THE PRINCESS 286
MOTOR CRUISER HANDBOOK
(STERNDRIVE ENGINE INSTALLATION)

prepared for Marine Projects (Plymouth) Ltd.

by Data & Decisions

Craft's Name _____

Craft Type: Princess 286

Owner's Name _____

Marine Project's Yard No _____

Engine Make _____

Type _____

Serial No. Starboard _____

Serial No. Port _____

Gear Box Make: _____

Type _____

Serial No. Starboard _____

Serial No. Port _____

INTRODUCTION

It is the earnest wish of Marine Projects (Plymouth) Ltd. that you should have the maximum amount of enjoyment from your Princess Motor Cruiser. With this in mind, this Handbook has been prepared to assist you to gain familiarity with the location and use of the equipment that is installed on the craft. The Handbook is therefore intended to augment the literature that is provided by the manufacturers of the equipment installed on your Princess Motor Cruiser.

In preparing the Handbook it is assumed that the Owner and others using the Handbook have already gained experience and are familiar with motor cruisers.

In addition, Check Lists have been included in the Handbook. Naturally the climatic conditions and circumstances in which the craft is operating will vary considerably. Thus the Check Lists are not intended to be comprehensive and as always, common sense and experience will always be the best guide.

Where further information is required of a more general nature, then you should contact the distributor who supplied the craft. The distributor has direct access to the Factory Service Department of Marine Projects (Plymouth) Ltd. should such assistance be required.

The Company are continuously seeking ways of improving all Princess Motor Cruisers, thus although every endeavour has been made to ensure the accuracy of the information contained in this Handbook, neither Marine Projects (Plymouth) Ltd. their distributors nor the publishers of the Handbook can be held liable for any inaccuracies or omissions that may occur. It should also be remembered that when additional optional equipment is installed in a craft, this may in turn affect the layout of the standard equipment.

Section 1

WHERE IS IT

INTRODUCTION

This Section is intended to illustrate where the most important Controls and Equipment are located. Where additional optional equipment has been fitted by Marine Projects (Plymouth) Ltd. this may in turn have affected the layout of the standard equipment that is installed in the craft.

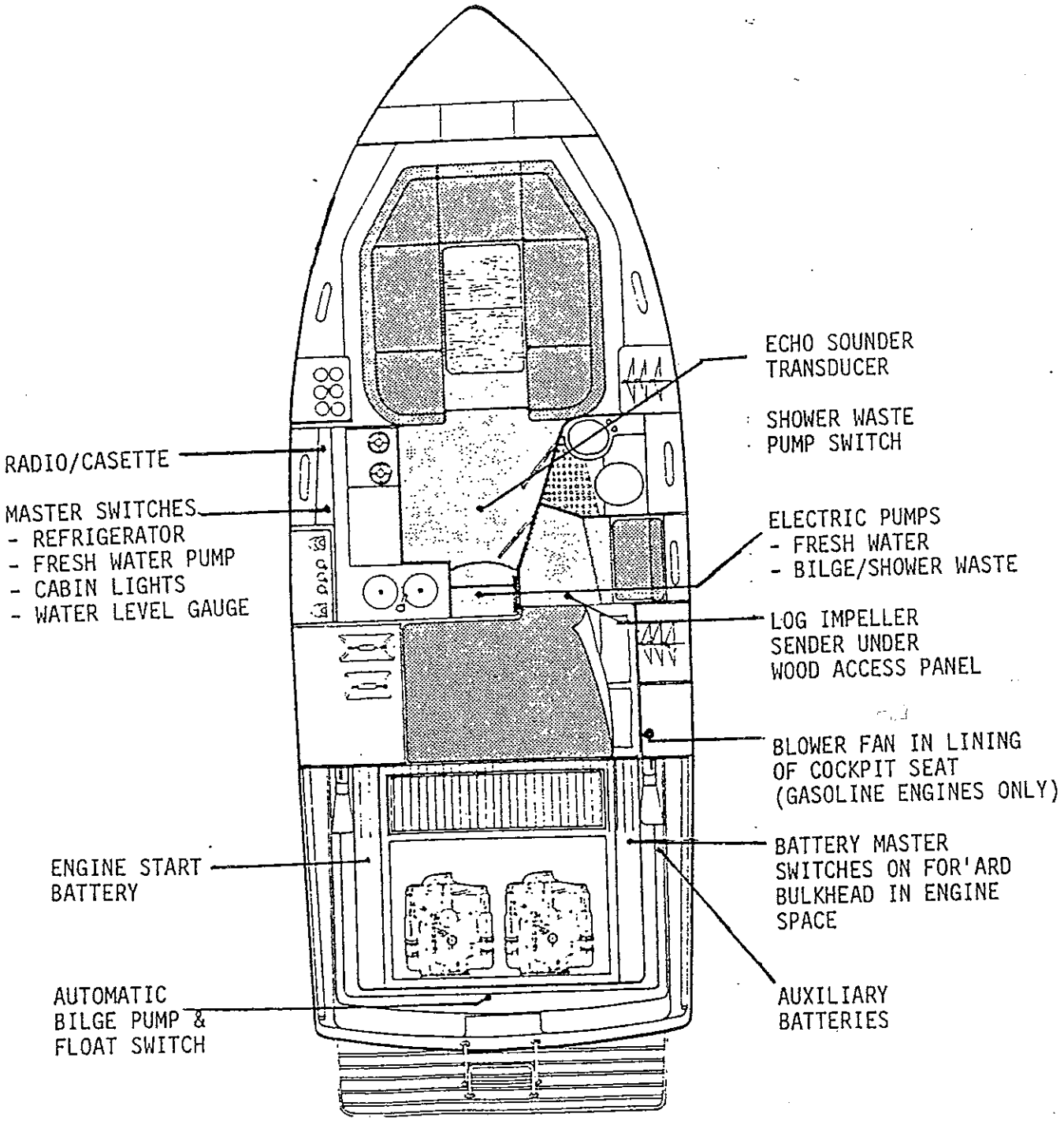
This Section consists of five diagrams, namely:

Fig. E The Electrical System
Fig. F The Engine Room and Fuel System
Fig. B The Bilges, Bilge Pumping and Sea Cocks
Fig. S Stowage areas
Fig. W Domestic Pipework for Fresh Water and Gas

WHERE IS IT

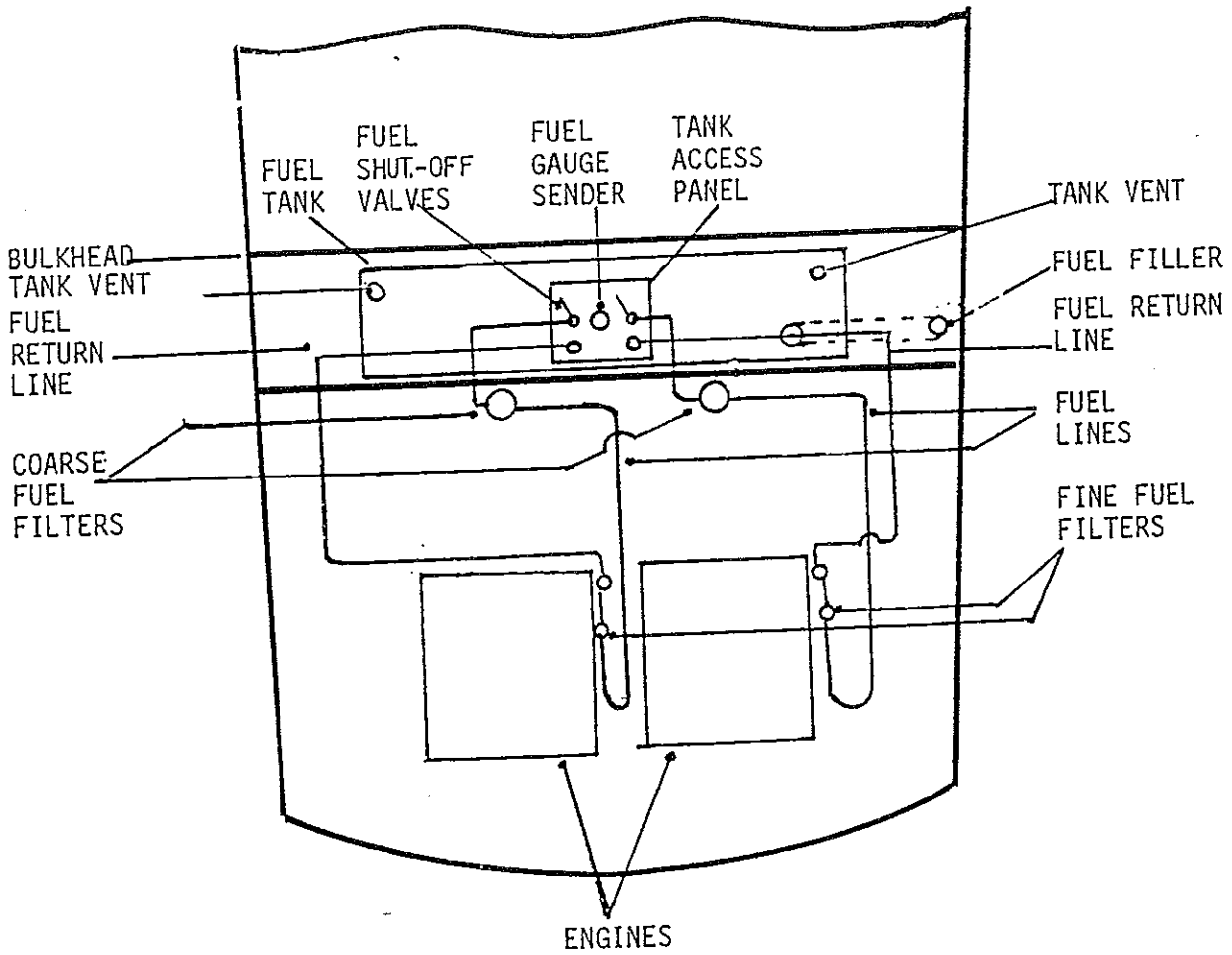
ELECTRICS

FIG. E.



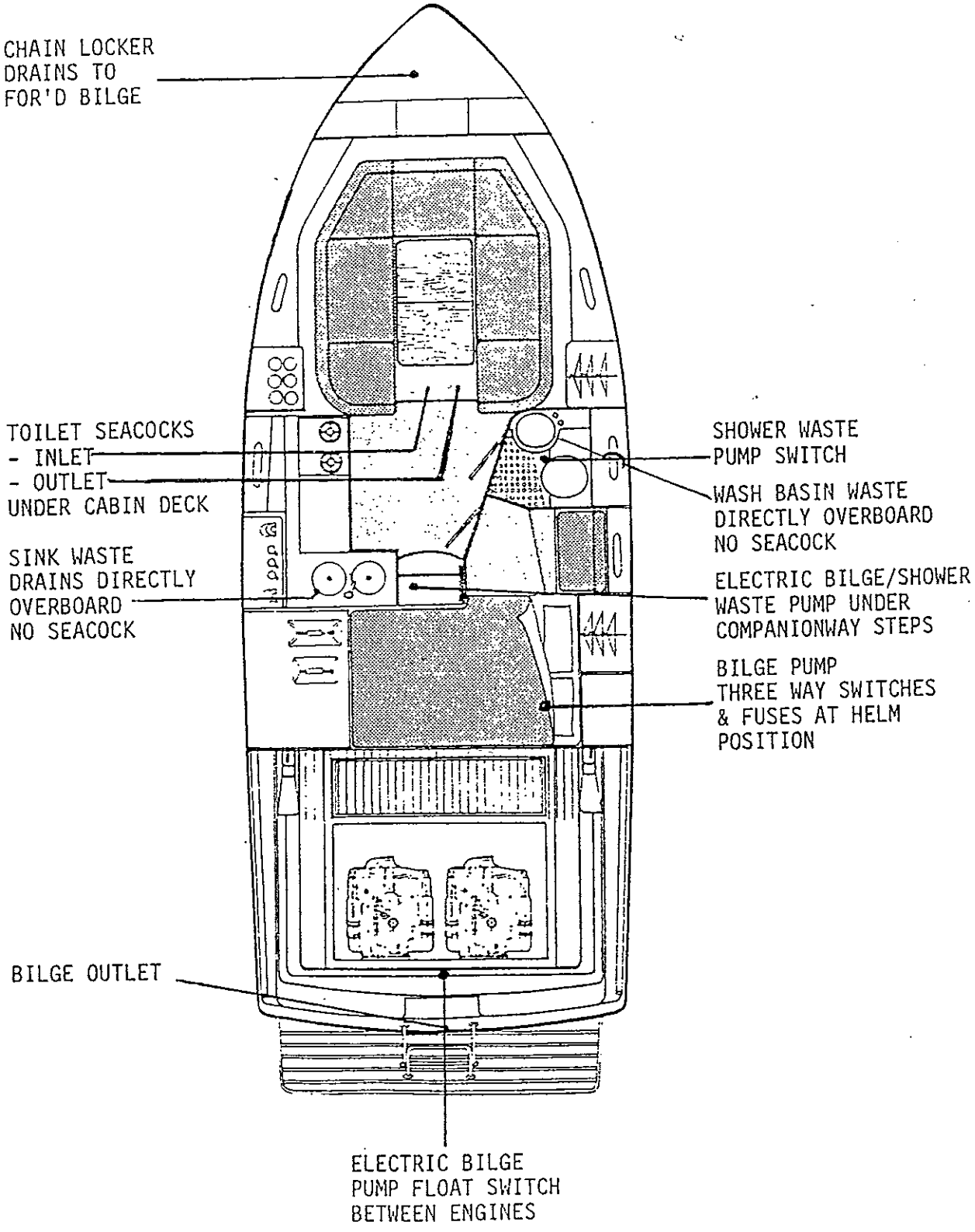
FUEL SYSTEM
TWIN STERNDRIVE INSTALLATION

FIG. F.



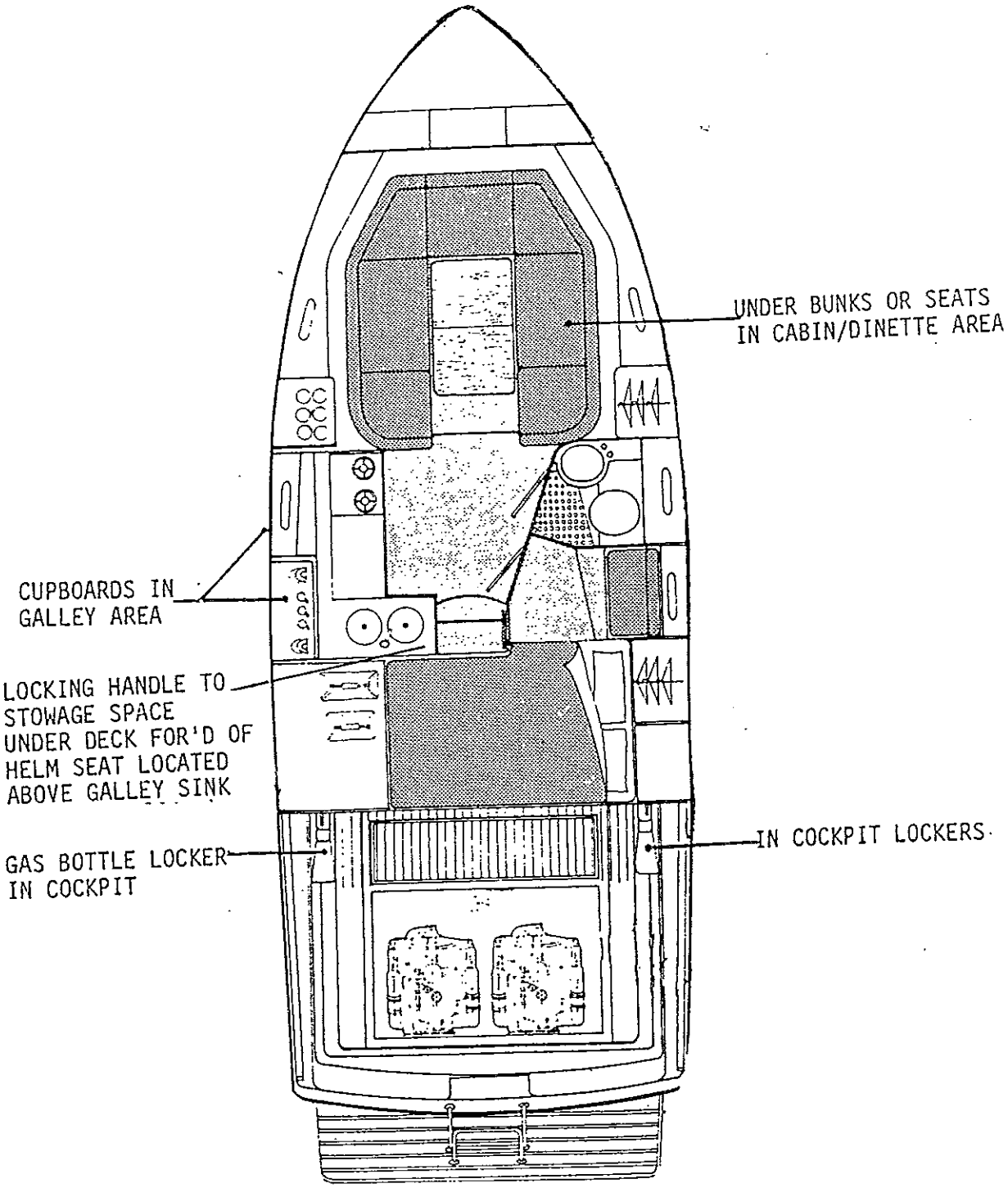
BILGES, BILGE PUMPING AND SEACOCKS

FIG. B.



WHERE TO PUT IT
(STOWAGE)

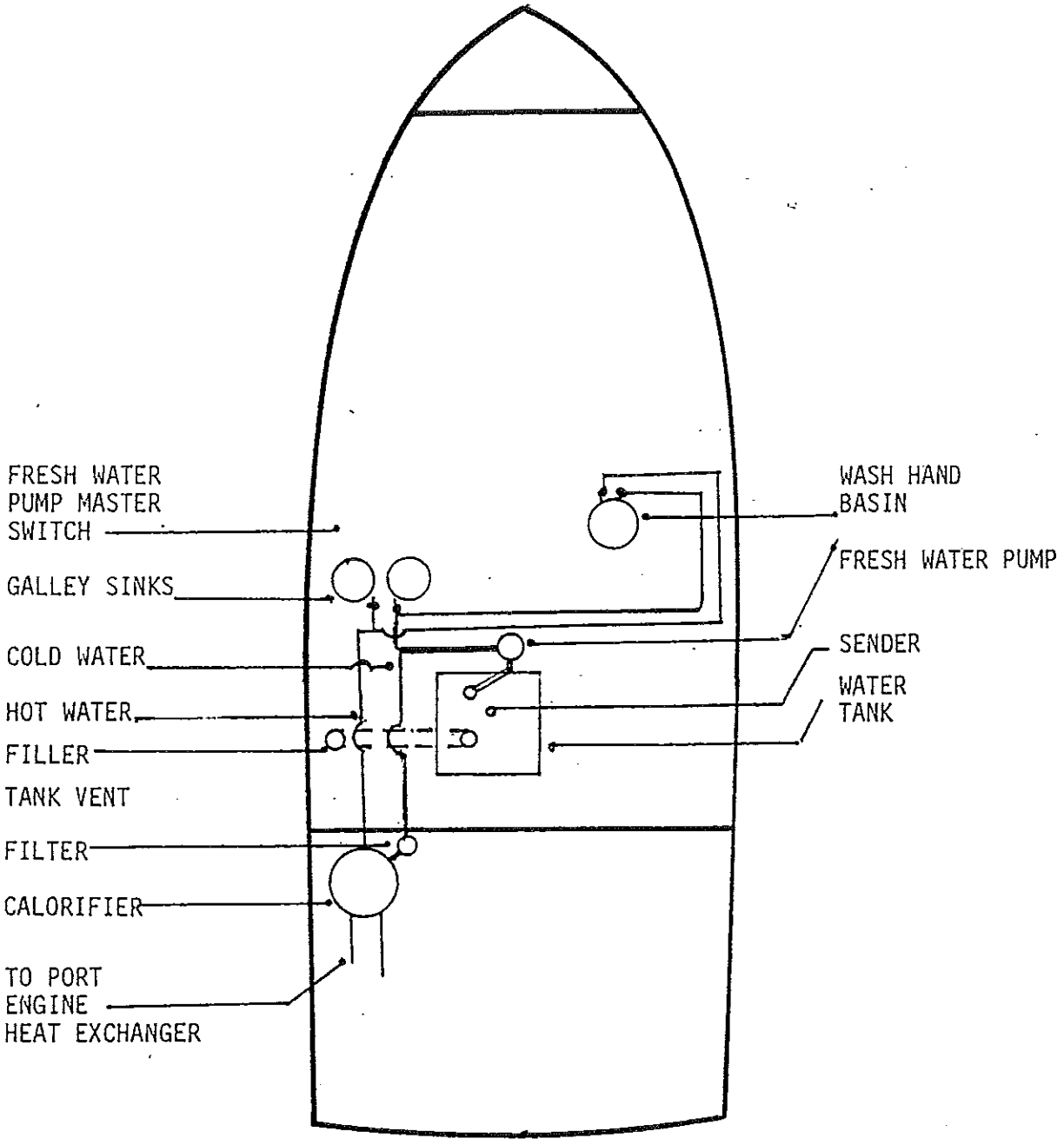
FIG. S.



DO NOT STOW ANY ITEMS NEAR FUSE PANELS, IN SALOON LOCKERS WHERE ELECTRICAL EQUIPMENT IS FITTED, IN THE CHAIN LOCKER, IN THE GAS BOTTLE LOCKER NOR PLACE METAL OBJECTS NEAR AUTOPILOT SENSOR. DO NOT USE THE ENGINE COMPARTMENT FOR STOWAGE AND SECURE HEAVY ITEMS STOWED IN THE TANK SPACE TO PREVENT EQUIPMENT DAMAGE WHEN UNDERWAY.

FRESH WATER SYSTEM
STERNDRIVE INSTALLATION

FIG. W



Section 2

CHECK LISTS

INTRODUCTION

To assist Owners, a series of Check Lists have been incorporated in the Handbook for quick reference.

The Check Lists are not intended to be exhaustive and Owners should refer to the appropriate literature provided by the various manufacturers of the proprietary equipment installed on the craft. Naturally, the Check Lists will also need to be modified to accord with local climatic conditions and circumstances. Marina personnel, Harbour Masters and boatyard personnel will undoubtedly be able to give useful advice on any local conditions that may affect the routines outlined in the appropriate Check Lists.

CHECK LIST 2.1

MINIMUM ROUTINE CHECKS

2.11 INTRODUCTION

The frequency of the Checks (particularly the Routine Checks) should be governed by such considerations as the frequency with which the craft is used, its age, the local climatic conditions and circumstances where the craft is generally kept. Owners should also refer to the literature supplied by the individual equipment manufacturers. The references given on the right hand side of the pages refer to cross references in the text regarding the location of the appropriate equipment and notes in later sections of the Handbook relating to the particular Check in question

2.12 REGULAR CHECKS (IN ADDITION TO THOSE APPEARING IN THE APPROPRIATE EQUIPMENT MANUFACTURERS LITERATURE)	References Location	Notes
Clean out limber holes in bilges		4.23
Clear cockpit drain holes		4.24
Clear bilge pump strainer		4.23
Clear engines raw water cooling strainers	B, F	4.54.1
Check the water level of the batteries and the electrolytic level using a hydrometer	F	4.42.2

2.13 QUARTERLY/HALF YEARLY CHECKS		
Check seacocks for operation and any leaks	B, F	
Check battery terminals	F	4.42.2
Check anodes	E	3.3
Check earth bonding wire connecting engines/ propeller across the flexible coupling		3.3
Check that the Fresh Water Tank vent/pipe is clear and that the connections at either end are secure.		4.11
Check Fire Extinguishers	F	3.4

		References Location	Notes
	MINIMUM ROUTINE CHECKS (continued)		
	Check that the gas bottle locker vent/drain pipe is clear and that the connections at either end are secure. Connections can be accessed below the cockpit deck.		4.3
	Lubricate steering linkages		

		References Location	Notes
14	ANNUAL CHECKS/RECOMMISSIONING (IN ADDITION TO REGULAR AND QUARTERLY/HALF YEARLY CHECKS)		
	Have manometer test undertaken on the gas system by competent personnel		4.31
	Check/tighten engine mounting bolts		
	Check fuel system for leaks		4.51.2, 4.53
	Check engine exhaust pipe for leaks		
	Check fresh water, bilge water and effluent pipes and connections for leaks		
	Flush out fresh water tanks		
	Adjust engine control cables, check fastenings at control positions and at the dual station unit in the engine compartment and at the engine and gear box connections.		
	Check for electrical continuity with respect to the cathodic protection system, i.e. all stern gear, seacocks, and the anodes themselves.		

CHECK LIST 2.2

PRIOR TO GETTING UNDER WAY

		References Location	Notes
21	ON BOARDING		
	Check for any smell of gas. Investigate ventilate and secure the system if a gas leak is detected prior to starting the engine or lighting a match or other flame.		4.31
	Pump bilges	B	4.22
.22	INITIAL CHECKS PRIOR TO GETTING UNDER WAY		
	Check fuel level		
	Check fresh water level		
	Check stowage throughout craft including the tank space	S	
	Check navigation lights all O.K.		
	Disconnect shore support cable (if fitted)	E	
	Turn off gas appliances and main control valve at bottle	W	4.31
	Switch refrigerator from mains to 12 volt operation after starting engines. (if appropriate)		4.33
	Lower water level in toilets	O	4.26
	Empty basins	W	4.12
.23	ENGINE PRE-START CHECKS		
	Check fuel cocks on	F	4.51.2
	Check raw water cooling water cocks on	F	4.54.1
	Check coolant level O.K.		4.54.2
	Check oil level O.K. - Engine		
	Check that throttles and gear controls at the helm position are in neutral prior to starting engines.		
	Check battery charger disconnected (if fitted)	E	
	Check autopilot in 'OFF' position (if fitted)		

CHECK LIST 2.3

LEAVING THE CRAFT FOR MORE THAN A FEW DAYS

	References Location	Notes
LEAVING		
Close all sea cocks (If Engine Cooling Sea Cocks are turned off, leave a note on Instrument Panel)	B, F	4.26,4.54.1
Turn off all instruments, equipment, lights etc.	E	
If fuel cocks are turned off, leave note on Saloon Instrument Panel		4.51.2
Turn off battery master switches	E	4.42.3
Turn off windlass master switch (if fitted)	E	4.42.3,4.46
Turn off gas equipment	W	4.31
Turn off gas supply at storage bottle	W	4.31
Pump bilges	B	4.22,4.23
Set electric bilge pump to AUTO	B	4.22
Switch off battery charger (if fitted) if absent for 7 days or more.	E	
Clean out refrigerator - leave door ajar.		
Pump toilet dry - treat lightly with ammonia based disinfectant.		4.26
Leave locker lids and cupboards open for ventilation.		
Lock all windows.		
Check and secure night covers.		
Check mooring lines and fenders.		
Hose down with fresh water if supply is available.		5.2

CHECK LIST 2.4

LAYING UP & COLD WEATHER PRECAUTIONS

Introduction:

Regardless of what precautions are taken, it is essential that the craft is visited at regular intervals throughout the winter if the craft is kept afloat to check the moorings and pump the bilges.

	References Location	Notes
2.41 Essential Requirements		
GO THROUGH THE "LEAVING SHIP" CHECK LIST		
Drain toilets and then turn off all seacocks, e.g. at the engines and toilets	B,F	4.26
Inhibit the engines as recommended in the engine manufacturer's handbook		
Ensure batteries are topped-up and re-charged	E	4.42,4.44
Ensure that there is anti-freeze in the closed circuit fresh water cooling system of the engines, or drain off the water		4.54.2
Drain engine raw water cooling system		4.51.1
Drain the calorifier	W	4.12.2
Drain the Fresh Water Tank	F	
Check all water, oil, fuel hose pipes and clips for security		
Ensure all ventilators are clear and unobstructed		
Open all cupboards, doors and lockers to ensure maximum air movement below decks.		
Having throroughly pumped the bilges disconnect the pipe and ensure that no water is left in the pump where frost damage might occur. This also applies to the electric bilge pump (if fitted)		
Ensure there is no water in the fresh water pump and the shower waste pump		
Put battery on trickle charge occasionally		
Ensure underside of cushions and carpets are dry (ideally store soft furnishings at home)		

Section 3

CHECK LISTS

- SUPPORTING NOTES

3.1 INTRODUCTION

Whilst the Section that follows dealing with the 'Basic Systems' covers various aspects referred to in the Check Lists there are a number of important points that do not fall naturally under any of the headings covered in that Section. These points have therefore been dealt with in these "Supporting Notes" to the 'Check Lists".

3.2 LAYING UP AND COLD WEATHER PRECAUTIONS

3.21 WINTER HEATING OF THE CRAFT

The recommendations set out above in Section 2.4 assume that the boat will not be used in the winter months and that the boat is located in a region where frosts and dampness are likely to occur. In the event that the boat is not being laid up completely or is located in a warm climate, common sense will be the best guide as to which of the following procedures should be followed.

Many of the problems that are encountered through frost and damp can be overcome by ensuring that all doors, drawers and lockers are opened to ensure the best possible circulation of air.

3.22 WINTER ENGINE 'WARM UPS'

There is a common fallacy that engines should be run for 20 minutes or so in neutral whilst the craft is still alongside at about monthly intervals to help safeguard the engines against internal corrosion and to charge the batteries.

RUNNING ENGINES IN THIS MANNER, WHEN THEY ARE NOT UNDER LOAD, IS IN FACT GENERALLY INADVISABLE.

When running in neutral, the engine is not under sufficient load to reach its correct operating temperature and the engines are likely to be overfuelled, particularly turbo-charged diesel engines that are sometimes installed in the Princess boats. This results in only partial combustion of the fuel in the cylinders and the cold damp air drawn into the engine condenses out on the cylinder linings.

Thus a series of so called 'warm ups' are likely to do more harm than good, particularly on new engines.

3.3 CATHODIC PROTECTION

For stern drive engines refer to the engine handbook for details on cathodic protection. It is fundamentally important to ensure that this protective system is operating efficiently as components will otherwise become badly corroded and have to be replaced at considerable cost.

In order to avoid severe electrolytic corrosion, those parts of the boat that are most likely to be affected are wired, by electrical cable, to Sacrificial Anodes which are fixed below the waterline on the sterndrive on the port and starboard engines.

In general, the propellers are more prone to corrosion due to electrolytic action than any of the other metal skin fittings.

The extent to which electrolytic action causes metal corrosion depends upon a number of factors such as:

1. The metallurgy of the components, such as the propeller.
2. The extent to which the water is salt or brackish.
3. The amount of turbulence at the point where the water and the metal components are in contact.

It is recommended that the following routine checks should be made:

1. Ensure that all the wiring connections are kept in good condition and preferably lightly greased with a petroleum jelly.
2. The sacrificial anodes must be replaced once they have reached a minimum thickness of ½" (i.e. 50% of original). As a guide this is going to occur every 6 to 24 months depending upon the salt/brackish nature of the water in which the boat is moored and the frequency with which the boat is used. Make the first check on a new boat after three months to establish the wastage rate for the conditions in which the boat is operating and moored.

The anode however should be inspected fairly regularly and if there is no visible deterioration of the anode itself, careful examination should be made of all exposed metal parts to see if there is any deterioration. It is particularly important to check the propeller as this is most prone to the risk of corrosion. In some cases, if the craft is moored in fresh water, a skin may form over the anodes which will impede their operation and this should also be checked, and scraped off if necessary.

3. Ensure that the studs that secure the anodes on the inside of the hull are not unduly corroded.

4. When the boat is out of the water, check that the studs securing the anodes are not corroded. This can often be best accomplished by removing the anodes and cleaning off any rust. In the event of excessive rust the studs will obviously require replacing.

Clearly this test can only be undertaken if the craft is out of the water. If the vessel is in the water it is possible, as a second best, to check for continuity between the stern fittings and the engines.

3.4 FIRE EXTINGUISHERS FITTED ON THE CRAFT

Automatic fire extinguishers are fitted to the underside of the access panel to the engine space and a further automatic extinguisher is located on the underside of the access panel to the fuel tank space. At the head of each fire extinguisher is a heat sensitive switch with twin sensors, either one of which will release the extinguishant on fracture due to heat. They operate when the surrounding temperature reaches 80°C (175%F). Each is generally fitted with an indicator. When this shows in the red zone, the extinguisher needs servicing.

The manufacturer provides a replacement service by which extinguishers can be recharged at half the current price of a new unit. Check the extinguishers regularly and if in any doubt as to their condition, take advantage of this service.

Hand operated fire extinguishers are provided in the living area and should be kept ready for use at all times. They are of the dry powder type and have a maximum life of 5 - 6 years.

FIRE EXTINGUISHERS

All Princess craft are equipped with both hand held fire extinguishers in the living areas and automatic extinguishers in the engine rooms and tank space when generators, or, central heating units are fitted.

The type used are Firemaster GT1360 Halon 1211. These extinguishers will require regular inspection at 6 monthly intervals to check that they are still fully charged. This 6 monthly check is carried out by weighing the whole extinguisher. The minimum weight for a Firemaster GT1360 will be 1.55 Kg and if found to be below this weight the extinguisher should be replaced.

Section 4

THE BASIC SYSTEMS

INTRODUCTION

This Section first covers the Fresh and Bilge Water Systems, starting with a description of the two systems, followed by hints on the use of the valves, pumps and other important parts of the systems.

This is followed by a brief mention of how the Gas System operates, where the gas cylinders are located and how the system should be used.

The next Section deals with the various Electrical Systems on the craft, including when and how they should be used. Finally comes a few notes on the Engines.

4.1 FRESH WATER SYSTEMS

4.11 INTRODUCTION

The fresh water storage tank which has a capacity of 35 Imperial gallons (159 litres) is located amidships immediately under the aft sleeping berth. The GRP access panel under the bunk mattress can be removed in order to get to the water tank. should the need arise. The tank is constructed in fibreglass.

The sender of the water gauge is located under the for'ard GRP access panel in the tank top whilst the inlet and outlet hoses are connected at the after end of the water tank under the second wooden access panel. The water tank filler is located on deck on the port side just for'ard of the aft cockpit area.

The air vent for the fresh water tank is a plastic pipe running from the top of the tank to atmosphere. (See Fig. W). If it should become blocked it will probably cause a malfunction of the water system and also affect the filling rate of the water tank. Taps in the galley and toilet areas take normal domestic tap washers.

4.12 THE OPERATION OF THE PRESSURISED WATER SYSTEM

A pressure controlled electric water pump is located under the companionway steps between the deck saloon and the galley area. (See Fig. W) There are two water pumps in this location and the fresh water pump is the one for shower discharge.

The pump powers both the hot and cold water systems. Water for the galley, wash hand basins and shower units is piped through plastic tubing. If modifications are made to the fresh water system, it is important to ensure that any new plastic piping that is used is suitable to be used with drinking water.

The electric pump is automatically activated when either a cold or hot tap is turned on by the pressure drop that occurs when the tap is opened. Similarly when the tap is closed the water pressure in the system rises and the electric pump automatically cuts out when the system pressure is reached. The layout of the whole Fresh Water System is illustrated in

There is a master switch on the control panel in the galley area. In the event that the fresh water runs out, the pump will continue to operate and the master switch must be switched off to prevent damage to the pump until the tank is replenished.

12.1 The Cold Water System

Water is supplied directly from the electric pump to the cold water system. Water is supplied from the pressurised cold water system to the wash hand basin, the galley basin and the shower.

12.2 The Hot Water System

The water pump also feeds water directly to the hot water calorifier. This calorifier, with a capacity of 6 gallons (27 litres) is located for'ard in the port side of the engine space (See Fig. W). The calorifier will only heat water when the engine to which it is connected is running. (NB: The calorifier is normally connected to the port engine.) At other times, water can only be heated if an immersion heater is fitted in the calorifier powered by a 220/240 volt shore support system. The calorifier is well insulated and will keep the water warm for a good period of time.

When laying up it is advisable to drain both the pump and the calorifier. If the boat remains in commission during frosty weather, ensure the fresh water system is well insulated.

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4.2 THE BILGE AND ALLIED SYSTEMS

4.21 INTRODUCTION

The hull of the Princess 286 is divided into three main bilge compartments. The fuel tank compartment drains into the engine compartment when the drain plug is released which is located for'ard midships of the engine compartment. An electric bilge pump and float switch are located in each of the two compartments as indicated in Figure B. The chain locker which is a separate compartment for'ard, drains directly into the main bilges for'ard.

4.22 Electric Bilge Pump System

The electric bilge pumps and float switches are located right aft amidships in the engine compartment and in the centre of the craft adjacent to the heads in the bilges under the wooden access panel. Both pumps are controlled by switches on the instrument panel at the helm position. The switches can be set at "OFF", "AUTO" or "MANUAL"

It is normal to leave the bilge pumps set at "AUTO" when the pumps will be activated by the float switches when the bilge water rises to a prescribed level. It is however possible to pump water from either of the bilges even when the water is below the depth at which the float switch engages by turning the control switches to "MANUAL". The fuses for the system are located adjacent to the switches.

4.23 Routine Procedures

The bilge compartments should be inspected prior to putting to sea to check on the water levels and should then be pumped out.

The bilges should also be inspected at other times on a routine basis and the following simple maintenance should be undertaken:

1. Ensure that the limber holes in the longitudinal ribs are kept clear.
2. Ensure that the strainer at the end of the suction hose is clean.
3. If the water in the engine bilge compartment becomes oily use a proprietary emulsifier carefully following the manufacturer's directions.

A completely dry boat is desirable and to achieve this, experienced owners will know the value of a bucket and sponge.

4.24 WASTE WATER DRAINS

Waste water from the galley and wash hand basins and rainwater from the cockpit areas, all drain directly overboard through separate systems. All drainpipes should be checked at regular intervals to ensure that they are not blocked or leaking.

If foreign matter blocks any of the drains, this should be cleared with an ordinary drain cleaner or by pressurising the pipe with a bicyle pump or domestic sink pump

1.25 THE SHOWER WASTE SYSTEM

The showers operate on an independent system in which the waste water drains into the base of the shower unit. It is then pumped overboard by a manually controlled electric pump which is located under the steps of the companionway (See Fig.B) The operating switch is located by the wash hand basin in the shower compartment.

4.25 THE MARINE TOILET.

To operate the system carry out the following steps:

1. Open both seacocks, located beneath the floor in the gangway to the toilet door.
2. Flush toilet, move valve level to FLUSH position and operate PUMP HANDLE.
3. Return lever to DRY BOWL position.
4. To empty bowl, leave lever in DRY BOWL position and operate PUMP HANDLE.
5. When leaving the craft overnight, or in rough seas, close all seacocks, Note: these must be re-opened before operating the toilet.

COLD WEATHER PRECAUTIONS

When laying up the vessel in cold climates where frost is likely, carry out the following steps:

1. Operate the pump handle to ensure that no soiled water remains in the system.
2. Close the seacocks.
3. Remove the drain plug in the base of the unit and operate the hand pump.
4. In salt water areas, flush the system through with fresh water and drain dry.

DO NOT USE ANTI-FREEZE, ACIDS, HARSH ALKALINE OR HOUSEHOLD BLEACHES IN CLEANING THE TOILET SYSTEM.

4.3 THE GAS SUPPLY SYSTEM

4.31 INTRODUCTION

The gas system supplies the cooker which is designed to run on butane gas. This is generally available at marinas and boat yards as well as many hardware and other specialist shops. The cylinders are usually painted blue or green.

Storage for two gas cylinders is provided in a locker on the port side of the cockpit (see Fig. S). One cylinder is connected to the system, while the other is a spare. THE PLASTIC CAP MUST BE KEPT ON THE SPARE CYLINDER AT ALL TIMES, AS THE CONTROL VALVE ON THE BOTTLE CANNOT ALWAYS BE RELIED UPON TO GIVE AN EFFECTIVE SEAL.

Most brands of bottled butane have a special additive to give it a distinctive smell to warn of any leaks. Butane is heavier than air and if any leaks occur, it will therefore sink into the bilges, or to the bottom of the storage locker. The locker has a vent/drain pipe fitted which drains overboard. Regular checks should be made to ensure that the pipes are clear and that the connections of the pipe are properly secured at both ends. The pipe can be accessed through the appropriate panel in the cockpit deck.

To minimise the risk of gas leaks which can lead to fire or an explosion, ENSURE THAT A MANOMETER TEST IS UNDERTAKEN ANNUALLY by qualified personnel. Consult your boatyard.

4.32 THE COOKER

The cooker consists of an oven, hob unit and grill. It is used and operated in a similar manner to any domestic cooker.

However additional safety procedures are recommended. When the craft is under way or when it is left unattended, turn off the pilot lights if fitted, and turn off the gas supply at the storage cylinder in the port cockpit locker.

4.4 THE ELECTRICAL SYSTEM

4.41 THE ALTERNATIVE SYSTEMS

An insulated earth return 12 volt battery system forms the only source of electrical power for the craft when under way. This can be augmented by a 220/240 volt AC mains system for direct coupling to a shore line enabling mains powered appliances to be used when alongside. The 12 volt batteries are charged by running the main engines or by coupling a converter/charger into the ship's AC system (if fitted)

The location of the principal electrical equipment and controls is given in Fig. E.

4.42 THE 12 VOLT DC BATTERY SYSTEM

.42.1 The 12 volt electrical system is powered by three heavy duty batteries located at the for'ard end of the engine space. The batteries are arranged in two banks, one of two batteries supplying the ship's electrical equipment when the engines are not running is located on the starboard side of the engine space. A third battery is located on the port side of the engine space and is dedicsted to starting the engines.

A double diode charging system is incorporated wherein the alternators on both engines can charge either bank of batteries depending on their state of charge.

.42.2 Care and Maintenance

The main points regarding the care and maintenance of the batteries and associated equipment, are as follows:

1. Check at weekly or fortnightly intervals that the batteries are topped up to the correct level with distilled water. The water will naturally evaporate somewhat faster during warm weather and when the engines are in frequent use. These considerations should determine the frequency with which the water level is checked.

2. Ensure that there is an adequate charge on the batteries. Whilst the voltmeter provides a guide as to the state of charge of the batteries, a much more accurate measure of the state of the batteries can be obtained by using an hydrometer and it is suggested that this should be done at least once a season.
3. Ensure that the terminals are free of corrosion by cleaning and smearing with petroleum jelly regularly. Also keep the battery cover on.

NOTE THAT IF A SET OF BATTERIES IS BELOW 25% OF FULL CHARGE THERE IS INSUFFICIENT CURRENT TO EXCITE THE ALTERNATOR TO START CHARGING, AN OUTSIDE POWER SOURCE WILL THEREFORE BE NEEDED.

42.3 Master Switches

There are two isolating switches for the batteries located on the for'ard bulkhead of the engine room for the auxiliary and engine starting battery systems respectively.

The master switches will turn off the power to all the ship's electrical equipment except:

- the VHF radio (if fitted)
- the central heating unit (if fitted)
- the automatic bilge pump (if fitted)

These latter pieces of equipment are wired directly to the auxiliary bank of batteries through a live fuse panel behind the dashboard, since they may require power at times when the ship's electrics are shut down or when the craft is unmanned.

When using the electric anchor windlass (if fitted) it is prudent to have the engines running, not only to minimise the current drain on the batteries but also to power the boat slowly forward to relieve the strain in the windlass, or to go gently astern to break out the anchor if this proves difficult.

4.43 THE 240 VOLT AC SYSTEM (if fitted as an optional extra)

This system is powered from a shore mains supply of 220/240 volts AC.

BEFORE CONNECTING THE SHORE SUPPLY PLUG CHECK THAT ALL THE A.C. SYSTEM SWITCHES ON THE PANEL ARE IN THE OFF POSITION. AS SOON AS THE SHORE LINE IS CONNECTED CARRY OUT A POLARITY CHECK.

The polarity check is especially necessary when visiting unknown marinas. It is simply carried out. At the top righthand side of the A.C systems switch panel above the galley by 12 volt panel there is a polarity check button. Press it and the orange light should show. If it does not, it will be necessary to consult the marina staff about a suitable adaptor to the shore line.

DO NOT CHANGE THE CRAFT'S WIRING ON ANY ACCOUNT.

Once the shore line is connected and the polarity checked, the various 220/240 volt circuits can be switched on via the A.C system switch panel. The function of each switch is clearly labelled. That labelled 'outlets' provides electricity to the power points located in the living accommodation into which mains powered appliances can be plugged, e.g. normal domestic T.V. sets, radios, cleaners etc.

The boat's A.C system can carry a maximum load of 6 KW but at a majority of marinas the shore line can only carry around 2 KW. Marina staff should be consulted to ascertain the maximum load possible and the use of mains powered appliances limited to the capacity available.

DO NOT ALLOW THE SHORE LINE PLUG TO FALL IN THE WATER, ALLOW THE CABLE TO CHAFE, OR BE PUT UNDER TENSION.

This mains system does not itself charge the batteries.

4.44 THE SHORE SUPPLY BATTERY CHARGER (OPTIONAL)

The battery charger unit when fitted is usually located forward in the engine room and is powered through the ship's AC system with a switch in the AC load centre at the end of the helmsman's seat. An ammeter is also incorporated in the switch panel to show the charging rate. The unit automatically regulates the voltage to prevent the batteries from being overcharged and also automatically restricts the flow of current from the mains to protect both the battery and the charger unit.

The unit can be connected to either the start or auxiliary bank of batteries using the selector switch located alongside the master battery switches in the locker at the rear of the porthand saloon seat.

A flat bank of batteries will take approximately 10 hours to bring near full charge.

DO NOT START THE ENGINES WITH THE BATTERY CHARGER CONNECTED.

.45 THE CHOICE OF POWER SUPPLY

The alternative systems should be used as follows:

CIRCUMSTANCES	SOURCE OF POWER
At sea under main engines:	Use battery system
At anchor or berthed alongside without mains supply:	Use 12 volt electrics very sparingly.
Alongside a berth with 220/240 volt AC mains available:	Use converter/battery charger (if fitted)
	Otherwise use 220/240 volt AC on appliances that will accept it and use the battery system sparingly for other appliances. (if fitted)

If a battery charger/converter is not fitted, the batteries can be charged by plugging in a conventional automotive 12 volt battery charger to the 240 volt system and connecting the charger to the batteries. However the rating of many such chargers is only about 3 amps. As a result it will probably take about 24 hours to charge a pair of batteries.

4.48 FUSES AND CIRCUIT BREAKERS

The main fuse panel is located below the main control panel at the helm position.

IT SHOULD BE NOTED THAT THE RATING OF THE FUSES MAY BE CHANGED WITHOUT NOTICE DUE TO CHANGES IN THE SPECIFICATION OF THE ELECTRICAL EQUIPMENT THAT IS INSTALLED IN THE CRAFT. As a result, the list given below should only be used as a guide and fuses should be replaced by fuses of an equivalent rating to that already used for particular circuits. The rating of the fuse is colour coded on the fuses so that it is only necessary to replace a blown fuse with a fuse of a similar type and colour. DON'T FORGET TO CARRY SPARE FUSES ON BOARD.

Fuses for Standard Equipment

Voltmeter	Voltmeter ..	8 amp
	The Log	8 amp
	Horn	25 amp
	Echo Sounder	8 amp
	Electric bilge pumps	16 amp
	Water Pumps	16 amp

Rating of fuses for Optional Equipment

	VHF Radio	8 amp
	Trim Tabs	25 amp

The stereo radio is fitted with in-line fuses which are located immediately behind the radio.

All negative returns throughout are fed to the negative strip alongside the fuseblock.
Code for Continental type fuses is: White - 8 amp; Red - 16 amp; Blue - 25 amp.
220/240 Mains power equipment should be fused according to makers' specification. Check equipment maker's literature for any sizes of any 'built in' fuses.

4.49 WIRING DIAGRAMS

Wiring diagrams of much of the equipment installed in the craft, such as the engine instrumentation, are given in the literature supplied by the equipment manufacturer. In addition a wiring diagram has been included in this Section for:

Battery Supply and Starting Circuit

4.46 THE ELECTRIC WINDLASS (if fitted)

An overload cut-out fuse is incorporated in the anchor windlass as a precaution against overloading the motor. This is mounted on the underside of the deck head inside the chain locker. (See Fig. E) access to which can be gained through the owner's cabin in the bow. Therefore if the windlass does not operate check:

1. that the switch is operating correctly and that the overload cut-out has re-set,
2. that the terminals in the terminal block also located on the deck head in the chain locker, are all in good condition.

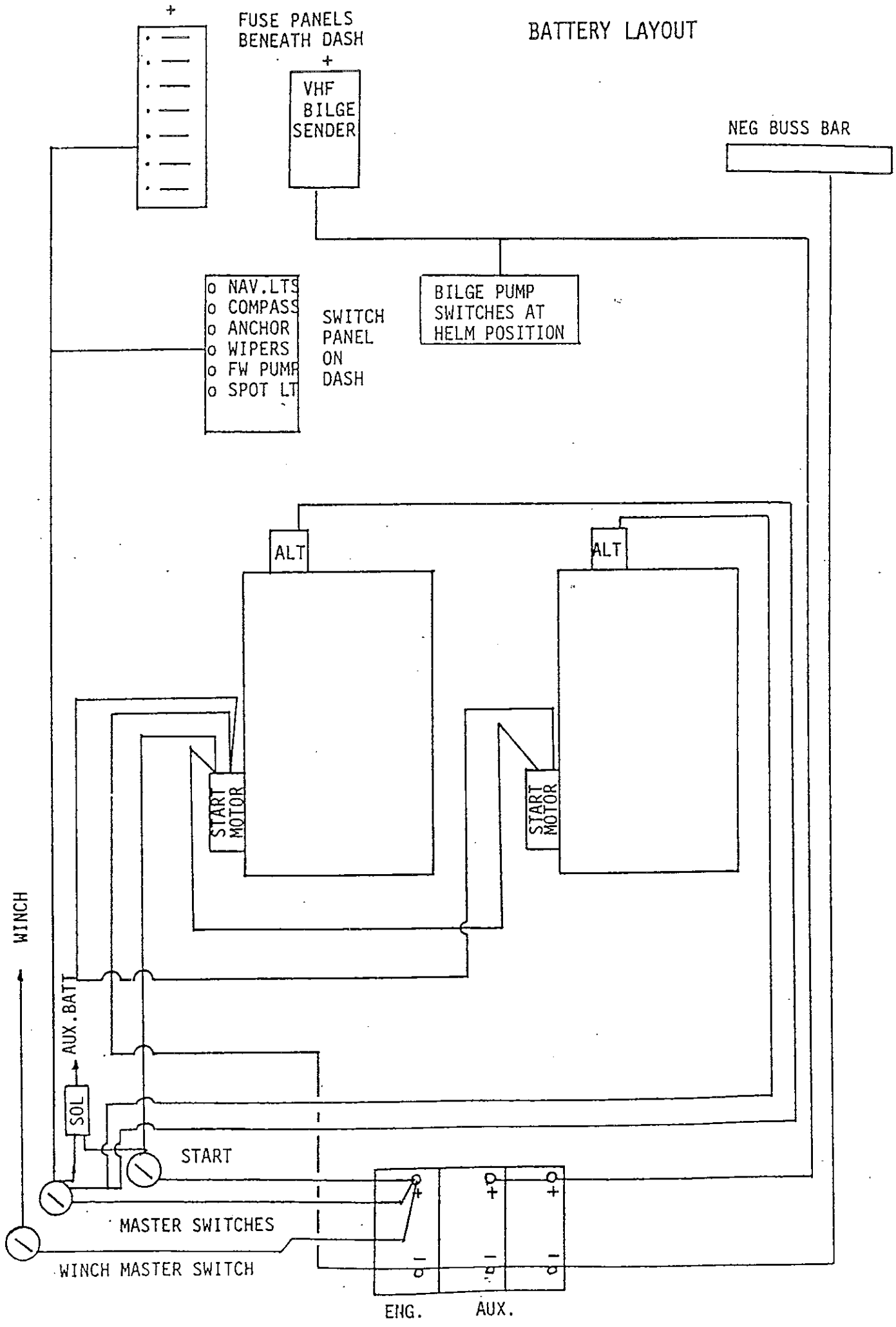
Also ensure that the master switch in the locker at the rear of the port hand saloon has been turned on.

If the fault is mechanical an exploded view of the windlass is given in the manufacturer's handbook for those who have the necessary experience and equipment to service the windlass themselves. Otherwise it will be necessary to call in the service engineer.

4.47 THE REFRIGERATOR

The refrigerator is located in the galley area and has a small freezer compartment in which frozen foods can be stored. It is normally powered by the boat's 12 volt electric system, or alternatively, by a 220/240 volt shore mains supply.

The refrigerator has a relatively high rate of electrical consumption and will therefore run down the batteries powering the boat's 12 volt system in a few hours if the engines are not running to maintain a charge on the batteries. Always use mains shore supply when available.


BATTERY LAYOUT
+
FUSE PANELS
BENEATH DASH
+
VHF
BILGE
SENDER
NEG BUSS BAR
NAV.LTS
COMPASS
ANCHOR
WIPERS
FW PUMP
SPOT LT
SWITCH
PANEL
ON
DASH
BILGE PUMP
SWITCHES AT
HELM POSITION
ALT
ALT
START
MOTOR
START
MOTOR
WINCH
AUX.BATT
SOL
START
MASTER SWITCHES
WINCH MASTER SWITCH
ENG.
AUX.

4.5 THE ENGINES

4.51 THE FUEL SYSTEM

51.1 Introduction

Gasoline or diesel powered engines can be fitted in this craft. The fuel tank is fitted in a compartment of its own immediately for'ard of the engine space and the access panel to the fuel tank is directly over it. The single fuel tank is fitted athwartships and has a capacity of 130 Imperial gallons (591 litres). The layout of the fuel system is illustrated in Figure F.

When gasoline engines are fitted, a bilge blower fan is installed in order to extract the fumes from the gasoline.

1.2 Description of the Fuel System

The filler point for fuel is on the outer starboard side of the craft adjacent to the for'ard end of the cockpit. It is clearly marked with the word "FUEL" (see Fig. F).

There is an access panel fitted to the centre of the fuel tank. The fuel gauge sender is located in the middle of this panel and two fuel lines also run from the access panel feeding the port and starboard engines respectively. Fuel cut off valves for each of the two fuel lines are located immediately above the fuel tank itself. They should only be used in an emergency such as when there is a fuel leak or a fire or when the engine cannot be switched off by any other means for one reason or another.

1.3 Fuel Filters

Water separator filters are mounted on the for'ard bulkhead of the engine compartment (See Fig. F) one for each engine. The filters are relatively coarse and the unit's primary task is to separate any water that may have condensed in the fuel tank, or entered the tank in any other way. The separators should be checked regularly and the water drained off as necessary.

.51.4 Diesel Engines

Diesel engines are not generally self-priming. If diesel engines are turned over with the fuel cocks turned off, the engine will start with the fuel already in the pump but will stop shortly afterwards.

If the engine fuel supply is interrupted for any reason the fuel system will have to be bled of air completely before the engine can be re-started. (See Engine Handbook for method of bleeding the engines).

If the fuel cocks are turned OFF at any time, leave a conspicuous notice on the control panel.

Whenever the filter is taken off, it is likely that air will have been introduced into the fuel system. When diesel engines are fitted the system should be vented in the way described in the Engine Handbook.

4.52 TAKING ON FUEL

REMEMBER, THE FUEL FILLER IS ON THE STARBOARD SIDE OF THE CRAFT OUTBOARD OF THE FOR'ARD END OF THE COCKPIT.

The Fine Fuel Filters are located immediately after the lift pump and filter the fuel before it is delivered to the fuel pump. The fine filters should be serviced regularly in accordance with the Engine Handbook.

Some Do's and Dont's

Do's

- always double-check that you identify the fuel filler cap correctly before fuelling. If water is inadvertently put into the fuel tank, or vice versa, the tank must be completely emptied together with the rest of the system if there is a risk of contamination, before replenishing the tank.

Dont's

- do not turn off the fuel cocks for diesel engines except in an emergency. When they are switched off always leave a note indicating that they are turned off on the engine control panel at the helmsman's position.

- don't run out of diesel engine fuel if it can possible be avoided as it will be necessary to completely re-prime the fuel system of the engine in question. Instructions for bleeding the system of air are given in the diesel Engine Handbook.
- do not allow any fuel that has been spilled into the bilges to lay there unattended. Whilst the diesel fuel is much less volatile, and therefore less hazardous than gasoline, it still represents a fire hazard and diesel fuel is also a solvent when it comes in contact with certain forms of plastic and synthetic rubber.
- do not let any fuel leak from the engines or pipework go unattended. Apart from the risks of the fuel entering the bilges, it is also conceivable that an air lock could form causing the engine to stall, with diesel engines this would in turn necessitate bleeding the system of air before the engine could be re-started.
- when leaving the craft for an extended period, particularly during the winter, it is advisable to ensure that the fuel tank is full to reduce the risk of condensation forming in the tank.

4 THE COOLING SYSTEM

4.1 The Raw Water System

The Raw Water Cooling System utilises the water taken from outside the hull to cool the Closed Fresh Water Engine Cooling System, the Engine oil and the Gear Box oil via a series of heat exchangers. Routine servicing of the raw water intake system is fully dealt with in the Engine Handbook.

4.2 The Fresh Water Cooling System

This system, which cools the engine block and exhaust manifold, is fully described in the Engine Handbook. The most important requirements are:

- That it remains topped up with Fresh Water
- That the system is drained down, or an appropriate quantity of antifreeze is added, before the onset of frosty weather.

55 OPERATING THE ENGINES

55.1 Introduction

BEFORE STARTING THE ENGINES, ALWAYS ENSURE THAT THE THROTTLES ARE IN THE NEUTRAL POSITION.

This warning is extremely important because if the throttles are not in the neutral position, when the engines are started the propeller drive will be engaged and the boat will immediately surge ahead or astern.

Each of the two hand throttle control levers operate independently to control the port and starboard engines, clutches and gearboxes respectively.

Otherwise, follow the starting instructions given in the Engine Handbook.

55.2 Stopping the Engine

1. If the engines have been running at high speed allow them to fast idle for a few minutes, without load, to enable the engine temperature to drop, thereby avoiding after boiling.

2. Gasoline engines can be stopped by switching the key switch to the OFF position. In the case of diesel engines, it is necessary to first of all press the STOP button if fitted, and keep it pressed until the engine is stopped. To determine which system applies to your craft, simply check whether or not a STOP button is fitted. Please check with Engine Handbook.

3. When the engine has completely stopped, switch off the current by turning the key switch to the 'O' position. NEGLECTING TO DO THIS WILL CAUSE THE BATTERIES TO DISCHARGE.

NEVER TURN THE IGNITION SWITCH OR BATTERY MASTER SWITCHES OFF WITH ENGINES RUNNING AS THIS WILL DAMAGE THE ALTERNATORS.

NEVER START THE ENGINES WITH A BATTERY CHARGER CONNECTED.

Section 5

CARE OF THE HULL

5.1 INTRODUCTION

Fibreglass has been established as a tried and tested material for the construction of boats of all sizes for many years. The manufacturers of your Princess motor cruiser exercise the greatest care and build the hulls under carefully controlled conditions.

These hulls require very little maintenance compared to boats made in other materials. However the following simple procedures set out below will preserve the appearance of the boat and safeguard the integrity of the hull.

5.2 PRESERVING THE GEL COAT

In order to preserve the glossy appearance of the gel coat which forms the outer surface of the hull and superstructure the following treatment is recommended:

1. During the first month of the craft's life polish all the outer surfaces with a silicone polish such as that used on cars.
2. Several applications of the polish should be given as this will then form a protective coating which will inhibit discolouration from foul water and also make stain removal much easier.
3. Give regular applications of silicone polish throughout the boat's life, say once a year.
4. In between applications of the silicone polish wash down with a weak solution of a mild soap powder.
5. If a fresh water supply is available, wash down to remove salt deposits particularly after having been at sea.
6. To help keep the boat clean place a rubber mat in the cockpit area close to the boarding point.

7. If any parts of the hull have a moulded-in anti skid texture heavy grime or staining can generally be removed by applying acetone with a soft bristle brush. DO NOT ALLOW ACETONE TO COME INTO CONTACT WITH PAINT OR VARNISH WORK AS IT IS AN EFFICIENT STRIPPER.

8. If discolouration cannot be removed by any other methods, a fine rubbing compound should be used on the hull. On coloured hulls, particularly dark colours, the gel coat can become discoloured by what is termed "chalking". This chalking effect can also generally be removed by applying a fine rubbing compound.

5.3 DEALING WITH HULL DAMAGE

Whilst it is feasible for boat owners to undertake damage repair if it is not undertaken without undue delay, and completed to professional standards, then inherent weaknesses in the hull could result. In most cases, boat owners will be properly insured against such damage and no repairs at or near the water line should be undertaken by owners unless they are completely confident.

5.4 BRIGHT WORK

The deck fittings and guard rails are best cleaned with a weak solution of washing-up liquid using a leather cloth to wipe dry and polish the surfaces.

Heavy stains on stainless steel can be removed with metal polish although it is better to prevent heavy staining by applying silicone wax polish to the bright work as well as to the hull.

5.5 DECK FITTINGS

All the deck fittings are bolted through the hull and supported with back plates prior to the bolts being secured. A flexible mastic compound is used between the deck and the fitting to ensure a waterproof joint and provide a firm base.

In the event that a fitting has to be removed for any reason it will be necessary to prize it away from the mastic which remains plastic but is also an adhesive.

Prior to re-fitting, clear the old mastic away completely and apply fresh mastic. A number of proprietary brands should normally be available from any chandlery.

Ensure that the backplate is put in place together with any washers that are fitted and that the bolts are then properly tightened.

5.6 SKIN FITTINGS

All skin fittings, such as sea cocks, which pass through the hull of the boat are made of either bronze or stainless steel. They are bonded into the fibreglass hull and bolted, thereby ensuring that they remain watertight.

All sea cocks should be regularly checked to ensure that they operate smoothly as they may be required in an emergency. In the event that they become stiff, they can be readily dismantled, cleaned and lubricated with a proprietary grease that is designed to operate in water, when the boat is out of the water.

All internal pipes are made of heavy duty propylene and are often secured with standard hose clips which could be checked frequently at the same time that the pipes are checked for possible leaks. If replaced use stainless steel types.

5.7 SECURING ADDITIONAL FITTINGS

The deck moulding is three-quarter inch sandwich construction with a balsawood centre core, except in way of cleats and other fittings that take an exceptionally heavy load where plywood reinforcing is fitted.

If any additional fittings are to be secured to the deck or flybridge, it is of course essential to ensure that they are suitable for the purpose that is intended and also made from a material that will not corrode.

When securing a new fitting ensure that a flexible mastic is applied to the exterior to cover a surface equal to the mounting surface of the fitting. Ensure that a suitable backplate is fitted over the bolts on the inside of the hull, that stainless steel washers are put on and that there is sufficient room on the bolt to allow the nuts to be properly tightened and still have some thread showing.

5.8 WINDOWS

The window frames are made from high grade aluminium which are designed to make a very close fit in the appropriate apertures in the hull or superstructure.

The anodised aluminium frames of the windows should be washed down with fresh water and cleaned as necessary with soap and water.

The windows should be cleaned with a soft cloth or leather to avoid the risk of scratching the surface. Sliding windows will move more freely if the runners are coated with silicone polish.

DAVITS

1. If davits have not been fitted before delivery then a Princess distributor must be consulted before carrying out the fitting of davits at a later date.

2. Davits if fitted must not be changed to heavier duty models or gangway handling systems fitted without first consulting dealer/distributor.

3. As with any boat fitted with davits, in rough seas the appropriate seamanship must be used to reduce speed and ease the load on davits. If dinghies are carrying excess gear, fuel or have water in them, they will overload the davits.

IMPORTANT -

4. Craft with transom door - where a craft has a transom door fitted it is important that the heavier end of the dinghy (usually the stern with an outboard motor) is carried on the davit furthest from the transom door, ie, in the case of a port side transom door the stern of the dinghy should be carried on the starboard davit.

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Maintenance of Sea cocks (See additional information at back of book)

SHAFT GLANDS (STUFFING BOXES)

It is advisable that maintenance of the shaft gland is carried out by an experienced Marine fitter, however, when this is not practicable, it is possible, with the correct tools and carefully following the procedures in the following text, to carry out both adjustment and the replacing of the packing material in the shaft glands, by princess owners.

1 SAFETY

The gland is a critical component of the boat - it forms the water seal between the engine room and the sea.

Never make adjustments to a gland with the engine running - clothing can get wrapped around the shaft and cause severe personal injury.

2 MAINTENANCE

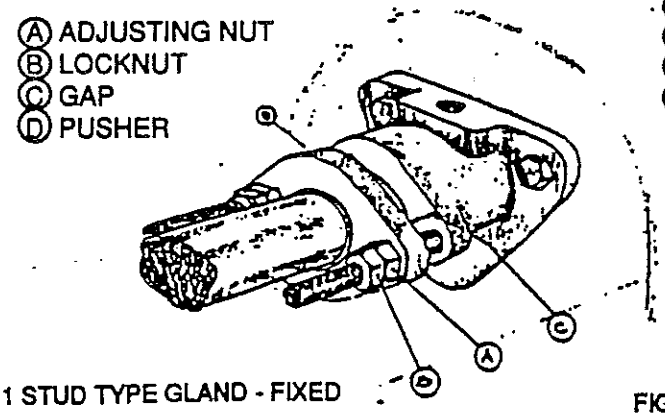
As the gland maintains the watertight integrity of the hull, it is important that any personnel who maintain it are familiar with the assembly, how it operates and how it is to be maintained. They must also have suitable tools and spares with which to maintain it.

2.1 TYPES OF GLAND

There are two types of gland in regular use on Princess boats:

a) FIXED GLAND - (Stud Type)

Fig. 1. PRINCESS 315, 330, 35, 36R, 388, 415, 435, 45, 46R, 48



1 STUD TYPE GLAND - FIXED

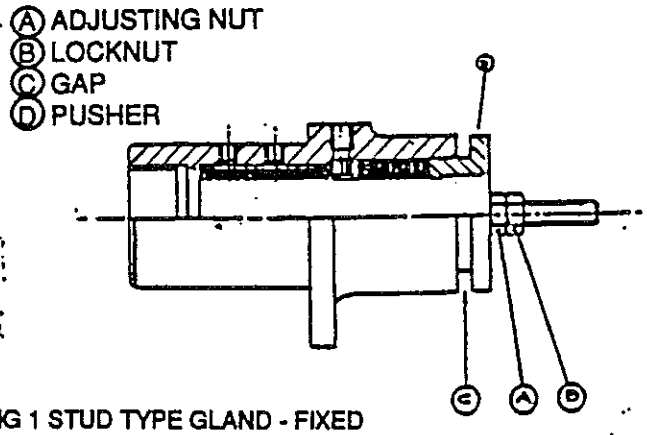
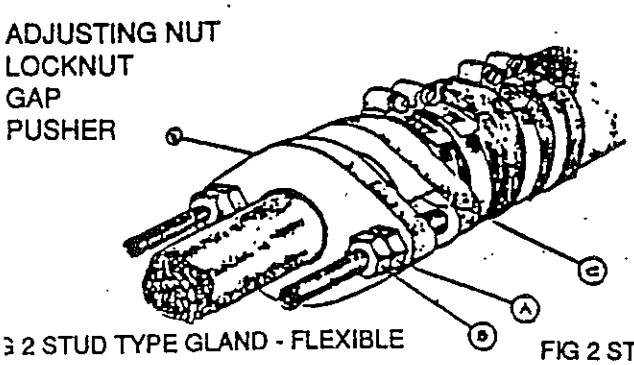


FIG 1 STUD TYPE GLAND - FIXED

b) FLEX GLAND - (Stud Type)

Fig. 2. PRINCESS 55



2 STUD TYPE GLAND - FLEXIBLE

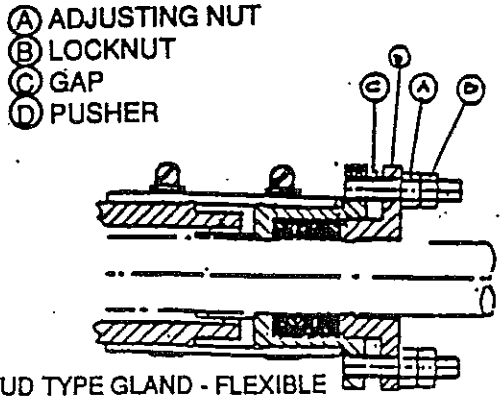


FIG 2 STUD TYPE GLAND - FLEXIBLE

2.2 MATERIALS AND CONDITIONS FOR MAINTENANCE

a The gland uses a fibrous packing material called P.T.F.E. NO OTHER PACKING MATERIAL IS TO BE USED as this may cause permanent damage to the shaft. Graphite and greasy hemp are NOT suitable for high strength stainless steel shafts.

b A gland which uses fibrous packing material will not always produce a completely watertight seal - some slight seepage is to be expected when the shaft is running. This is not detrimental, and the quantity of seepage may be controlled by adjusting the gland. When the shaft is stationary there should be no seepage, but with the shaft rotating a seepage of one drip every five seconds, to one drip every half minute is acceptable.

c The packing material is a woven fibre which is impregnated with sealant and lubricant. It is an expendable product and requires to be replaced on a regular basis. The interval between replacement will depend upon the amount of running of the shafts and how well the gland is adjusted. If a boat is slipped annually for overhaul then it would be advisable to replace the packing annually. If the boat is run frequently and on long trips then it would be advisable to replace the packing every 500 hours.

d It is important not to tighten up the gland too tightly - this can lead to failure of the packing material, consequential leakage, overheating of the shaft and gland, and in extreme cases, permanent damage to the propeller shaft.

HINTS ON PACKING STUFFING BOX/GLANDS

1 Ensure all old packing is removed before attempting to fit new packing.

2 For stuffing boxes fitted to Princess craft, the square section of the packing is:

3/8" for 1.5" dia shaft and needs 4 rings of packing P315, 330, 35, 36R.

3/8" for 1.75" dia shaft and needs 4 rings of packing P388, 415, 435, 45 46R, 48

5/16" for 2" dia shaft and needs 5 rings of packing P55

3/8" for 2.25" dia shaft and needs 4 rings of packing P65

3 Do not try to force more than the stuffing box will take. Remember the gland pusher must be able to enter the stuffing box before tightening the nuts.

4 Ensure that the gland is tightened up equally so that is does not bear on the shaft.

5 It is important to remember that is is considerably cheaper to renew the packing than to renew the shafting. Screwing down on worn packing will only increase shaft wear.

6 Checks should be made regularly, particularly when the vessel is first in service or after renewing the packing, for:

a) Leakage of water inboard when the packing has settled in and may require a little re-tensioning.

b) Gland overheating due to over-tightening of gland. In this case the gland should be re-packed if "glazed" by overheating. In an emergency, the packing may be turned to allow a different face of the square section to sit on shaft, but the packing should be replaced as soon as possible.

2.3 PROCEDURE FOR ADJUSTMENT

Fixed Stud Type Gland and Flexi Gland

a Two spanners are required for shafts of 1 1/4", 1 1/2" and 1 3/4" diameter, spanners are to be 0.82" A/F, (20.8mm A/F). These are supplied on the standard tool kit.

b To tighten the gland, hold nut 'A' still, and loosen lock-nut 'B' by rotating anti-clockwise (viewed from gearbox looking towards the stern), repeat on the other pair of nuts. Tighten nut 'A' by half a turn clockwise, hold it still with a spanner and tighten the lock-nut 'B' onto it. Repeat for the other pair.

c Run the shaft for about five minutes and check the seepage rate and the gland temperatures. Repeat the above procedure if there is still excessive seepage but the gland is not running too hot. ON NO ACCOUNT SHOULD ANY OF THE HOSE CLIPS BE LOOSENED WHILST THE VESSEL IS AFLOAT. NEITHER SHOULD BOTH NUTS 'A' AND 'B' BE REMOVED FROM THE SCREW THREAD AND THE PUSHER REMOVED WHILST THE BOAT IS AFLOAT.

d The gland should run from warm, to hand hot (80 deg c). If it burns the hand immediately upon touch, and it is seeping too much water then the gland needs to be re-packed, and the condition of the shaft surface in contact with the packing needs to be carefully examined.

e There must always be a gap between the flange of the pusher and the body of the gland 'C'.

2.4 PROCEDURE TO FIT NEW PACKING

a This should always be done with the boat out of water.

b Ensure sufficient P.T.F.E. packing of the correct section is available.

c Remove all of the packing from the gland ONLY IF THE BOAT IS OUT OF THE WATER.

d Take one of the pieces of old packing and use it as a gauge to cut the new packing exactly to length. A sharp knife must be used to avoid fraying the fibres and causing a ragged joint. Cut four or five identical lengths of packing.

e Fit the first piece of packing, ensuring that it is a tight push fit inside the gland body (stud types 'b' and 'c') or nut (nut type 'a') and that the joints meet without a gap. Push it into the body until it is firmly up against the plastic spray ring.

f Fit the following pieces of packing each at 180 deg. to the one preceding. (see Fig. 3)

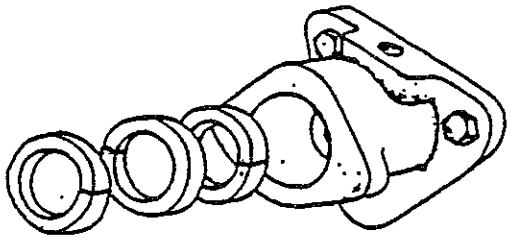


FIG 3 PACKING RINGS - SHOWING THE JOINT

g Refit the pusher and secure the nuts/lock-nuts as described in section 2.3 above. Ensure that the pusher enters the body of the gland.

h Run the shaft and monitor the seepage rate and the gland temperature during the first hour and adjust as necessary.

i On stud type glands, ensure that if the lantern spray ring is removed at any time it is refitted in the correct direction, with the larger bore facing the stern.

MAINTENANCE OF SEA COCKS

epending the areas in which the craft is kept, a certain amount of crustacian growth an occur on the inner barrel of a sea cock.. This can cause a stiffness in the operation f the sea cock and in extreme circumstances seize the sea cock in an open, or, closed osition.

egular opening and closing is therefore recommended and we advise that this is carried ut wherever possible at least once a month to dislodge any likely build up of growth nside the chamber of the sea cock.

hen the craft is lifted out for scrub off and re-antifouling, it is good practice to nsert into the inner moving barrel of the sea cock a small quantity of vaseline which hen operating an opening and closing movement of the handle will coat the inner surface nd help to keep a free movement for the following season.