THE PRINCESS 36 RIVIERA

MOTOR CRUISER

HAND BOOK

prepared for

Marine Projects (Plymouth) Limited

by

Data & Decisions

ACKNOWLEDGEMENTS

The Authors would like to take this opportunity to thank all the Equipment Manufacturers and Suppliers for their patience and co-operation in supplying information about the use and maintenance of their Equipment.

Our particular thanks and gratitude is extended to the dedicated team of craftsmen who design and build the Princess Motor Cruisers at Marine Projects (Plymouth) Limited, whose enthusiasm and support have made this Handbook possible.

Craft's Name "_____"

Craft Type: Princess _____

Owners Name: _____

Marine Projects' Yard No: _____

Engine Make: _____

Type: _____

Serial No: _____

Gear Box Make: _____

Type: _____

Serial No: _____

INTRODUCTION

It is the earnest wish of Marine Projects (Plymouth) Limited 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 that is 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.

A number of 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 detailed 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 is continuously seeking ways of improving the Princess Motor Cruisers. Thus whilst every endeavour has been made to ensure the accuracy of the information contained in this Handbook, neither Marine Projects (Plymouth) Limited, nor 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 optional additional equipment is installed in the craft, this may in turn affect the location of the standard equipment.

C O N T E N T S

Section 1

WHERE IS IT

INTRODUCTION

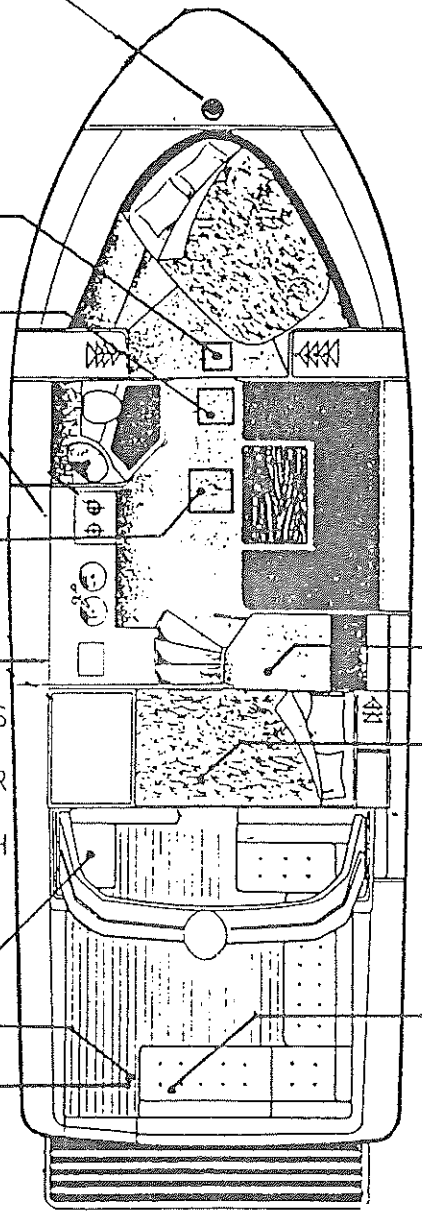
This Section is intended to illustrate where the most important Controls and Equipment are located. Where additional optional equipment has been fitted by Marine Projects (Plymouth) Ltd. this may in turn have affected the layout of the standard equipment that is installed in the craft.

This Section consists of eight 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 & HYDRAULICS

Fig. E



ANCHOR/WINDLASS

HEAD INLET SEACOCK

HEADS OUTLET SEACOCK

RADIO/CASSETTE

ECHO SOUNDER SENDER

MAIN ELECTRIC PANEL

- RADIO TELEPHONE
- BATT.CHARGE PANEL
- BATT.MASTER SWITCHES
- WATER GAUGE
- MAIN CIRCUIT BREAKER /FUSE PANEL
- SHORE SUPPORT SWITCH & RESTART

REFRIGERATION UNIT FOR ICE BOX

AFT TANK SPACE

- MAIN RELAY SWITCH FOR BATTERY CIRCUIT
- WINCH RESTART CIRCUIT BREAKER

FUSE PANEL BEHIND PANEL UNDER HELM POS'N

LOG IMPELLER TRANSDUCER UNDER PANEL UNDER BUNK

AFT TANK SPACE

BATTERY CHARGER

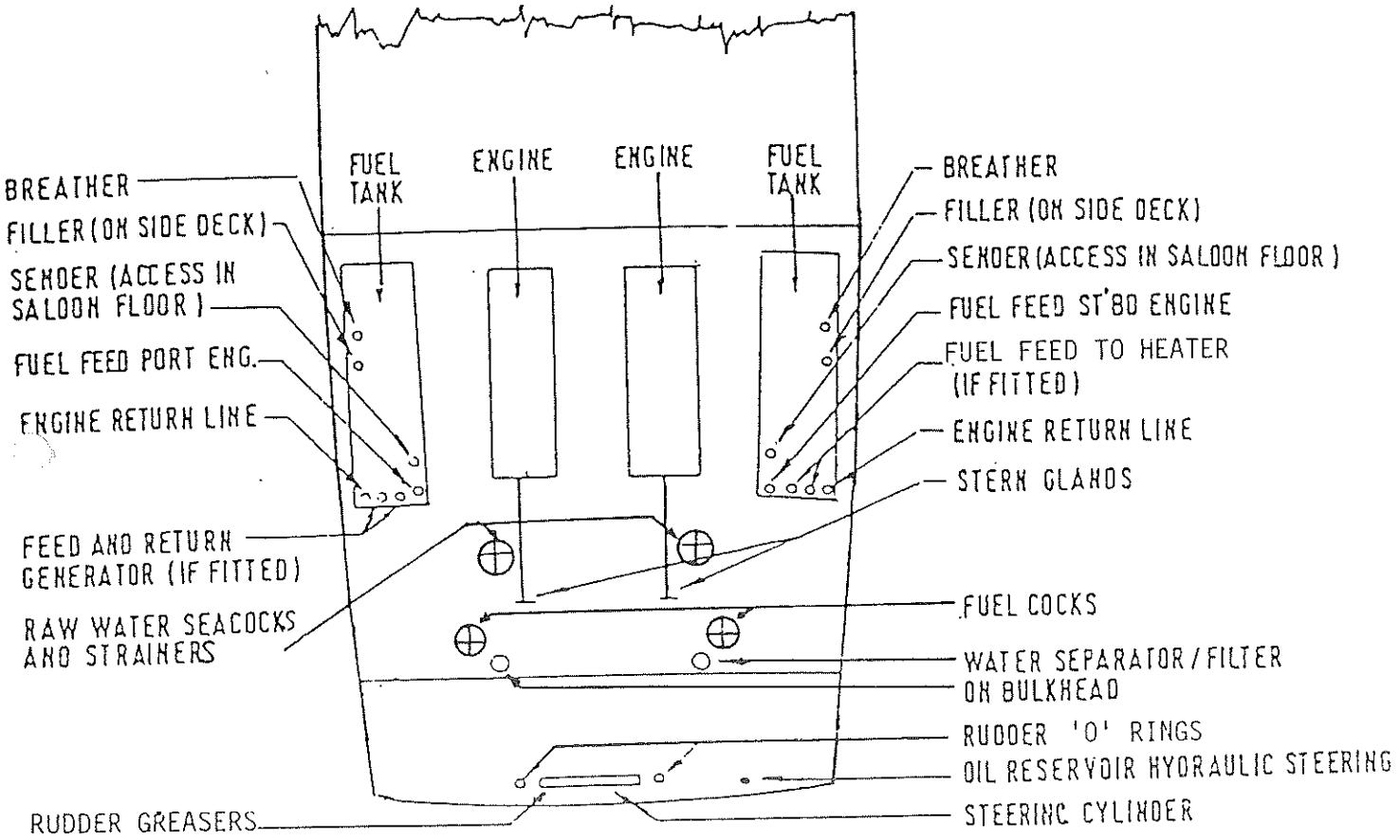
TRIM TAB HYDRAULICS & RESEVOIR

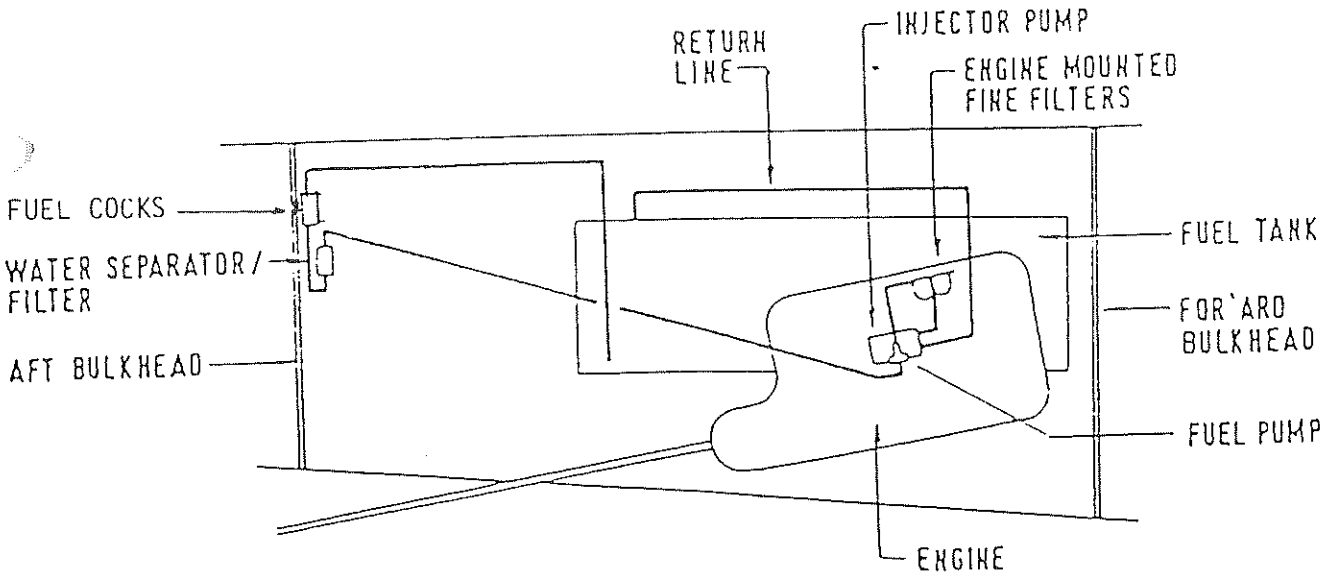
STEERING HYDRAULICS RESEVOIR

BATTERIES

RESIDUAL CIRCUIT BREAKER

FUEL SYSTEM AND ENGINEROOM LAYOUT Fig. F





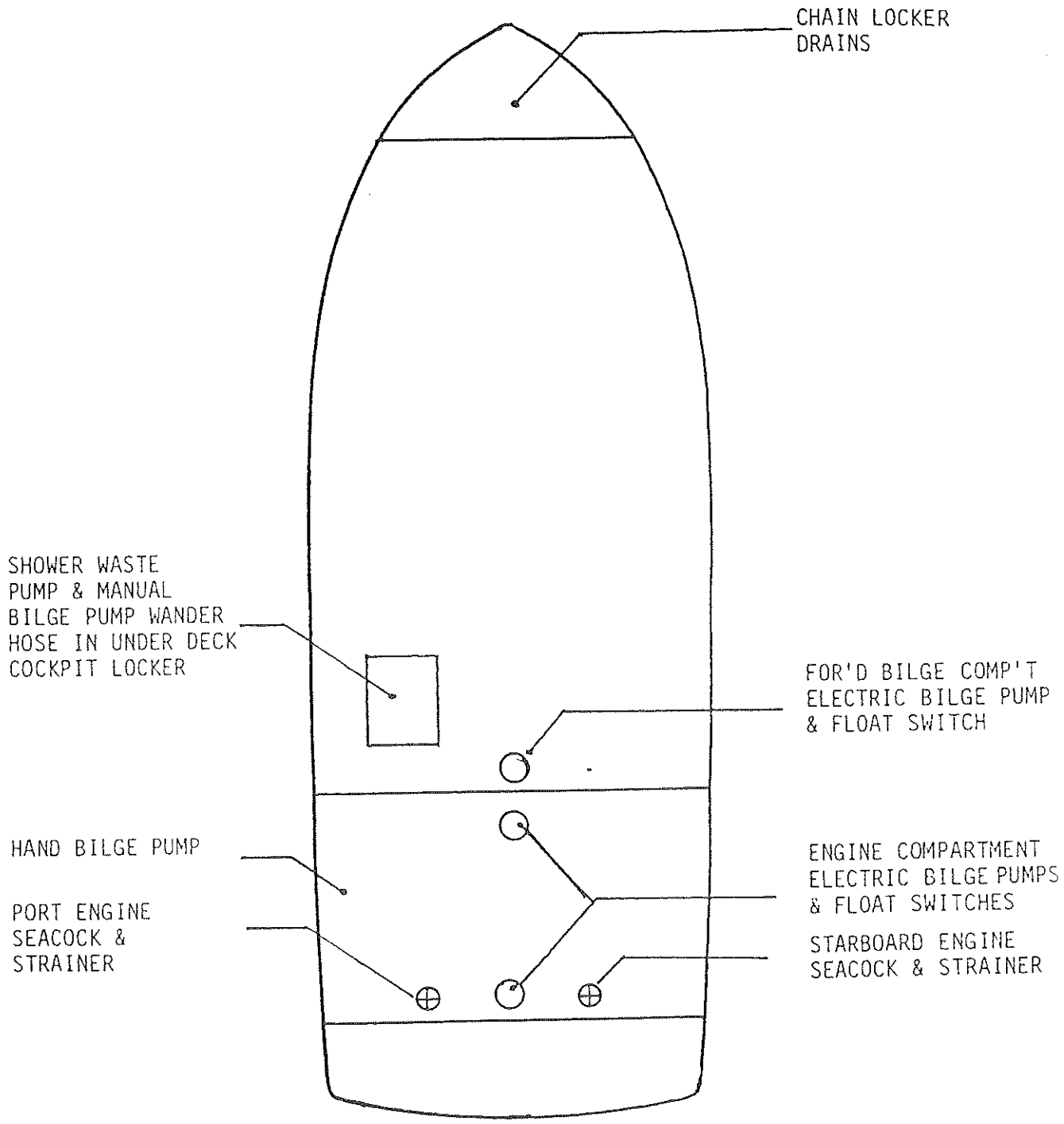
FUEL SYSTEM -

Fig. F

WHERE IS IT?

Fig. B

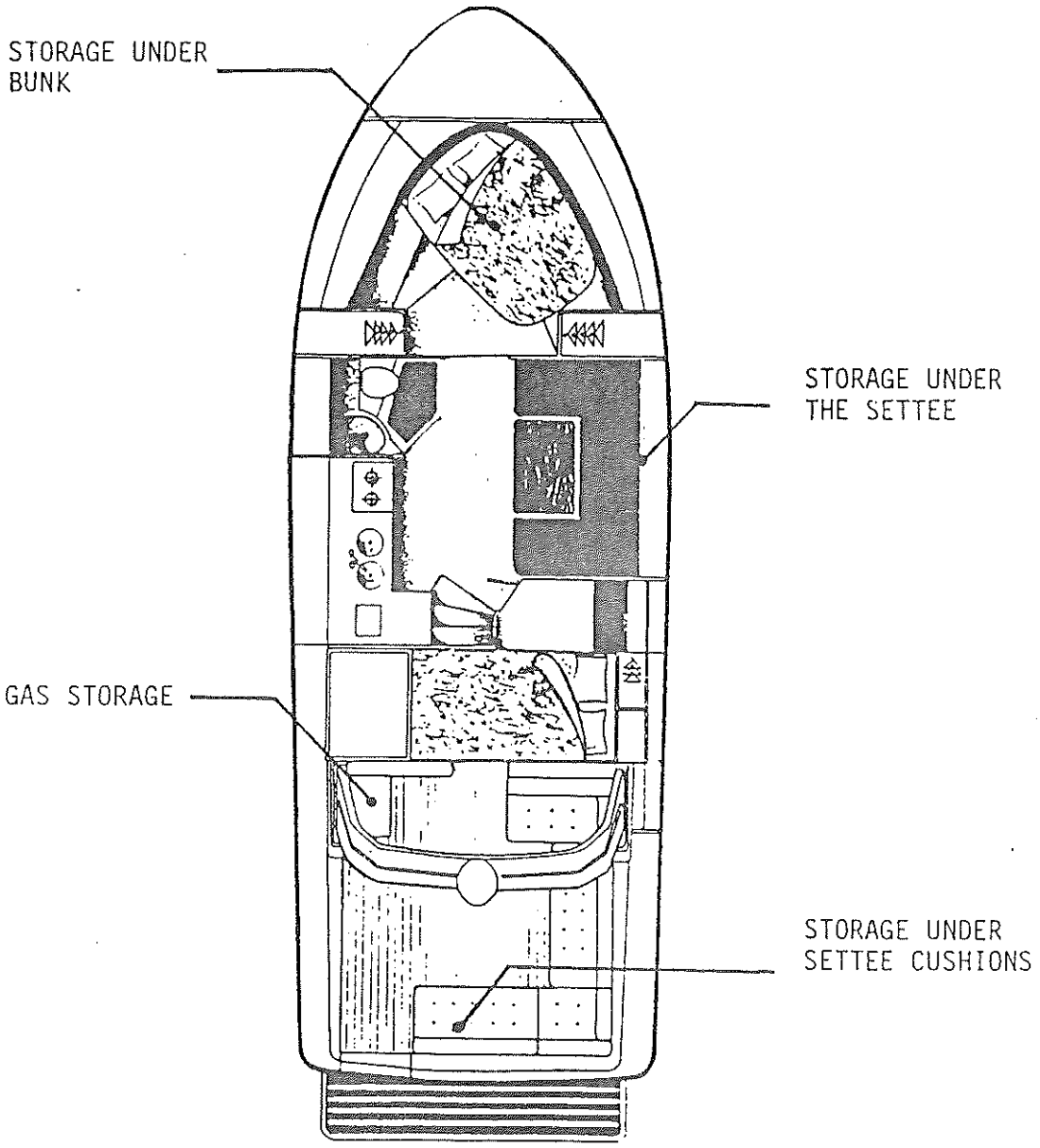
BILGE & WASTE WATER SYSTEM



WHERE IS IT?

Fig. S

STOWAGE

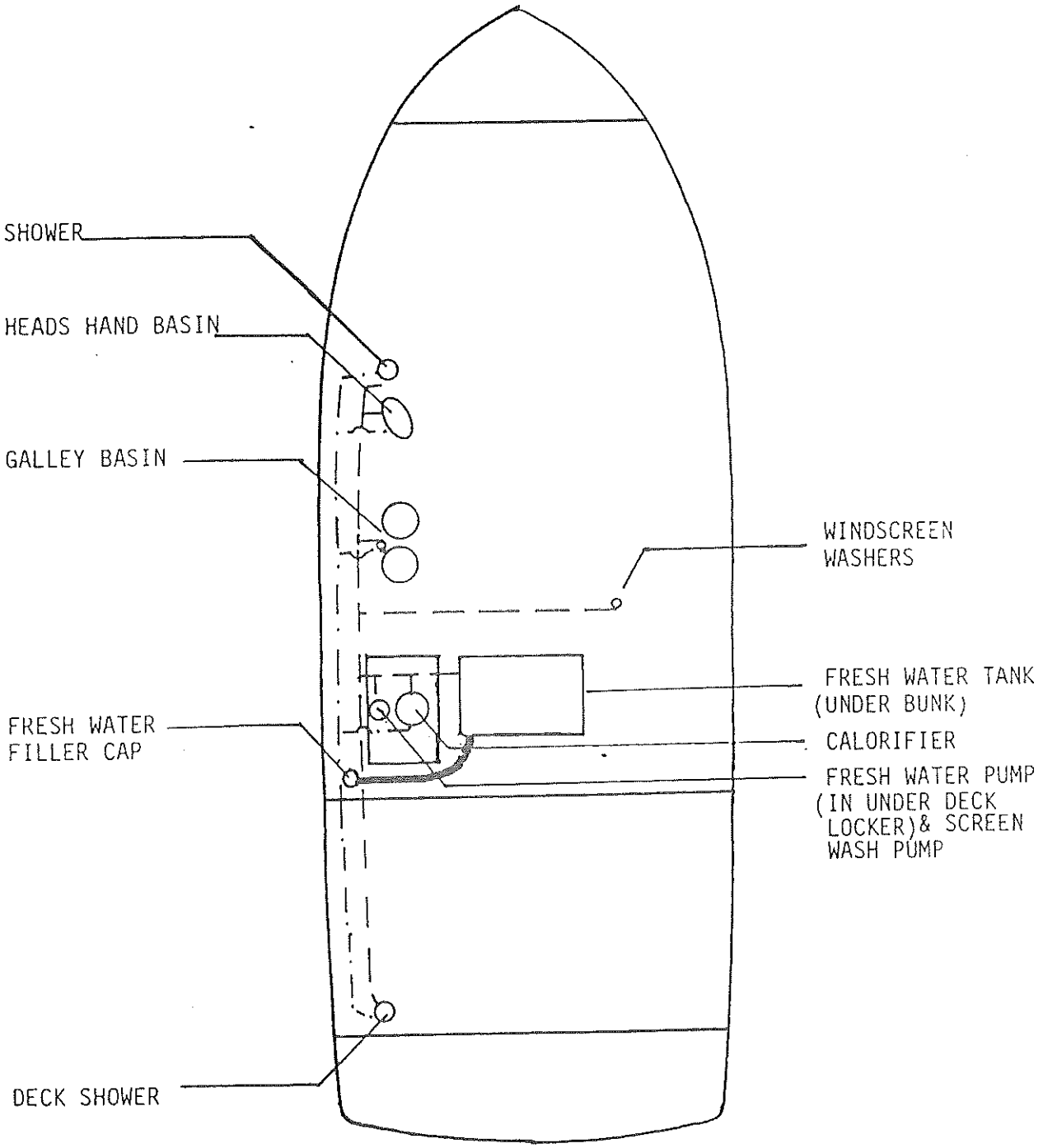


WHERE IS IT?

Fig. W.

FRESH WATER

FRESH WATER SYSTEM



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.

38,412/4
82.1

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 strainers		4.23
Clear engines raw water cooling strainers	B, F	4.54.1
Check stern glands for leaks	F	3.41
Check rudder glands for leaks	F	3.42,4.21
Check the water level of the batteries and the electrolytic level using a hydrometer	F	4.42.2
Check fluid level in trim tab pump and windlass (see manufacturers handbook) also water and oil levels in engine and gear box.		

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 binding wire connecting engines/ propeller shafts 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. Connections can be accessed below the cockpit deck		4.11
Check Fire Extinguishers	F	3.5

		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 and check oil reservoir level and pressure (2[illegible]0 p.s.i)		3.42
	Grease the rudder gland using the remote greaser or the grease nipple whichever system is fitted in the craft.		

		References	
		Location	Notes
2.14	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/tighten engine/propeller shaft coupling nuts		
	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		
	Clean cooker flue (see cooker handbook)		
	Adjust engine control cables, check fastenings at control positions 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, electric trim tabs when fitted, and the anodes themselves.		
	Check all rudder connections and lubricate all bearings and grease the rudder post using the remote greaser or the grease nipples, whichever system is fitted in the craft.		

CHECK LIST 2.2

PRIOR TO GETTING UNDER WAY

	Location	References Notes
2.21 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	4.22,4.23
2.22 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	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 not automatic)		4.33
Lower water level in toilets	O	4.26
Empty basins	W	4.12
2.23 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 and transmission		
Check that throttles and gear controls are in the neutral position before starting the 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	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 (if fitted)	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 sea cocks, e.g. at the engines and toilets	B, F	4.26
Inhibit the diesel engines (not forgetting the diesel generator if installed) 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.	F	4.54.2
Drain engine raw water cooling system.		4.54.1
Drain the calorifier (see calorifier handbook)	W	4.12.2
Drain the water heater (see water heater handbook)		
Drain the Fresh Water Tank	F	
Check all water, oil, diesel 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 thoroughly pumped the bilges open all gate valves and pump air through the manual bilge system to ensure that no water is left in the manual bilge system where frost damage might occur.	B	4.23
At locations where there is a risk of frost damage occurring(check with the local harbour master or marina personnel) drain the electric bilge and disconnect the electric bilge pump from the pipe to allow it to drain.	B	4.22
Ensure there is no water in the fresh water pump and the shower waste pump.	W	4.12
Put battery in trickle charge occasionally	F	4.42.2,4.44
Ensure underside of cushions and carpets are dry		

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 diesel 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 THE 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 engines such as often installed in the Princess 38. This results in only partial combustion of the diesel 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

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. There is the additional risk that components that are fundamental to the safety of the boat, such as the sea cocks, could fail at sea or when the boat is unattended.

In order to avoid severe electrolytic corrosion the usual procedure is to use electrical cable to connect the rudder, the gland supporting the propeller and the engine(and thereby the propeller and the propeller shaft) to the sacrificial anodes. The anodes are secured to the underside of the hull below the waterline by bolts which are located on either side of the engine compartment at the aft end.

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 six months to establish the wastage rate for the conditions in which the boat is operating and moored.

3.4 PROPELLER SHAFTS & STEERING GEAR

3.41 PROPELLER SHAFTS

Each of the contra-rotating stainless steel propeller shafts is mounted on the two separate Cutlass bearings. A cutlass bearing is mounted in the aluminium bronze P brackets (at the stern of the shaft) and another bearing is mounted at the outboard end of the shaft log. Cutlass bearings are water lubricated and there is therefore no need to apply any grease or oil whatsoever. The clear plastic pipe(s)at the shaft log deliver a copious flow of water which is essential for lubrication. When a type of log is fitted that necessitates two pipes, one supplies the lubricating water (from the engine raw water system) and the other is an Air Vent. When an Air Vent is fitted it is most important to check at regular intervals that it is clear and correctly located.

Water is prevented from entering the hull along the propeller shaft by a stern gland. A slight weep of water from the gland is desirable because this assists in lubrication.

The maintenance that is possible while the boat is afloat is confined to adjusting the stern glands; which can be reached from the engine compartment.

If the amount of water entering the hull through the stern gland is judged to be excessive, (only a slight weep is desirable) the graphite impregnated packing around the shaft can be compressed by tightening both nuts on the gland by an equal amount. It is advisable to tighten each of them by about half a turn alternately until seepage has been reduced to an acceptable level.

DO NOT OVERTIGHTEN, ALLOW SOME SEEPAGE OTHERWISE THE PACKING WILL BURN OUT.

The stern glands should only be repacked when the craft is out of the water.

3.42 THE STEERING GEAR

Each rudder post is supported in a bearing which is lubricated with grease forced into the bearing by the hand operated lubricator. Give a half turn at frequent intervals, and especially if the boat has not been used for a while. Water is prevented from entering the hull by an 'O' ring at the top of the bearing.

The rudders are operated from the helm position hydraulically. Rotation of the steering wheel generates a differential pressure which, through the system, moves the steering cylinder proportionally. This in turn is attached to the rudder posts. The system is pressurised at the oil reservoir mounted inside the starboard transom in the aft compartment. A quarterly check should be made on the reservoir level, the pressure (20-30 p.s.i), the fittings for leaks, and the linkages for security, as outlined in the equipment suppliers' handbook. For further information refer to the hydraulic steering manufacturer's handbook.

3.5 FIRE EXTINGUISHERS FITTED IN THE CRAFT

Fire extinguishers are fitted to the underside of the Engine Space covers on the port and starboard side and alongside the central heating unit and generator (if fitted). hese two items of equipment are normally fitted in the tank space. All of these extinguishers operate automatically. At the end of each extinguisher is a bulb which will activate the extinguisher if the surrounding air temperature reaches 80° C (175° F)

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.

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 50 Imperial gallons (or 227 litres/60 US gallons) is located under the bunk of the amidships cabin. (See Fig. W)

The tank is constructed of fibreglass and incorporates baffles running fore and aft to prevent water surging thereby preserving the stability of the boat.

The tank filler is located on the port deck generally just for'd of the FUEL filler. (See Fig. W) Double check that it is the correct filler before filling with water.

The air vent for the fresh water tank is a plastic pipe running from the top of the tank through the port side of the bulkhead and into the engine compartment ventilating duct. (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

The pressure controlled electric water pump is located in the port side under deck locker at the for'd end of the cockpit.

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 Fig. W.

There is a master switch for the fresh water pump on the main control panel which is at the aft end of the saloon on the port side. 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.

4.12.1. 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 basins, the galley basin, the showers and deck shower if fitted.

4.12.2 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 in the deck locker on the port side of the cockpit. (See Fig. W) The calorifier will only heat water when the engine to which it is connected is running. (NB the calorifier may be connected to either the port or starboard engine depending upon what optional equipment is fitted.) At other times, water can only be heated if an immersion heater is fitted in the calorifier powered by the 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.

4.12.3 THE WINDSCREEN WASHERS

If windscreen washers are fitted, a non pressurised feed is taken from a junction between the main water pump and the main water tank (See Fig. W). The water is then pressurised by the washer pump, located beside the main water pressure pump.

4.2 THE BILGE AND ALLIED SYSTEMS

4.21 INTRODUCTION

It should be remembered that it is quite normal for a small amount of water to enter the hull through the stern tube glands, through which the propeller shafts pass, and the rudder post gland. However the amount of water entering the hull in this way can be controlled and this is dealt with in Section 3.4. The layout of the Bilge System is illustrated in Fig. B)

The hull is devided into three separate bilge compartments of which two are served by electric bilge pumps as indicated in Fig. B. They are not connected in any way and must therefore be pumped out separately.

The chain locker, which is a separate fourth compartment drains directly overboard.

The central engine compartment, where seepage from the stern tube glands collects, is fitted with two electric bilge pumps and float switches that are activated automatically as the water level rises above a predetermined level. They are mounted between the two engines at the fore and aft ends of the engine compartment.

In addition, all three compartments can be pumped manually. Operating procedures for the electric and hand bilge pumps are given below.

4.22 THE ELECTRIC BILGE PUMP SYSTEM

The electric bilge pumps are of the submersible type. They pump out the water from their respective bilge compartments through the the hull above the waterline via the plastic pipe systems that are fitted. The pumps can be operated at will by using the switches that are located at the helmsman's position. A fuse for each pump is built into each switch.

At other times the switches should all be left in the AUTO position so that the pumps will be automatically activated by their float switches when the water in the

4.24 WASTE WATER DRAINS

Waste water from the galley and wash hand basins and rainwater from the flybridge and 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 bicycle pump or domestic sink pump.

4.25 THE SHOWER WASTE SYSTEM

The shower operates 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 located under the floor in the gangway adjacent to the shower door (See Fig. B) The operating switches are located by the wash hand basin in each shower compartment.

NOTE Switch off the pump immediately the water has been evacuated from the shower area, otherwise the pump impeller is liable to be damaged.

4.26 THE MARINE TOILET

To operate the system carry out the following steps:

1. Open both sea cocks, located beneath the floor in the master cabin.
2. Flush toilet, move valve lever 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 sea cocks. Note, these must be re-opened before operating the toilet.

4.4. THE ELECTRICAL SYSTEM

4.41 THE ALTERNATIVE SYSTEMS

An earth return 12 volt battery system forms the only source of electrical power for the craft when under way. This is augmented by a 220/240 volt[1] 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. The location of the principal electrical equipment and controls is given in Fig. E.

4.42 THE 12 VOLT DC BATTERY SYSTEM

4.42.1 Introduction

The 12 volt system is powered by four heavy duty batteries located in the tank space. The four batteries are arranged in two banks of two batteries.

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. One bank of batteries is used solely for starting the engines, while the other bank provides power for all the boat's 12 volt equipment. Thus, if the boat's equipment is over used when the engines are not running, only one set of batteries will be drained, thus minimising the risk of having no power available to start the engines to recharge the batteries.

4.42.2 Care & 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.

1) The shore supply system may be 110 volts, depending upon the system which is installed.

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 battery, 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.

4.42.3 Master Switches

There are two key switches located at the main control panel which is located at eye level in the galley on the port side of the craft. These keys are used to switch on or isolate the Engine and Auxilary battery banks respectively.

If these keys fail to activate the batteries and the voltmeter fails to register, this is generally due to the batteries being discharged. Should the key switches fail to activate the batteries this can be accomplished by manually by pushing up the plungers on the isolating relays simultaneously by hand. These relays are located on the for'd bulkhead of the aft tank space adjacent to each other.

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

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

These latter pieces of equipment are wired directly to the starboard bank of batteries since they may require power at times when the ship's electrics are shut down or alternatively, when the craft is unmanned.

When using the anchor windlass 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 on the windlass, or to go gently astern to break out the anchor if this proves difficult.

4.43 THE 240 VOLT AC SYSTEM

This system is powered, unless a generator is installed, from a shore mains supply of 220/240 volt A.C.[1] The connecting socket for this is located on the port side of the after deck. (see Fig. E)

BEFORE CONNECTING THE SHORE PLUG CHECK THAT ALL A.C. SYSTEM SWITCHES IN THE PANEL OVER THE GALLEY ARE SWITCHED OFF AND AS SOON AS THE SHORE LINE IS CONNECTED CARRY OUT A POLARITY CHECK BEFORE SWITCHING ON THE MAIN SWITCH.

The polarity check is especially necessary when visiting unknown marinas. It is simply carried out. A polarity check button is located on the main control panel at the aft end of the saloon on the port side. Press it and the green 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[1] 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 3.5 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.

1) Note the shore system installed on the craft which is specified by the boat owner can be 110 volts and not 220/240 volts.

4.46 THE ELECTRIC WINDLASS

An overload cutout fuse is incorporated in the anchor windlass as a precaution against overloading the motor. This is mounted inside the casing containing the relay switch located in the tank space at the aft end of the craft. (See Fig. E).

Thus if the windlass will not operate check as follows:

1. that the switch is operating correctly and that the overload cut-out has re-set,(push to reset)

2. that the terminals in the terminal block also located on the deck head in the chain locker, are all in good condition.

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 electrically powered by the 12 volt battery supply or by the 220/240 volt supply from the shore support system or from the generator if fitted. The refrigerator changes from one source of supply to the other automatically. Note the refrigerator may be powered by a 110 volts shore supply, depending which shore supply system is installed on the craft.

4.48 FUSES AND CIRCUIT BREAKERS

It now the general practice to fit fuses to most of the electrical equipment rather than conventional fuses. Most of the circuit breakers which are clearly labelled are located on the main switch panel which is at eye level in the galley area.

Conventional Continental style fuses are use to safe guard the electrical equipment listed below, the fuse panel for which is located behind the main instrument panel at the helm position. These fuses can be reached by removing the screws which secure the lower facing panel located below the helm.

The equipment covered by these fuses is as follows:

Screen wash system
Trim Tabs
Horn

There are also a number of fuses that are surplus to the normal requirements and which can be used for optional equipment that might be installed on the craft.

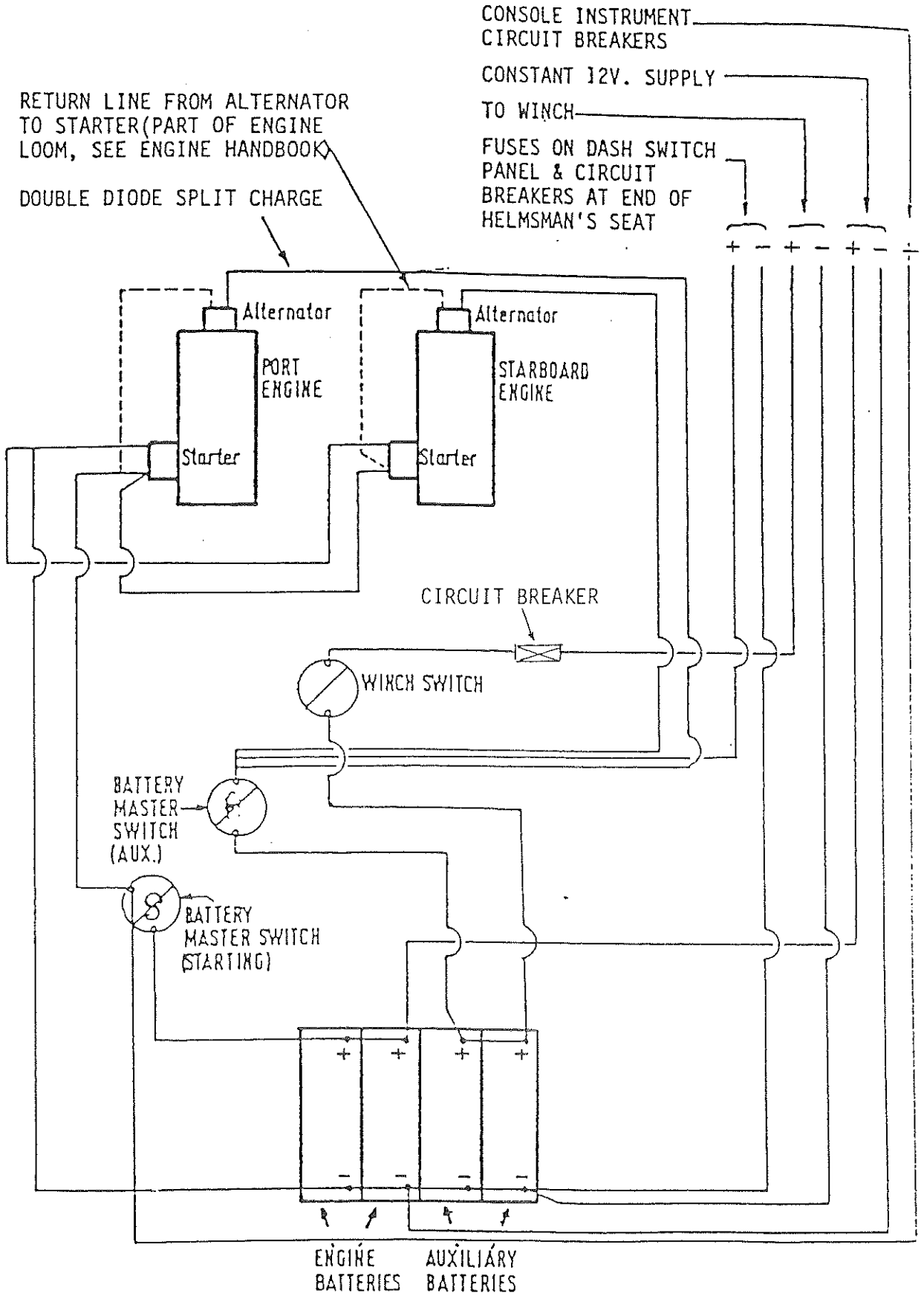
All negative returns throughout are fed to the negative strip alongside the fuse block under the helmsman's seat.
Code for continental type fuses is: White - 8 amp, Red - 16 amp, Blue - 25 amp.
220/240 mains powered equipment should be fused according to the makers' specification. Check equipment makers' literature for any sizes of any 'built-in' fuses.

The VHF radio telephone fuse is at the rear of the instrument panel and is accessed by removing the screws holding the lower instrument panel in place.

The stereo radio fuse is also at the rear of the unit in the power feed line and the radio must be demounted for access. The bilge pumps also have fuses located at the control panel adjacent to the switch for the bilge pump.

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 diagram of the Battery Supply Circuit has been included in this Section.



BATTERY SUPPLY CIRCUIT

4.5 THE ENGINES

4.51 THE FUEL SYSTEM

4.51.1 Introduction

The engines and the central heating system (if fitted) use diesel fuel. Two diesel fuel tanks are fitted each with a capacity of 90 Imperial gallons (that is, 409 litres or 108 US gallons). The layout of the Fuel System is illustrated in Fig. F.

4.51.2 Description of the Fuel System

The two fuel tanks which are made of mild steel, are located on either side of the boat outboard of the engines. Each tank should serve only one engine. There is a balance pipe connecting the tanks to allow fuel to be transferred from one tank to the other. However, the valves on the balance pipe which are close to the tanks are normally to be kept shut. (See 4.52 below).

Each tank has its own filler pipe and the filler caps are located on either side of the craft as indicated in Fig. F. Both are clearly marked with the word FUEL and coloured RED.

Fuel cocks which cut off the fuel from the tank to the respective engines are located on the bulkhead at the aft end of the engine compartment. (see Fig. F) 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. Similarly when a central heating system is fitted, a fuel cock is generally located for the system on the starboard side adjacent to the starboard engine fuel cock.

Diesel engines are not generally self-priming. If the 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.

The senders for the fuel tank gauges and fuel inlet can generally be accessed through holes located under the saloon settees on both the port and starboard side.

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.

4.51.3 Fuel Filters

Water separator filters are mounted on the rear 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.

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

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

Inspection and maintenance procedures for the fuel system and the engine are incorporated in the Engine Handbook.

4.52 Taking on Fuel

The diameter of the balance pipe connecting the two tanks will not generally allow fuel to flow from one tank to another at the same rate at which the tank can be filled with fuel. Thus it will be necessary to fill each tank separately. Should the amount of fuel in the two tanks become unequal at any time (which could cause the craft to list) then the two valves on the balance pipe may be opened until the amount of fuel in the tank equalises.

4.53 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 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 fuel if it can possibly 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 Engine Handbook.
- do not allow any diesel oil that has been spilled into the bilges to lay there unattended. Whilst 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 diesel leak from the engine 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 which could 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 tanks are full to reduce the risk of condensation forming in the tanks.

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4.54.2 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.

4.55 OPERATING THE ENGINES

4.55.1 Introduction

BEFORE STARTING THE ENGINES ALWAYS ENSURE THAT THE THROTTLES AT THE SALOON CONSOLE ARE IN THE NEUTRAL POSITION.

The warning given above is extremely important. If for example, the throttles have been moved accidentally whilst the vessel is alongside, the propeller drive will be engaged and when an engine is started 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.

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.

4.55.2 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. Turn the Starting key to the STOP position until the engine has stopped
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.

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 the 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.

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