock is in the "open" position—check for cooling water in
- Turn battery switch to position 1 or 2 and turn instruments to the "On" position.
- Lower one centerboard for slow speed maneuvering.
- Lower drive leg for motoring—periodically check and re-grease drive leg lock claw.
- Confirm location and quantity of PFD's for each person aboard and place throw-able PFD in cockpit.
- Check engine oil, transmission oil, coolant, and fuel levels and visually inspect engine hoses, belts, and engine bilge.
- Start engine, check for cooling water exhaust, and allow engine to come up to operating temperature.
- Turn off master shore power switch and disconnect shore power cable.
- Turn on VHF radio—turn to the emergency channel: 16.
- Check to make sure bilges are dry.
- For an extended voyage, issue a float plan with a friend. Include when and where you are leaving from, when and where your destination is, and a description of your boat.
- If you have air conditioning, turn the cooling water seacock to the "upright" position so as not to lose the system's prime.
- A second person onboard should be capable of operating the boat, including the drive leg, engine, and radio.
- Remove leeward dock lines and then windward dock lines before leaving the slip.

**Before Leaving the Boat**

- Raise and tighten both centerboards in the full up position—lower the rudders.
- Raise drive leg and close off red valve by the pump.
- Turn the main battery switch to "off."
- Replace sail cover and ensure all hatches, windows, and doors are shut and locked completely.
- If leaving for an extended time, turn refrigerator off and then turn propane off at the bottle.
- If leaving briefly (and you want to leave the refrigerator running on propane), make sure refrigerator is running through the Xintec Propane Detection system—and leave the batteries "On."
- Double-check all dock lines.
- If you have air conditioning, be sure the cooling water seacock is the "open" position before
- Lock main cabin door.

**Minimal Toolkit to Have Onboard**

- Set of screwdrivers—various sizes of flat head and philips head
- 8" Adjustable Wrench
- 8" Vice Grip Wrench
- Socket Set—Metric
- Wrenches—Metric
- Oil Filter Wrench

## ***Gemini 105Mc Owner's Manual***

### **Air Conditioning**

Model M16 RC

Mermaid Marine  
2651 Park Windsor Dr. Ste 203  
Fort Myers FL 33901  
800.330.3553  
<http://www.mmair.com/>

### **Batteries**

East Penn Manufacturing Company, Inc.  
Deka Road  
Lyon Station, PA 19536 USA  
Main Phone: 610-682-6361  
Customer Service: 610-682-4231  
Fax: 610-682-4781  
Email: [eastpenn@eastpenn-deka.com](mailto:eastpenn@eastpenn-deka.com)  
<http://www.eastpenn-deka.com/index.html>  
Where to Buy:  
<http://www.eastpenn-deka.com/cgi-bin/distributor.pl>

### **Cabin Heater (500H)**

Heater Craft  
P.O. Bo 1149  
Post Falls ID 83854  
(208) 687-4400  
<http://www.heatercraft.com/>

### **Compass**

Ritchie HV-76—Helmsman (Bulkhead Mount)  
Ritchie Navigation  
243 Oak Street  
Pembroke, MA 02359  
Phone: 1-781-826-5131  
Fax: 1-781-826-7336

Cover Available: HC 80—Helmsman  
Light Assembly: SH-0102XSP

### **Cushions / Canvas Work / Enclosures**

Almo  
P.O. Box 944  
1311 Serendipity Dr.  
Millersville MD 21108  
410.987.2121

### **Engine**

Westerbeke Engines  
Engines1  
3504 Shipwright Street  
Portsmouth, VA 23703  
(800) 548-6252  
<http://www.engines1.com>

Marine Muffler  
185 East 9th Street

Apopka FL 32703  
407.886.1144  
Muffler: SA-200-0606  
90° Elbow: EL-020-0090

### **Engine Thru-Hull / Flush Valve**

Model 931274 1 1/4"  
Forespar Products Inc.  
22322 Gilberto  
Rancho Santa Margarita, CA 92688  
(949) 858-8820  
[sales@forespar.com](mailto:sales@forespar.com)  
<http://www.forespar.com/>

### **Fans**

Part Number: 87176 Turbo Fan  
Hella Inc.  
201 Kelly Drive  
Peachtree City GA 30269  
770.631.7500

### **Faucets (Galley/Head/Shower)**

Galley Faucet: Part 104500-MR  
Head Faucet: Part 10410  
Shower: Part 14120

Scandvik  
423 4th Place SW  
Vero Beach FL 32962  
800.535.6009  
[www.scandvik.com](http://www.scandvik.com)

### **Fuel Tanks / Gauges**

Fuel Tanks: Part TP18T  
Fuel Gauges: Part 576 ERU

Tempo Products  
P.O. Box 901443  
Cleveland OH 44190-1443  
(440) 248-1450  
<http://www.tempoproducts.com/>

### **Fuel / Waste Tank Caps**

Scandvik—see Faucets

### **Galley Toe Tip Pump**

Whale Water Systems  
One Second Street  
Peabody, MA 01960  
(978) 531-0021  
<http://www.whale.ltd.uk/>

### **Gear Lever / Throttle / Steering Cables**

Teleflex Morse Motion Systems  
640 North Lewis Rd.

## ***Gemini 105Mc Owner's Manual***

Limerick, PA 19468  
Phone: 610-495-7011 Fax: 610-495-7470  
Gear/Thottle/Kill Switch: Part #CC63317

UFlex Corp.  
26 S. Dawson Street  
Seattle WA 98134-2406  
(206)762-1240  
<http://www.uflexusa.com>  
B73 Single Lever Top Mount Engine Control  
Steering Cables

### **Hatches**

20 X 25 (CE Approved)  
Square Hatches: N1039-10AX  
Trim Ring: NT2039 Off W  
Hatch Screen: NS2039-EX

6.75" X 13.69" (CE Approved)  
Small Hatches: N5512-W-SA  
Small Ring: P3000-SP  
Small Hatch Screens: P3000-13  
Continued on Next Page...

20" X 25" (CE Approved)  
Head Hatch w/ Built-in Screen  
N1039-1S-AX

Bomar Inc.  
SO. West St P.O. Box 1200  
Charlestown, NH 03603  
(603) 826-5791  
<http://www.pompanette.com>

### **Hot Water Heater**

Atwood Mobile Products  
4750 Hiawatha Drive  
Rockford, IL 61103  
815-877-5700  
[atwoodmobile.com](http://atwoodmobile.com)

### **Instruments**

Raymarine  
AutoPilot: ST4000 + MKII  
Tridata: ST60  
Wind: ST60  
Telephone: 603 881 5200  
Toll Free: 800 539 5539  
Facsimile: 603 864 4756

### **Life Lines & Pelican Hooks**

Performance Yacht Systems  
222 Severn Avenue Suite 9  
Annapolis MD 21403  
(410) 268-9696  
[PYacht.com](http://PYacht.com)

### **Pressure Water Pump**

Flojet

### **Mast and Rigging**

Selden Mast  
4668 Franchise St  
N. Charleston, S.C. 29418  
(843) 760-6278

### **Sails**

Bierig Sails  
11092 Freeport Lane  
N. East PA 16428  
814.459.8001

### **Shower Sump Pump**

220 Gulper-Whale  
978 531 0021  
800 883 3372  
One, Second Street  
Peabody, Massachusetts 01960

### **Sillette Sonic Drive Leg**

Sillette Marine  
Alan Plant  
011-44-208-715-0100  
182 Church Hill Road  
North Cheam Sutton Surrey  
SM3 8NF UK  
[www.sillette.co.uk](http://www.sillette.co.uk)  
[sales@sillette.co.uk](mailto:sales@sillette.co.uk)

### **Stainless Work— Stanchions / Rails**

**Stanchions : 24" Double: 8575**  
**Stern Handrails: 5575**  
**Visor: dc 00929**

Tops in Quality  
314 East Huron Blvd  
P.O. Box 148  
Marysville Michigan 48040  
(810) 364-7150

### **Rub Rail**

PVC Rub Rail—40': 1051D0732-0040B

Barbour Plastics  
P.O. Box 2158  
Brockton MA 02405  
(508) 583-8200  
[www.barbourplastics.com](http://www.barbourplastics.com)

### **Refrigerator**

## ***Gemini 105Mc Owner's Manual***

4 Cubic Foot Refrigerator: RM 2452  
Dometic  
P.O. Box 7777  
South Bend IN 46634-7777  
(574) 389-3702  
<http://www.dometic.com/>

### **Solar Panels**

Rail Mounts: Part #123RM  
20' 10 Gauge Wire: Part #OPWK10-20  
Solar Panel: Part #Sharp123  
SunSaver Regulator: Part #SS-10

Power Up Inc.  
12230 Eastern Ave.  
Chase MD 21220  
410.344.9206  
866.346.1391

### **Stove**

Leisure Products  
Holly St Astley Bridge  
Bolton BL186R England  
0204 308 458

### **Toilet**

Model: PHII-LH  
Raritan Engineering Co.  
530 Orange Street, PO Box 1157  
Millville, NJ 08332 USA  
856-825-4900  
<http://www.raritaneng.com>

### **Trim—Door and Window**

Trimlock  
P.O. Box 6180  
6855 Hermosa Circle  
Buena Park CA 90622-6180  
(714) 562-0500

### **Water Tank Caps**

Perko Inc.  
16490 N.W. 13th Ave  
Miami FL 33169-5707  
(305) 621-7525  
[www.perko.com](http://www.perko.com)

### **Winches**

Model: 40 AST Ocean Winches  
Lewmar IMI  
New Whitfield St  
Gulford CT 06437  
(203) 458-6200  
<http://www.lewmar.com/>

### **Windows**

**Lexan ¼" MR10**

### **Xintec Propane Control Panel**

Fireboy Xintec Saftey Systems  
(Includes control panel, sensors, and solenoid)  
P.O. Box 152  
Grand Rapid MI 49501-0152  
(616) 735-9380

## ***Gemini 105Mc Owner's Manual***

### **Version Update History**

1.0 February 1, 03  
Initial Release

1.1 February 10, 03  
Grammatical corrections.

1.2 February 21, 03  
Added Sillette Marine Spare Parts Kit Information

1.3 March 3, 03  
Small correction to blocking the Gemini— forward and backward blocks are placed 16' apart. The forward support should be located 4" forward of the toilet through-hull.

1.4 April 4, 2003  
Updated cabin heater information with BTU output and make/model information.

1.5 April 15, 2003  
Updated Air Conditioning description.

1.6 April 24, 2003  
New addendum with instructions for removing and replacing the oil drain plug on the Sillette drive leg. Added Westerbeke Authorized Service Center info and engine part numbers.

1.7 July 7, 2003  
Added new toilet illustration and description for the combination shower drain pump/bilge pump. Added air conditioning system overview illustration.

1.8 July 21, 2003  
Updated Lexan window care and maintenance, operational checklists, and Raymarine contact information.

1.9 October 21, 2003  
Added description and illustration of how a propane refrigerator works to the addendums section.

2.0 January 22, 2004  
Added Westerbeke Diesel Engine 30B Quick Notes covering breaking the engine in, oil changes, fuel filters, and the Westerbeke Spare Parts Kit.

2.1 May 28, 2004  
Added Sillette drive leg propeller specifications and recommended tools list to the Operational Checklist. Updated rudder usage guidelines.

2.2 July 21, 2004  
Updated Westerbeke engine FAQ with advise on prolonged cranking. Updated solar panel information for new panel and configuration. Updated battery section with information on checking battery levels. Updated Sillette propeller specifications. Added bottom paint FAQ addendum. Corrected mast stay measurements.

2.3 August 23, 2004

Add Aqua Signal mastlight bulb specifications and Raritan Marine Head model information.

2.4 November 11, 2004

Added new Dometic refrigerator operation description, updated third-party contact information, updated sail cloth weights in Sails and Sailing section.

2.5 March 4, 2005

Added anchor line chaffing guard information and throttle/gear shift selector model information. Added additional information on the sails—direct from Bierig Sail Makers.

**Removing the Sonic Drive Oil Drain Plug**

Sillette-Sonic Ltd  
182 Church Hill Road, North Cheam, Sutton  
Surrey SM3 8NF United Kingdom  
+44 (0)20 8715-0100

[sales@sillette.co.uk](mailto:sales@sillette.co.uk)  
<http://www.sillette.co.uk>

1. The plug located in the skeg is ¼" BSPT (British Standard Pipe Thread) and uses a ¼" A/F hexagon Allen key to remove. You should use a key with at least 6" / 150mm of arm and not the cheaper short series key with only 3" / 75mm of arm. Sillette can provide a long series set for \$23.00 plus shipping and taxes
2. To remove - clean the area around the plug using a wire brush. Insert and fully locate ¼" A/F Allen key and unscrew counter-clockwise.
3. If resistance is too great to unscrew, use a steel punch 7/16" / 11.5mm diameter about 4" / 100mm long, preferably with a raised point one end 3/16" diameter to roughly locate in the hexagon hole. Then, using a large engineers or club hammer, while holding the punch with mole grip or pliers, and while supporting the opposite side of the drive leg, holding the punch firmly against the face of the drain plug and with a firm and determined force, strike the punch with the hammer. This may be repeated several times. After each blow, re-insert the Allen key and attempt to unscrew. Do not strike the Allen key with the hammer as this has little affect and usually damages the hexagon in the plug.
4. If the process fails to remove the drain plug, then apply heat to the aluminum around the plug until warm to the touch to encourage it to expand. Note if you heat the plug, the heat will cause it to expand and become even tighter in the aluminum. Then repeat step 3.
5. To drain the oil, it is necessary to remove the filler plug #616/30, which is located on the top of the leg.
6. When refitting the drain plug, use PTFE/Teflon Tape and keanol grease on the threads. Centralize the taper plug into the hole and turn clockwise. Resistance should be light until fully inserted. Note - the taper plug is difficult to cross thread accidentally as the plug draws itself in on the thread when turned clockwise. Do not use copper based anti-seize compounds as this causes corrosion in the salt water environment.

**Comments:**

Sillette has never failed to remove a drain plug by methods 2, 3, or 4 unless the hexagon had been previously damaged.

If the hexagon is damaged, the plug can be drilled out using a masonry drill (carbide tipped or similar). Use at slow speed with plenty of coolant. Start with a small size, gradually increasing to 3/8" / 9.5mm. The remainder of the plug can usually be removed by using an "EasyOut" (tool with a left-hand spiral - available from any good tool supplier). If, however, you do not succeed with an "EasyOut", continue drilling to 11.5mm diameter and clear remaining plug material using a ¼" BSPT or ¼" NPT tap. Ensure twist drill remains central and square when drilling. The oil usually flushes out the drillings. If in doubt, flush through with more oil.

If the thread is damaged, re-drill to 15mm diameter and re-tap 3/8" BSPT/NPT and fit oversize 3/8" BSPT/NPT taper plug.

Remember, "On Board Spares Kit", spare drain plugs, and the correct Allen key set are available from Sillette.

Sillette uses a nickel plated high tensile steel taper plug and have done so since 1975. The plug causes less corrosion to the aluminum and the hexagon socket is stronger than stainless steel. Once removed and replaced for the first time - fill the end with silicone and allow to cure which seals off the plug from the marine environment. Consider replacing every two years. A4/316 stainless plugs are available, but remember they are less durable and react more with the aluminum skeg casing.

## Gemini 105Mc Owner's Manual

### How a Propane Refrigerator Works

The continuous absorption type of a cooling unit is operated by the application of a limited amount of heat furnished by gas. No moving parts are employed. The unit consists of four parts: the boiler, condenser, evaporator and absorber.

When the unit operates on propane, the heat is supplied by a burner which is fitted underneath the central tube (A).

The unit is charged consisting of a quantity of ammonia, water and hydrogen at a sufficient pressure to condense ammonia at the room temperature for which the unit is designed. When heat is supplied to the boiler system, bubbles of ammonia gas are produced which rise and carry with them, quantities of weak ammonia solution through the siphon pump - (C). This weak solution passes into the tube (D), while the ammonia vapor passes into the vapor pipe (E), and on to the water separator. Here any water vapor is condensed and runs back to the boiler system, leaving the dry ammonia vapor to pass to the condenser. Air circulating over the fins of the condenser removes heat from the ammonia vapor to cause it to condense to liquid ammonia from where it flows into the evaporator.

The evaporator is supplied with hydrogen. The hydrogen passes across the surface of the ammonia and lowers the ammonia vapor pressure sufficiently to allow the liquid ammonia to evaporate. The evaporation of the ammonia extracts heat from the evaporator, which in turn extracts heat from the food storage space, as described above, thereby lowering the temperature inside the refrigerator.

The mixture of ammonia and hydrogen vapor passes from the evaporator to the absorber.

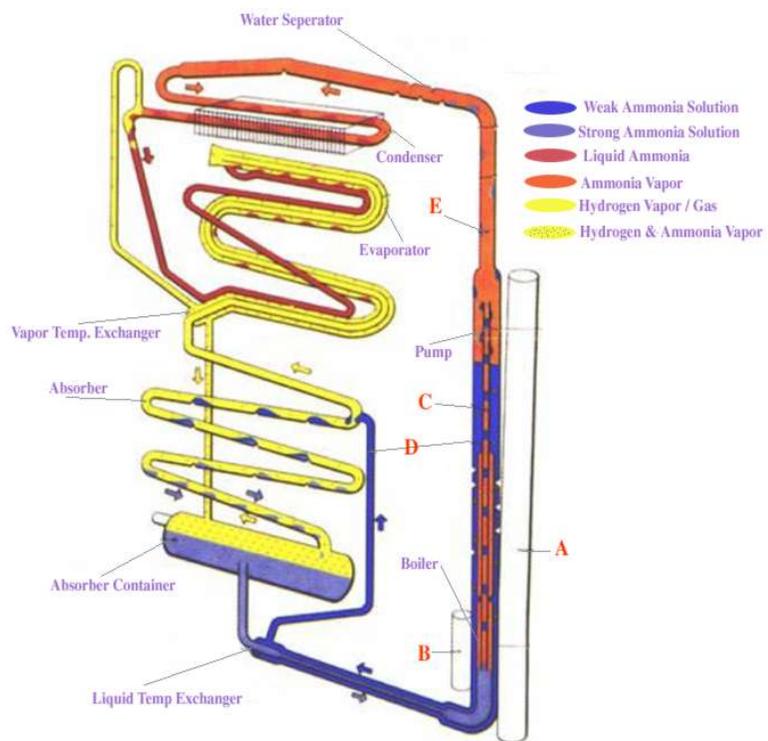
Entering the upper portion of the absorber is a continuous trickle of weak ammonia solution fed by gravity from the tube (D). This weak solution, flowing down through the absorber, comes in contact with the mixed ammonia and hydrogen gases which readily absorbs the ammonia from the mixture, leaving the hydrogen free to rise through the absorber coil and to return to the evaporator. The hydrogen thus circulates continuously between the absorber and the evaporator.

The strong ammonia solution produced in the absorber flows down to the absorber vessel and from there to the boiler system, thus completing the cycle of operation. The liquid circulation of the unit is purely gravitational.

## How a Propane Refrigerator Works

Heat is generated in the absorber by the process of absorption. This heat must be dissipated into the surrounding air. Heat must also be dissipated from the condenser in order to cool the ammonia vapor sufficiently for it to liquefy. Free air circulation is therefore necessary over the absorber and condenser.

The whole unit operates by the heat applied to the boiler system and it is of paramount importance that this heat is kept within the necessary limits and is properly applied.



**Westerbeke Model 30BTHREE Diesel Engine Parts List**

Alternator	30594		Panel,Instrument-Captain	36473
Belt,Sea Water Pump			Panel,Instrument-Admiral	36843
Belt,STD Alternator	38527		Preheat & Start Switch	33764
Circuit Breaker	24683		Pump,Fresh Water	37015
Dipstick	37072		Pump,Mounting Gasket	36957
Filter,Lube Oil	36918		Pump,Rebuild Kit	N/A
Filter,Fuel Oil	30200		Pump,Sea Water	33636
Filter,Electric Lift	NA		Pump,Mounting Gasket	30326
Gasket,Head	36969		Pump,Impeller Kit	34440
Gasket,Oil Pan	36988		Pump,Repair Kit	34466
Gasket Set,Upper	37116		Pump,Seal	33043
Gasket Set,Complete	37117		Pump,Fuel Lift	37828
Glowplug	36961		Remote Lube Oil Filter	40078
Harness 15 FT. EXT 8	30760		Silencer,Air Intake	36342
Harness 15 FT. EXT 4	36557		Solenoid,Fuel Shut Off	
Heat Exchanger	37564		Solenoid,Preheat	24639
Heat Exchanger End	22850		Spare Parts Kit A	37118
Heat Exchanger Gas-	22851		Spare Parts Kit B	37119
Injector	37091		Starter Motor	34552
Injection Pump	37103		Starter Solenoid	36218
Injection Hardware Kit	37121		Tank,Coolant Recovery	24977
Injector Nozzle	36935		Thermostat	37043
Injector Return Line	37099		Thermostat Mounting	36956
Isolators, Front	40621		Valve Cover Gasket	37007
Isolators, Rear	303062		Voltmeter	37605
Manual,Operator	36906		Water Temperature	37601
Manual,Partslist	37115		Water Temperature	35109
Manual,Technical	37600		Water Temperature	37493
Oil Pressure Switch	Below		Water Inj. Exhaust Elbow 45	37402
Oil Pressure Meter	37603		Water Inj. Exhaust Elbow 90	37401
Oil Pressure Sender	24132		Zinc	11885

A.) Oil Pressure Switch - 34761 to Dec. 1988 - 37323 From Dec. 1988

## ***Gemini 105Mc Owner's Manual***

## ***Westerbeke Service Centers***

To find the closest Westerbeke Authorized Service Center, contact your local Westerbeke distributor.

**A.E.R. MARINE SUPPLY CO.** Distributor Covers: Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, Texas.

P.O. Box 349  
2301 Nasa Road One  
Seabrook, TX 77586

**Contact Information:**

Main Contact(s): Mr. Richard S. Miller  
Phone: (281) 474-3276 Fax: (281) 474-2714  
Email: rsmiller@aersupply.com, dstevens@aersupply.com

**COOK ENGINE COMPANY** Distributor Covers: Oregon.

530 NE Tomahawk Is. Dr.  
Portland, OR 97217

**Contact Information:**

Main Contact(s): Ms. Nicki Hudson  
Phone: (503) 289-8466 Fax: (503) 286-2836  
Email: sales@cookengine.com  
Web: www.cookengine.com

**ENGINES 1** Distributor Covers: Delaware, District of Columbia, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia.

3504 Shipwright St.  
Portsmouth, VA 23703

**Contact Information:**

Main Contact(s): Mr. Tim Walters  
Phone: (757) 673-7200  
Fax: (757) 673-7211  
Email: engines1@wbdiesel.com  
Web: www.engines1.com

**HANSEN MARINE ENG. INC.** Distributor Covers: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York (East of 181), Pennsylvania (East of 181), Rhode Island, Vermont.

Tioga Way, P.O. Box 1106  
Marblehead Business Park Marblehead, MA 01945

**Contact Information:**

Main Contact(s): Mr. Bob Hansen, Mr. Fred Knowles  
Phone: (781) 631-3282 Fax: (781) 639-1467  
Email: hansen@hansenmarine.com  
Web: www.hansenmarine.com

**MARYSVILLE MARINE NORTH** Distributor Covers: Illinois, Indiana, Michigan, New York (West of 181), Ohio, Pennsylvania (West of 181).

1551 Michigan Avenue  
Marysville, MI 48040

## ***Gemini 105Mc Owner's Manual***

## ***Westerbeke Service Centers***

### Contact Information:

Main Contact(s): Mr. John Dillon  
Phone: (810) 364-7653 Fax: (810) 364-4112  
Email: marketing@marysvillemarine.com  
Web: www.marysvillemarine.com

### **MARYSVILLE MARINE SOUTH**

Distributor Covers: Kentucky, Tennessee.

127 Industrial Drive  
White House, TN 37188

### Contact Information:

Main Contact(s): Mr. Matt Harvey  
Phone: (615) 672-1142 Fax: (615) 672-8084  
Email: mharvey@marysvillemarine.com  
Web: www.marysvillemarine.com

### **MARYSVILLE MARINE WEST**

Distributor Covers: Iowa, Minnesota, Nebraska, North Dakota, South Dakota, Wisconsin.

405 S. Thompson Rd.  
Sun Prairie, WI 53590

### Contact Information:

Main Contact(s): Mr. Brian Hunter  
Phone: (608) 825-3878 Fax: (608) 825-2790  
Email: bhunter@marysvillemarine.com  
Web: www.marysvillemarine.com

### **R.B. GROVE INC.** Distributor Covers: Florida.

261 SW 6th Street  
Miami, FL 33130-2991

### Contact Information:

Main Contact(s): Mr. Tom Piper, Mr. Chris Herting  
Phone: (305) 854-5420 Fax: (305) 854-0532  
Email: sales@rbgrove.com  
Web: www.rbgrove.com

### **SEA CHEST MARINE**

Distributor Covers: Alabama, Louisiana, Mississippi.

7385 West Broadway  
New Orleans, LA 70124

### Contact Information:

Main Contact(s): Mr. Lawrence Sintes  
Phone: (504) 288-8431 Fax: (504) 288-1758  
Email: l-sintes@hotmail.com

### **TDC EQUIPMENT**

Distributor Covers: Arizona, California (Southern), Hawaii, Nevada, Utah.

15886 Manufacture Lane  
Huntington Beach, CA 92649

### Contact Information:

***Gemini 105Mc Owner's Manual***

***Westerbeke Service Centers***

Main Contact(s): Ms. Cindy Tutt, Mr. Terry Brown  
Phone: (714) 373-8099 Fax: (714) 898-1996  
Email: tdcequip@ix.netcom.com  
Web: www.tdcequipment.com

**TRANS PACIFIC DISTRIBUTORS**      Distributor Covers: California (Northern).

1941 Walters Court  
Fairfield, CA 94533

Contact Information:  
Main Contact(s): Mr. Henry Bramhall, Mr. Arley Harty, Mr. Jeff Hemmerlin  
Phone: (707) 426-6670 Fax: (707) 426-0206  
Email: sales@marinegate.com

**GALLERY MARINE**      Distributor Covers: Alaska, Idaho, Montana, Washington, Wyoming.

717 NE Northlake Way  
Seattle, WA 98105

Contact Information:  
Main Contact(s): Ms. Barbara Jordan  
Phone: (206) 547-2477 Fax: (206) 547-2180  
Email: parts@gallerymarine.com

This addendum is intended as a FAQ (Frequently Asked Questions) resource for new Gemini owner's. For complete instructions on maintenance and care of your new Westerbeke 30B Diesel Engine, please read the included manual thoroughly.

### Breaking in Your Diesel Engine

Although current technology provides the means of manufacturing engine parts with unimaginable precision, the manufacturer still falls far short of achieving the near perfect fit that a proper break-in will provide. "Break-in," for the most part, is the allowance of the machined cylinder and ring surfaces to conform to each other's shape during engine operation. This conforming or "mating" of ring and cylinder surfaces is the ultimate goal of a proper break-in. "Mating" these two specific parts will produce a very tight seal in each cylinder. A tight seal is very important because it prevents the escape of unburned fuel and pressurized gasses into the crankcase, while further preventing crankcase oil from entering the cylinder above the top compression ring.

1. Start engine and run at fast idle, approximately 1500 RPM, and check the oil pressure. Run the engine for 30 minutes even though coolant may rise to operating temperature in a few minutes. If the coolant should "boil over," stop engine and allow to cool. Then start again and proceed as above.

2. Start engine again and make a test run, on the water at 1500 to 2000 rpm's, and rapidly accelerate to 3500 and decelerate to 1500 rpm's 10 times. Applying loads to the engine for short periods of time causes increased ring pressure against the cylinder walls and helps to seat the rings. This is especially important because you are "breaking-in" the engine with heavy-duty oils. The rapid deceleration increases vacuum and gives extra lubrication to the piston and ring assemblies.

3. When you have accumulated 25 to 50 hours of operation, change the engine oil and filter according to manufacturer's recommendations for oil type and filter number.

4. When required as per your manual, re-torque cylinder heads and manifolds to engine manufacturer's specifications in proper sequence. Readjust tappets if necessary. This job is typically performed by a qualified mechanic.

### Westerbeke Spare Parts Kit

Performance Cruising does resell the Westerbeke Spare Parts Kit - (A) - please make checks payable to Performance Cruising for a total of \$170.00 The kit includes:

- Kit A Zinc (2)
- Heat Exchanger Gasket
- Fuel Elements (2)
- Oil Filter
- Belt
- Fuel Hardware Kit
- Impeller and Gasket Kit

### Changing The Oil

Westerbeke recommends replacing the oil filter (Part 36918) with only the Westerbeke supplied oil filter. There is little price difference between the Westerbeke filter and off-the-shelf filters, but a major difference in the quality of the filter. For your engine's sake, use only the Westerbeke filter.

As for oil, the best choice is a heavy duty SAE 30 single grade oil for our all around operating conditions in the mid-Atlantic region. . The oil should be changed after the initial 50 hour break-in period and every 100 hours of operation or once a season which ever comes first. Synthetics oils are acceptable, but should not be used during the break-in period. Check your manual for exact instruction on how to replace the oil.

### Transmission Fluid

The Westerbeke transmission is filled with the same SAE 30 single grade oil as used in the engine. There is approximately 1 quart.

### Fuel Filters

Your Westerbeke 30B comes installed with one external fuel filter and an additional internal fuel filter. Westerbeke recommends changing the filters annually except if you have contaminated fuel, in which case you will need several filters. The external filter is a Racor Model 120AS. We recommend using a 30 micron filter for replacement—part #R12P. Additional replacement filters are part #R12S (2 micron) or R12T (10 micron).

### CAUTION: IN THE EVENT OF ENGINE TROUBLE:

If you encounter engine trouble and cannot start the engine, do not continue attempting to crank the engine without taking a precaution. Prolonged cranking

intervals without the engine starting can result in filling the engine mounted exhaust system with sea water coolant. This may happen because the sea water pump is pumping sea water through the cooling system during cranking. With prolonged cranking of the engine, the sea water can enter the engine cylinders by way of the exhaust manifold once the exhaust system fills. To prevent this from happening, close the sea cock valve supplying sea water while attempting to crank the engine. Once you have corrected the problem and the engine starts, stop the engine and open the sea water seacock to allow the flow of sea water to the engine.

**Scheduled Maintenance  
Daily (Before Use) Check**

1. Oil sump level
2. Coolant level
3. Fuel supply
4. Primary fuel filter/water separator
5. Panel gauges operation (indicating lights, alarms)
6. Transmission fluid level
7. Loose belts, clamps, fittings, wires

**Monthly**

1. Check zinc anode in heat exchanger

**After 50 Hours Initial Operation**

1. Change engine lube oil & filter
2. Replace fuel filter elements
3. Torque cylinder head bolts \*\*
4. Adjust valve clearances \*\*
5. Adjust drive belts
6. Check electrical connections
7. Lubricate control cables
8. Change transmission fluid
9. Check idle speed \*\*

**After Every 100 Hours**

1. Change engine lube oil & filter
2. Adjust drive belts
3. After Every 250 Hours
4. Replace engine fuel filter(s)
5. Check siphon break operation (if installed)

**After Every 500 Hours**

1. Torque cylinder head bolts \*\*
2. Adjust valve clearances \*\*
3. Drain, flush, refill fresh water coolant
4. Check starter motor drive, lubricate pinion \*\*
5. Check glow plugs
6. Check water injected exhaust elbow condition \*\*
7. Check raw water pump impeller & connections
8. Check Hurth transmission cooler

**After Every 800 Hours**

1. Remove and check fuel injectors \*\*
2. Check compression pressure \*\*

**After Every 1,000 Hours**

1. Remove & clean heat exchanger
2. Remove & clean hydraulic transmission cooler

\*\* Should be done by competent mechanic. Refer to Operator's Manual.

FAQ Courtesy of BoatingMadeSimple.com

### Fading

Antifouling paints are not meant to be cosmetic or decorative coatings and while every effort is made to make them as aesthetically pleasing as possible. The copper compound within the antifouling is difficult to mask with color pigments.

All antifouling paints change when they are immersed. So don't be surprised when you have finished and the color is not what you had hoped from the color chart, The true color will establish itself after the boat has been launched. Copolymer and ablative type coatings tend to fade more than hard antifouling paints.

Along the waterline you will often the antifouling looks dirty or faded, and can even turn green. This is due to the reaction of the paint with oxygen forming green copper oxide. Also paints with a higher copper content will turn greener at the waterline than paints with a lower copper content. For these reasons you should try keep the paint as close to the true waterline as possible. Fading is more noticeable in of ablative coatings than in hard coatings.

### How Often Should I Paint My Boat?

That depends on the type of antifouling that is used. The longevity of multi-season copolymers such as Micron Extra & Micron CSC is related to the amount of paint applied. These paints will retain the antifouling properties as long as the paint is on the hull. Hard antifouling paints work by leaching biocide out of the paint film and leaving the paint film behind. When this paint film is left out of the water it oxidizes and any biocide that is left in the coating will not leach out at the proper rate to control fouling.

### Must I Sand the Bottom Before Repainting with the Same Antifouling Especially Since It Was Powerwashed in the Fall?

Antifouling paint is not meant to be exposed to the elements and when it sits out of the water for a couple of months the outside layer of paint film becomes oxidized, and gets soft, plus it picks up dirt and dust. New paint does not adhere well to this type of surface and may begin to peel off. Most non-copolymer paints have a porous "leach layer" and if they are painted over, after just a power washing the pigment and the resin penetrate into that porosity and leave a "blush" of cuprous oxide on the surface. This is a cosmetic problem and does not really affect the antifouling quality of the paint but most people if they buy blue paint they want it to look blue not purple. High-pressure fresh water washing (3000 psi) will remove the leach layer but the paint will need to be over-coated immediately after it dries. The other reason for sanding antifouling paint is that there is only so much paint that will hold onto a given surface. That amount may be 10 coats or the first coat may delaminate. This is related to how good the original surface preparation was and how it is maintained between recoating. Sanding when recoating will add to the longevity of the bottom jobs. By

sanding the bottom in the spring you will get more coats to adhere and forestall the day when you must remove all the antifouling paint from the surface. Soft rosin based antifouling must always be sanded even if they have just been powerwashed.

**Keep in mind that the hulls require only a light hand-sanding and not a power sanding.**

### What Is The Difference Between Hard & Soft Paints?

Antifouling type is dictated by the quality, combination, quantity and type of resin.

### Copolymer and Ablative Antifouling

These types of antifouling are partially soluble which means that as water passes across the surface of the coating, the coating wears down much like a bar of soap would wear away. The action of the water steadily reduces the thickness of the paint at a controlled rate, which results in always having fresh biocide at the surface of the paint throughout the season. For this reason these types of antifouling have the capability to perform in the areas of highest fouling challenge.

Hard antifouling leach the biocide out of the paint film and leave the paint film behind on the hull, which causes a build up of old, spent coatings. Because copolymer and ablative types of antifouling wear away with use. There is no build-up of coatings that will eventually have to be removed from the surface. The minimal build up reduces the maintenance and preparation needed when it is time to apply more antifouling. In addition Copolymer types such as Micron Extra with Biolux and Micron CSC can be hauled and relaunched without repainting as the longevity these coatings are related to the thickness of the paint.

Ablative types such as Fiberglass Bottomkote Act do not retain their antifouling ability for more than 30 days after being hauled out.

### Hard Antifouling

The technical term for these types of antifouling paints is "contact leaching". The paint dries to a porous film that is packed with Biocides, which leach out on contact with water to prevent fouling growth. This leaching is chemically design to release biocide throughout the season, but the amount will steadily decrease until there is not enough biocide coming out of the paint film to maintain fouling protection. Once the biocide is exhausted, the hard paint film remains on the boat. One of the main benefits of this type of antifouling is its resistance to abrasion and rubbing. This makes it ideal for fast powerboats, racing sailboats or boats where the owners have the bottoms cleaned regularly.

Most hard antifouling paints can be wet sanded and buffed prior launch to reduce drag and improve hull speed.

A disadvantage to hard antifouling paint is the buildup of residual paint film that occurs when the surface is not prop-

erly sanded prior to application of new coats of antifouling. When hard paints are hauled and stored for the winter season, the paint film, as well as the biocide oxidizes and this makes it more difficult to release more biocide out of the film. For this reason, they must be sanded and recoated with fresh antifouling before relaunching.

### **Teflon Antifoulings**

Most people associate Teflon with nonstick household products or with the space program, but the properties that made it perfect for those applications also make it an ideal ingredient in antifouling paint. Teflon creates the lowest coefficient of drag in any coating available. The lower the friction, the less energy is required to move the boat through the water. For powerboats this means greater RPM's, increasing speed and fuel savings. For sailboats, greater speeds are achieved with less wind.

### **Soft Antifoulings**

Soft or sloughing antifoulings provides dependable low cost protection for cruising boats or boats with displacement or non-planing hulls. These paints are easy to clean and remove at haul out which prevents paint build-up. These types of coatings must be launched within 48 hours of painting to retain maximum effect effectiveness.

### **Is More Copper Better In Bottom Paints?**

The level of copper is not the only determining factor of how an antifouling paint will perform.

The resin-binder system, the material that holds the paint together, is equally important. Not only does the resin-binder system hold the paint together, it is the mechanism that determines how fast the copper and other biocide will be released. The resin-binder system must be carefully tailored for the amount and type of copper and other biocides used to obtain maximum efficiency. The amount of copper or other biocide may effect the life of an antifouling paint but the sophistication of the resin-binder system to hold and release copper or other biocide at the proper rate is far more important to the effectiveness of the antifouling. A copolymer or ablative antifouling will release biocide at nearly constant rate throughout its life. For this reason, highly efficient antifouling paints like Micron, are less dependent on large amounts of copper and other Biocides and deliver the best possible performance.

The presence of boosting biocides, such as Biolux, by keeping the bottom clear of slime will make the copper more effective.

### **Why Should I Bother Painting My Boat?**

Once fouling has established a hold on a boat hull it will rapidly spread or "colonize" the surface. Prevention is therefore better than the cure of having to remove the fouling by scraping.

There are a number of key reasons to keep your hull free from fouling:

**Safety** - Heavy fouling growth reduces responsiveness of the craft. The added weight of the fouling can make the boat sit lower in the water than intended. This can have obvious implications in heavy weather conditions.

**Protection** - Prolonged growth of certain types of fouling can damage the substrate of the hull. For example, the natural glues used to attach organisms to the hull can damage wood and fiberglass. Fouling can also clog water intakes and cause damage to the engines.

**Speed and efficiency** - Fouling causes drag. As drag is increased, fuel consumption increases and speed is reduced even to the point where a planing hull may not be able to get on plane. For racing boats, this can be the difference between winning and losing a race.

### **What's This I Hear About Pettit's Irgarol & Interlux's Biolux Anti Slime Additives?**

#### **Trinidad SR Slime-Resistant Antifouling Paint**

How do you make the best better? By adding new technological developments to your number one antifouling paint. Trinidad SR has the same basic hard-to-improve-on formula as our regular Trinidad but with the addition of a booster additive called Irgarol, that significantly reduces soft growth and slime (SR stands for Slime Resistant). Irgarol was developed by the Ciba Additive Group has gone through years of extensive testing under the auspices of the EPA. Trinidad SR meets all VOC (Volatile Organic Compounds) regulations. Trinidad SR high copper load (contains 70.0% cuprous oxide), will give excellent service even in most heavily infested waters. Trinidad SR is easy to apply by brush, roller or spray and has excellent adhesion to fiberglass, wood and steel hulls.

Trinidad SR is available in four colors.

### **What is Biolux?**

Biolux is a unique antifouling technology developed by Interlux incorporating organic boosting biocides into a special biocide release system. This blocks slime growth for a fouling free boat bottom.

### **How does it work?**

Just like ordinary plants, Slime and Algae feed on sunlight. Formulations that use Biolux technology prevent algae and slime from being able to grow by acting like sunscreen to block this process.

Soon after the boat is launched it comes in contact with algae in the water. Once these materials attach and feed, they begin to secrete a gel like substance that attracts more algae until it begins to look like a carpet on the bottom of your boat. This increases drag, increases fuel consumption and makes the boat more difficult to handle, which can be a problem in heavy weather. If left on the surface, it restricts the copper being released to the surface to prevent shell fouling.

Assorted Paint And Environmental Questions Below

How many coats of antifouling paint do I need for complete protection?

For complete protection throughout the boating season, two full coats of antifouling paint are recommended. For multi-seasonal protection with ablative antifouling, three or more coats are recommended, with an extra coat on high wear areas such as the waterline and leading edges. Since each coat of paint is only around two thousandths of an inch thick, it is vitally important to apply the correct number of coats.

Sometimes I hear stories of freshly painted hulls fouling.

**Why does this happen?**

Antifouling paints in general, perform admirably even when faced with overwhelming fouling pressure. Early fouling is often attributed to silt or slime clogging the pores of the antifouling paint reducing its efficacy. This is why it is important to maximize the service life of the antifouling paint by lightly scrubbing periodically to remove slime or dirt accumulations.

**How long will the antifouling paint last?**

This depends on several factors, not the least of which are the choice of paint and location of the boat. Two coats of a weaker paint applied to a boat in a high fouling area will most likely not prevent fouling for the entire season. It is important to match the paint with the boat location. When the proper paint is chosen, two coats should last the entire boating season. safety and safe procedures while harvesting geoducks.