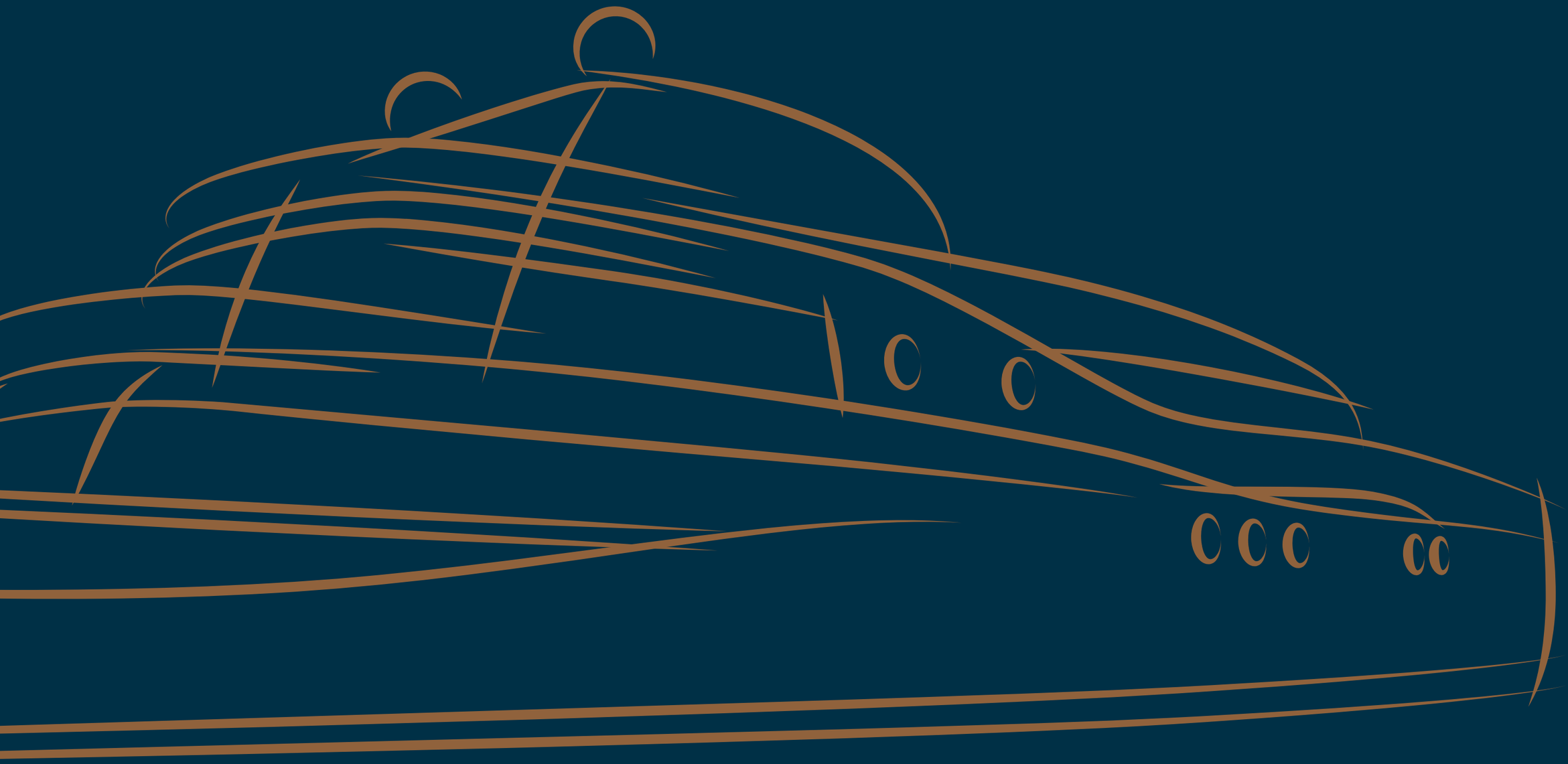

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Technical Operating Manual

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2.3.2 Main Fresh Water Cooling System

2.3.1 Main Sea Water Cooling System

MAIN SEA WATER COOLING PUMPS

Reference No:	XH/234.1/2
Manufacturer:	Pompe Garbarino
Type:	Vertical, centrifugal with pneumatic ejector priming unit
Model:	MU 300-200 LDS
No. of sets:	2
Capacity:	200m^3/h at 1.8 bar
Motor:	400V, 20kW, 1,500 rpm

MAIN ENGINE SEA WATER CIRCULATION PUMPS

Reference No:	XH/242.1/2
Manufacturer:	Pompe Garbarino
Type:	Engine-driven centrifugal
Model:	MU 300-200 LDS
No. of sets:	2
Capacity:	240m^3/h at 2.8 bar
Motor:	400V, 22kW, 1,500 rpm

GENERATOR ENGINE SEA WATER CIRCULATION PUMPS

Manufacturer:	Allweiler
Type:	Engine-driven centrifugal
Model:	NC80-200
No. of sets:	2
Capacity:	80m^3/h at 2.7 bar

ACCOMMODATION AIR CONDITIONING WATER CHILLER SEA WATER CIRCULATION PUMPS

Reference No:	XH/252.1-3
	XH/252.4-6
	XH/252.7-92
Manufacturer:	Behrens.
Type:	Centrifugal
Model:	VRF 3/300F
No. of sets:	7
Capacity:	95m^3/h at 1.8 bar
Motor:	400V, 11kW, 950rpm

MAIN FRESH WATER COOLING HEAT EXCHANGERS

Reference No:	XH/135.1/2
Manufacturer:	Alfa Laval
Type:	Titanium plate
Model:	FW 746XL
No. of sets:	2
Heat exchange area:	20m^2
Heat exchange capacity:	FW - 160m^3/h, 43°C to 39°C
	SW - 160m^3/h, 33°C to 38°C
Design temperatures:	0°C to 85°C

MAIN ENGINE COOLANT HEAT EXCHANGERS

Reference No:	XH/138.1/2
Manufacturer:	Alfa Laval
Type:	Plate
Model:	FW 746XL
No. of sets:	2
Heat exchange area:	18m^2
Heat exchange capacity:	FW - 160m^3/h, 43°C to 39°C
	SW - 160m^3/h, 33°C to 38°C
Design temperatures:	0°C to 80°C

GENERATOR ENGINE COOLANT AND FUEL OIL HEAT EXCHANGERS

Reference No:	FW/SW Cooler - XH/234.1/2
	SW/FO Cooler - XH/156.1
Manufacturer:	Sondex
Type:	Plate
Model:	S345-261-76T
No. of sets:	3

Evaporator Ejector Pump

Ref. No:	XH/234.1
Manufacturer:	Allweiler
Type:	NC80-500
Capacity:	100m3/h at 6.5 bar
Rating:	690V, 50kW at 1,750 rpm

Distilled Water Pump

Ref. No:	XH/250.1
Manufacturer:	Allweiler
Type:	LT5-350
Capacity:	33m3/h at 4.0 bar
Rating:	690V, 12kW at 1,750 rpm

INTRODUCTION

The high sea chest is located on the starboard side of the vessel and the low sea chests is located on the port side. They are located aft in the main engine room with sea water entering a Sea Water (SW) crossover via large capacity coarse (2mm) basket strainers. The SW crossover allows all of the sea water pumps to be supplied from either side of the vessel.

Both of the sea chests have compressed air connections for sea chest weed clearing and they are also equipped with an automatic Marine Growth Prevention System (MGPS) which must be in use at all times to prevent fouling when that sea chest is operational. The compressed air is supplied from the working air system via 38 bar to 7 bar pressure reducing stations and manual isolation valves.

The sea chests and SW crossover are vented to above deck 3 level via vent lines which are fitted with manual isolating valves; these vent line valves should remain open during normal operation, but should be closed and immediately re-opened on a regular basis to ensure they are not seized.

The pneumatically actuated ship-side SW strainer isolation valves (port and starboard) are remotely operated from the vessel's Integrated Monitoring, Alarm and Control System (IMACS). The valves can also be operated locally.

Both sea water inlets to the SW cross over are fitted with strainers. Strainers are vented locally via vent lines and are also fitted with local pressure gauges, as well as inlet and outlet pressure transmitters; these pressure transmitters connect with a differential pressure transducer which indicate when strainer cleaning is necessary. Strainers are drained by the stripping connection to reduce the production of unnecessary bilge water.

Normally, the low sea suction (Port) will be used when the vessel is at sea or when surface contamination such as weed is present and the high sea suction (Starboard) will be used when the vessel is operating in brackish or shallow water, to prevent the ingestion of sand and silt into the sea water system.

2.3.1 Main Sea Water Cooling System

The following sea water pumps are supplied from the sea water crossover:

- Main cooling sea water pumps (2 sets).
- Fire and bilge pumps (2 sets).
- Ballast pumps (2 sets).
- Air conditioning chilled water SW circulation pumps (7 sets).
- Main engine cooling SW pumps (2 sets).
- Generator engine cooling SW pumps (2 sets).

SHORE CONNECTION

When the vessel is in dry dock, the SW crossover can be supplied from port and starboard shore connections to allow the service systems which require cooling SW to be supplied.

MAIN SEA WATER COOLING SYSTEM

The vessel's main cooling SW pumps, located at the engine room floor level, are both fitted with compressed air driven priming ejector pumps. The pumps draw sea water from the SW crossover and discharge into a common manifold which supplies sea water as the cooling medium to one or both of the 100% capacity main cooling Fresh Water (FW) heat exchangers.

Each of the main SW pumps can supply 100% of the required capacity for the heat exchangers and normally one pump will be selected as the duty pump and the other will be selected as the standby pump. The selected standby SW pump starts automatically should the duty pump fail to maintain the set system pressure.

No.1 main cooling SW pump is supplied with power from the Main Switchboard (MSB) via the Starboard side main Engine Room (ER) Motor Control Cubicle (MCC) and No.2 main cooling SW pump is supplied with power via the port side main ER MCC. They can be selected for MANUAL or AUTOMATIC from their Local Control Panels (LCP) and they will normally be selected for AUTO operation. When selected for AUTO operation at their local starter cubicles, the pumps are controlled from the appropriate IMACS sea water system mimic.

Normally, one of the main cooling FW heat exchanger will be in service with the other main cooling FW heat exchanger on standby in a clean condition with its inlet and outlet valves closed. Duty main cooling SW pumps and heat exchangers should be changed over at three monthly intervals to even out operating running hours.

The main cooling FW heat exchangers have 2.5mm mesh in-line strainers fitted in the SW inlet to prevent blocking of the cooling passages. If the water flow is restricted, there will be a high pressure drop (Δp) across the heat exchanger and cleaning is required. The interval between cleaning of the in-line strainer is dictated by the contamination of the sea water in which the vessel is operating, although it is recommended that the strainers are examined at three monthly intervals, even when there is no appreciable pressure drop across the exchanger. The sea water pipework connected to the cooler must be completely isolated before the strainer is removed and a check made to ensure there is no residual pressure before the final bolts are removed.

If, after cleaning the strainer, there is still an excessive pressure drop (Δp) across the heat exchanger, it indicates that the cooler SW channels are fouled, having become restricted by debris, and the heat exchanger must be cleaned to remove the debris. After leaving the main cooling FW heat exchangers, the SW is discharged overboard via ship-side valve 3082.

Emergency SW supply connections are available at the pump suctions lines from the deck wash system. These can be used when the vessel is in dry dock as the fire main will be pressured by shore supply water. However, shore fire main water supply is limited and so the systems to be operated must be limited to maintain effective cooling. Arrangements must be made with the dry dock for water overboard discharge to prevent splashing in the dry dock.

OPERATION OF THE MAIN SEA WATER COOLING PUMP PRIMING EJECTOR UNIT

The main SW cooling pump is fitted with priming ejector unit to assist in priming when started. The priming ejector unit has a compressed air supply (8 bar) which is controlled by a solenoid valve. The ejector is a venturi through which the compressed air flows. When the air passes through the restriction in the venturi, the velocity increases and the pressure reduces; this draws any air out of the pump casing and SW is drawn in.

When the pump has gained suction the solenoid valve closes, stopping the compressed air supply and the ejector unit is isolated.

MAIN ENGINE SEA WATER COOLING SYSTEM

Each main engine has its own SW supply with two SW cooling branches. One branch supplies approximately 100m^3/h through the Lubricating Oil (LO) heat exchangers then the charge air Low Pressure (LP) and High Pressure (HP) intercoolers; the second branch supplies approximately 140m^3/h through the gear oil coolers and engine cooling fresh water cooler/return fuel heat exchanger.

Sea water is drawn directly from the SW crossover by the engine-driven centrifugal pumps, and after passing through the heat exchangers, is either discharged directly to overboard or is discharged to overboard via the engine underwater exhaust manifolds. In an emergency, both main engine can be supplied with a limited amount of SW via the deck-wash system.

System valves which are normally maintained in the closed position should be opened and immediately closed (when this will not affect the operational safety of the vessel) at approximately three-monthly intervals to ensure that these valves remain operable.

GENERATOR ENGINE SEA WATER COOLING SYSTEM

Each generator engine SW circulation pump draws from the SW crossover via a 2mm mesh suction strainer which reduce the likelihood of any contaminants that may have migrated through the port or starboard sea chest suction strainers. After passing through the generator engine combined cooling FW and fuel heat exchanger, the SW is discharged to a common manifold which can be set up to discharge overboard on either the port or starboard sides of the vessel as required.

EMERGENCY BILGE SUCTION

The port main engine driven centrifugal sea water pump has an emergency bilge suction connection from the main engine room. The emergency bilge suction valve (4191) is normally closed but should be test opened (when safe to do so) at annual intervals. This should only be undertaken when there is no risk of pumping bilge water directly overboard.

AIR CONDITIONING REFRIGERATION CONDENSER SEA WATER COOLING SYSTEMS

The air conditioning refrigeration condenser SW circulation pumps draw directly from the SW crossover via isolating valves. There are connections fitted with blank flanges at the SW inlets to all of the chiller units which allow them to be operated using a shore water supply during dry dock.

BALLAST PUMP/DRAIN CROSSOVER

The ballast system SW pump takes suction from the SW crossover via remotely operated valve 5210.

FIRE FIGHTING/BILGE PUMP

There are two SW supplies from the SW crossover to the fire fighting/bilge pumps via remotely operated valves 5190 - 5191.

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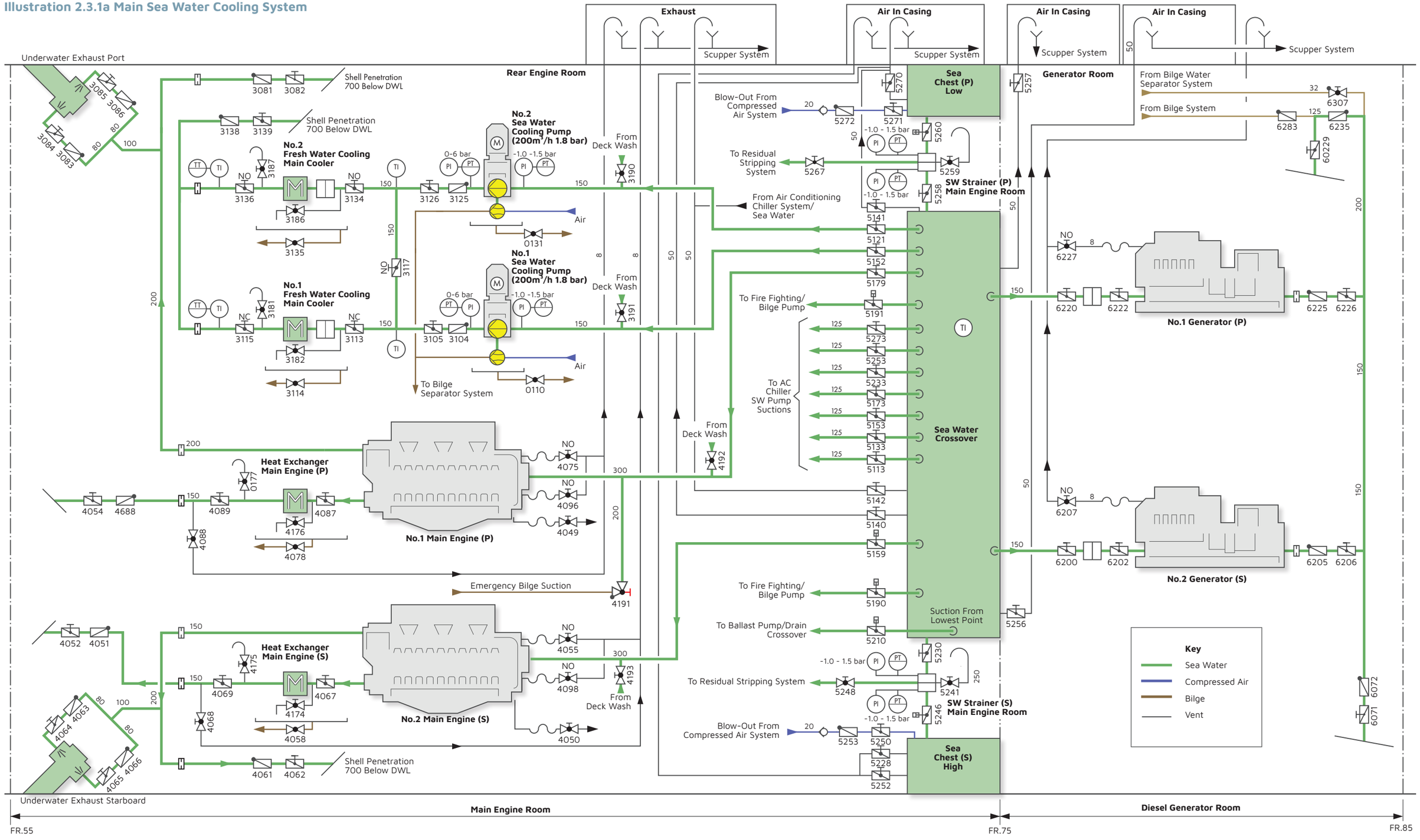
2.3.1 Main Sea Water Cooling System

Illustration 2.3.1a Main Sea Water Cooling System



2.3.1 Main Sea Water Cooling System

OPERATING THE SEA WATER CROSSOVER

a) Check that the main SW suction strainer from the sea chest to be used, high (S) and low (P), is secure and the drain and air vent valves are closed.

Note: Suction strainers should be cleaned when the pressure difference (Δp) across the strainer reaches an unacceptable level. When cleaning a strainer, ensure that the inlet and outlet valves are securely closed and that the strainer is vented and drained. The strainer cover must be opened carefully with the nuts still in place, to check that there is no residual pressure in the strainer and that the ship-side SW valves are not leaking.

CAUTION

Prior to removing the cover from a suction strainer, the joint must be broken with the nuts still attached to the cover studs; this will allow the cover to be bolted back into position should the strainer be pressurised due to a leaking ship-side valve.

The following procedure assumes the starboard side low sea chest is to be used:

b) Set up the SW crossover valves.

Illustration 2.3.1a is to be referenced in order to determine which valves must be opened and those which must be closed to prepare the SW crossover for operation. One sea chest and the associated suction strainer should be set for operation with the other sea chest and suction strainer closed. The sea chest vent valves must be open and the blowing air valve closed. The sea water crossover vent valve must be open.

c) The SW crossover is now ready for use. The SW service and cooling systems can now be taken into service as necessary.

d) Start the Marine Growth Prevention System (anti-fouling system).

CAUTION

Whenever a sea chest is in service, the Marine Growth Prevention System (MGPS) for that sea suction chest, MUST be operational.

OPERATING THE COOLING SEA WATER SYSTEMS

There are a number of independent cooling SW systems which draw from the sea water crossover:

- No.1 and No.2 auxiliary machinery SW cooling pumps (for the Low Temperature (LT) FW cooling heat exchangers).
- No.1 (S) and No.2 (P) main engine SW cooling systems.
- No.1 (P) and No.2 (S) generator engine SW cooling systems.
- Air conditioning chilled water SW cooling systems.
- Fire fighting/bilge pump sea water pumps.
- Ballast pump suction/crossover drain.

NO.1 AND NO.2 AUXILIARY MACHINERY LOW TEMPERATURE (LT) FRESH WATER COOLING HEAT EXCHANGER SW COOLING SYSTEM

The main LT FW heat exchangers use SW as the cooling medium for the cooling FW supply to auxiliary machinery, which includes the following:

- Bow and stern thruster frequency converters, motors and LO coolers.
- Provision refrigeration plant condensers.
- Stabiliser Hydraulic Power Unit (HPU) oil coolers.
- Main engine reduction gearboxes.
- Controllable Pitch Propeller (CPP) LO coolers.
- Stern tube LO coolers.
- FO separator coolers.
- Alternators.

In an emergency, the main cooling LT FW heat exchangers can be supplied with a limited amount of SW via the deck wash system.

a) Ensure that the SW crossover is flooded with sea water and the SW cooling system is ready for service.

b) Check that all pressure gauge and instrumentation root valves are open, and that the instruments are working correctly.

c) Set No.1 and No.2 auxiliary machinery LT FW cooling heat exchanger SW cooling system valves.

Illustration 2.3.1a is to be referenced in order to determine which valves must be opened and those which must be closed to prepare the auxiliary machinery LT FW cooling heat exchanger SW cooling system for operation.

d) Set the main cooling SW pumps to AUTOMATIC operation using the Local Control Panel MAN/O/AUTO selector switches.

e) From the IMACS mimic, START one of the SW cooling circulation pumps. Set the second SW cooling circulation pump to standby.

f) Open the vent valve of the in service heat exchanger until SW is seen to be leaving the vent pipe. Firmly close the vent valve when all air has been vented from the heat exchanger SW system.

g) Confirm that the duty SW cooling circulation pump is delivering SW to the main FW heat exchangers (coolers) at the correct pressure.

h) The main FW heat exchanger SW cooling system is now operational.

i) During operation, check the system for leaks, and ensure that the pumps are operating without undue noise or vibration.

Note: The standby SW cooling circulation pump will start automatically if the discharge pressure from the duty pump falls below a predetermined value.

NO.1 AND NO.2 MAIN ENGINE COOLING SEA WATER SYSTEMS

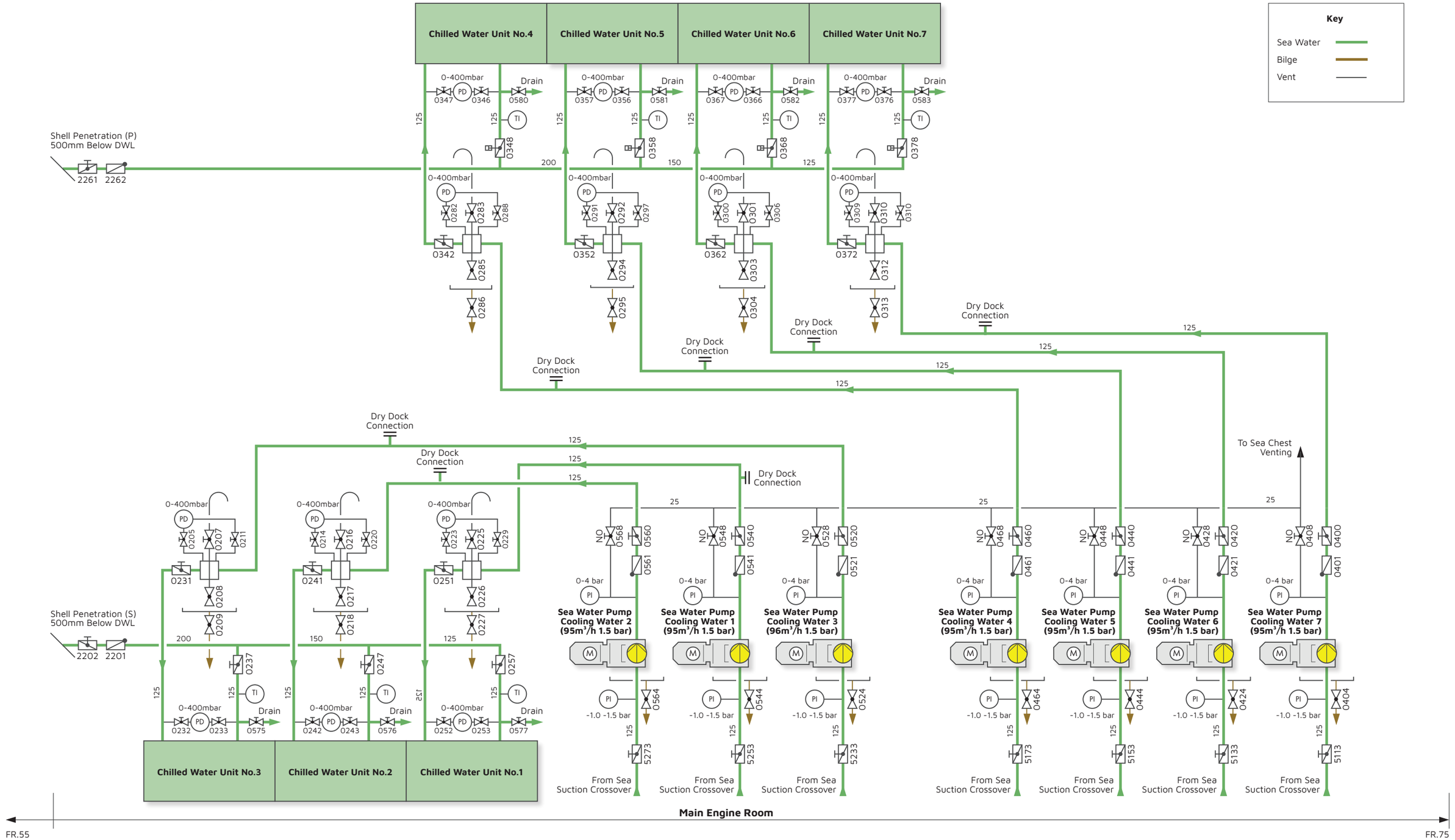
The main engine engine-driven SW circulation pumps draw directly from the SW crossover, but in an emergency, the main engines can be supplied with a limited amount of SW via the deck wash system. Some of the SW (approximately 100m^3/h) is branched from the system to pass through the engine LO heat exchangers and charge air LP and HP intercoolers with the remainder (approximately 140m^3/h) passing through the gear oil coolers and engine coolant/return fuel heat exchanger.

The SW which has passed through the gear oil coolers and engine coolant/return fuel heat exchanger is directed to overboard, whereas, the SW that has passed through the charge air LP and HP intercoolers and LO heat exchanger is either discharged directly to overboard or is discharged to overboard via the engine underwater exhaust manifold.

a) Ensure that the SW crossover is flooded with sea water and in service as previously described.

2.3.1 Main Sea Water Cooling System

Illustration 2.3.1b Air Conditioning Chilled Water Unit Sea Water Cooling System



2.3.1 Main Sea Water Cooling System

b) Check that all pressure gauge and instrumentation root valves are open, and wherever possible that the instruments are working correctly.

c) Set No.1 and No.2 main engine SW cooling system valves.

Illustration 2.3.1a is to be referenced in order to determine which valves must be opened and those which must be closed to prepare the main engine SW cooling systems for operation.

No.1 main engine SW circulation pump is provided with a direct emergency 200mm diameter bilge suction line, the opening of which is positioned approximately 50mm above the tank top; this allows it to be used in an emergency to pump the engine room bilges and prevent flooding. The suction valve 4191 is fitted with an easily identified handwheel on an extended spindle that protrudes approximately 460mm above the engine room floor plates. This valve is normally closed and sealed with a breakable tag.

CAUTION

The use of the No.2 main engine SW circulation pump for emergency bilge pumping duty should only be considered in extreme circumstances when the stability and safety of the vessel are in danger.

d) During operation, check the system for leaks, and ensure that the main engine SW circulation pumps are operating without undue noise or vibration.

NO.1 AND NO.2 GENERATOR ENGINE COOLING SEA WATER SYSTEMS

The generator engine SW circulation pumps draw water from the SW crossover via 2mm mesh suction strainers.

After passing through the generator engine the cooling sea water is directed to a common sea water discharge manifold which can be set to discharge overboard on either the port or starboard sides of the vessel as required.

a) Ensure that the SW crossover is flooded with sea water and in service as previously described.

b) Check that all pressure gauge and instrumentation root valves are open, and that the instruments are working correctly.

c) Ensure that the relevant generator engine 2mm mesh suction strainer is clean and open the SW inlet and outlet valves.

d) Set No.1 and No.2 generator engine internal SW cooling system valves; ensure that the SW system vent valve is open.

Illustration 2.3.1a is to be referenced in order to determine which generator SW supply and outlet valves must be opened to prepare the generator engine SW cooling systems for operation.

Note: If it is known that a generator engine is going to be out of service for a period which will exceed 24 hours, and it is not to be selected for automatic standby, the SW suction and discharge valves should be closed.

e) During operation, check the system for leaks, and ensure that the generator engine SW circulation pumps are operating without undue noise or vibration.

AIR CONDITIONING REFRIGERATION CHILLED WATER UNIT SEA WATER COOLING SYSTEMS

Each air conditioning chilled water unit has an associated SW circulation pump which draws directly from the SW crossover. There are seven air conditioning chilled water units and these are located in two groups, one of three and the other of four. These pumps supply chilled water for the HVAC chiller units which are located at different positions around the vessel:

- Chilled water units 1, 2 and 3.
- Chilled water units 4,5,6 and 7.

There are dry dock connections, fitted with blank flanges, at the SW supply lines to all of the chilled water units and these allow them to be operated using a shore water supply during dry dock.

a) Set the air conditioning chilled water unit SW cooling system valves. There is a differential pressure transducer across the sea water circuit of each air conditioning unit and the valves to these should be open whenever the unit is set for operation.

Illustration 2.3.1b is to be referenced in order to determine which valves must be opened and those which must be closed to prepare each air conditioning chilled water unit SW cooling systems for operation. The SW outlet valve from the No.2 group of AC chiller units are controlled valves and these must be selected for operation.

b) The air conditioning chilled water unit SW cooling systems can now be put into service.

Section 9: Navigation and Communication Equipment

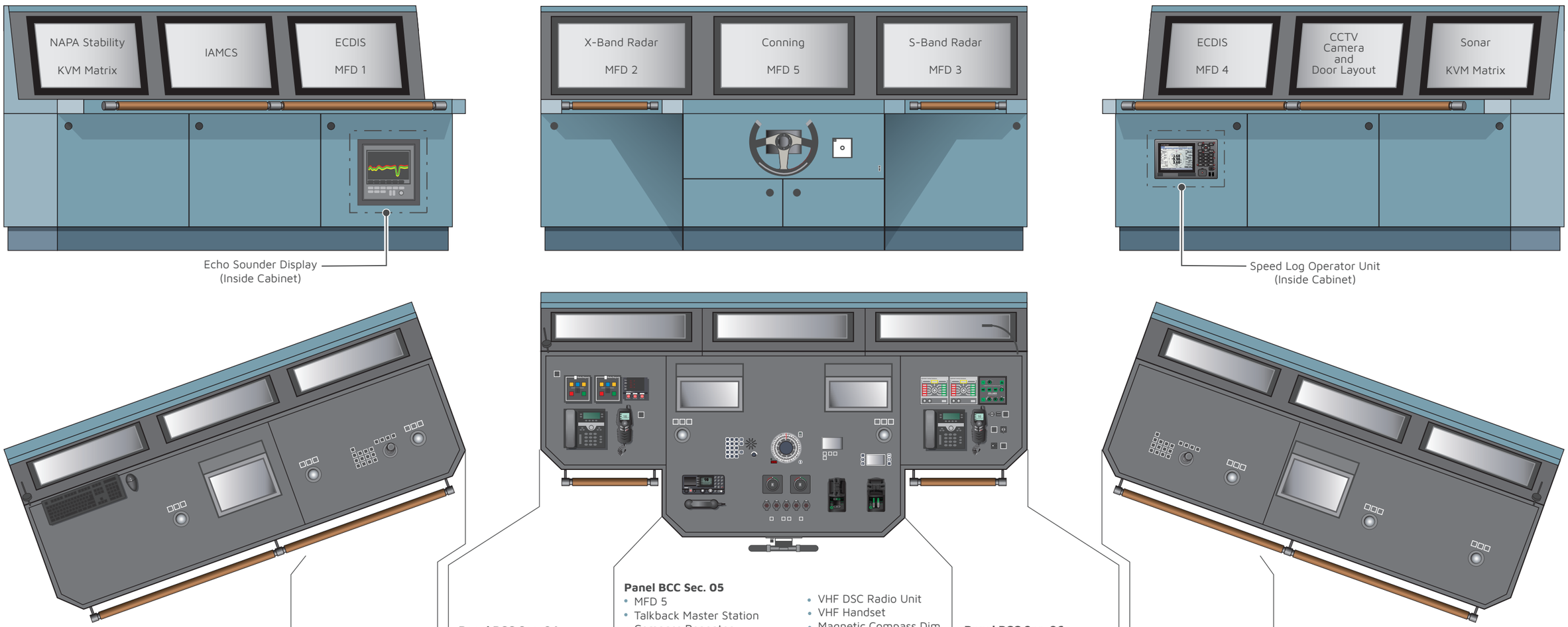
9.1 Bridge

Illustration 9.1b Main Console and Overhead Panels

The system displays shown here are the most commonly used on board.
However, they can be configured as required by the operators.

Overhead Panels

4x Overhead Panel Presets
Navigation - RoT & True Wind PS / Main Prop. PS & SB / Sp.d & Heading / True Wind SB & Depth Below Keel (DBK)
At Anchor - Hawse Pipe PS CCTV / True Wind & DBK / Speed & Heading / Hawse Pipe SB CCTV
Propulsion - Bow Thruster F+A / Stern Thruster F+A / Main Prop. PS & SB / DBK, Speed & True Wind SB
Alongside - True Wind PS & DBK / Main Prop. PS & SB / Conning and Speed



Panel BCC Sec. 01 and 02
- Table Lamp
- KVM Matrix Display
- NAPA Computer Mouse and Keyboard
- Display 1 Trackball
- Auxiliary Touch Control Panel (TCP) 1
- IAMCS Display

Panel BCC Sec. 03
- ECDIS MFD1 Display
- IAMCS Trackball
- FLIR Control Panel

Panel BCC Sec. 04
- GMDSS Alarm Panel
- Telephone
- VHF Remote Radio
- IAMCS Acknowledge Pushbutton
- Emergency Steering Gear Panels (PS & SB)

Panel BCC Sec. 05
- MFD 5
- Talkback Master Station
- Compass Repeater
- Steering Levers (PS & SB)
- Emergency Stops
  - Main Engines (PS & SB)
  - Bow & Stern Thrusters
- General Alarm Pushbutton
- BNWAS Reset Pushbutton
- Whistle Pushbutton
- Mode Pane
- Gyrocompass Operator Unit
- Propulsion Control Levers
- Bow & Stern Thruster Cont. Levers
- Mini-Wheel (Helm)
- VHF DSC Radio Unit
- VHF Handset
- Magnetic Compass Dim.
- MFD 2
- TCP 1
- Navigation Display PS Trackball
- MFD 3
- TCP 2
- Navigation Display SB Trackball

Panel BCC Sec. 06
- Emergency Engine Telegraphs (PS & SB)
- Whistle Control Panel
- Telephone
- VHF Remote Radio
- Radar On/Off Key Switch
- Security USB Ports
- Panic Alarm
- BNWAS Func. Key Switch
- BNWAS Reset Pushbutton
- GA Horn On/Off Switch
- Table Lamp

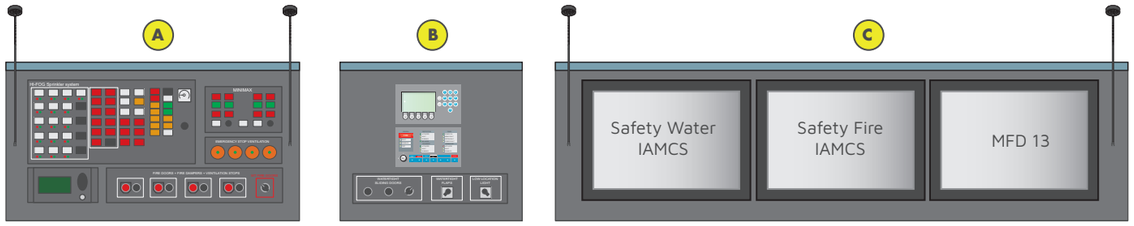
Panel BCC Sec. 07
- ECDIS MFD4 Display
- FLIR Control Panel
- Display 7 Trackball

Panel BCC Sec. 08 & 09
- KVM Matrix
- CCTV Display
- Auxiliary TCP 2
- Display 8 Trackball
- Display 9 Trackball
- Table Lamp

9.1 Bridge

Illustration 9.1d Safety Centre and Chart Room Consoles

Safety Console Panels



Console Panel A:

- Table Light (x2)
- Hi-Fog Sprinkler System Panel
- Helideck Pop Up Fire Fighting System Panel
- Emergency Stop Ventilation Panel:
  - Main Engine Room
  - Generator Room
  - Tender Garage
  - Helicopter Hangar
- Air Band Radio
- Fire Doors, Dampers & Ventilation Stops:
  - Main Fire Zone 1/2/3/4
- Watertight Fire Doors Auto Closing/Local Control Switch

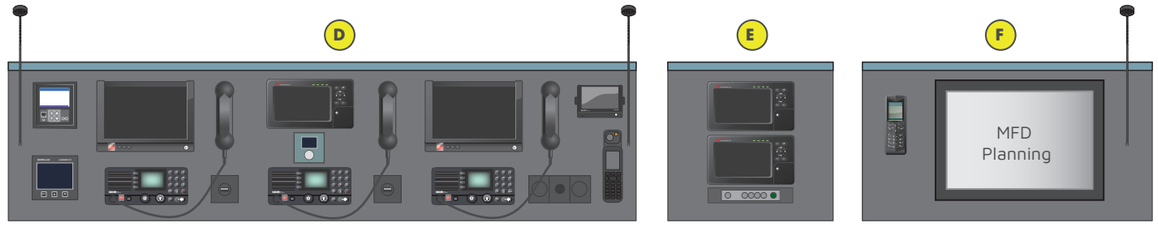
Console Panel B:

- Fire Detection System Panel
- Watertight Doors Operating Panel
- Watertight Flaps Operating Panel
- LLL Manual Activation Panel

Console Panel C:

- Table Light (x2)
- Safety Water IAMCS Monitor
- Safety Fire IAMCS Monitor
- Multi-Functional Display (MFD) 13

Chart Table Panels



Console Panel D:

- Table Light (x2)
- VDR Remote Control Unit
- Wind and Weather Indication Display
- Inmarsat-C Message Terminals and USB Socket for Keyboard (x2)
- VHF DSC Radio and Handset (x2)
- AIS Control Unit
- Master Clock Monitor
- MF/HF Radio and Handset
- NAVTEX Receiver
- Tetra Radio Handset
- Plug Sockets including Pilot Plug

Console Panel E:

- DGPS Control and Display Units (x2)
- Chart Table Display Control Panel

Console Panel F:

- Fleet Broadband Handset
- MFD 6
- Table Light

Safety Console

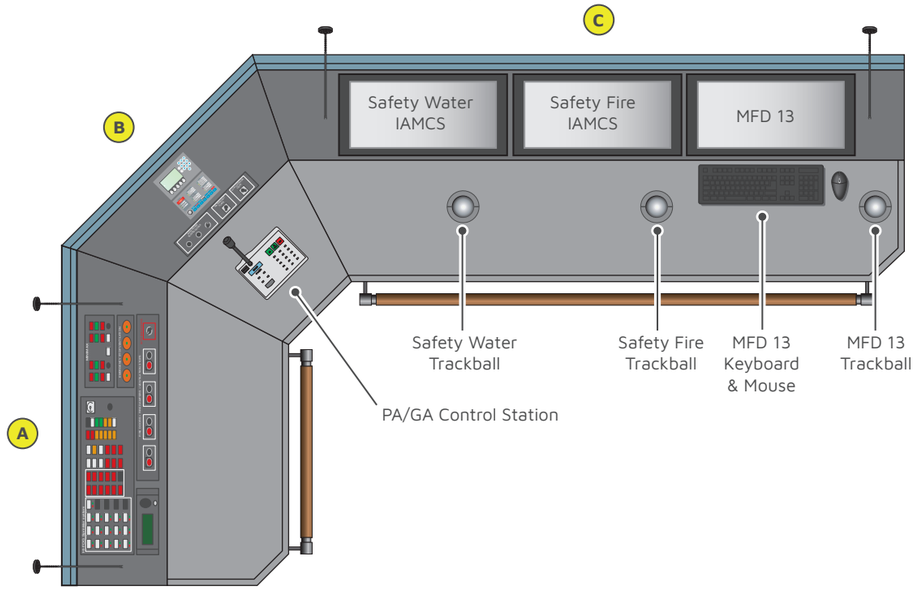
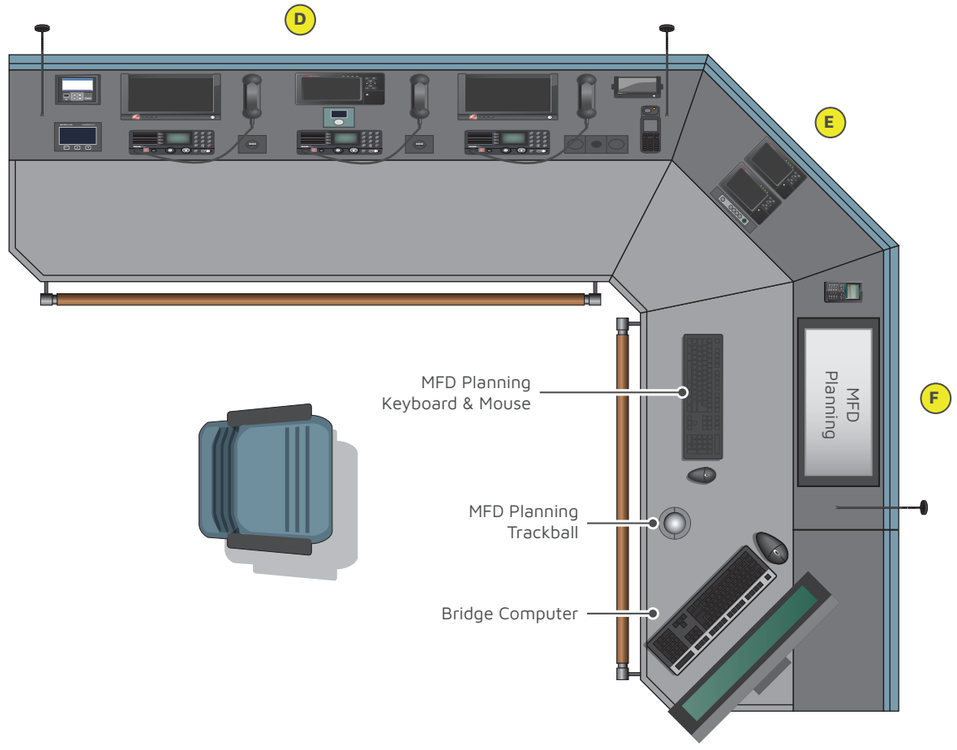


Chart Table



9.2.1 Radar System

Manufacturer: Kongsberg

Type: K-Bridge System X-Band and S-Band

INTRODUCTION

Radar is an acronym of RAdio Detection And Ranging and uses a transceiver to transmit a high energy 25-30kW pulse at high frequency from a rotating antenna. The antenna consists of a slotted waveguide designed to produce the correct polar pattern for a narrow beam width, the same antenna is used for transmission and reception. The very small energy echoes from the target are highly amplified prior to being displayed on the Plan Position Indicator (PPI). The exact time delay can be measured and the distance to the medium calculated. The direction from which the wave is received can be easily measured as an azimuth bearing with reference to a selected datum point.

The K-Bridge Automatic Radar Plotting Aid (ARPA) radar is designed to conform to the IMO and IEC standards.

The K-Bridge navigation consoles communicate over a Local Area Network (LAN). K-Bridge Multi-functional Display (MFD) units run Radar, ECDIS and Conning applications. Radar, ECDIS, and Conning controls, and K-Bridge Autopilot systems are all able to communicate with each other over the LAN.

CAUTION

The radar is an aid to navigation and should not be relied upon as a sole means of detecting the potential of a risk of collision. When in use, the radar does not relieve the operator from keeping a visual lookout for potential dangers.

EQUIPMENT DESCRIPTION

The vessel is fitted with two ARPA radars. All displays are fitted in the wheelhouse centre console. The inputs to the radars are from a radar interface (RIN). This arrangement relies on a dual LAN to offer a choice of transceiver to the operator.

The radars are arranged as follows:

- X-band - 25kW (2.4m antenna).
- S-band - 30kW (3.6m antenna).

MAIN FEATURES

The 24" display carries on-screen alphanumeric data down both sides of the screen providing a square display of radar information. Guard zone protection is provided with audible and visual alarms. Target movement may be assessed by trails or by electronic plotting; additional target assessment is provided by historical plots, vectors and target data tables. On-screen data includes Closest Point of Approach (CPA), Time to CPA (TCPA), range, bearing, speed/heading of up to 6 targets at a time with a target relative speed of up to 100kts. Up to 100 targets can be acquired automatically and/or up to 100 targets manually, the required numbers being set by the operator. Traffic lanes, buoys, dangerous points and other important reference points may be displayed.

The radar system is a key component of the integrated navigation system and is interfaced with the ECDIS. The displays are referred to as Multi-Function Displays (MFD), as well as receiving data from other navigational equipment via the Sensor Integrator (SINT) cabinet, for example:

- DGPS navigator.
- AIS transponder.
- Gyrocompass.
- Speed log.
- Bridge alarm system.

In this way, own ship's data is common to all display units.

BASIC RADAR OPERATION

Operation of the radar is primarily via the trackball unit which comprises the trackball and three mouse buttons, left, centre and right click. The trackball is used to position the cursor at the required location on the screen. Dialogue boxes on the display can then be activated by pressing the mouse buttons.

The coverage of the radar in this section will be describe the operation using the trackball and the on screen menu system within the radar display. However, in addition to the track ball, the K-Bridge system also features a number of Touch Control Panels (TCPs) which can also be used to control certain aspects of the radar such as range, gain, rain/sea clutter, true/relative motion, target acquisition, target/object information and autopilot planned manoeuvre execution.

In addition to displaying the radar picture and providing ARPA functions, the K-radar system MFD configuration displays electronic chart information, the planned route and the vessel's geographical position and can serve as the control unit of the automatic navigation and route keeping system.

In the top left-hand corner of the screen below the Kongsberg label there is a selector menu. Next to the menu arrow is the name of the application currently in use: RADAR, ECDIS or CONNING.

To switch to another application, click the arrow and select the application required.

WARNING

Before starting up the radar, ensure that no personnel are working in the vicinity of the radar scanner. Serious or fatal injuries may result from being struck by a rotating scanner.

It is advisable make a visual inspection of the radar scanners prior to switch-on. Check for personnel or obstructions which may be struck by a rotating scanner. The radar may be switched on when the area around the scanner is confirmed to be clear.

Power On

Open the computer door on the radar console and switch on the computer.

a) Click the Radar Scanner/Transceiver button on the side panel, this brings up the Radar Source Control dialog.

b) In the dialog, select a transceiver to use. (If available, use the S-band transceiver in bad weather.)

c) Make 'own display' the master transceiver by selecting Master.

d) Start the transceiver by selecting Run.

Once operational, the system will use a dark palette if the display is in Stand Alone mode if no other K-Radar system is operational on the bridge network, otherwise the current palette in use is selected.

The display configuration is selected from the side panel information area:

- Select the scanner (master/slave) from the radar selector menu.
- Select the range (from a choice of 11 ranges, 0.125 - 96nm), and range rings (on/off) as required by either the range ± keys, or by using the mouse left-click on the range field and use the trackball to change the range settings.
- Set the optimum gain, sea and rain clutter (sea and rain clutter may be manual or automatic).
- Set the tuning as required via the radar menu.

9.2.1 Radar System

- Select HUP (Head Up) or RM (Relative Motion) from the permanent information area.

Standby may be selected from the radar control menu which is accessible via 'Radar' in the permanent information area.

Marker

Pressing the Marker soft key toggles between three marker parameters:

- Bearing and range to own ship.
- Marker latitude and longitude.
- Time to marker and ETA.

Power OFF

This can be achieved by selecting Power OFF or STBY from the Master menu. From the shutdown dialog, click Power Off twice to stop all application software and remove power to the computer.

Data Display

The display provides a square Plan Position Indicator (PPI) display for the radar information and uses a top bar, with a menu at the right of the top bar. A radar side panel is to the left of the radar display and a boarding area to the right of the radar display.

Entering Numeric Data

Using the trackball, select the data to be changed and then using the left mouse button and trackball, scroll through the legal value options until the desired value is highlighted. The operation of the trackball will increase or decrease the set value from the original setting.

Three different marker symbols are used with the trackball, a cross inside the PPI area, a double arrow in the entry field and a diagonal arrow in all other areas.

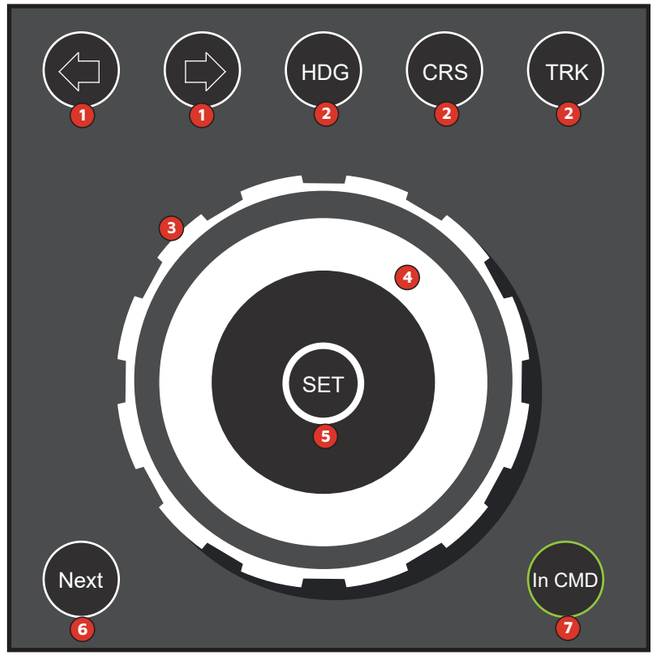
Heading Wheel

The heading wheel is used for setting or changing new course for the navigation systems and is mounted on the arms of the navigational chairs.

The heading/course buttons adjust the new course by 1° increments.

Note: For autopilot operation and information, refer to Section 9.7.3 of this manual.

Illustration 9.2.1a Heading Wheel



Key

1 - Heading / Course buttons (port/starboard) (for setting new course)
2 - Mode switching buttons
3 - Planning wheel (set-point for preset / planned turns)
4 - 4-way knob:
Push left/right to adjust radius (preset / planned turns)
Push up/down to adjust time / distance to turn (planned turns)
5 - Set / Activate button
6 - Next set-point (select from list of sources)
7 - Take command of autopilot

ARPA FUNCTIONS

Targets on the display can be tracked by the radar. Targets to be tracked may be selected manually or automatically. A tracked target can then initiate alarms when the target becomes a hazard to own ship safety. This occurs when the target crosses into a preset boundary around own ship position.

The system has the capacity to handle 1,000 AIS targets in addition to 100 ARPA targets, traveling at high speed, may be plotted.

Standard target symbols are used to indicate the target status; this covers the course and speed of the targets, lost targets and also indicates which targets are a hazard to own ship.

Manual Target Selection

Select the target using the cursor and right click, then select Acquire Target from the pop up menu. The initial tracking symbol will appear at the tracking position.

Auto Acquisition

Select Targets from the main menu, followed by Auto Acquisition Area to display the auto activation dialog. Within this dialog, check the 'Auto Acquisition of Radar Tgt' box to turn on the automatic acquisition of targets. The acquisition area is displayed in the Radar area. This box also allows auto acquisition of AIS targets.

Any targets now entering the area will automatically be tracked and an alarm generated should the target be considered as dangerous.

Target Data Display

Information on the target can be displayed in the menu area of the screen, by selecting the target with the cursor and right clicking. This will display a pop up menu from which Target Data can be selected. The data displayed includes target number, course, speed, bearing, CPA, TCPA, bow crossing range and time to bow crossing.

AIS/ARPA Targets

True or relative presentation mode can be used for both AIS and ARPA targets. Accuracy of AIS target information is dependent on the sensor accuracy of the other ship, ARPA targets are independent of these potential errors.

Electronic Bearing Line and Variable Range Marker

These are commonly used to monitor the position of the vessel or to monitor the position of targets. Either may be displayed individually on the screen if required. The distance and bearing of the Electronic Bearing Line (EBL) and Variable Range Marker (VRM) is displayed on the screen as digital information.

The EBL and VRM can be switched on and off from the permanent information area of the screen. The settings of the EBL and VRM may be adjusted by use of the trackball and left button to drag the selected line/ marker to a new position, either individually or both together (by selecting the intersection). Alternatively, range and bearing values may be entered in the information field in the permanent information area of the screen.

9.2.1 Radar System

Parallel Index Lines

These may be displayed in relative or true mode and are activated by accessing Tools from the Menu and selecting Parallel Index (PI) Lines. The position may be adjusted by entering data in the index lines menu or by dragging the grab mark on the line using the trackball. The heading of the lines may also be adjusted by using the trackball.

Many additional functions are available from the Tools menu.

CAUTION

For collision avoidance, Speed Through Water (STW) must be used.

Curved Heading Line

This allows for planning and executing a turn using a fixed radius. The curved heading line is selected from the Tools menu. The curve, distance to turn and course are adjusted individually using the trackball, menu or by rotating the heading wheel.

Sailing Routes and Waypoints

By accessing Manage Route from the routes section of the menu, it is possible to enter waypoints and course changes to be displayed on the screen. Under normal circumstances, the ECDIS would be used for route planning.

When the radar is interfaced with an autopilot, the created route information can be used to steer the vessel by sending this route information to the autopilot. The autopilot can be controlled by the radar in one of four modes.

- Heading mode (no route required).
- Course mode (no route required).
- Waypoint mode (one waypoint at a time, change to course mode on approaching the waypoint).
- Track mode (turns carried out automatically).

For the above functions, the steering system is set to autopilot, the radar autopilot menu must read LOCAL, and the autopilot display must read HDG, CRS, WP or Track.

Alarms

Appropriate alarms will be given of approach to Wheel Over Point (WOP) and also loss of navigational data alarms.

Mariners Notes

The Note menu is a sub-menu of the Chart menu. Select Chart - Manage Notes and enables the creation and management of mariners notes. Mariners notes are geographically fixed symbols, lines and areas that can be used to supplement radar information.

There are also dialogs for Nav Notes and Other Notes via the chart menu.

Display Charts

Although it is primarily a radar, charts may be overlaid after confirmation that no radar targets are being obscured. The radar display is relative to own ship and the chart data based on geographical position.

For successful overlay, the parameters such as heading and position must be accurate and both the DGPS and radar are on the same geographical datum. For example, WGS84.

Chart alignment may be adjusted if required when targets from land allow a good reference for this alignment. The chart overlay cannot be used during head up modes on the radar.

The chart can be turned on and off by selecting the Chart check box on the radar side panel.

Performance Monitor

A hardware unit attached to the transceiver detects and measures the magnetron pulse, and a small transmitter which sends a series of signals to the radar's main antenna. The strength of these signals is determined by, but weaker than, the measured strength of the radar pulse. The signals are timed to appear on the display as a series of simulated echoes at a fixed range and in a pattern of four concentric arcs. The arcs start at a range of 8nm and are 0.3nm apart. It is the third arc that will be used to gauge the deterioration of the radar's performance over time. When that arc has lost its solidity and intensity, it means that the transmit power of the radar magnetron has weakened by up to 5dB.

Select Radar - Perform. Monitor this from the menu. Select Rx mode and adjust the PM Tune setting until the setting that displays the arcs with greatest solidity and intensity.

For a comprehensive guide on operating the K-Bridge radar, refer to the K-Bridge Radar 8.2 operator manual.

9.3.1 Speed Log

Manufacturer: Furuno

Model: GS-100

INTRODUCTION

The GS-100 Global Navigation Satellite System (GNSS) speed log uses satellite signals to determine the ship's longitudinal and transverse ground speeds. The antenna unit comprises dual path resistant GNSS antennas to determine the vessel's heading and to calculate velocity, course and altitude relative to the ship. The antenna unit computes position, velocity and heading from comparison calculations made between data received and processed by the two antenna elements which are fitted in the fore and aft plane inside the antenna casing. A Furuno GS-1002 display unit is located on the wheelhouse centre console.

The system can be used for the calculation and visualisation of longitudinal and transversal speed over ground, distance travelled relative to ground and consists of three main components: the antenna unit, the display unit, and the junction box.

Due to the high accuracy, a precision of greater than 0.2 knots or 2% of speed, the unit can be used as a speed log for ground stabilising applications or docking manoeuvres.

INDICATORS AND DISPLAYS

The speed log unit is located inside the starboard wheelhouse console so is not readily visible. However, the information is fed to the integrated navigation system and is made available to the operator via the radar and ECDIS displays.

GS-1002 Control Unit

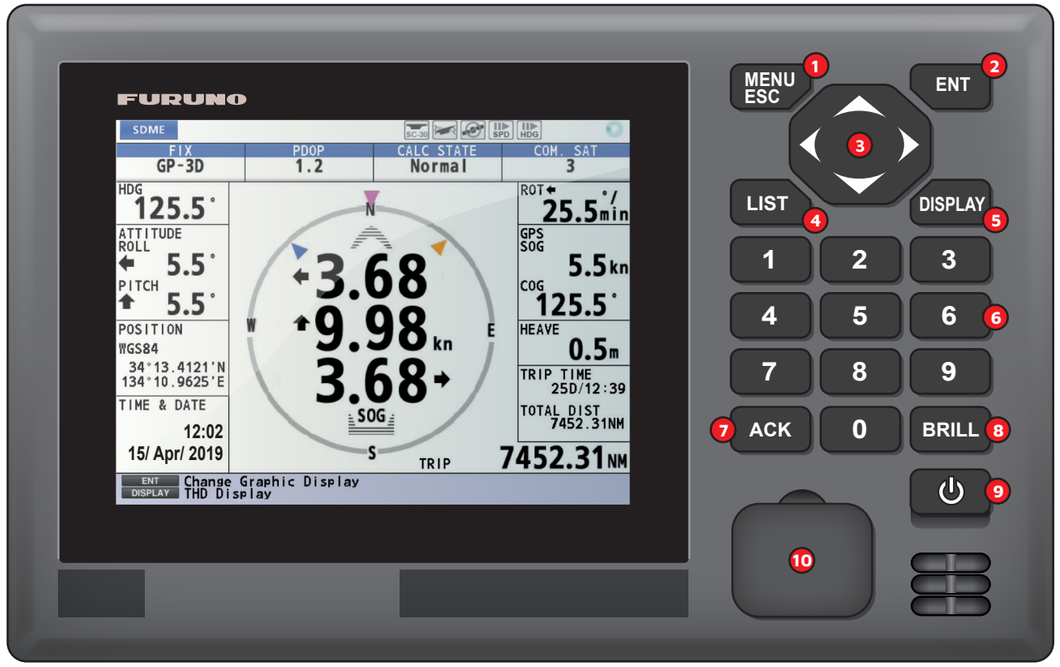
The unit features a high resolution colour LCD screen and an operational key pad capable of performing the functions indicated on the illustration opposite.

Display Modes

The unit has two main display modes which are:

- The Speed and Distance Measuring Equipment (SDME) mode which measures speed and distance.
- The Transmitting Heading Device (THD) outputs heading data to external equipment.

Illustration 9.3.1a Satellite Speed Log Display Unit



	Key	Menu Screen	Display Screen
1	MENU/ESC	Closes the menu. Quits current operation.	Opens the menu.
2	ENT	Confirms a selection.	Switches the screen between main (digital navigation data) and sub (graphic screen).
3	CURSOR PAD	● ▲ or ▼: Selects the menu item. ● ◀: Goes back one layer in multi-layer menu. ● ▶: Goes forward one layer in multi-layer menu.	▲ or ▼: Switches display on the integrity display.
4	LIST	Opens the List. ● Switches the list (any display → active alert → alert log → device list → any display). Long-press to switch the list in reverse order.	
5	DISPLAY	Opens the display mode.	Switches the screen between THD and SDME modes.
6	0 to 9	Selects and confirms the menu item. Enters a numeric value	—
7	ACK	Acknowledges an unacknowledged alert when the pop-up appears.	
8	BRILL	Opens the brilliance adjustment window. Adjusts the display brilliance when the adjustment window opens.	
9	POWER	● Turns the power on or off.	
10	USB Port	Hidden port for connection to USB flash memory.	

9.3.1 Speed Log

The display modes can be switched between using the DISPLAY key and the current mode displayed is indicated in the top left corner of the display screen. Each mode has a main (digital navigation data) and a sub (graphic) display and to switch between the two press the ENT button.

Note: The trip distance can be reset from the main screen of the SDME mode by pressing the 0 button for more than 1 second.

Navigation Display

The navigation display in the SDME mode shows various navigational data. It has a series of five window panes bordering the graphic outline of a cardinal compass rose encircling a ship shape outline with the 3-axis speed values for bow, stern and heading in the centre. The data to be displayed in the five surrounding windows can be selected on the unit as follows:

a) Press the MENU ESC key to open the main menu.

b) Select [1 Display], followed by [2 Navigation Display].

c) Select [1 Window 1], and then select either [1 Roll/Pitch] or [2 SDME].

d) Select the desired options for the other four windows in the same method as above.

Integrity Display

The integrity display is available in the THD mode and provides information about GPS satellite position and signal quality. There are three different integrity displays and they are as follows:

- GNSS - This display shows the condition of the satellite positioning system including the number, azimuth and elevation angle of all the satellites in view of the receiver.
- Satellite angle graph - This display shows the satellite angle that has been used for positioning for the last six hours.
- Signal noise ratio graph - This display shows the signal noise ratio that has been used for positioning for the last six hours.

An alert may be generated informing the operator of any errors in data and the item of concern will be highlighted with a red bar and triangle.

Notices

Ship speed and trip can generate notice conditions where both will generate audio and visual alarms (notices). When these are outside of the setting value, a buzzer sounds and the icons in the top bar will change from grey to blue. The ACK button will silence the buzzer.

Ship Speed Notice

The ship speed notice alerts the bridge team when the speed is lower or higher than the speed setting or within the range set by the operator.

The speed setting can be adjusted from the main menu, speed /trip setting and then selecting ship speed.

Trip Notice

The trip notice alerts the bridge team when the ship has travelled the preset distance.

For adjusting the trip notice, the same menu path is followed as described for adjusting the speed, however this time 'Trip' is selected.

ALERTS

In SDME mode there are two types of alert, warning and caution.

- The warning alert is where conditions or situations require immediate attention for precautionary reasons.
- A caution alert is the awareness of a condition which continues to require attention.

Alerts are displayed across the bottom of the screen with an identification number and name. In the case of a warning being activated, then a circular speaker icon is visible in the bottom left hand corner and a buzzer is sounded. The background colour across the bottom of the screen and the item on the screen becomes a flashing yellow/orange. When acknowledged the buzzer is silenced and the flashing becomes fixed yellow/orange. If the warning is not acknowledged within 3 minutes, the warning is repeated.

When a caution message is activated a fixed yellow square, with an exclamation mark inside is visible in the bottom left hand corner of the display alongside the identification number and caution name. The item causing the caution alert values will be highlighted on the screen. There is no buzzer sounded.

The alerts can be acknowledged by using the ACK button on the display panel. The buzzer will be silenced in a warning condition. If multiple alerts occur simultaneously the alerts are acknowledged in order of importance.

Alert List

The alert list shows all current alerts, acknowledged and unacknowledged. The list is opened from the main menu by pressing the MENU/ESC button and through the sub menu 'Alert' and 'Active Alert'. Unacknowledged alerts will be flashing. The alerts can be acknowledged from this page by using the up and down arrows to scroll the list and then pressing the ENT button.

Alert Log

The alert log shows the latest 50 alerts. When the log becomes full the oldest entry is erased to make room for new alerts. The log is opened from the main menu by pressing the MENU/ESC button and opening the sub menu 'Alert' and 'Alert Log'.

9.3.2 Echo Sounder

Manufacturer: Skipper
Type: GDS-102

INTRODUCTION

The GDS-102 echo sounder has a large, high resolution graphic Liquid Crystal Display (LCD) and is installed on the main wheelhouse console. The display graphics are continuously shown on the LCD with complete navigation details. Depth, time and all available navigation data are stored continuously and the information for the previous twenty-four hours is available.

The GDS-102 employs a bottom detection algorithm that extracts the bottom signal from any noise or secondary echoes. If the software algorithm loses track of the bottom altogether, then a warning beep is sounded and the message 'Lost Bottom' is displayed in the lower right-hand corner of the screen. There are two types of transducer fitted. The forward transducer is a 50kHz type, and the after transducer is a 200kHz type.

The operator panel includes a keyboard with fixed keys, soft keys and a rotating encoder. The function of each soft key button depends on the active screen, and the buttons are labelled on the lower edge of the LCD display. There are also buttons for the depth range, picture speed and screen select.

The display is back-lit, the intensity and contrast are adjustable. Day/night and brightness buttons are also available.

The operator panel is located inside the port wheelhouse console so is not readily visible. However, the information is fed to the integrated navigation system and is made available to the operator via the radar and ECDIS displays.

DATA ENTRY

Several screens may be selected to enter various settings and calibration parameters. The displayed menus are activated using the corresponding soft keys. Screens 1 to 3 are primary operation screens with appropriate operator controls. Screens 4 to 12 are calibration set-up and system supervision screens.

HISTORY MEMORY

The GDS-102 has a twenty-four hour history flash memory. Depth, time and all available navigation data are stored continuously so that the previous twenty-four hours of information is always available.

Illustration 9.3.2a Echo Sounder Display

Key

1 - Depth Range Setting.

2 - Display Speed Setting.

3 - Menu Select Button
Press the Menu Select Button Repeatedly to Cycle Through the Primary Soft Key Screens.

4 - Screen Contrast.

5 - Screen Backlight.

6 - Encoder Knob
Rotate Encoder while Keeping a Key Pressed to Change Setting or Menu.

7 - Soft Keys.

8 - Soft Key Screens.

OPERATION

Power On/Off

During normal daily operation, the system may be switched off from screen 2, this puts the GDS102 into standby mode. The system may be switched on again by pressing any button. Do not run the sounder for a long time without a submerged transducer connected, as in a dry dock situation.

Parameter Entry

The fixed function buttons and the soft key buttons in conjunction with the rotating encoder allows for the entry of parameters, set points and other data. Pressing a fixed function button or soft key once advances the fixed state or value to the next fixed state or value. Keeping a fixed function button or soft key pressed and rotating the encoder knob in either direction increases or decreases the value. Observe the screen for the desired result, and when it is obtained, stop rotating the encoder knob and release the function button.

Auto Range

Auto range automatically adjusts the depth range to maintain the bottom contour within the middle half of the screen height, and is accessible on screen 3. Auto range operates down to 1,600m.

Screen Selection

Each of the operation screens contains a graphic picture and a selection of up to six soft key buttons. The various screens are selected by keeping the menu button pressed and rotating the encoder in either direction. Turning the encoder clockwise cycles the screens in the sequence 1 to 12, and anti-clockwise rotation cycles the screens in the sequence 12 to 1. Screens 1 to 3 (primary functions) may also be cycled by repeatedly by pressing the menu button.

9.3.2 Echo Sounder

Screen 1 - Primary Operation Screen - Gain, Time Variable Gain (TVG) and alarm settings.

Screen 2 - 2nd Operation Screen - Display and print settings.

Screen 3 - 3rd Operation Screen - Power adjustment and options.

Screen 4 - Transducer details.

Screen 5 - Calendar and clock setting.

Screen 6 - Units of measurement.

Screen 7 - Interface set-up screen.

Screen 8 - Recordings and playback.

Screen 9 - Recordings options.

Screen 10 - NMEA control screen.

Screen 11 - System status screen.

Screen 12 - Oscilloscope Screen - Used by service personnel to monitor the performance of the transducer.

Alarm Acknowledgement - When the depth alarm is activated, the alarm may be acknowledged by pressing any button.

FIXED KEYS

Depth Range

The depth range button can be used to set the depth limit between 0 and 5,000m.

Picture Speed

Picture speed may be selected from 30 seconds to 5.0 minutes per division, defining the speed of graphic echogram update and horizontal scrolling of the screen.

Menu

The menu button allows the selection of one of the 12 screens and soft key layouts. The 3 primary operation screens may be cycled by repeatedly pressing the menu button. Access to the other screens is through an encoder operation. Turning the encoder with no button pressed will activate screen 1.

Contrast and Backlighting

Contrast and backlight may be continuously controlled by means of the appropriate buttons and the encoder. Press either button and rotate the encoder until a satisfactory setting is obtained, then release the button.

The settings are maintained in the non-volatile memory, and the last settings are restored on power-up. Press the brightness button repeatedly to select one of four standard backlight/picture settings. The settings are as follows:

1) Full backlight, normal screen picture.
2) Half backlight, normal screen picture.
3) Full backlight, inverted screen picture.
4) Half backlight, inverted screen picture.

SOFT KEYS

Gain

The gain can be adjusted from 0-100% to allow for optimum echo levels, this setting affects signals from all depths.

Time Variable Gain

Time Variable Gain (TVG) may be adjusted from 0-100% to allow detailed echo control from the 0-50m depth range. A low setting reduces the gain in the area near the surface to suppress noise and unwanted signals in this area.

Digital Indication

Small or large digits may be selected in screen 2.

Frequency

This key toggles between 38, 50 and 200kHz to select the required transducer on screen 4.

Output Power

This can be adjusted from 1-100% in case of difficult shallow water conditions.

Draught

This key allows draught compensation to be activated, this is indicated by a flashing number on the display.

Alarm Settings

Depth alarm settings are performed from screen 1. Alarm limits are referred to the indicated depth. The local alarm buzzer may be disabled from screen 9, but the external alarm relay will always operate. The only way to disable the alarms completely is to reduce the shallow alarm to zero depth and to increase the deep alarm to the maximum range. An active shallow alarm must be less than an active deep alarm limit.

Clock and Calendar Settings

A UTC input from the DGPS navigator automatically updates the clock and calendar settings, therefore no manual adjustment is required.

History Memory

The history memory is controlled from screen 8 and 9, the normal history modes are on and recording. New depth information is continuously updated with the oldest samples being discarded. Bottom information is stored along with time and any other navigational information available in the GDS102.

If the history is switched off, the stored previous twenty-four hours will be kept in the memory and no new samples will be written. To remind the operator that the history function is switched off, 'History Off' will flash at the bottom of the screen.

If the history modes On and Playback are selected, the contents of the history memory will be displayed on the screen and printed on the printer if it is switched on. As a warning to the operator that the displayed bottom contour is from the memory and not real time, 'History' will be flashing at the bottom of the screen. The History Hours and History Minutes buttons in conjunction with the encoder will allow positioning within the twenty-four hour memory to observe the desired part of the time frame during playback.

The history is kept in a Random Access Memory (RAM) with battery back-up. The batteries should last the lifetime of the equipment unless the equipment has been kept in store for a number of years with no mains supply switched on.

Non-Volatile Parameter Memory

The non-volatile memory maintains the user and installation parameters such as language and unit of measurement selection etc. These parameters are kept in the EEPROM memory and automatically restored on power-up. Default settings are used in the absence of user defined parameters.

For additional information, refer to the manufacturer's manual.

SPURIOUS

9.3.3 Differential Global Positioning System

Manufacturer: SAAB

Model: R5

INTRODUCTION

The Global Positioning System (GPS) is a satellite-based navigation system operated and maintained by the US Department of Defence. The system comprises a constellation of 24 satellites (four in each of six operational planes) at altitudes of approximately 20,000km. The system provides two-dimensional fixes (latitude and longitude) for marine users. It provides Speed Over Ground (SOG) information to the same accuracy as that required for Speed and Distance Measuring Equipment (SDME).

Differential Global Positioning System (DGPS)

The accuracy of basic GPS signals (especially in areas such as harbours and their approaches) can be improved by the reception of correction data transmitted from a shore-based station. DGPS works on the principle of a fixed receiving station knowing its exact location (latitude and longitude) derived from a survey.

The station is equipped with a DGPS receiver to obtain its position from the satellite system. The received position is compared with the surveyed position of the station. If an error exists between these two positions, then correction data is calculated and transmitted by M/F radio, in the frequency band 283.5-325kHz, with a range of approximately 40-60 nautical miles. GPS will give an accuracy of 5m for 95% of the time and DGPS will give an accuracy of 2m for 95% of the time.

A Note of Caution When Using GPS

Attention is drawn to the fact that the US Department of Defence controls the transmission of GPS signals. They can, if they wish, introduce errors or even stop transmission without warning. With this in mind, GPS should be used with caution. An alternative independent means of position fixing should always be used in conjunction with the GPS.

Equipment Description

Two SAAB R5 control units are located on the chart table. The DPGS configuration features a R5 DGNSS sensor and a MGL-5 DGPS antenna. The R5 control display unit has a seven inch colour touch display and provides a graphical interface to the system. Via the R5 SUPREME CDU it is possible to create, edit and modify routes and waypoints, navigate following a route, plot the route, view sensor data, configure the system as well as supervise the system status. The R5 navigation sensor is combined with GLONASS, Beidou and GALILEO operation, as well as a dual channel beacon receiver for reception of International Association of Lighthouse Authorities (IALA) radio beacon DGPS corrections.

Illustration 9.3.3a DGPS Control Panel

The system provides navigational views with next waypoint information and cross-track error visualisation, display of latitude, longitude, speed over ground and course over ground. It has the capability to handle and store up to 4000 individually named waypoints and up to 128 different routes, also a Man Over Board (MOB) and Event Mark functionality.

Operation

The POWER button is used to turn off the display and can also be used to quickly change the settings for the backlight of LCD, buttons and LEDs. A quick press of the POWER button will turn off all backlight but the R5 will still be running. If the POWER button is pressed for more than two seconds, a Power Down Menu will appear.

The R5 system will power-up in the position view which shows current position, speed over ground (SOG) and course over ground (COG) as reported by the R5 navigation sensor. The position is represented by latitude and longitude. Current date and time, in UTC or local time, is also displayed.

The STATUS LED (multi-colour) is constantly green when the R5 navigation system is operating and no alarms are active. The LED is constantly red if there are one or more active alarms and flashing red if there are one or more unacknowledged alarms.

The RAIM LED will display one of three colours to indicate the current status. Green is safe (estimated position error is smaller than RAIM level), yellow is caution (position error is unknown), and red is unsafe (estimated position error is larger than RAIM level).

A light sensor can be used to automatically dim the backlight of the display depending on the light level measured by the sensor.

When the OPT button is pressed, it gives the user a list of options that can be performed on the highlighted item. In screens with parameters, the OPT button can be used to set the parameter to a default value.

The MOB button is used to mark the spot of an event or when a person has fallen overboard. To mark an event, press the key momentarily. To activate the Man Over Board (MOB) function, press the key for at least 5 seconds.

The ESC button is used to return to the previous screen or to cancel an edit change of a data field.

Menus

To operate the system it is required to access the menus from which all functions can be displayed, monitored or edited. Once the required menu is open, use the directional pad and ENTER to follow the on-screen prompts and make the selection or changes.

9.5.1 VHF System

Manufacturer: Cobham

Model: Sailor 6222

INTRODUCTION

One 6222 VHF simplex/semi-duplex Digital Selective Calling (DSC) radio unit is fitted on the wheelhouse centre console and two are fitted on the chart table. There is GPS input into the units. The units cover the frequencies TX: 156,000MHz-157,425MHz, and RX: 156,000MHz-163.425MHz. The 6222 conforms to all relevant international requirements and resolutions as agreed by ETSI, IEC, ITU and IMO.

OPERATION

The position and MMSI number are always shown in the DSC window (the lower half of the control unit display) in standby mode. The display also shows the latest position from the GPS, the UTC, position type and GPS status.

A number of functions are accessible and set using the four soft keys to the left of the display. The current function of a soft key is shown in the display next to the key. To display more options, press the 'MORE' key. The 'DROBOS' stands for Distress Relay On Behalf Of Someone Else.

Switching the Control Unit On and Off

Press the ON/OFF/VOLUME CONTROL to switch on. To switch off, press and hold the control. Select the channel using the selector knob and press to accept.

Volume

Use the rotary control to increase and decrease the volume. To mute the speaker, turn the volume knob until the speaker is muted.

Transmitter Power

Each press of the 1W key switches between high power (25W) and low power (1W). Low power is indicated by the 1W text on the display. The transmitter power is automatically set for 1W on some channels. The output of 25W (switchable to 1W) will give approximately 25nm range.

Display Brightness and Dimming

Red text on black background is available for optimal night vision. To dim the display backlight, press and hold, then turn the selector knob anti-clockwise. The display shows a brightness bar. At the brightness value 45, the display changes to night view with red text on black background.

Illustration 9.5.1a VHF DSC Control Panel

Squelch

Use the rotary control SQ key to adjust squelch.

Dual Watch

In dual watch, both the working channel and channel 16 are monitored. In triple watch, the working channel, channel 16 and the programmed call channel are watched. If there is a signal in one of the watched channels, the display shows the channel in which the signal is received. To start the watch function, press the DW key. The control unit also has a 'triple' watch mode that can be set-up via the 'Radio Setup' settings which is accessed by pressing the MORE soft key.

Replay Button

There is a replay feature which allows messages to be replayed to confirm interpretation of the communication by pressing the SPEAKER key located at the bottom right corner of the control unit. Holding the button pressed will increment a counter showing the number of minutes replay selected. Replay will commence when the button is released. The last 240 seconds of any message is recorded for replay as required.

Sending an Undesignated Distress

Lift the DISTRESS button cover and press for more than three seconds. The receiver watches for an acknowledgement on channel 70. The distress is repeated every 3.5 to 4.5 minutes. On receipt of an acknowledgement, transmit the distress message on channel 16. To annul the distress message, press the soft key ANNUL.

Sending a Designated Distress Alert

A designated distress contains additional information to aid rescuers. This is used when time allows in a distress situation. The message is composed prior to pressing the DISTRESS key.

From the top-level standby, press the soft key ALERT. If it is not in the display, press the soft key MORE until ALERT appears. If necessary, the current position information can be entered manually by using the soft key POS. Press the selector knob, then turn it to select a nature of distress followed by pressing the key to accept. Then press the DISTRESS button for more than three seconds.

DSC Self-Test

a) Press the MORE soft key to a point at which 'SET-UP' appears.

b) Press the arrow soft keys until 'DSC SETUP' appears.

c) Rotate the selector wheel knob to a point at which 'DSC SELF TEST' appears.

d) Press and turn the selector wheel knob to select 'RUN'.

e) On completion of the self-test, the result will be displayed on screen.

9.5.1 VHF System

Receiving Distress Calls

On reception of a distress alert, a 2-tone alarm will sound. To stop the alarm, press SILENCE or any other key on the control unit. Press OK to continue monitoring communications or press CANCEL.

Distress Call Log

Received distress messages can be viewed by pressing the MORE soft key to a point at which HIST appears. Press the soft key arrows to alternate between messages received.

Other DSC Calls

A DSC call can be used to establish communications with one or more other radio stations.

When a DSC call is sent to another radio station, the radio station acknowledges the alert and voice communication can commence on the designated channel in the DSC alert. An 'INDIVIDUAL', 'SAFETY TEST', 'GROUP' or 'ALL SHIPS' call can be sent.

To make a DSC call, carry out the following:

a) Press the soft key CALL.

b) Select the type of DSC call by using the selector wheel knob.

c) Enter the MMSI number of the vessel if applicable in the 'TO' field.

d) Enter the channel number in the 'CH' field.

e) Press the soft key SEND to commence the call.

Illustration 9.5.1b VHF Remote Speaker/Microphone

Remote Speaker/Microphones

A Sailor 6204 speaker/microphone enables remote control of the VHF No.2 transceiver. It is waterproof and it has a 40 x 30mm display screen which can be dimmed for optimum reading for both day and night operations.

There are a total of four fitted with two on the wheelhouse centre console and one on each bridge wing, port and starboard.

The functions are controlled by the use of a top knob, selector wheel and buttons as follows:

- To switch on and illuminate the display, press the knob at the top of the set.
- To switch off, press the knob at the top of the set.
- To transmit, press the PTT button on the left-hand side of the unit.
- To adjust the speaker volume, turn the knob at the top of the set.
- To switch between channel and soft key selection, press the SHIFT key then:
  - Rotate the selector wheel to select channel or soft key.
- To dim the display, short press the Dim/Lock button on the left of the set.
- To lock/unlock the keys, long press the Dim/Lock button on the left of the set.
- To replay messages recorded by the transceiver, press the REPLAY key.
- To adjust the squelch, press the SQ key.
- To go to CH 16 immediately, short press the 16/C key.