The Engine Room Simulator

Manual Release Date: 27.08. 2011

User Guide

Contents

1. Introduction

Virtual Engine Room – Free Student Version (VER_FREE) is PC-based full mission engine room simulators developed to comply with STCW and ISM Code as far is as possible. This means that all the important systems in a ship's engine room have been modelled and implemented.

VER_FREE has all the consoles, lamps, switches, levers, pushbuttons and analogue gauges and digitised sounds required. The mimic diagrams are similar to those found in 'Big' simulators, divided into smaller sections. The multichannel digitised sound is fully comparable with the best simulators available today.

VER_FREE has many features which are not currently available in big full mission simulators including built in checklists that can be used by students when learning by themselves. This compact simulator has also another unique feature - Computer Aided Assessment (CAA) for student competency evaluation.

The full commercial version of Virtual Engine Room has several additional features which are listed below:

- - interactive checklists,
- - automated assessment,
- - scenarios,
- - resources manipulation,
- - synthesised spoken instructions (in English),
- - faults simulation,
- - interaction with an instructor,
- - more modelled systems,
- - VIT simulation,
- - and much more...

1.1 Simulator Basics

1.1.1 Application

Virtual Engine Room – Free Student Version is a compact, computer based, engine room simulator for personal and home use only. VER_FREE cannot be used for commercial training.
VER_FREE has been developed in compliance with:

- STCW Code: Section A-1/12 and Section B-1/12.
- ISM Code: Section 6 and Section 8.

Here is a list of VER_FREE main features:

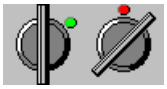
- VER_FREE is a highly realistic simulator for ship's engine room training
- VER_FREE simulates a typical ship's engine room with a 2-stroke, low speed engine, its auxiliary systems, power plant and a steam system.
- The user interface includes virtual controls and alarms imitating control room equipment and creates a very realistic environment.
- The mimic diagrams with active valves, pump status indicators, tank level indicators and selected digital gauges enable engine room operation and monitoring.
- Multichannel digitised sound provides a very realistic ships' engine room feel. The sound effects include: engine sound correlated with engine speed, the sound of a diesel generator starting and running, open indicator valve sound, alarm and machine telegraph buzzers. Additionally the volume level for all sound channels can be freely selected according to personal preferences.

1.1.2 Abbreviations

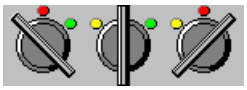
Abbr.	Description
DG	Diesel generator
ME	Main engine
DO	Diesel oil
HFO	Heavy fuel oil
LO	Lubricating oil
CO	Cylinder oil
CA	Compressed air
AXB	Auxiliary boiler
HR	Heat recovery
TC	Turbocharger
CYL	Cylinder
VER2 (ERC2)	Virtual Engine Room 2 Engine Room Console 2
CAA	Computer Aided Assessment
FW	Fresh water
SW	Sea water
Press.	Pressure
Temp.	Temperature
RPM	Revolution per minute (speed)

1.1.3 Graphic symbols

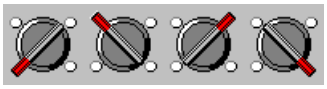
Virtual Active Controls



The 2-position switch. A mouse click on any part of this control will toggle its status.

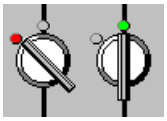


The 3-position switch. A mouse click on the left, centre or right \side of this control will switch its status.



The 4- position switch. A mouse click on the down-left, upper-left, upper-right or down-right part of this control will switch its status.

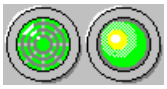
The push-button. The control will be in the pressed position as long as the mouse button is pressed.



The electric breaker. A mouse click on any part of this control will toggle its status.

Virtual Non-active Controls

LED-type lamp (Off, On). The mouse click at this control has no effect.



The indicator lamp (Off, On). The mouse click at this control has no effect.

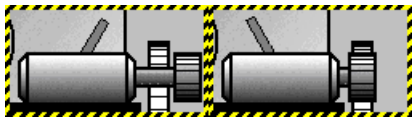
Symbolic Active Controls

Active hand pump (Left, Right). The mouse click at this control will change its state and it will remain unchanged until the mouse button is pressed. This control has to be pressed many times

in order to pump the oil manually from one tank to another.

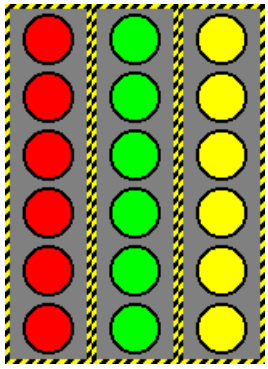
Active valve (Closed/Opened). The mouse click at this control will toggle its status.

Separator operation valve (Close, Start, Work, Shut). The mouse click at this control will sequentially change its status.

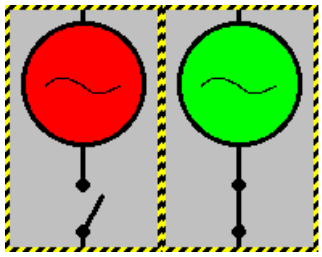


The turning gear clutch control. A mouse click on this control will toggle its status, but only if the engine is stopped.

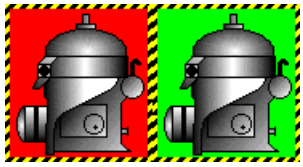
Hot-spot. A mouse click on this control will open another related window.



The diesel generator status indicator (Off, On, Standby) and hot-spot. The mouse click at this control will open the diesel generator control panel.



The generator/barker breaker status indicator (off, on) and hot-spot. . The mouse click at this control will open the main switchboard panel.



The separator status indicator (No oil output, oil output) and hot spot. The mouse click at this control will open the related separator control panel.

Symbolic Non-active Controls

The auxiliary boiler burner status indicator (Off, On). The mouse click at this control has no effect.

The flow indicator (No flow, Flow). This control will usually be placed at separator outlets. . The mouse click at this control has no effect.

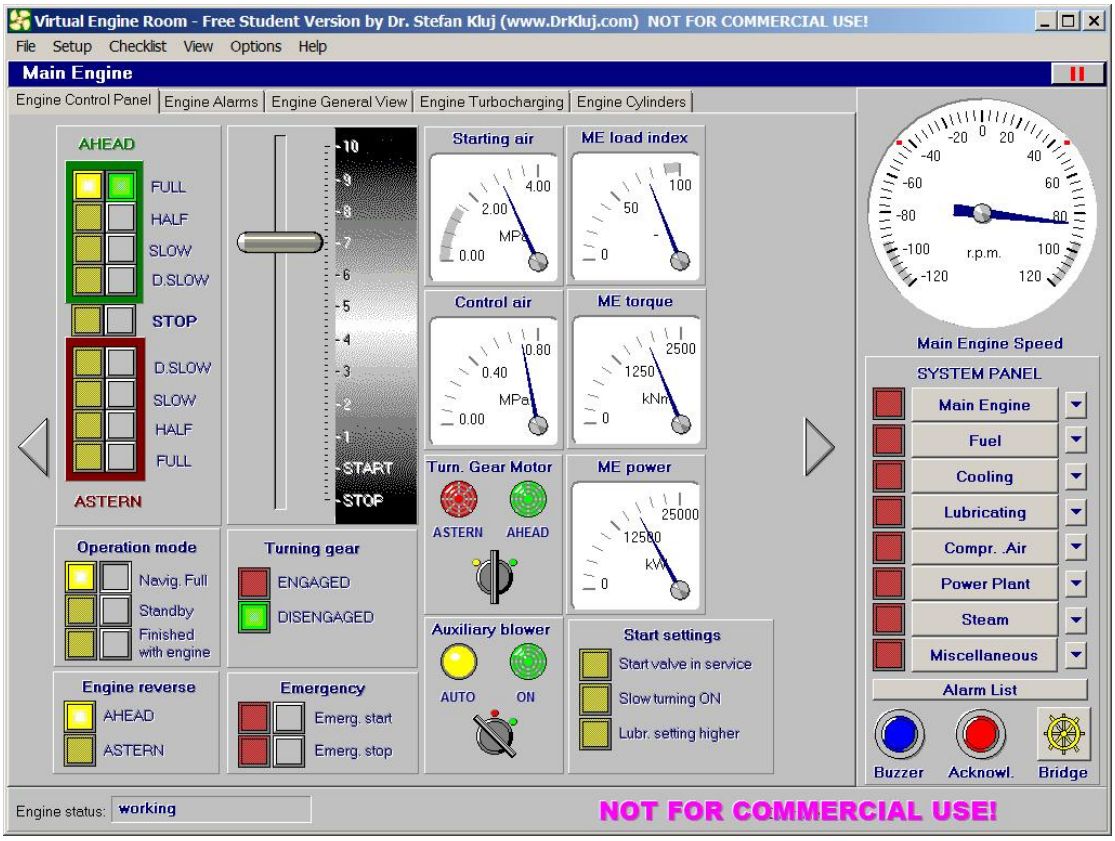
The overflow indicator (No overflow, Overflow). This control will be placed over a tank level indicator in most cases. The mouse click at this control has no effect.

Automatically controlled valve status indicator (Closed/Opened). The mouse click at this control has no effect.

The pump status indicator (Off, on, Standby-off, Standby-on). The mouse click at this control has no effect.

1.2 Virtual Engine Room – Free Student Version

Virtual Engine Room – Free Student Version (VER_FREE) is a pure software simulator. All simulator controls are virtual and no additional hardware is required to run this simulator.



2. Installation

After the software installation the program should be started for the first time in order to finalize the program registration and the following window appears.

Please follow the instruction shown in the window and register the program at the author's web site.

3. Simulator Description

The computer model of the ship's engine room and its auxiliary systems is the heart of the simulator. The program uses multiprocessing and code overlaying in order to ensure that the very sophisticated mathematical model will be able to run on a Pentium class machine.

The computer model is based on actual plant data and will react naturally under any operating conditions.

The model is divided into several modules each dealing with one sub-system and comprises:

- Main Engine
- Fuel System
- Cooling System
- Lubricating System
- Compressed Air System
- Power Plant
- Steam System
- Miscellaneous Systems (Bilge System, Ballast System, Fire Fighting System, Steering Gear).

The systems can be initialised in many different conditions by loading an appropriate setup, so no extensive setting of engine room controls is required. The detailed description of all sub-systems can be found in section 4 of this documentation.

4. Engine Room Specification

4.1 Main Engine

The ME drives a fixed pitch propeller and has a remote control system. The ME can run on DO or HFO during manoeuvring.

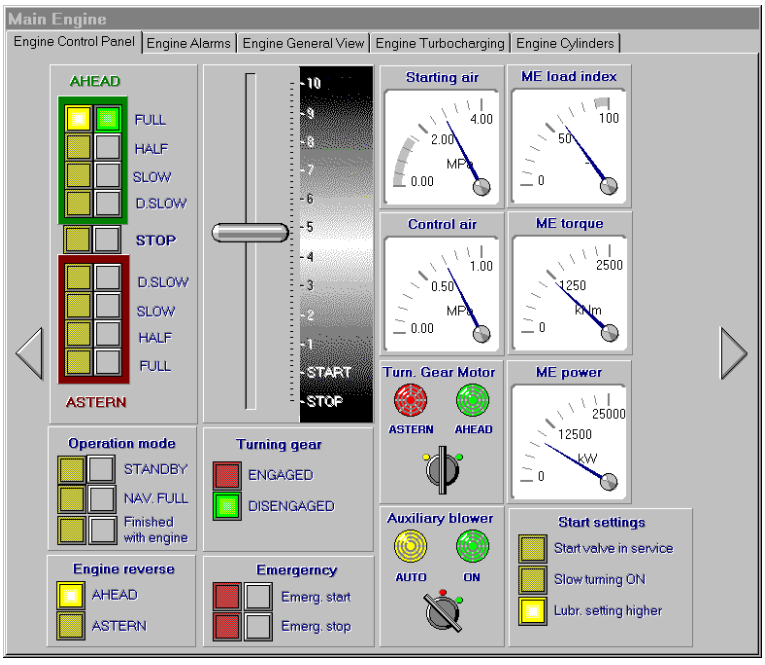
The technical data for the ME simulated in VER_FREE is given below:

- Type: 2 stroke, low speed, reversible
- No of cylinders: 7
- No of turbochargers: 2
- Nominal output: 19670 kW
- Nominal speed: 91 rpm
- Diameter of cylinder: 700 mm
- Length of stroke: 2674 mm

The ME mimic diagrams, displays and controls have been divided into several tabbed windows, each of which includes specific controls and gauges.

4.1.1 Main Engine Control Panel

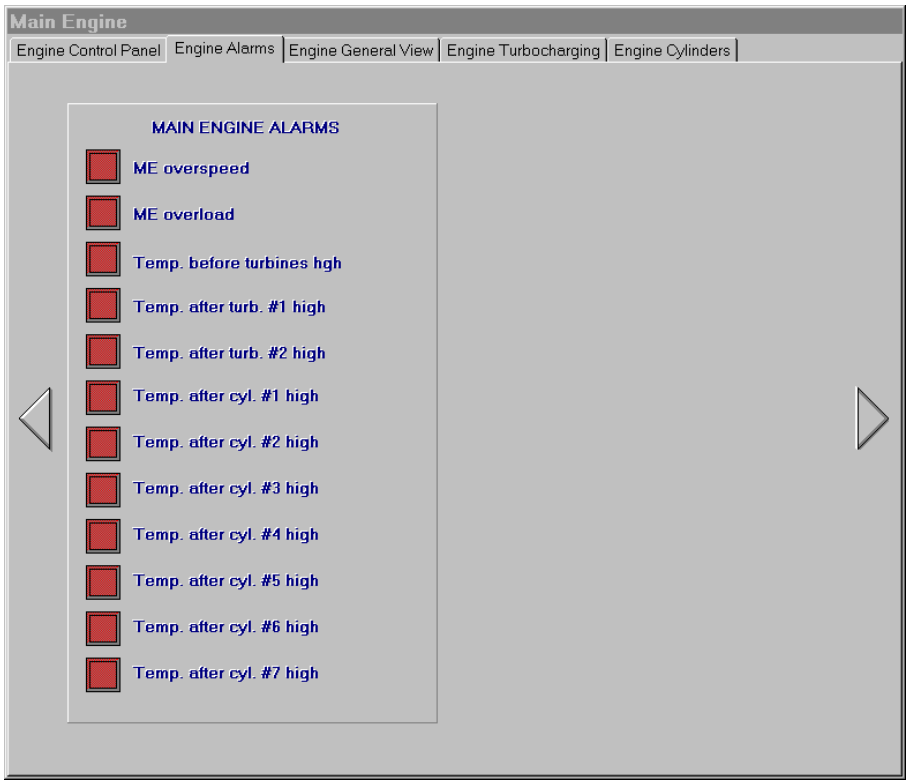
The ME Control Panel includes all controls and gauges necessary for ME remote control, the main task of this window. The ME remote control system does not include manoeuvring from bridge, because it is out of the scope of this simulator unless the simulator is operated with the instructor station. The ME is started with the use of compressed air. When starting the engine, the control lever should be moved upwards from the START position only when ME speed is higher than 40 rpm. Please note also, that the starting valve will be opened automatically only if the Control Lever is at the STOP position just before moving it to the START position. Please move the lever to the position 1.5 (or above) when the starting speed (40 rpm) has been reached.



This window includes the following controls and gauges:
- Machine telegraph ("push-button" type).
- ME control lever.
- The set of 3 push-buttons for operation mode selection.
- The set of 2 lamps indicating the engine reverse.
- The set of 2 lamps showing if turning gear is engaged.
- The 3-position switch for turning gear motor control.
- The 3-position switch for auxiliary blower control.
- The set of 3 lamps showing ME start settings.
- The set of 2 lamps and push-buttons for emergency operation (start and stop).
- The analogue gauge showing starting air pressure before ME.
- The analogue gauge showing control air pressure before ME.
- The analogue gauge showing ME load index.
- The analogue gauge showing ME torque.
- The analogue gauge showing ME power.

4.1.2 Main Engine Alarm Panel

The ME Alarm Panel includes all alarm lamps connected with ME alarms. The overview of ME alarms is the main task of this window.

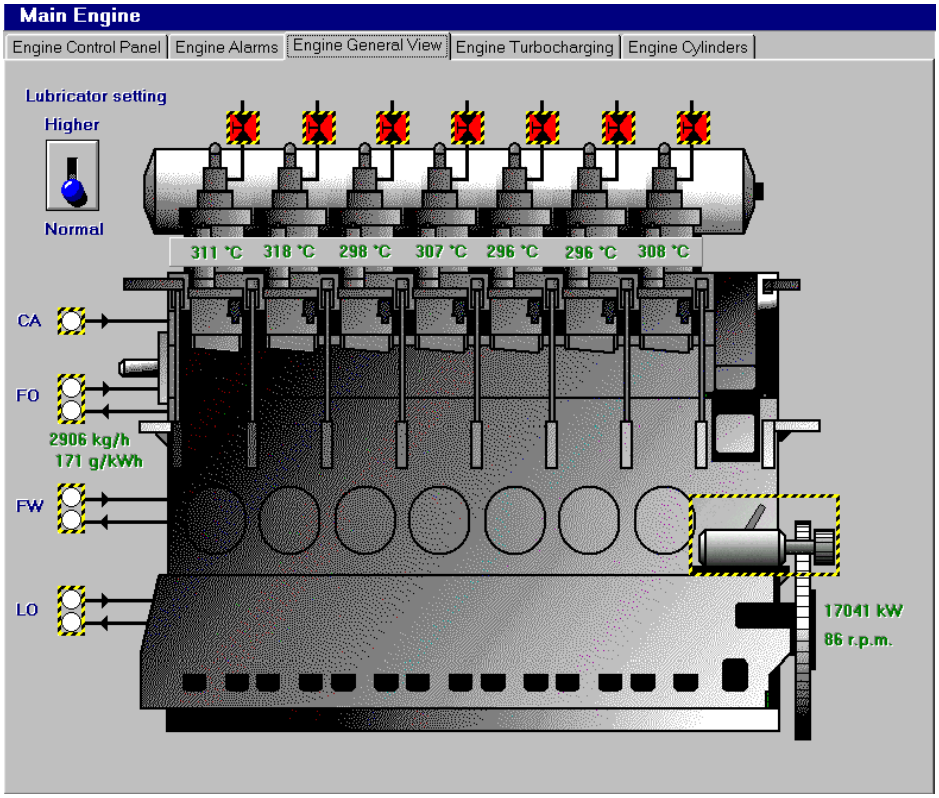


This window includes the following alarm lamps:
- ME overspeed.
- ME overload.
- Temp. before turbines high.
- Temp. after turbine high (#1, #2).
- Temp. after cylinder high (#1 - #7).

The window does not include any active controls.

4.1.3 Main Engine General View

The ME General View window shows a side view of the ME and several related controls. The ME local control is the main task of this window. The active hot-spots enable easy transfer to other co-operating systems. Please remember that the turning gear clutch can be operated only when the ME is stopped. The Lubricator Setting lever should be moved to the 'higher' position before engine start and during manoeuvring, and to the 'normal' position when running 'AT SEA'.

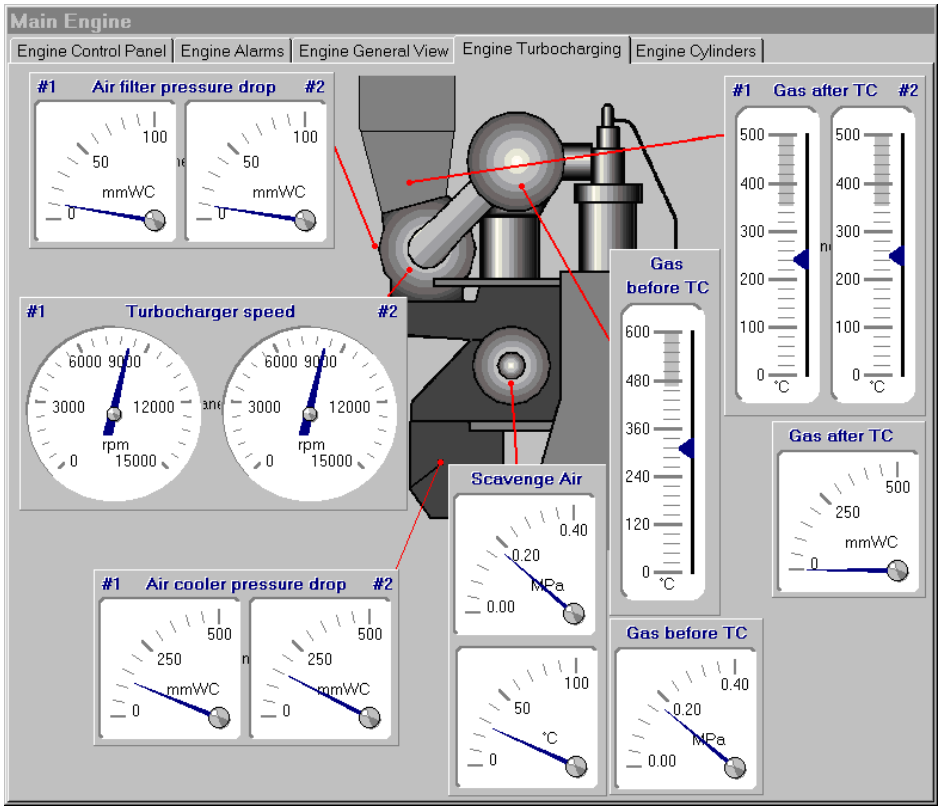


This window includes the following controls:

- Turning gear clutch lever.
- ME indicator valve (#1 - #7).
- Lubricator output setting lever (normal, higher).
- The set of digital gauges showing the exhaust gas temp. after cylinder (#1 - #7).
- The digital gauge showing engine speed.
- The digital gauge showing engine torque.
- The digital gauge showing fuel consumption per hour.
- The digital gauge showing specific fuel consumption.
- The set of active hot-spots for switching between systems.

4.1.4 Main Engine Turbocharging System

The ME Turbocharging System window includes ME front view and shows all gauges related to the ME turbocharging system monitoring. The turbocharging system overview is the main task of this window.



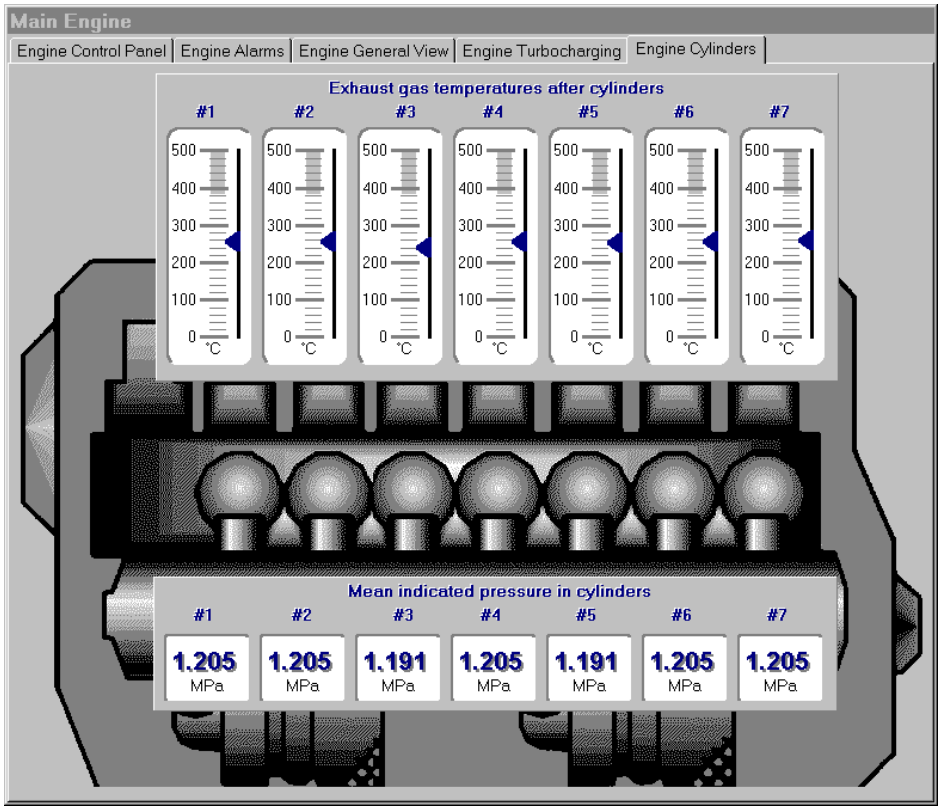
This window includes the following gauges:

- Air filter pressure drop (#1,#2).
- Turbocharger speed (#1,#2).
- Scavenge air pressure.
- Scavenge air temp.
- Exhaust gas pressure before turbines.
- Exhaust gas temp. before turbines.
- Exhaust gas pressure after turbines.
- Exhaust gas temp. after turbine (#1,#2).

This window does not include any active controls.

4.1.5 Main Engine Cylinders

The ME Cylinders window includes a ME top view and all of the gauges related to ME cylinders monitoring. The combustion process overview is the main task of this window.



This window includes the following gauges:

§ Exhaust gas temp. after cylinder (#1 - #7).

§ Mean indicated pressure in cylinder (#1 - #7).

This window does not include any active controls.

4.2 Fuel System

The fuel system is responsible for DO and HFO storage and delivery for the main engine, diesel generators and steam boiler.

The fuel system consists of the following components:

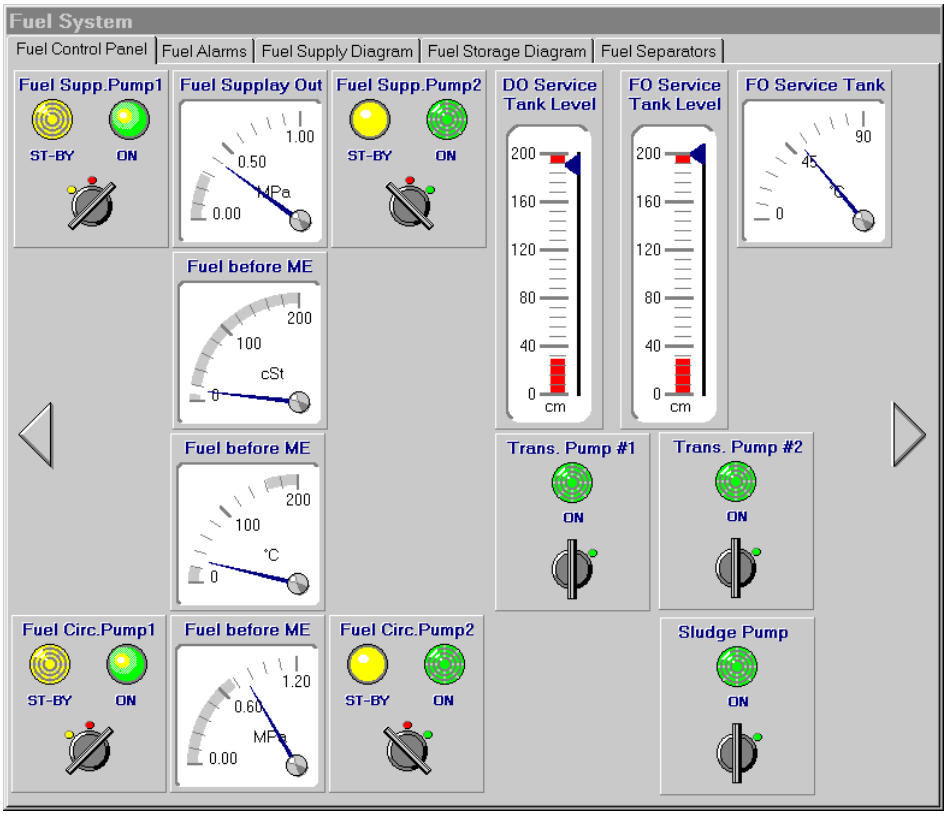
- 5 HFO and DO storage tanks (2 deep and 3 bottom).
- 2 HFO settling tanks.
- 1 drain tank.
- 2 fuel transport pumps.
- 1 sludge pump.
- 3 fuel separators (2 for HFO and 1 for DO).
- 1 HFO service tank.
- 1 DO service tank.
- 1 vent box.
- 2 fuel supply pumps.
- 2 fuel circulation pumps.
- 1 fuel hand pump.
- 1 fuel pre-heater with an automatic viscosity control.

- 1 multi-section fuel filter.

The fuel system visualisation has been divided into several tabbed windows, each including specific controls and gauges.

4.2.1 Fuel System Control Panel

Fuel System Control Panel window includes all controls and gauges necessary for fuel system remote operation. the main task of this window. Good practice is to always set one of the two circulation (or supply) fuel pumps to ON and the other one to STANDBY. In this case, if the operating pump should stop due to a fault, the other one will be able to take over the duty of the faulty pump.



This window includes following controls and gauges:

§ The 3-position switch and lamps for fuel supply pump control (#1, #2).
§ The 3-position switch and lamps for fuel circulation pump control (#1, #2).
§ The 2-position switch and lamp for fuel transfer pump control (#1, #2).
§ The 2-position switch and lamp for sludge pump control.
§ The analogue gauges showing fuel pressure, temp. and viscosity before ME.
§ The analogue gauge showing fuel level in DO service tank.
§ The analogue gauges showing fuel level and temp. in HFO service tank.

4.2.2 Fuel System Alarm Panel

The Fuel System Alarm Panel window includes all alarms relating to the fuel system. An overview of fuel system alarms is the main task of this window.

This window includes the following alarm lamps:

- Fuel press. before ME low.
- Fuel temp. before ME low.
- Fuel temp. before ME high.
- Fuel viscosity before ME low.
- Fuel viscosity before ME high.
- Fuel press. after supply pump low (#1, #2).
- Fuel press. after circulation pump low (#1, #2).
- Fuel supply press. low.
- DO service tank level low.
- DO service tank level high.
- HFO service tank level low.
- HFO service tank level high.

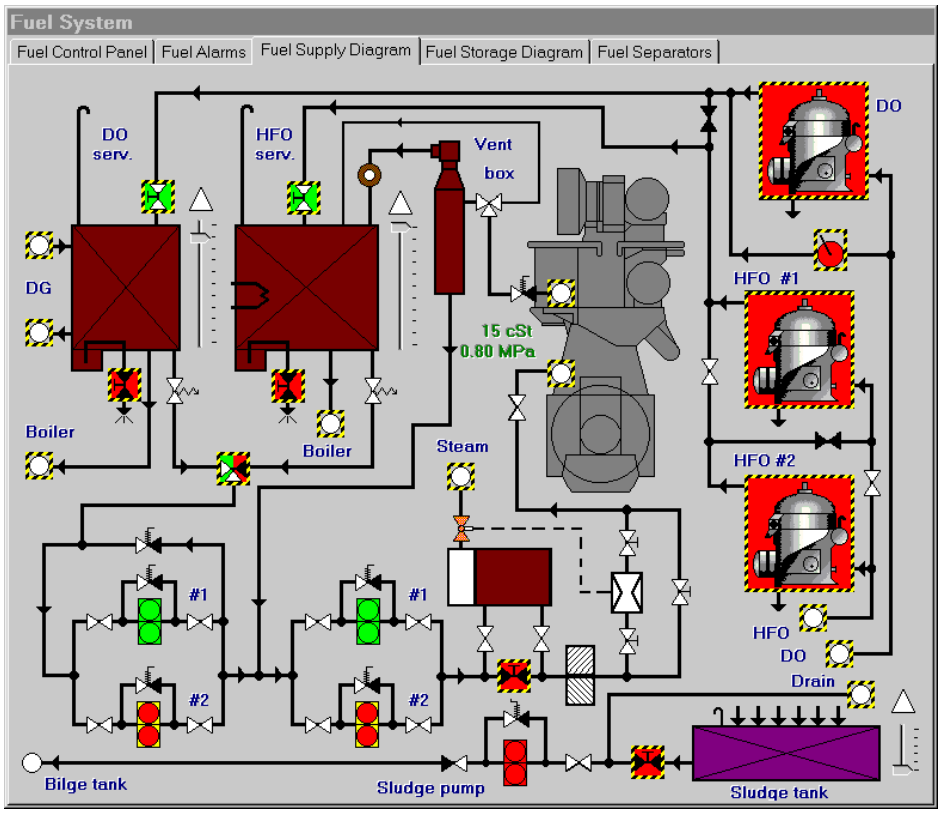
The window does not include any active controls.

4.2.3 Fuel System Supply Diagram

The Fuel System Supply Diagram includes a mimic diagram with active controls (Valve and pump buttons), status indicators and selected gauges. The fuel supply system status overview and local control is the main task of this window. The active hot-spots enable easy communication with other co-operating systems.

The fuel hand pump is available for use when there is no electric power available in the engine room and the DO service tank is empty. This pump button should be pressed many times consecutively, in order to obtain the effect of pumping. The fuel pre-heater is controlled automatically by the viscosity before ME. Re-circulated fuel returns to

the vent box to join fuel from the service tank. The vent box (Also called the mixing tank) is intended to enable the change over from hot HFO to cold DO to occur gradually and to permit vaporised lighter fractions to re-circulate to HFO vent.
Two HFO separators and one DO separator are intended for full time operation in either series or parallel.

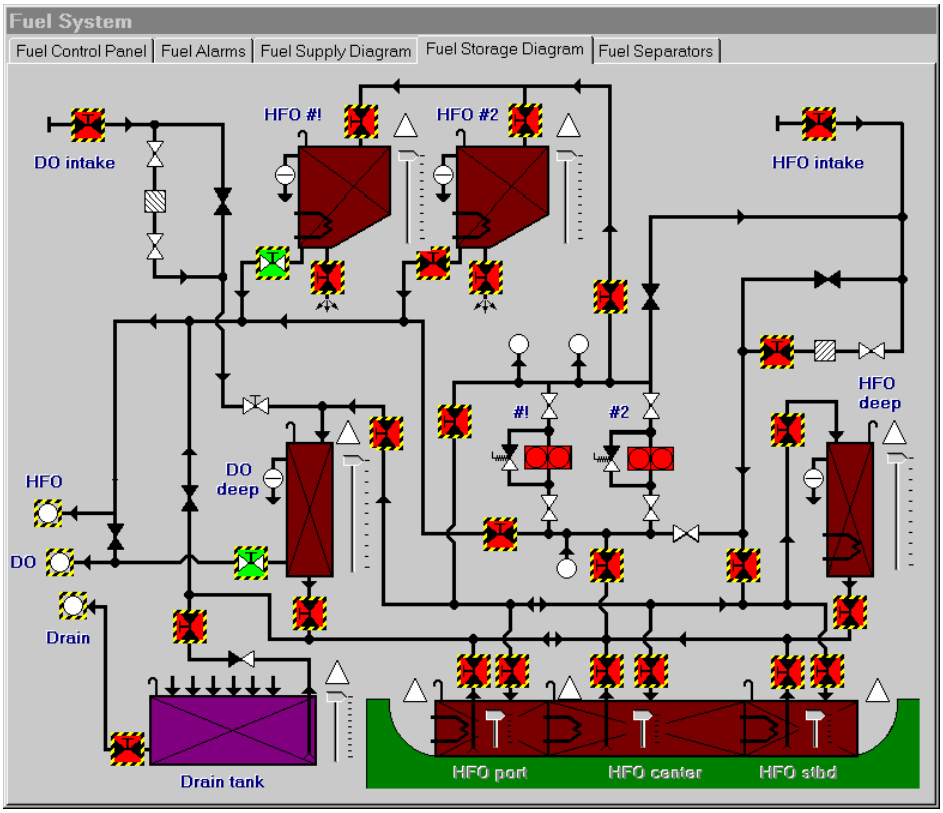


This window includes the following controls and gauges:

- The inlet and drain valves for both service tanks.
- Fuel type selection valve
- Fuel pre-heater by-pass valve.
- Sludge tank outlet valve.
- Fuel hand pump button.
- Fuel circulation pump status indicator (#1, #2).
- Fuel supply pump status indicator (#1, #2).
- Sludge pump status indicator.
- DO separator status indicator.
- HFO separator status indicator (#1, #2).
- Linear gauges showing a level in DO and HFO service tanks.
- Linear gauge showing a level in sludge tank.
- Overflow indicators for DO and HFO service tanks.
- Overflow indicator for sludge tank.
- Digital gauges showing fuel pressure viscosity and pressure before ME.
- The hot-spots for switching between systems.

4.2.4 Fuel System Storage Diagram

The Fuel System Storage Diagram window includes a mimic diagram with active controls, status indicators and selected gauges. The storage system overview and local control is the main task of this window. The active hot-spots enable easy transfer to other co-operating systems. The Fuel System Storage sub-system enables all bunker tanks to be filled from pumps ashore or aboard a bunker barge. There is also the ability to transfer fuel from bunker tanks back ashore or to a barge alongside. This sub-system includes two HFO settling tanks, each of 24 hour capacity, so that fuel can settle undisturbed for an extended period. This will reduce the burden on the purifiers. To avoid drawing settled water and sediment into the purifier, settling tanks have sloped bottoms with the suction connection at the upper end and the drain valve at the lower end.



This window includes the following controls and gauges:

- The inlet and outlet valves for all storage, settling and drain tanks.
- DO and HFO intake valves.
- The valves for fuel flow manipulation.
- Fuel transfer pump status indicator (#1, #2).
- Liner gauges showing a level in all storage, settling and drain tanks.
- Overflow indicators for all storage, settling and drain tanks
- The hot-spots for switching between systems.

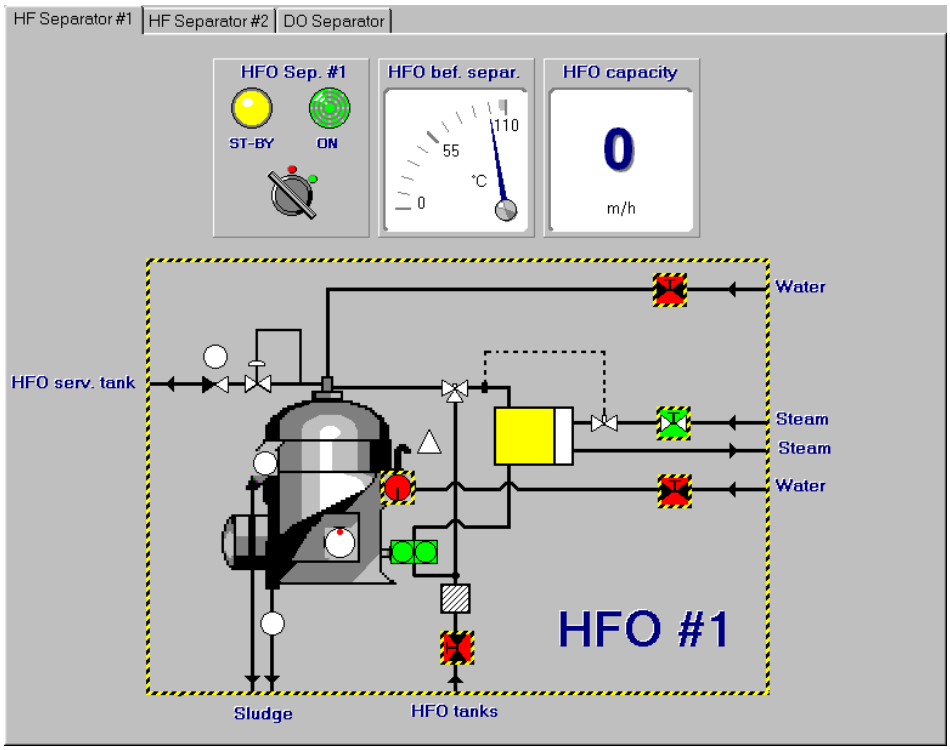
4.2.5 Fuel System Separators

The Fuel System Separators window consists of 3 tabbed sub-windows designated for 2 HFO separators and 1 DO separator. The automated and manual operation of the

separators is the main task of this window. The active hot-spots enable easy transfer to other co-operating systems.

The separators are sludge-ejecting units which operate automatically including periodic cleaning. The user can also learn how to operate the separator manually with the help of the checklists available at Checklist | Manual | Separator start or Checklist | Manual | Separator stop.

The separators can be operated in automated (ST-BY) or in manual (ON) mode. When working in the automated mode, the separator will start when the fuel level in the corresponding service tank reaches the low limit level and stop when the level reaches the upper limit. The ON lamp always lights when the separator is working.



Each of the 3 sub-windows includes the following controls and gauges:

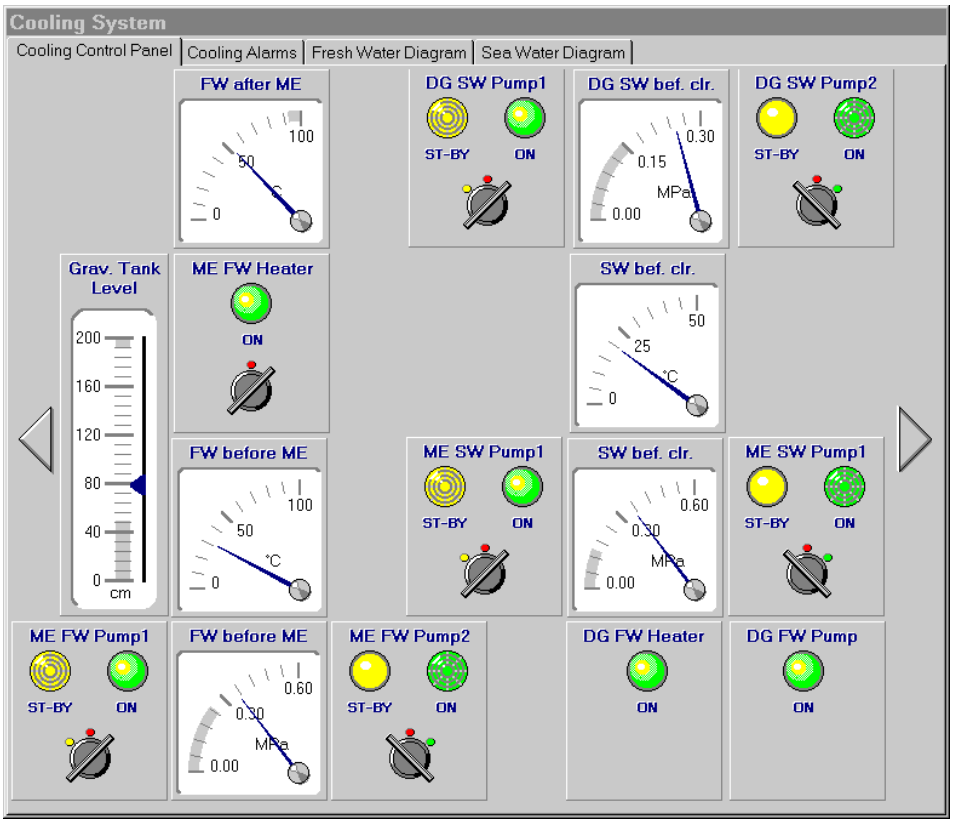
- The 3-position switch and lamps for a separator remote control.
- The analogue gauge showing fuel temp. before separator.
- The analogue gauge showing separator capacity flow.
- The inlet valves for steam, water and fuel.
- The separator main operating valve.
- The separator speed indicator.
- The separator pump status indicator.
- The fuel and sludge flow indicators.

4.3 Cooling System

The cooling system is divided into 2 sub-systems: fresh water cooling and sea water cooling. Sea water is responsible for cooling the fresh water coolers and for the scavenge air direct cooling. The fresh water system cooling includes ME jacket, piston and injector cooling, as well as cooling the diesel generators

4.3.1 Cooling System Control Panel

The Cooling System Control Panel includes all gauges and controls necessary for FW and SW sub-system remote operation. Just as in the fuel system, one circulating pump should always be set to ON and the other to STANDBY. Please remember to switch off the ME FW pre-heater when ME is started.

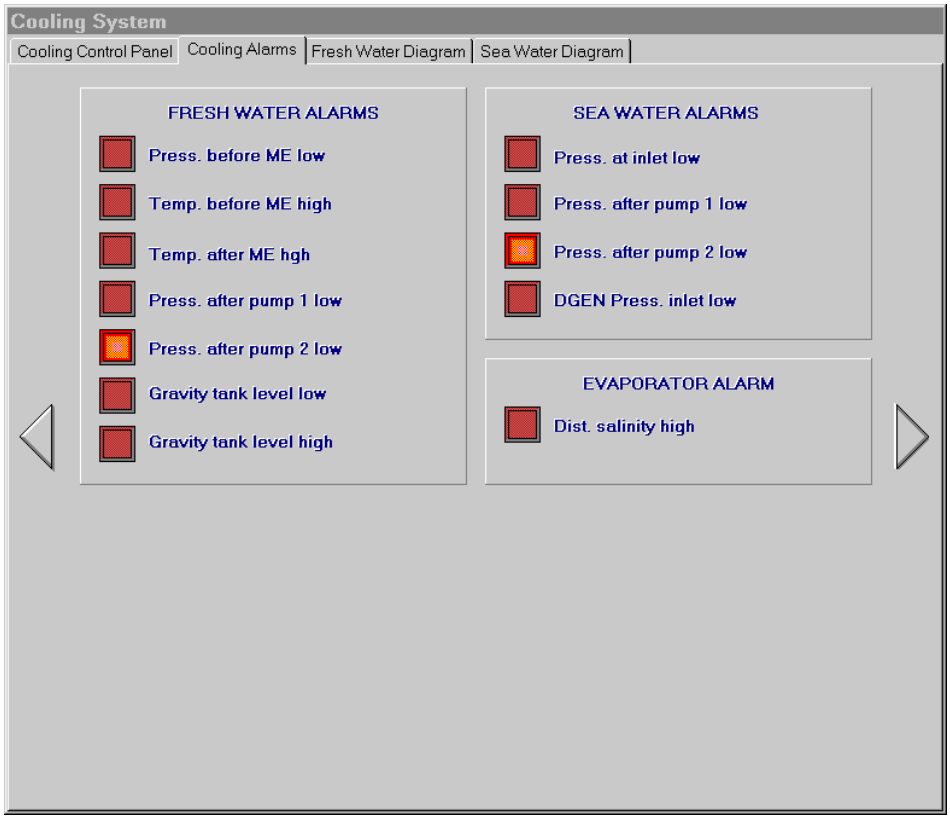


This window includes the following controls and gauges:

- The 3-position switch and lamps for FW circ. pump remote operation (#1, #2).
- The 3-position switch and lamps for SW circ. pump remote operation (#1, #2).
- The 3-position switch and lamps for a DG/FW circ. pump remote operation (#1, #2).
- The 2-position switch for FW pre-heater.
- The analogue gauge showing the water level in FW gravity tank.
- The analogue gauges showing FW temp. and pressure before ME.
- The analogue gauge showing FW temp. after ME.
- The analogue gauges showing SW temp. and pressure before cooler.
- The analogue gauge showing DG/SW pressure before cooler.
- The control lamp showing DG/FW pre-heater operation.
- The control lamp showing DG/FW pump operation.

4.3.2 Cooling System Alarm Panel

The Cooling System Alarm Panel includes all alarms related to the FW and SW sub-systems. The selected alarms overview is the only task of this window.

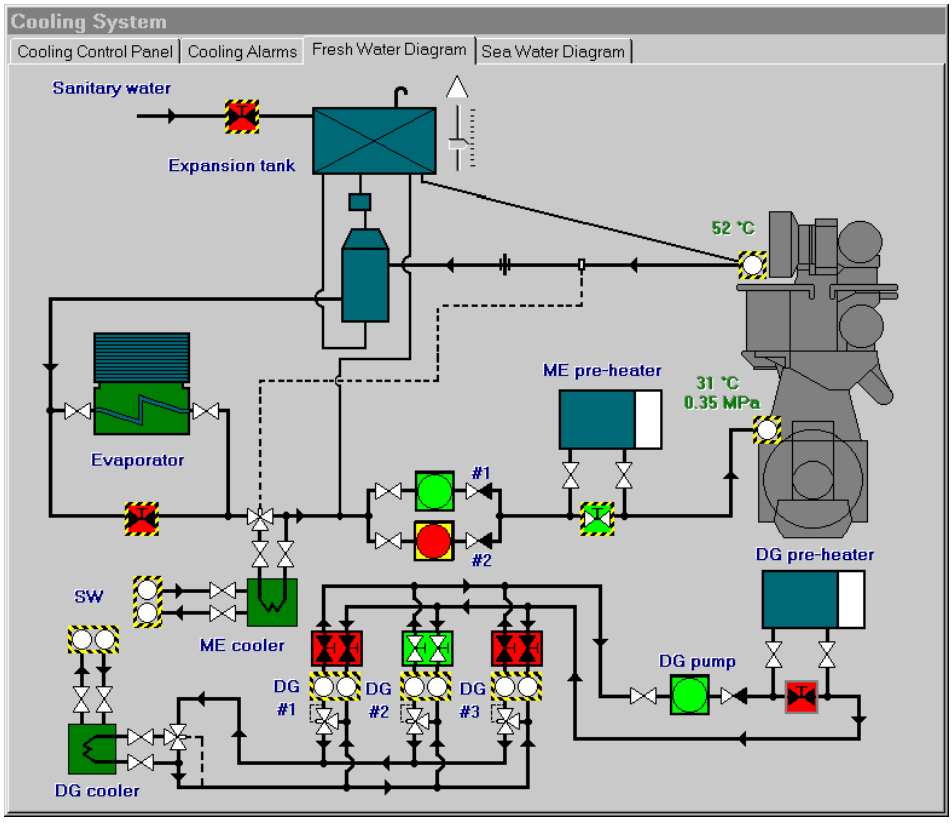


This window includes the following alarm lamps:

- § FW press. before ME low.
- § FW temp. before ME high.
- § FW temp. after ME high.
- § FW press. after circulation pump low (#1, #2).
- § FW gravity tank level low.
- § FW gravity tank level high.
- § SW inlet press. low.
- § SW press. after circulation pump low (#1, #2).
- § DG/SW inlet pressure low.

4.3.3 Fresh Water Diagram

The Fresh Water Diagram window includes the FW mimic diagram with active controls, status indicators, selected gauges and hot-spots. The ME/FW and DG/FW system overview is the main task of this window. The active hot-spots enable easy transfer to other co-operating systems. The ME pre-heater by-pass valve should be opened when the heating is OFF and closed when the heating is ON. The DG cooling system valves are controlled automatically, so the user does not have to think about the DG pre-heater by-pass valve position. The cooling water outlet temperature controls the FW cooler water flow.

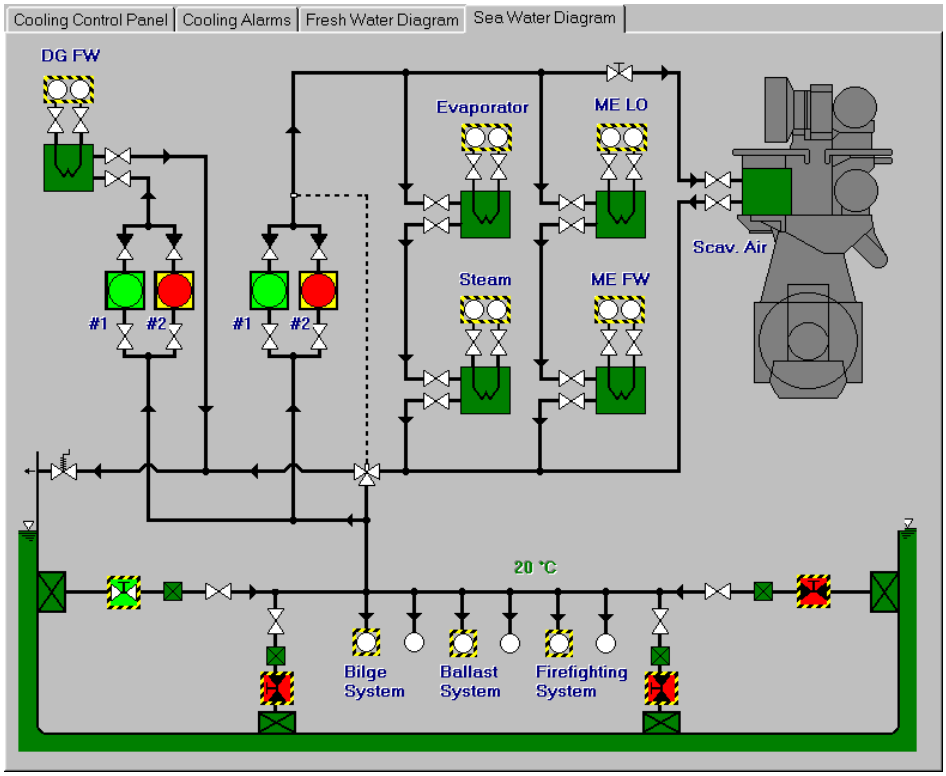


This window includes the following controls and gauges:

- The ME/FW circulation pump status indicator (#1, #2).
- The ME/FW pre-heater by-pass valve.
- The evaporator by-pass valve.
- The FW gravity tank inlet valve.
- The DG/FW cut-off valve status indicator (This valve operates exclusively in automated mode) (#1, #2, #3).
- The DG/FW pump status indicator.
- The DG/FW pre-heater by-pass valve status indicator (This valve operates exclusively in automated mode).

4.3.4 Sea Water Diagram

The Sea Water Diagram window includes the SW mimic diagram with active controls, status indicators and hot-spots. The SW flow overview and control is the main task of this window. The SW enters the system through high and low sea chests on opposite sides of the ship. The low suction is used at sea where it is more likely to remain immersed as the ship rolls and pitches. The high suction can be used in harbour, especially when the water is shallow. The sea chests are connected by a large diameter cross connection. Sea water pumps take suction from the cross connection. The SW re-circulation secures the temperature of the water before the coolers.



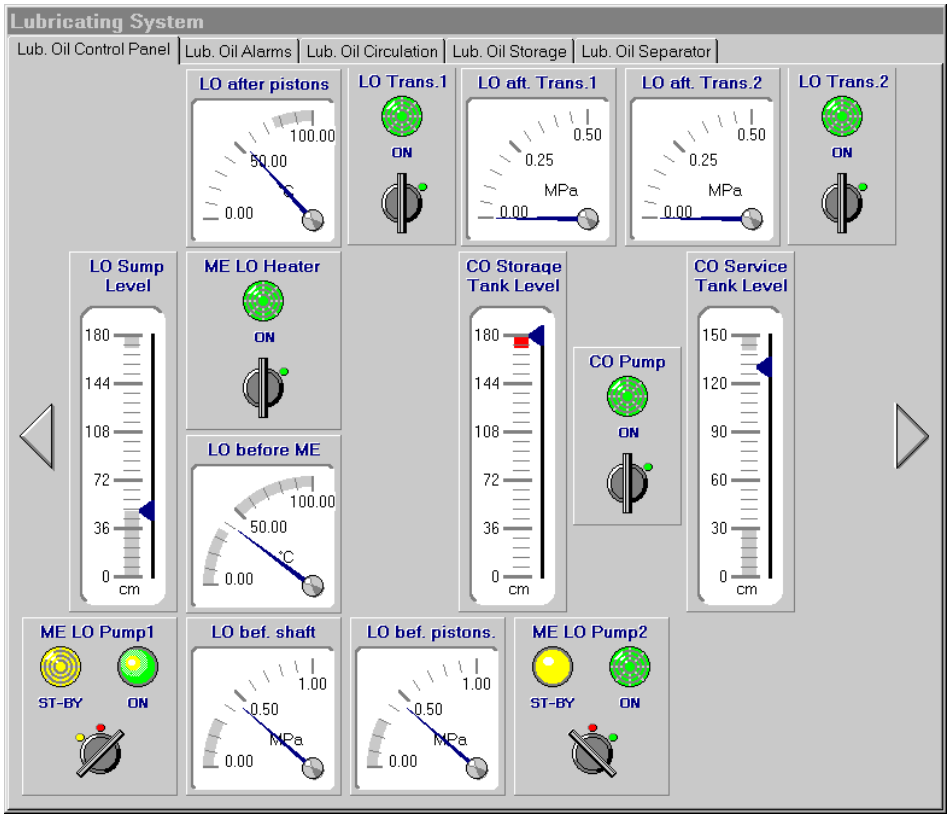
This window includes the following active controls and status indicators:
⇒ The high and low sea chests valves (both sides).
⇒ The ME SW circulation pump status indicator (#1, #2).
⇒ The DG SW circulation pump status indicator (#1, #2).
⇒ The digital gauge showing SW temp. in cross connection.

4.4 Lubricating System

The lubricating system main task is the storage and delivery of lubricating oil for the main engine and diesel generators. The lubricating system is also responsible for the storage and delivery of the ME cylinder oil.

4.4.1 Lubricating System Control Panel

Lubricating System Control Panel includes all gauges and controls necessary for LO remote operation. As in the fuel system, one ME circulation pump should be On and the other one on STANDBY. The LO pre-heater should be switched off when the ME is started.

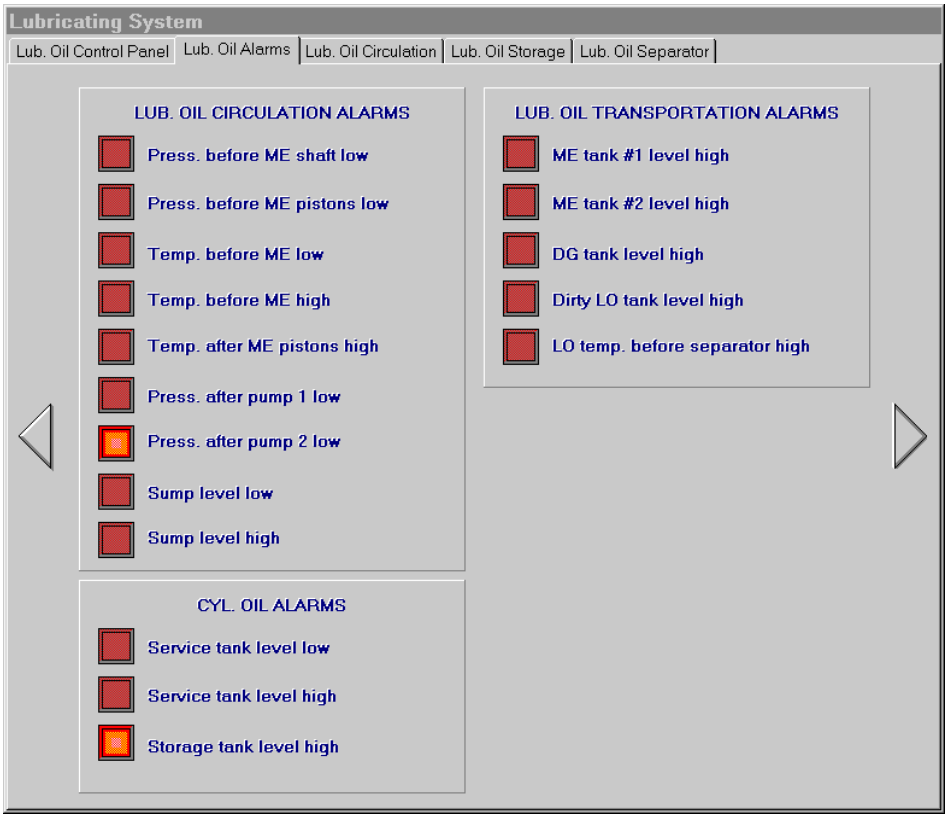


This window includes the following controls and gauges:

- The 3-position switch and lamps for ME LO circ. pumps remote oper. (#1, #2).
- The 2-position switch for ME LO pre-heater remote operation.
- The 2-position switch for LO transport pump remote operation (#1, #2).
- The 2-position switch for CO transport pump remote operation.
- The analogue gauges showing LO pressure before ME (shaft inlet and piston inlet).
- The analogue gauge showing LO temp. before ME.
- The analogue gauge showing LO temp. after ME (piston outlet).
- The analogue gauge showing ME sump level.
- The analogue gauge showing CO level in a storage tank.
- The analogue gauge showing CO level in a service tank.
- The analogue gauge showing LO pressure after transport pump (#1, #2).

4.4.2 Lubricating System Alarm Panel

The Lubricating System Alarm Panel includes all alarms related to the LO and CO (circulation and storage). The selected alarms overview is the only task of this window.



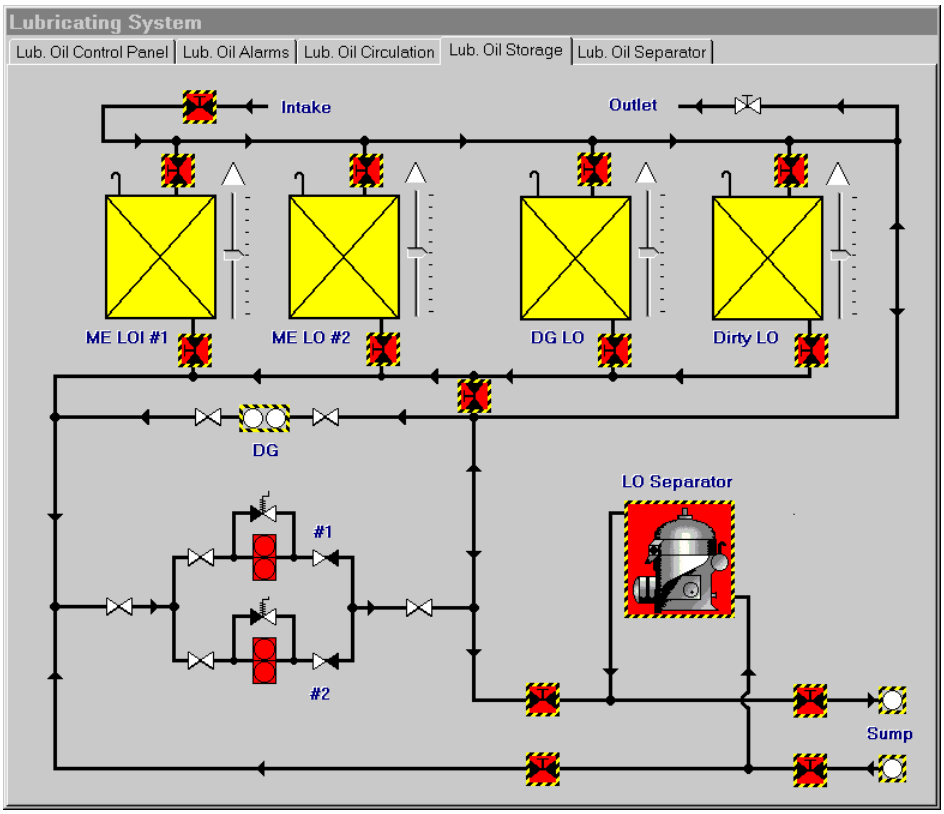
This window includes the following alarms:

§ The LO pressure before ME shaft inlet low.
§ The LO pressure before ME piston inlet low.
§ The LO temp. before ME low.
§ The LO temp. before ME high.
§ The LO temp. after ME piston outlet high.
§ The LO press. after circulation pump low (#1, #2).
§ The LO level in ME sump low.
§ The LO level in ME sump high.
§ The LO level in ME storage tank high (#1, #2).
§ The LO level in DG storage tank high.
§ The liquid level in dirty oil storage tank high.
§ The LO temp. before separator high.
§ The CO level in service tank low.
§ The CO level in service tank high.
§ The CO level in storage tank high.

4.4.3 Lubricating System Storage Diagram

The Lubricating System Storage Diagram window includes the LO storage sub-system mimic diagram with active controls, status indicators, selected gauges and hot-spots. The LO storage overview and LO transport control is the main task of this window.
The low speed diesel plant requires different grades of oil for the main and auxiliary engines so the system includes two ME LO storage tanks and one DG LO storage tank. It is possible to transfer LO between storage tanks, to and from ME sump and it is also possible to clean LO in a separator. The storage tanks are filled from deck by

gravity. The dirty LO can be stored in a separate tank and transferred to a barge alongside.



This window includes the following active controls and gauges:

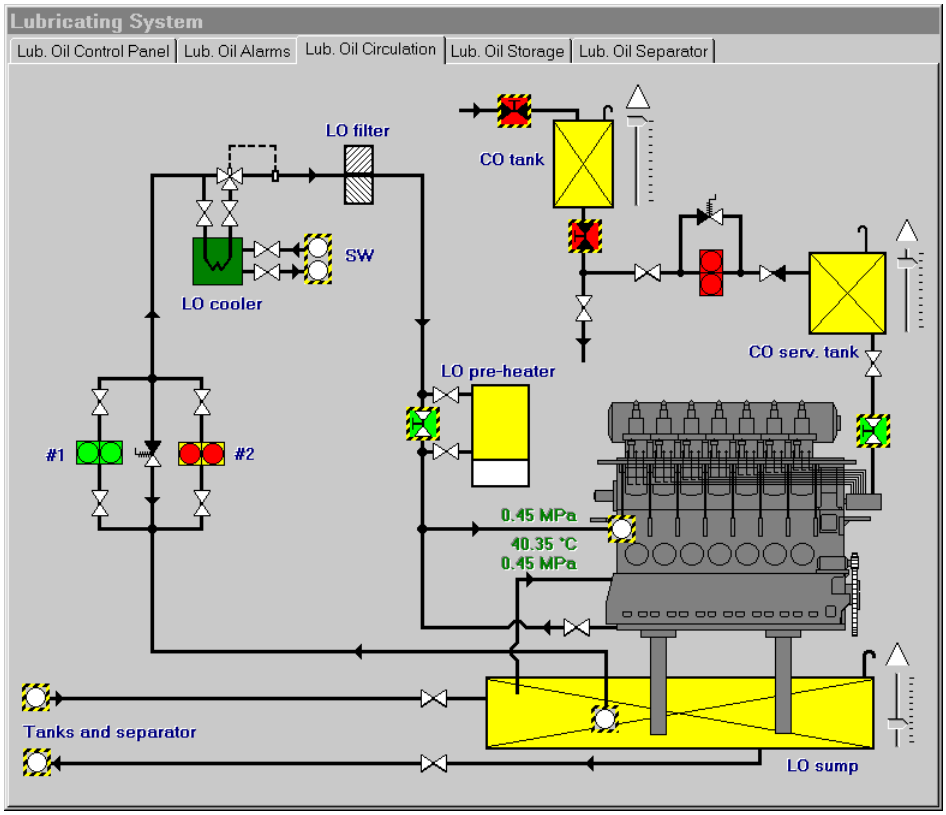
- The LO intake valve.
- The inlet and outlet valves for ME LO storage tank (#1, #2).
- The inlet and outlet valves for DG LO storage tank.
- The inlet and outlet valves for dirty oil storage tank (#1, #2).
- The set of valves for LO flow control.
- The LO transfer pump status indicator (#1, #2).
- The LO separator status indicator/hot-spot.
- The linear gauges showing the level in all storage tanks.

4.4.4 Lubricating System Circulation Diagram

The Lubricating System Circulation Diagram includes the ME LO circulation mimic diagram with active controls, status indicators, selected gauges and hot-spots. The ME LO circulation operation and CO storage and supply control is the main task of this window.

LO draining from bearing and cooling passages to the bottom of the crankcase passes into an independent sump built into a double bottom below the engine. From there, it is drawn by the LO circulating pump for re-distribution via a cooler and filter. A self-cleaning, full flow filter is provided in the pump discharge line. Filtered oil is distributed to engine bearings and used also for piston cooling.

The cylinder oil is stored in one tank and is transferred daily to a small capacity measuring tank, from which it is drawn by gravity to the cylinder lubricators on the engine. The cylinder oil storage tank is filled from deck by gravity or by a small pump.



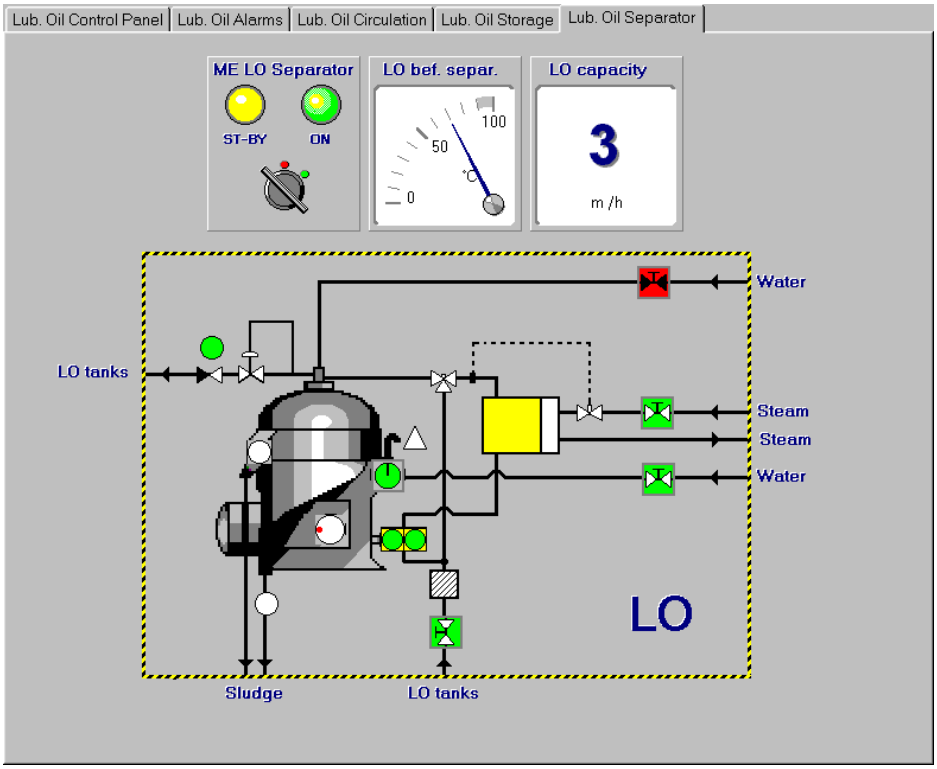
This window includes the following active controls and status indicators:

- The LO pre-heater bypass valve.
- The inlet and outlet valves of CO storage tank .
- The inlet valve of ME lubricators.
- The ME LO circulation pump status indicator (#1, #2).
- The CO transfer pump status indicator.
- The linear gauge showing LO level in ME sump.
- The linear gauge showing CO level in storage tank.
- The linear gauge showing CO level in service tank.
- The digital gauge showing LO press. and temp. before ME.

4.4.5 Lubricating Oil Separator

The Lubricating Oil Separator window includes a separator mimic diagram with active controls, status indicators, gauges and hot-spots. The automated and manual operation of the separators is the main task of this window. The active hot-spots enable easy transfer to other co-operating systems.

The LO separator is self-cleaning and fully automated. Its' operation is similar to that of the fuel separators.



This window includes the following controls and gauges:

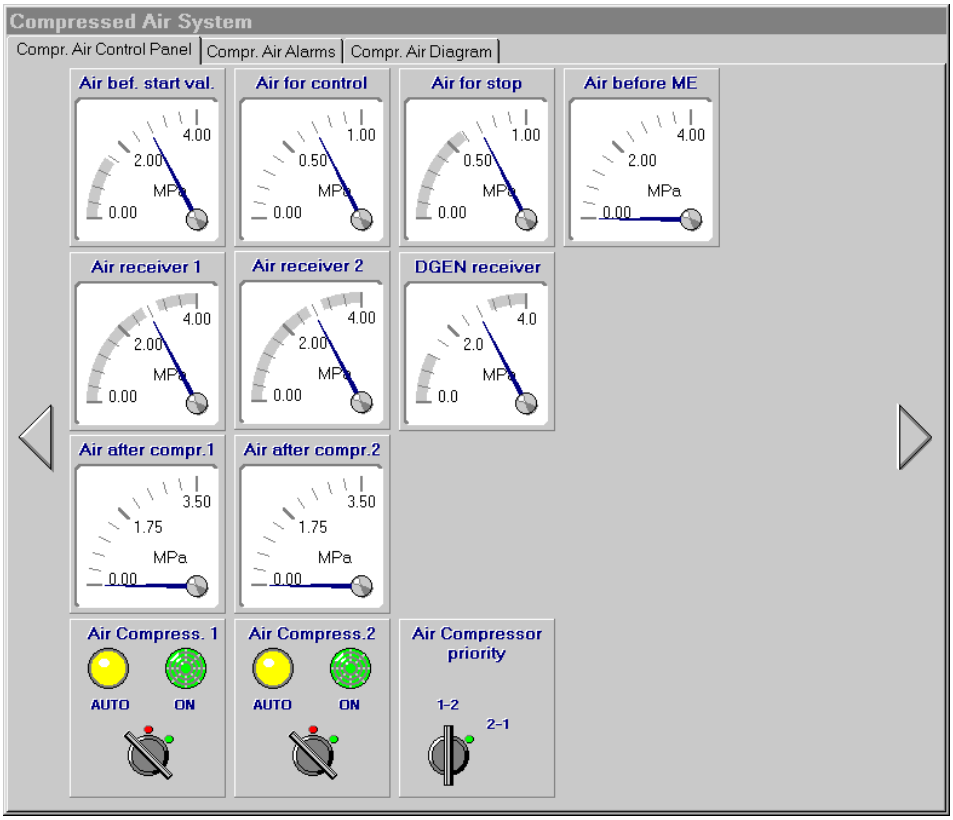
§ The 3-position switch and lamps for a separator remote control.
§ The analogue gauge showing LO temp. before separator.
§ The analogue gauge showing separator capacity flow.
§ The inlet valves for steam, water and LO.
§ The separator main operating valve.
§ The separator speed indicator.
§ The separator pump status indicator.
§ The LO and sludge flow indicators.

4.5 Compressed Air System

The compressed air system is responsible for the compressed air storage and delivery.

4.5.1 Compressed Air Control Panel

The Compressed Air Control Panel window includes all controls and gauges necessary for the system remote operation.

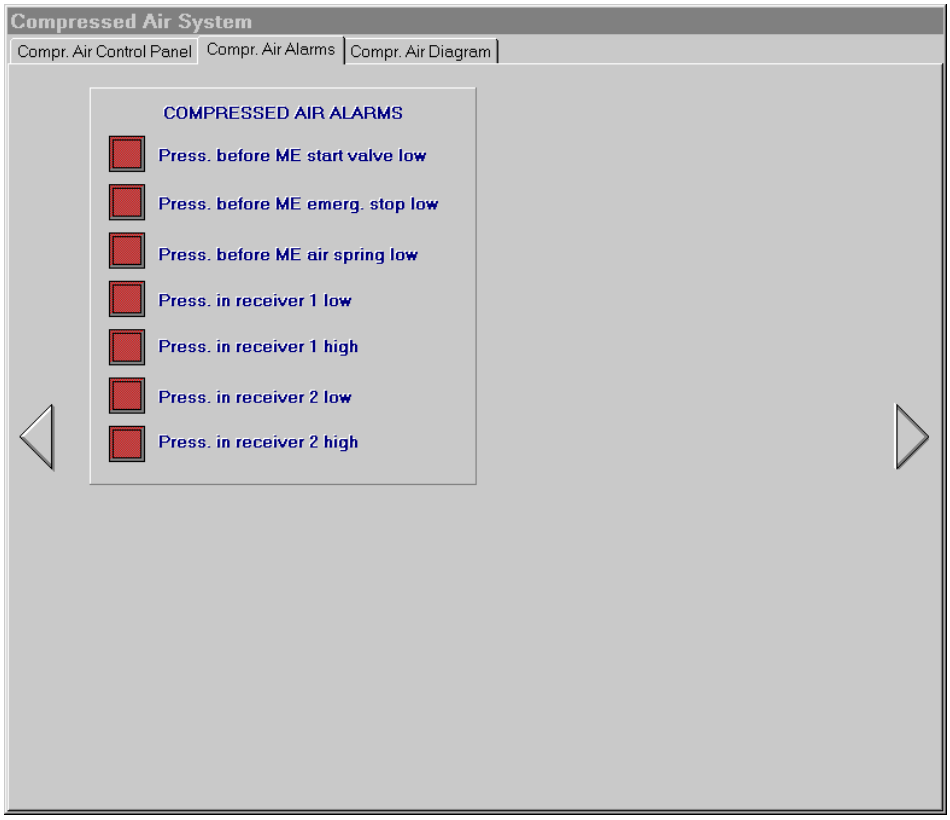


This window includes the following controls and gauges:

- The 3-position switch and lamps for air compressor remote operation (#1, #2).
- The 2-position switch for compressor priority selection.
- The analogue gauge showing CA pressure after compressor (#1, #2).
- The analogue gauge showing CA pressure in a receiver (#1, #2).
- The analogue gauge showing CA before ME starting valve .
- The analogue gauge showing CA after ME starting valve (i.e. before ME air distributor).
- The analogue gauge showing CA before ME control air inlet.
- The analogue gauge showing CA before ME emergency stop air inlet.
- The analogue gauge showing CA before DG starting valves.

4.5.2 Compressed Air Alarm Panel

The Compressed Air Alarm Panel window includes all alarms related to the CA system. The selected alarms overview is the only task of this window.



This window includes the following alarms:

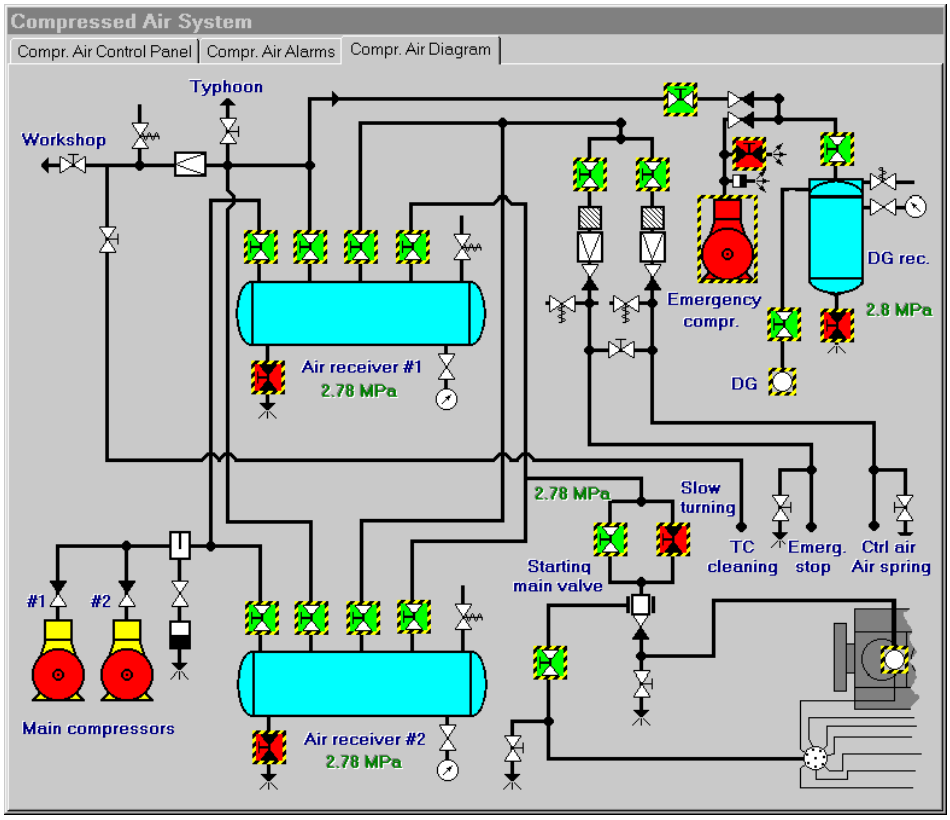
- § CA press. before ME start valve low.
- § CA press. before ME control air inlet low.
- § CA press. before ME air spring inlet low.
- § CA press. in receiver low (#1, #2).
- § CA press. in receiver high (#1, #2).

4.5.3 Compressed Air Diagram

The Compressed Air Diagram includes the CA system mimic diagram with active controls, status indicators, selected gauges and hot-spots. The CA flow and distribution control is the main task of this window.

The system can be divided into three segments providing air for main and auxiliary engine starting, air for instrumentation and control and air for miscellaneous ship's services (workshop, hand tools, turbocharger cleaning, typhoon, blowing out sea chest etc.). Because the manoeuvrability of a ship is tied to the availability of starting air, the minimum number and size of the starting air receivers must enable twelve consecutive starts of a direct reversing engine. The main air receivers are high pressure up to, 30 bars, in order to reduce the size of the receivers. The main air receivers are normally supplied by two large air compressors. A separate, small auxiliary air receiver is provided for starting the diesel generators. Normally this receiver is supplied from the starting main air through a stop check valve. For cold ship start up, the auxiliary air receiver is supplied by an emergency air compressor which is driven by a hand-started diesel engine.

The slow turning valve should be opened only if ME has been stopped longer than half an hour. This valve will be closed automatically when the ME has completed its first two revolutions during an ME start.



This window includes the following active controls, status indicators and gauges:

§ The inlet, outlet and drain valves for CA main receiver (#1, #2).
§ The inlet, outlet and drain valves for DG CA receiver.
§ The ME starting valve.
§ The ME slow turning valve.
§ The control air inlet valve.
§ The air spring inlet valve.
§ The DG receiver supply valve.
§ The main CA compressor status indicator (#1, #2).
§ The emergency compressor pushbutton and status indicator.
§ The digital gauge showing CA pressure in main receiver (#1, #2).
§ The digital gauge showing CA pressure before ME starting valve.

4.6 Power Plant

The ship power plant is responsible for the supply of electric power. The power plant includes 2 medium speed diesel generators with the following specification:

- Type: 4 stroke, medium speed, non-reversible
- Number of cylinders: 6
- Nominal output: 600 kW
- Nominal speed: 1000 rpm

The diesel generators can be operated remotely from the control panel and locally from the mimic panel. The electric power supply system is operated from the main

switchboard. The electric power consumption depends on the number and type of working consumers such as pumps, heaters, etc.. A single diesel generator can deliver enough power for normal ships operation, but the electric power consumption can increase during ship manoeuvring. The modelled power plant automation system does not include an automatic start for a second diesel generator in the case of an overload, so it is highly recommended to start and synchronise the second diesel generator before manoeuvring. One diesel should be always in standby mode in order to enable it to automatically start and synchronisation in a case of blackout.

The power plant also includes a shaft generator (600 kW) with a static frequency converter. The generator is mounted at the front part of the main engine and is driven directly by the crankshaft. The shaft generator can deliver 100% of its power when running in range 60-95 shaft rpm. The shaft generator power and voltage will be reduced in the speed range between 35-59 shaft rpm. This means that non-essential consumers and later also the lighting will be automatically disconnected when the appropriate voltage limit is reached. The diesel generator parallel operation is not possible when the shaft generator is delivering a lower voltage. The shaft generator should not be used during manoeuvring but can be used at sea when shaft speed is higher than 60 rpm. The shaft generator can be also used as standby generator, but only when the ME is running.

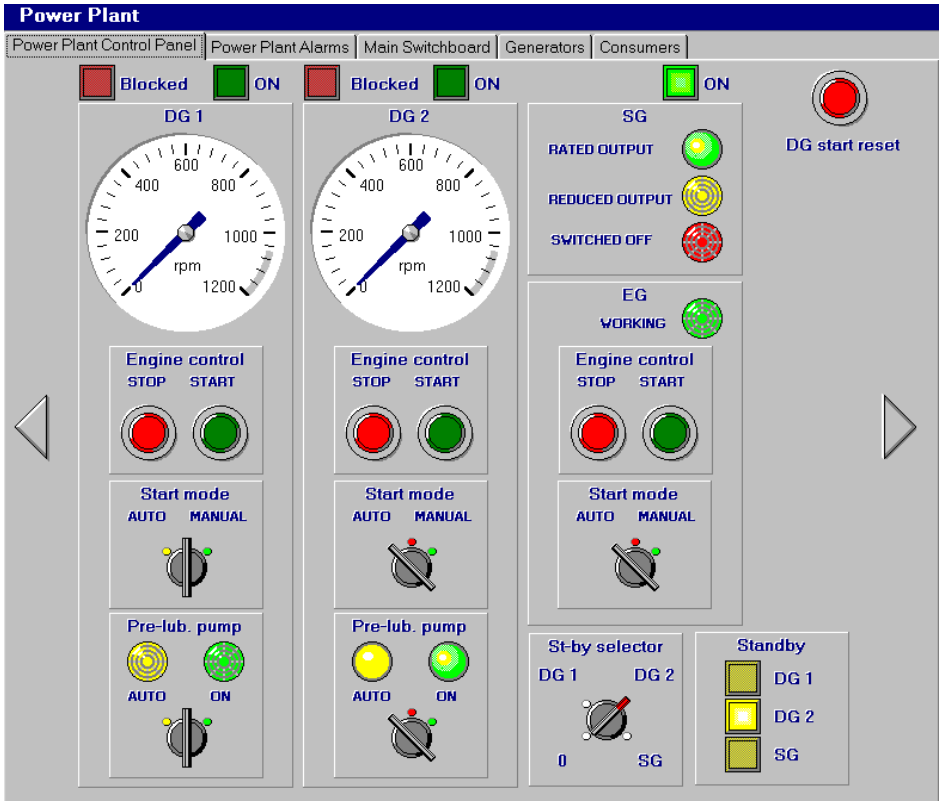
The emergency diesel generator (300 kW) is powered by a four-stroke diesel engine running on DO. The emergency generator can be started both automatically or manually. When a main bus bar voltage drop occurs, the emergency generator will be started automatically. When the nominal speed is reached, the generator will be connected to emergency bus bar. At the same time the main bus bar will be disconnected and the non- essential consumers and the lighting will be disconnected as well. The emergency generator is automatically disconnected when the voltage on the main bus bar is again available. The emergency bus bar is automatically dis-connected from the main bus bar. However, the lighting and non-essential consumer breakers have to be re-connected manually.

4.6.1 Power Plant Control Panel

The Power Plant Control Panel window includes all controls and indicators necessary for diesel generator remote operation. The power plant consists of:

- Two identical diesel generators.
- One shaft generator.
- One diesel driven emergency generator.

The diesel generators can be started manually or automatically when the DG is in standby mode. The DG start will be blocked after an emergency stop, so it is necessary to solve the problem and press the DG start reset button in order to enable it to restart.

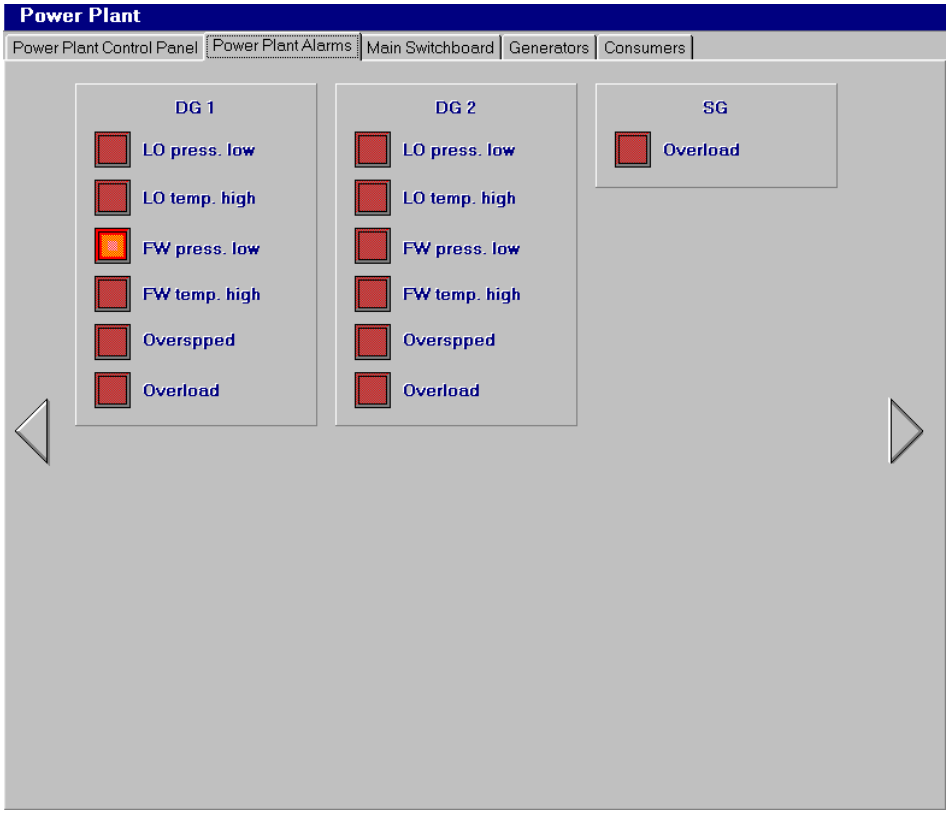


This window includes the following active controls and gauges:

- The 3-position switch for DG start mode selection (#1, #2, #3).
- The 3-position switch and lamps for pre-lubrication pump work mode selection (#1, #2).
- The pushbutton for a DG manual start (#1, #2).
- The pushbutton for a DG manual stop (#1, #2).
- The digital gauge showing DG speed (#1, #2).
- The lamp showing if the engine start is blocked (#1, #2).
- The lamp showing if the generator is connected to bus bars (#1, #2, #3).
- The pushbutton for a DG start reset.
- The 4-position switch for standby DG selection.
- The set of 3 lamps showing which DG is in standby mode.

4.6.2 Power Plant Alarm Panel

The Power Plant Alarm Panel window includes all alarms relating to the diesel generators. The alarms overview is the only task of this window.



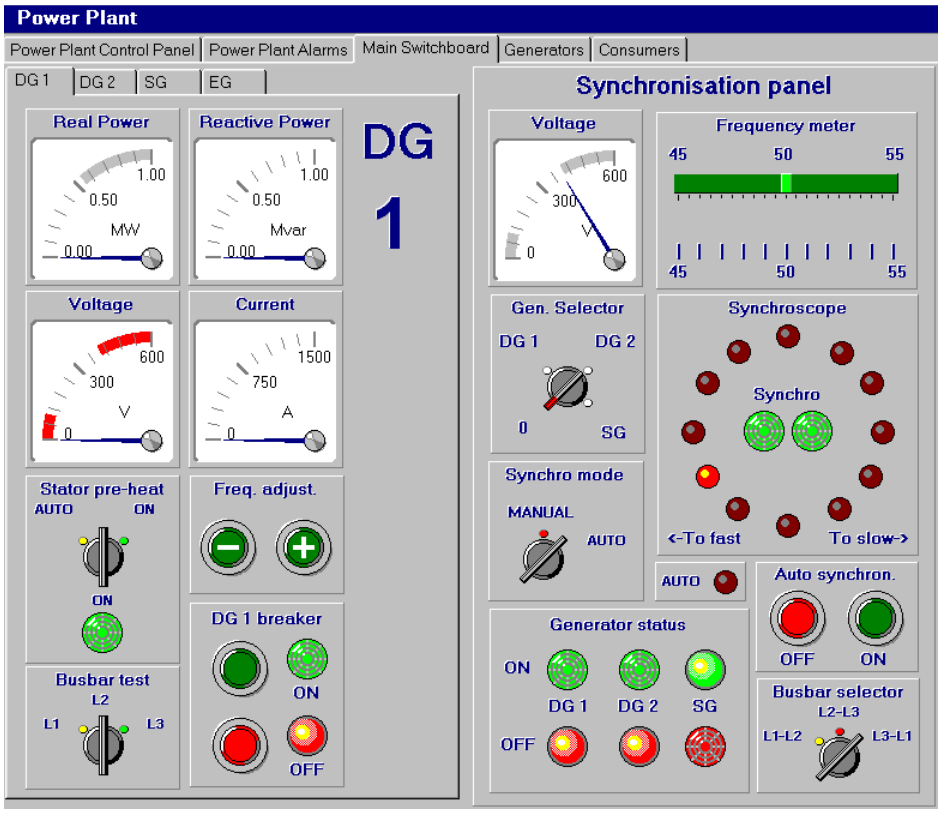
This window includes following alarms:

- The DG LO inlet pressure low (#1, #2).
- The DG LO outlet temp. high (#1, #2).
- The DG FW inlet pressure low (#1, #2).
- The DG FW outlet temp. high (#1, #2).
- The DG overspeed (#1, #2).
- The generator overload (DG1, DG2, SG).

4.6.2 Power Plant Main Switchboard

The Power Plant Main Switchboard includes all controls and indicators usually available on real switchboards. The right side of this window shows the part of the switchboard that is common to all generators and is used mainly for their synchronisation. The left side of the window has tabbed panels, each representing a part of the switchboard which is specifically designed for single generators called terminals. The DG selector switch connects DG terminals to the synchronisation section. Note that the display showing which DG terminal is selected in the left part of the window has nothing to do with the terminal connection to the synchronisation block.

The main switchboard should be used for DG synchronisation, connecting to bus bars and electric load control.



The right part of the window includes following active controls and gauges:

- The analogue gauge showing the voltage at the busboys.
- The linear frequency meter showing bus bar frequency in the upper part and the selected terminal frequency in its lower part.
- The 4-position switch for the selection of which terminal is connected to the common synchronisation point
- The 2-position switch for the synchronisation mode selection.
- The pushbutton for auto synchronisation initialising.
- The pushbutton for auto de-synchronisation initialising.
- The LED showing if the auto synchronisation is already active.
- The synchroscope panel showing the difference in frequency between bus bars and the generator with terminal already connected to the common synchronisation point. The two green lamps will be on always when the difference will be close to zero.
- The set of 3 lamps showing which DGs are currently connected to the bus bars
- The 3-position switch for selecting which pair of bus bar voltages are to be displayed.
- The 3-position switch for generator bus bar test selection.

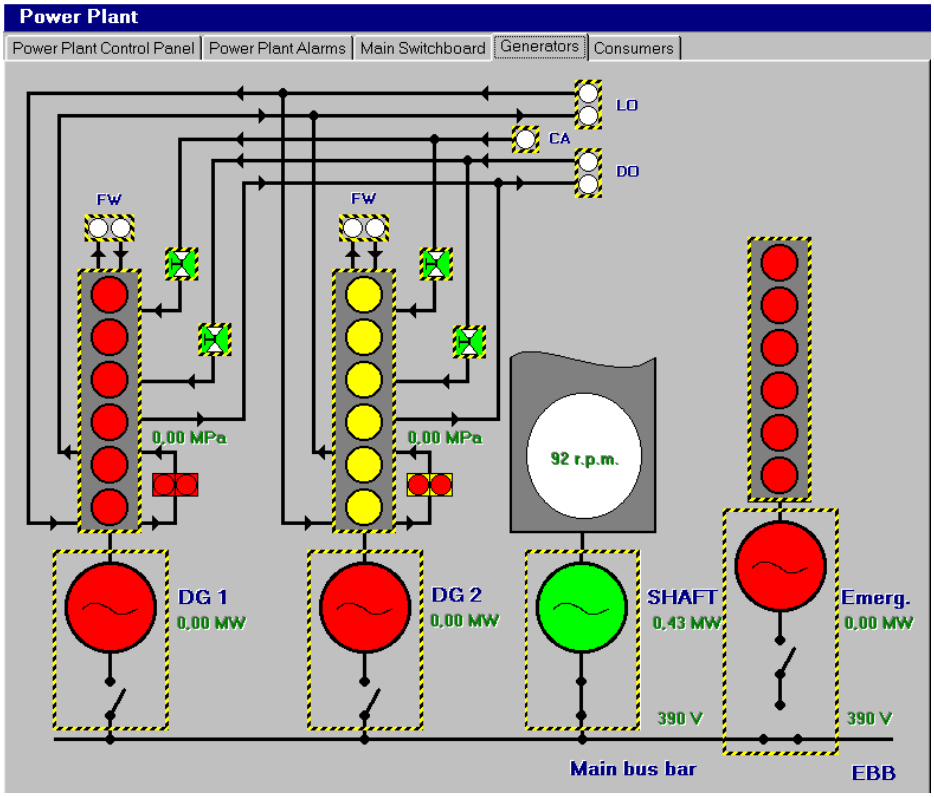
Each tabbed panel at the left side of the main switchboard window includes following controls and gauges:

- The analogue gauge showing the electric voltage generated by the selected generator.
- The analogue gauge showing the electric current generated by the selected generator.

§ The analogue gauge showing the real electric power delivered by the selected generator.
§ The analogue gauge showing the real electric power delivered by the selected generator.
§ The analogue gauge showing the reactive electric power delivered by the selected generator.
§ The set of 2 pushbuttons used for increasing/decreasing frequency when the generator is not connected to the bus bars and for increasing/decreasing load and frequency when the generator is connected to the bus bars
§ The set of 2 pushbuttons for the selected generator breaker manual control (connecting/disconnecting).
§ The set of 2 lamps showing if the breakers are currently connected.
§ The 3-position switch and the lamp for the stator pre-heating control.

4.6.3 Power Plant Diagram

The Power Plant Diagram window includes a mimic diagram with active controls, status indicators, selected gauges and hot spots. The mimic diagram shows all diesel generators and their connections to fuel, lubricating, fresh water and compressed air systems.



This window includes the following controls, status indicators and gauges:

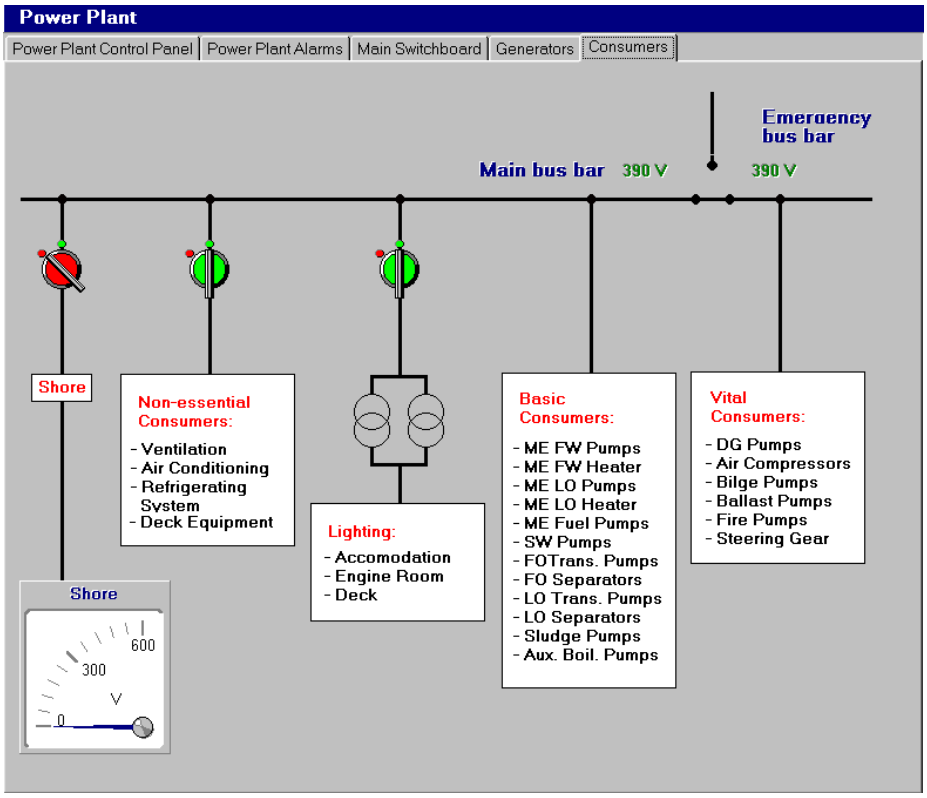
§ The DO inlet valve before DG (#1, #2).
§ The CA inlet valve before DG (#1, #2).
§ The auxiliary engine status indicator (#1, #2, EG).
§ The generator/breaker status indicator (DG1, DG2, SG, EG).
§ The digital gauge showing LO pressure after pre-lubricating pump (#1, #2).
§ The digital gauge showing generator real power (DG1, DG2, SG, EG).

§ The digital gauge showing main bus bar voltage.
§ The digital gauge showing emergency bus bar voltage.

4.6.3 Consumers Diagram

The consumer diagram shows both: main and emergency bus bars, the electric power consumer groups and the shore connection as well. The non-essential consumers and the lighting will always be switched off automatically a blackout occurs. When the voltage on the main bus bars is available again (because of the stand-by generator start for example), the breakers for non-essential consumers and lighting must be connected manually again.

The shore connection can be used only when the ship is in the harbour. This means that ME has to be stopped.



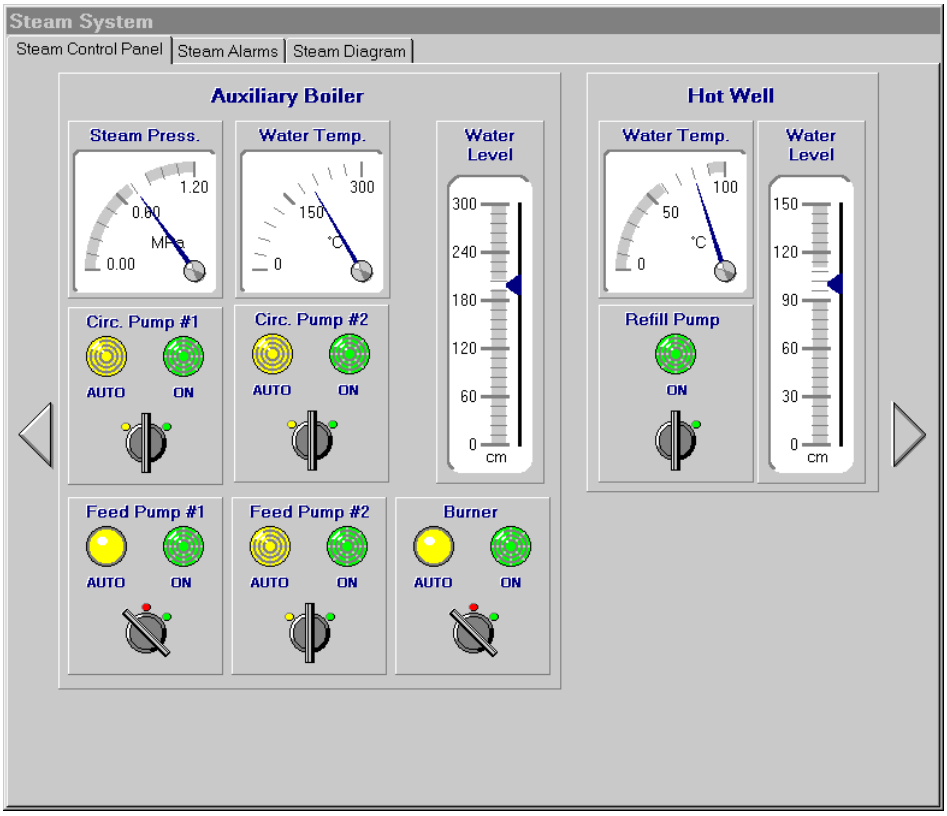
This window includes the following controls, status indicators and gauges:
The shore connection breaker
The non-essential consumers breaker
The lighting breaker
The breaker connecting main and bus bars with the emergency generator.

4.7 Steam System

The steam system is responsible for heating steam delivery. This steam is used for HFO heating and water heating.

4.7.1 Steam System Control Panel

The Steam System Control Panel window includes all controls and indicators necessary for the steam system remote operation.

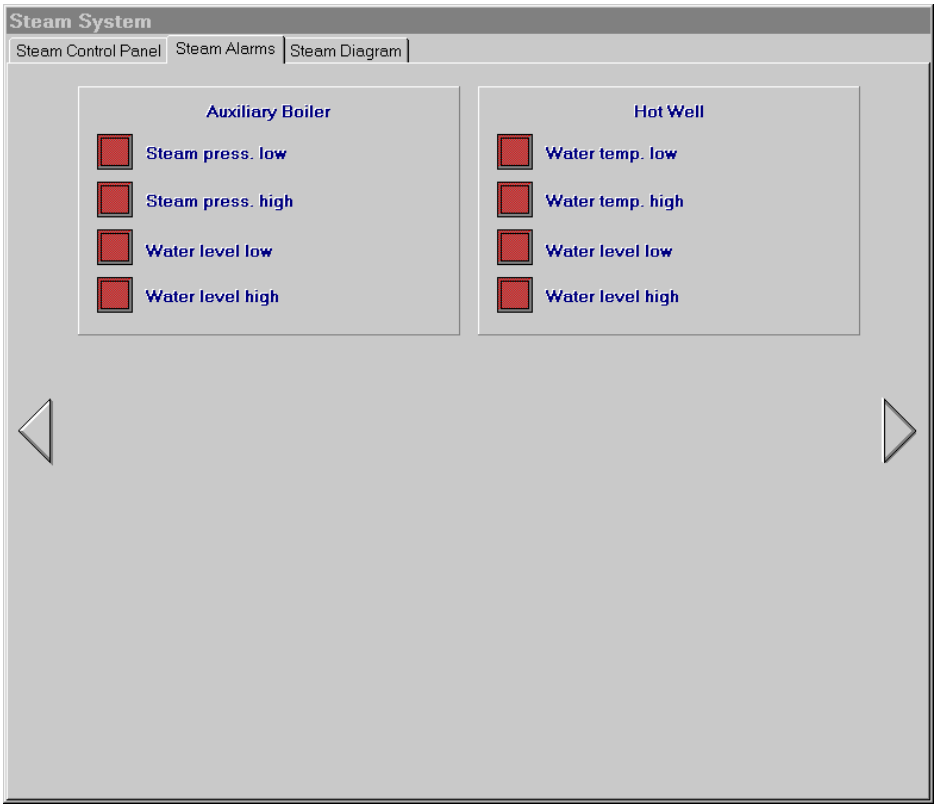


This window includes the following controls and gauges:

- The 3-position switch and lamps for auxiliary boiler feed pump control (#1, #2).
- The 3-position switch and lamps for auxiliary boiler circulation pump control (#1, #2).
- The 3-position switch and lamps for auxiliary boiler burner control.
- The 2-position switch and lamp for hot well refilling control.
- The analogue gauge showing auxiliary boiler steam pressure.
- The analogue gauge showing auxiliary boiler water temp'.
- The linear gauge showing auxiliary boiler water level.
- The analogue gauge showing hot well water temp'.
- The linear gauge showing hot well water level.

4.7.2 Steam System Alarm Panel

The Steam System Alarm Panel window includes all alarms relating to steam systems. The alarms overview is the only task of this window.



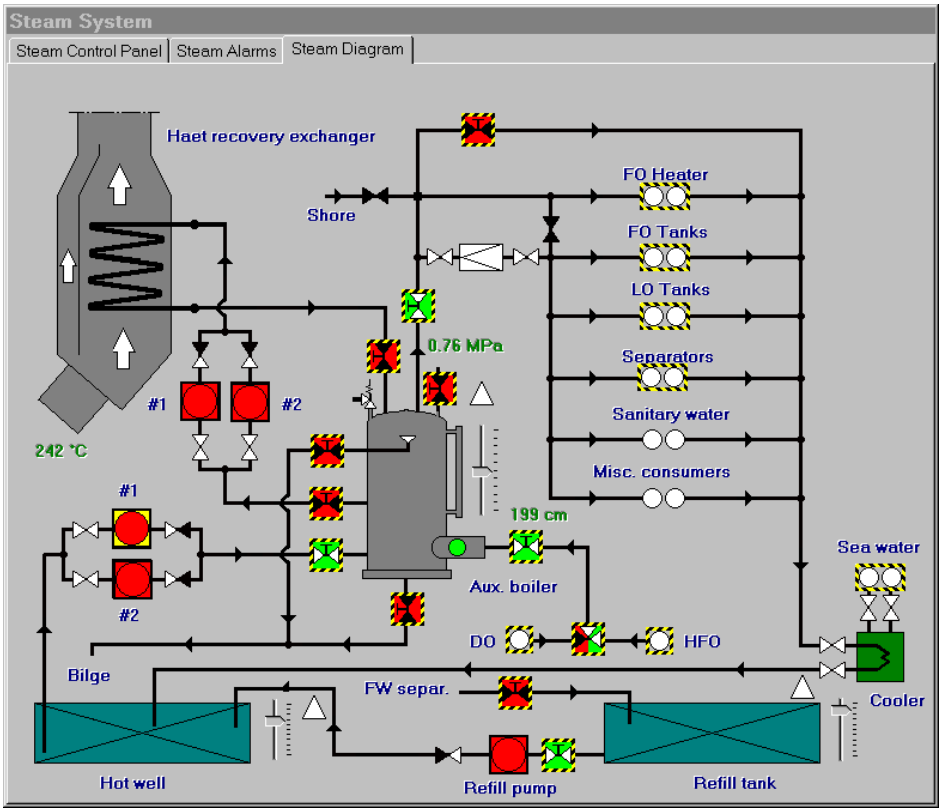
This window includes the following alarms:

- The auxiliary boiler steam pressure low.
- The auxiliary boiler steam pressure high.
- The auxiliary boiler water level low.
- The auxiliary boiler water level high.
- The hot well water level low.
- The hot well water level high.
- The hot well water temp. low.
- The hot well water temp. high.

4.7.3 Steam System Diagram

The Steam System Diagram window includes the steam system mimic diagram with active controls, status indicators, selected gauges and hot-spots.

The oil-fired auxiliary boiler serves as the steam drum for the forced-circulation water tube waste heat boiler. The excess steam produced is dumped through a pressure regulating valve to the sea water circulating cooler, while a shortage of steam will trigger a pressure switch to supplementary fire the oil-fired boiler. When sufficient waste heat is available, the automatically controlled circulation pumps can be started. The operation of these pumps is controlled by steam pressure, and the oil-fired burner can be switched “off” when sufficient waste heat is available. For cold ship start DO has to be used as auxiliary boiler fuel. The burner can be switched to HFO only if heating steam is available for fuel heating.



This window includes the following controls and gauges:

- The auxiliary boiler feed pump status indicator (#1, #2).
- The auxiliary boiler circulation pump status indicator (#1, #2).
- The auxiliary boiler burner status indicator.
- The hot well refill pump status indicator.
- The set of auxiliary boiler valves.
- The set of auxiliary boiler burner fuel kind level.
- The hot well refill valve.
- The linear gauge showing auxiliary boiler water level.
- The linear gauge showing hot well water level.
- The linear gauge showing hot well refill tank.

4.8 Miscellaneous Systems

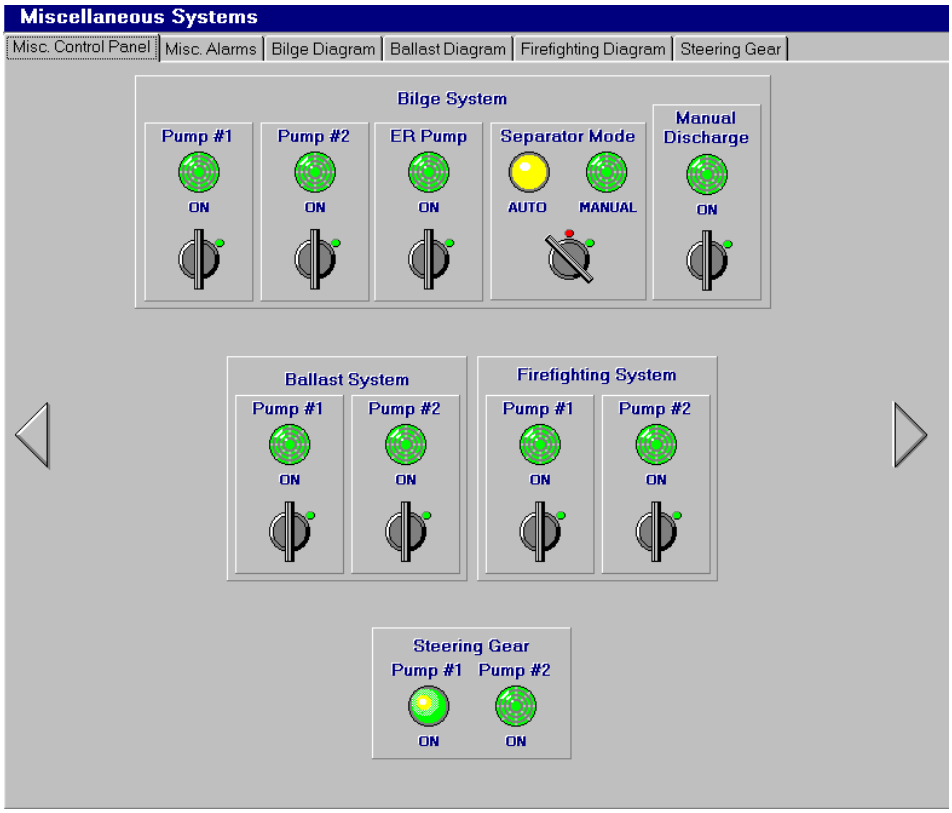
The miscellaneous systems group includes following systems:

- The bilge system.
- The ballast system.
- The fire-fighting system.
- The steering gear.

The above mentioned systems have been integrated into one group called Miscellaneous Systems and they have a common control panel but separate mimic diagrams.

4.8.1 Miscellaneous Systems Control Panel

The Miscellaneous Systems Control Panel window includes all controls and gauges necessary for the remote operation of bilge, ballast and fire-fighting systems and also the indicator lamps for the steering gear. The remote control for the steering gear can be found on the Bridge Panel.



This window includes the following controls and gauges:

- The 3-position switch and lamps for the oily water separator operation mode.
- The 2-position switches and lamps for the bilge pumps (#1, #2, Engine Room).
- The 2-position switch and lamp for the manual discharge of the oily water separator.
- The 2-position switches and lamps for the ballast pumps (#1, #2).
- The 2-position switches and lamps for the fire-fighting pumps (#1, #2).
- The indication pumps for the steering gear pumps (#1,#2).

4.8.2 Miscellaneous Systems Alarm Panel

The Miscellaneous Systems Alarm Panel window includes all alarms related with bilge system and steering gear. The selected alarms overview is the only task of this window.

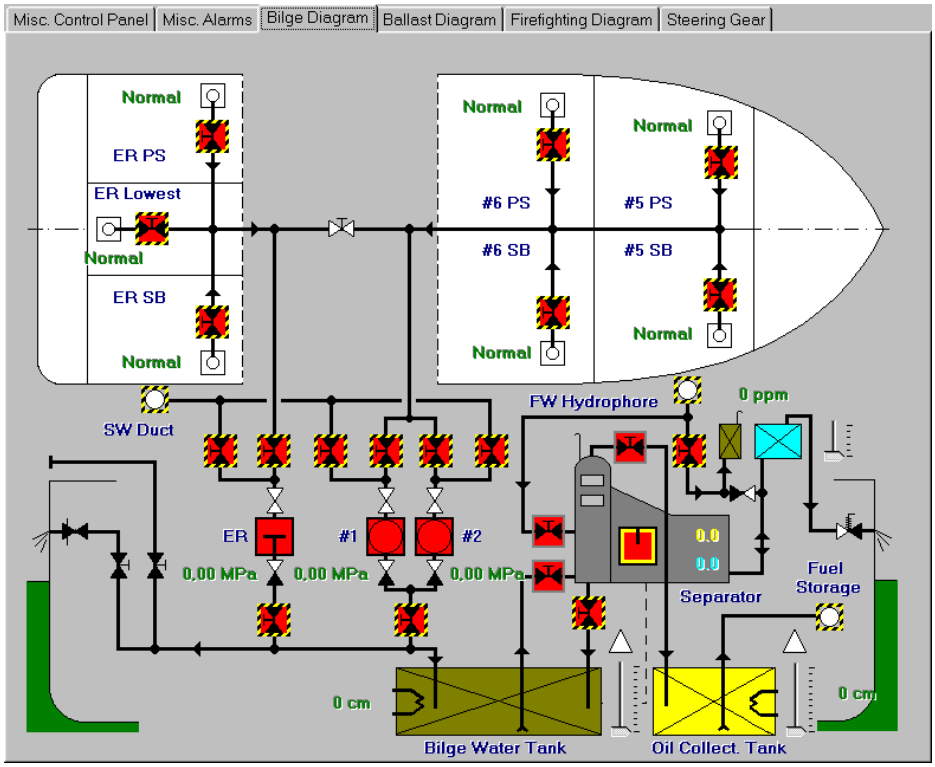
All other alarms belonging to the systems being the members the Miscellaneous Systems group are shown on the related system mimic diagrams.

This window includes the following alarms:

- Bilge tank level high.
- Oil tank level high.
- Steering gear pump pressure low (#1, #2).

4.8.3 Bilge System Diagram

The bilge system includes four hold bilges and three engine room bilges. Each bilge has a well and the related alarm controlled by the bilge level. Three bilge pumps can be used: two (#1 and #2) are centrifugal pumps. The engine room (ER) bilge pump is a displacement type. Each bilge pump has to be primed. This operation is slightly different for each pump type. The bilge water is collected in a separate tank and when the level in this tank reaches the limit, it has to be pumped out to the oily water separator. This is necessary because bilge water discharges must contain less than 15ppm of oil under the current IMO regulations. The overboard discharge is sampled through an oil content meter. Prior to startup and shutdown the oily water separator must be flushed through with a clean sea water. This is done automatically when the separator operates in the automated mode and its operation is controlled by the level in the bilge water tank. The appropriate checklists (7g and 7h) show how the separator can be operated in the manual mode. The clean water goes overboard through the flush tank and the oil is collected in the oil collect tank. This tank can be emptied manually by the fuel transfer pumps controlled from the fuel system.

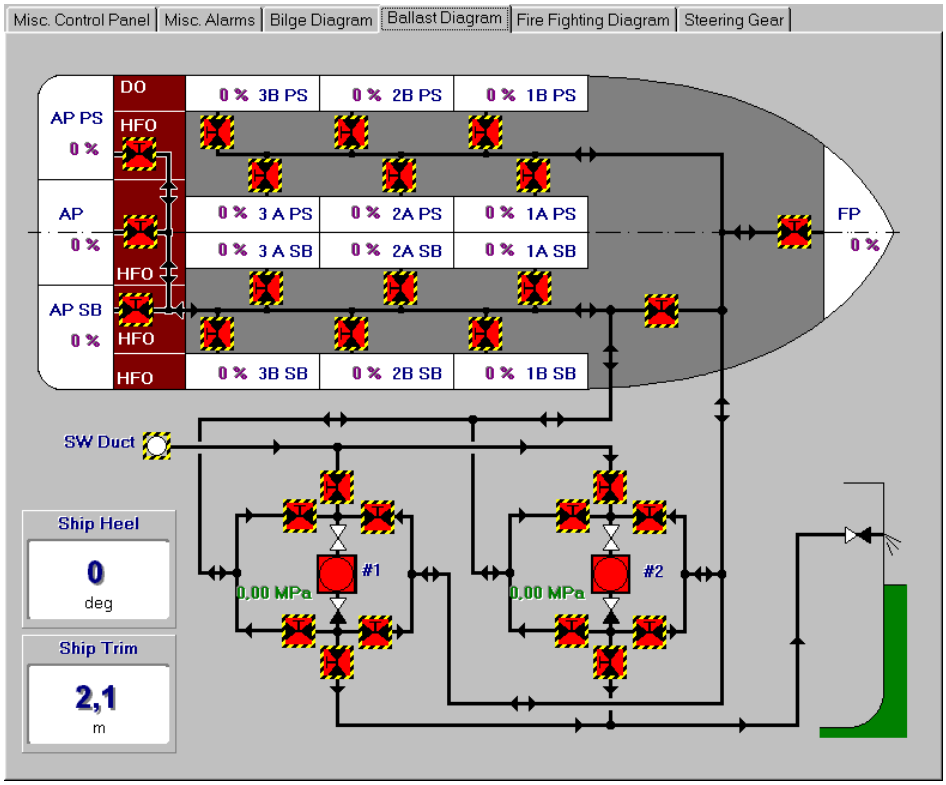


This window includes the following active controls and gauges:

- Bilge well valves (#5 PS, #6 PS, #5 SB, #6 SB, ER PS, ER SB, ER Lowest).
- Bilge pump suction, discharge and priming valves (#1, #2, ER).
- Bilge pump status indicator (#1, #2, ER).
- Oily water separator and the related valves.
- Oily water separator status indicator.
- Oily water low and high level lamps (grey, green, yellow).
- Bilge water tank level gauge.
- Oil collect tank level gauge.
- Flush water tank level gauge.

4.8.4 Ballast System Diagram

The ballast system includes sixteen example ballast tanks with valves, piping system and ballast pumps. The ballast pumps are connected to the two separate mains, one on each board. This arrangement enables not only filling and emptying of the ballast tanks, but also quick correction of the large stability changes (for example when bunkering a fuel).

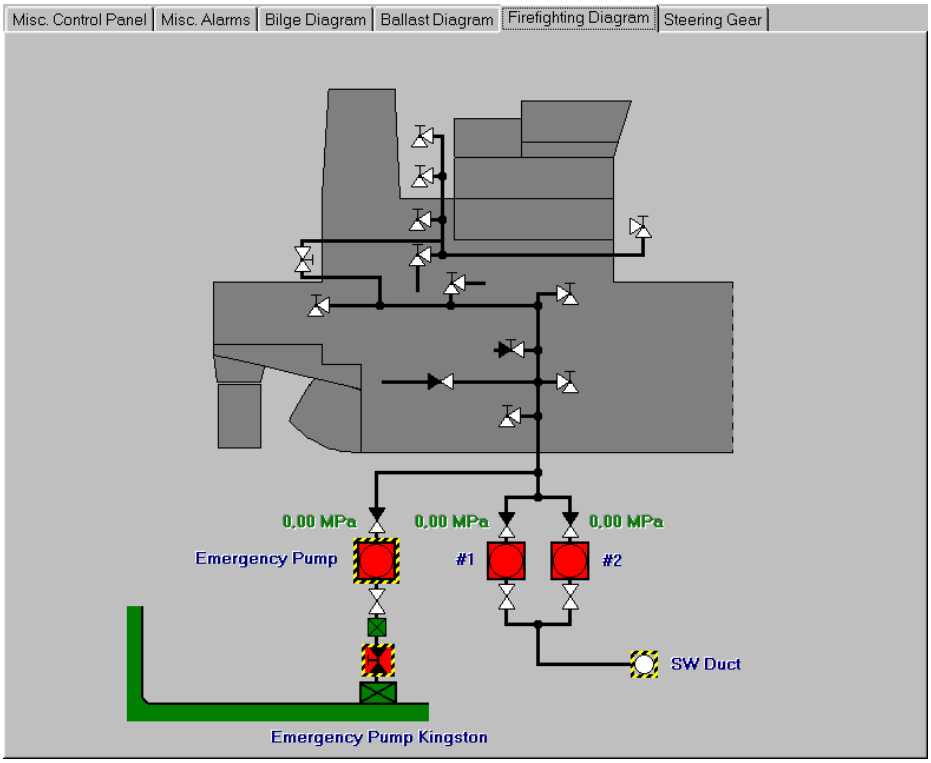


This window includes the following active controls and gauges:

- Valves at tanks
- Ballast pump suction, discharge and priming valves (#1, #2).
- Ballast pump status indicator (#1, #2).
- Heel gauge.
- Trim gauge.

4.8.5 Fire Fighting System Diagram

The fire fighting system includes two fire pumps driven by electric motors and one independent emergency fire pump driven by an independent diesel engine. The emergency fire pump is also connected to a separate sea water chest and is located outside the engine room.

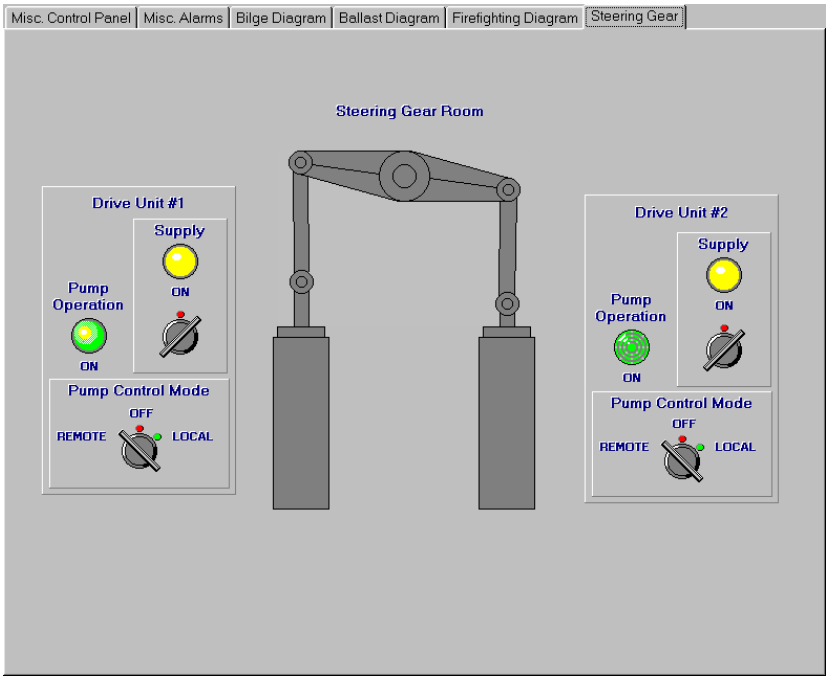


This window includes the following active controls and gauges:

- § Fire pump status indicator (#1, #2).
- § Emergency fire pump switch.
- § Emergency fire pump sea chest valve.

4.8.6 Steering Gear Diagram

The steering gear is an electro-hydraulic device i.e. the rudder movement is driven by a hydraulic system that is controlled by an electro-hydraulic system. The steering gear is ready for the operation when one of the two pumps, driven by an electric motor, is running. The pumps have to switched-over every 24 hours. Both pumps can also be run simultaneously when international regulations require this mode of operation (especially during manoeuvring). This mode also provides higher rate of rudder movement and usually a faster rate of turn for the ship. The control panels placed close to the rudder hydraulic cylinders include only basic controls. The main steering gear controls are placed at the bridge and become operational when the remote control mode has been selected and the supply is on.

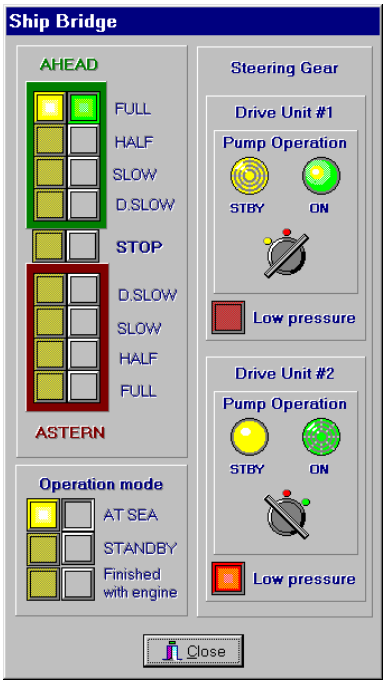


This window includes the following active controls and gauges:

- The 3-position switch for pump control mode selection (#1, #2).
- The 2-positions switch of the pump supply (#1, #2).
- Pump supply indication yellow lamp (#1, #2).
- Pump operation indication green lamp (#1, #2).

4.9 Bridge Panel

The Bridge Panel window includes The Engine Order Telegraph (push button type) and the steering gear pump control panels. Usually one of both hydraulic pumps has to be manually switched on and the other one has to be in standby mode.



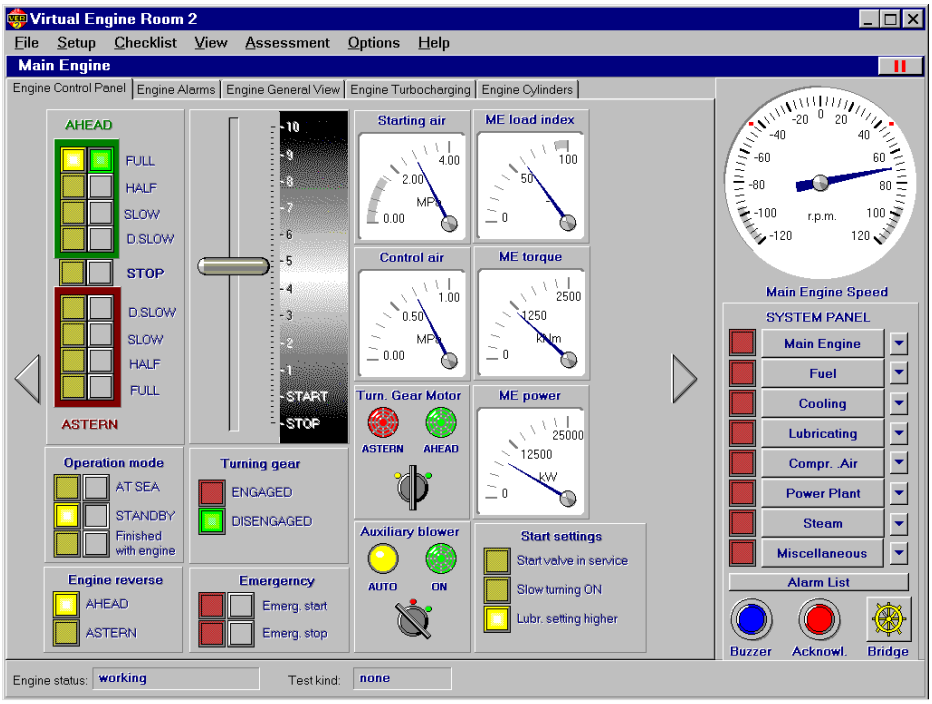
This window includes the following active controls and gauges:

- The 3-position switch for the steering gear pump operation (#1, #2).
- The indication lamps (green and yellow) showing the pump operation (#1, #2).
- The low pressure alarm indicator (#1, #2)..

5. Simulator Operation

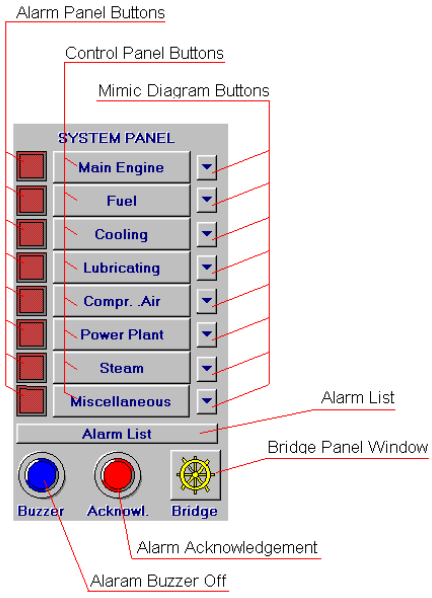
5.1 System Switching

The ship's engine room comprises several functional systems; consequently the size and resolution of the computer monitor are serious limitations when trying to present the current status of the engine room. The VER_FREE main window includes several overlapping system windows and a special system panel for switching or navigating between them. Any of the following of navigation can be used.



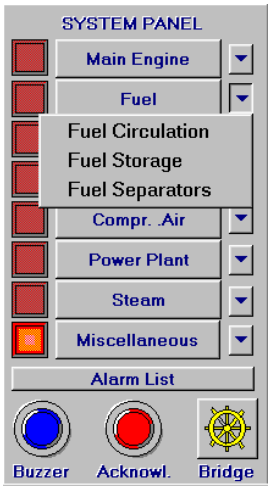
a. First Method

The System Panel includes several pushbuttons and lamps with different tasks.



A mouse click at one of the buttons in the middle column opens the appropriate system window and at the same time selects its control panel. The operator can use control panel controls and gauges, can select another tabbed window for the selected system or select another system using the System Panel again.

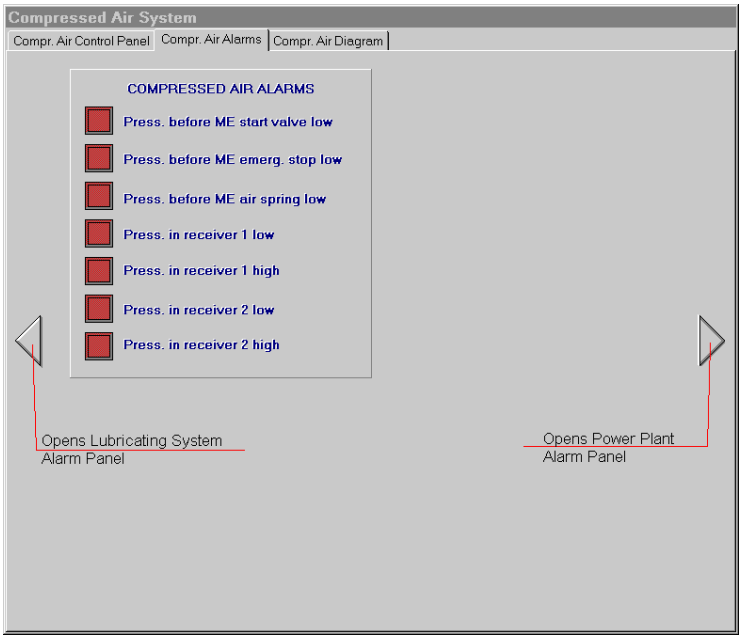
A mouse click at one of the buttons in the right column opens the appropriate pull down menu which enables the selection of one of the system diagrams depending on the chosen button.



The left column comprises system alarm lamps (Not buttons) which will blink when an alarm in the specified system occurs. A mouse click on one of these lamps will open the appropriate system window and will select the alarm panel window at the same time.

b. Second Method

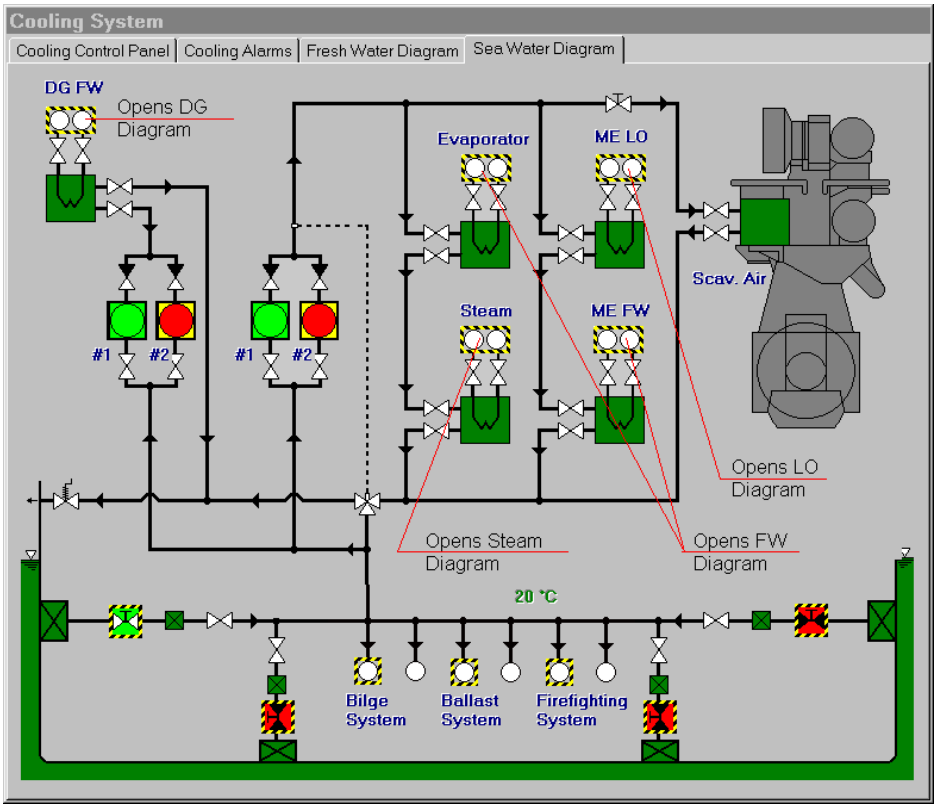
Every Control or Alarm Panel has been equipped with two arrow buttons (left and right).



A mouse click at one of them opens the corresponding control or alarm panel in the linked system. The system sequence in the chain is the same as the vertical sequence of systems in the System Panel. This method provides the easiest way to get an overview of all alarms or all control room panel segments.

c. Third Method

As mentioned in the chapter describing the engine room systems, almost all mimic diagrams have been equipped with hot spots.



This method is recommended when navigating through mimic diagrams, for example in order to check the status of the related systems.

The time delay when switching between systems depends on the computer. This delay is only significant on older computer systems with low system memory, a slow hard disk or slow graphic card. The best way to solve this problem is to add some extra RAM and upgrade the graphic card.

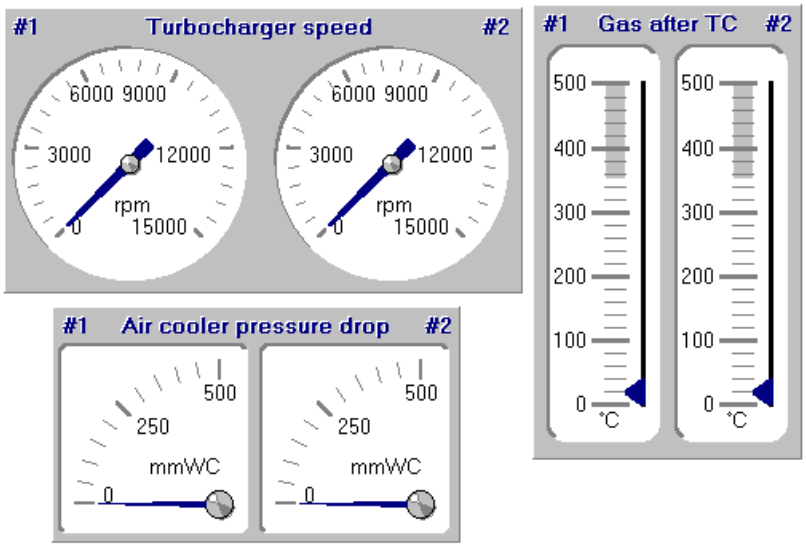
5.2 Controls

Two main control types have been implemented:

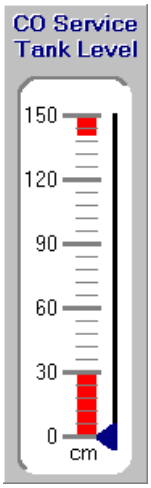
5.2.1 Virtual Controls

Virtual Controls have a realistic look and feel. The analogue gauges, switches, lamps, levers, and pushbuttons can be found mainly on control and alarm panels. They create the virtual control room environment.

a. Gauges
Different types of analogue gauges are used for parameter presentation.

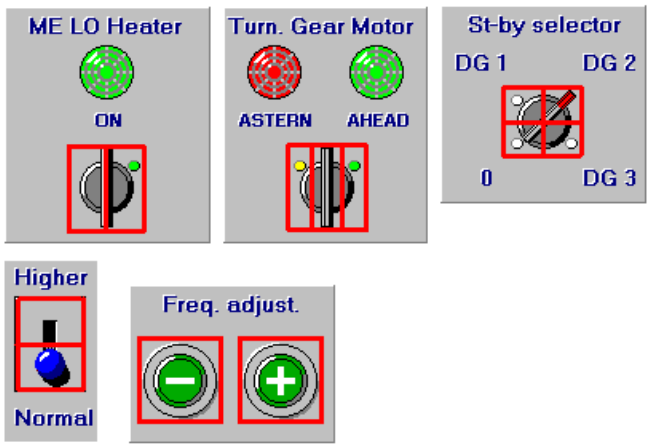


Sometimes, the gauge has marked alarm ranges: low, high or both.



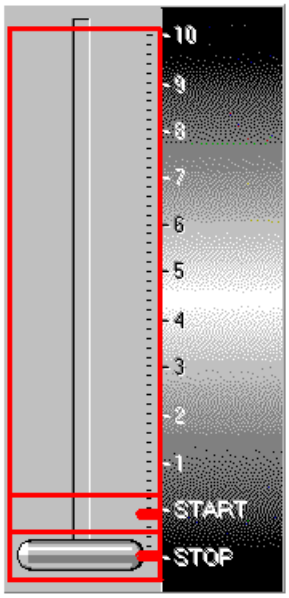
The alarm range is marked grey as long as the measured parameter value is not in this range. When the alarm limit is reached, the range will start to blink red and continue until the alarm is acknowledged, then it will cease blinking. When the parameter value leaves the alarm range, its colour changes back to grey again.

b. Switches
The operation of virtual switches requires some precision. Here is an explanation regarding where to click in order to change the switch positions.



c. Control lever

The ME control lever is a very special control. First, in order to move it, it is necessary to mouse click at the handle and drag it, keeping the mouse button pressed. Secondly, when it will be released close to the START or STOP sign (See marked fields), it is automatically positioned (Locked) in the middle of the field. However, when the lever is above the second small mark, it can be moved freely and be left at any chosen position.

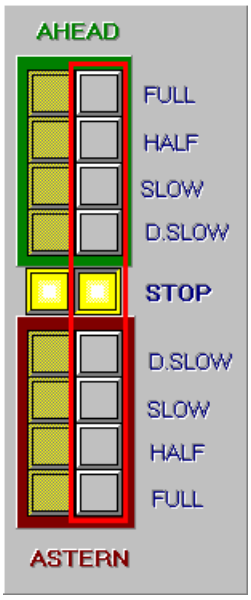


This feature mimics closely the behaviour of the actual control lever used in this kind of ME remote control

d. Machine Telegraph

The VER2 machine telegraph is a "push-button" type. The column of lamps on the left hand side show the telegraph position required from bridge. The column of illuminated push-buttons on the right hand side is used for the confirmation of order. The buttons act as a set of radio-buttons, i.e. only one button can be locked in the pressed position at the same time. The button can be released only when another button is pressed.

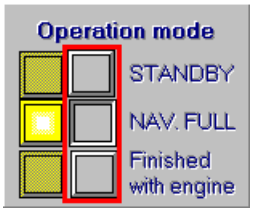
Always, one button has to be in the pressed position and the built in lamp will confirm that fact. When the pressed button confirms precisely the order from the bridge, the bridge order lamp will not blink, however, when the position is incompatible the lamp will blink and the special telegraph buzzer will be activated.



e. Operation Mode Selector

The Operation Mode Selector acts in a similar way to a machine telegraph, but with two differences:

- The pressbutton can be also released by a mouse click, so it is possible that none of them will be pressed. This situation is typical for the engine room standstill.
- There is no buzzer sound when the order lamp blinks.

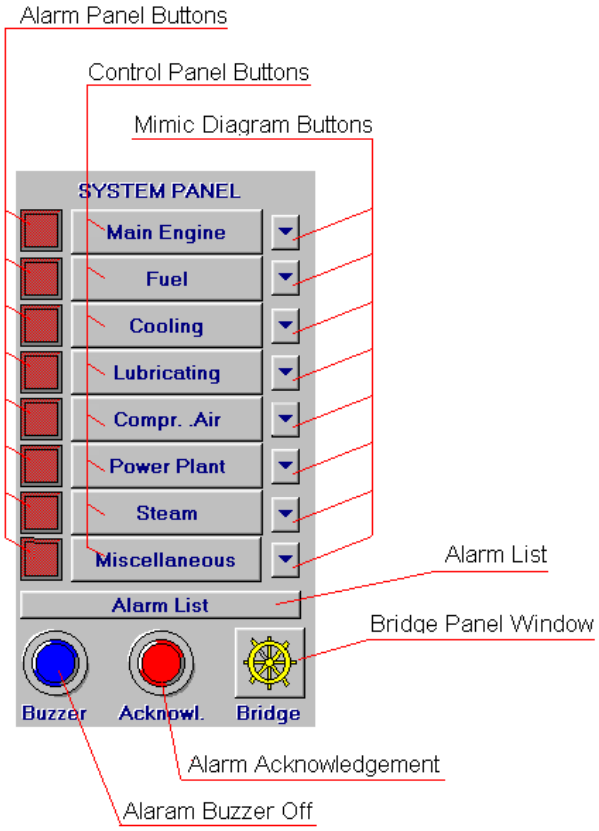


5.2.2 Symbolic Controls

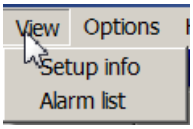
Symbolic Controls do not have to imitate the actual control devices. They have to be easy to use, compact and informative. The valves, status indicators, hot spots and linear gauges can be found mainly in mimic diagrams. The symbols used on these controls are based on the engine manufacturer's recommendation, however it has to be said that different producers sometimes prefer different standards. In order to recognise which of them are active controls, they have a black and yellow warning border. It does not matter where you click as long as it is inside the warning border.

5.3 Alarms

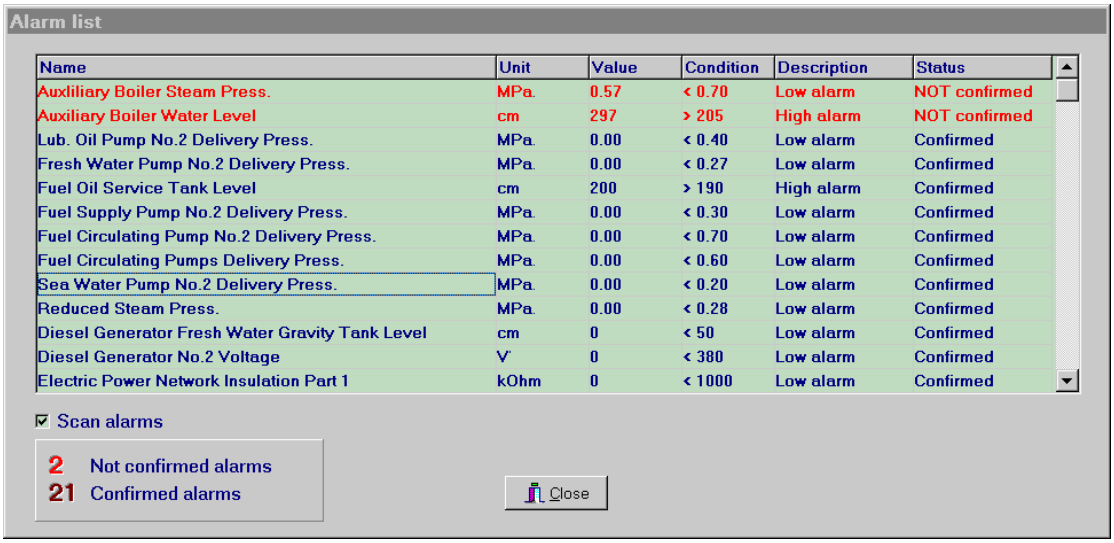
An alarm occurs when the parameter value exceeds the alarm limit (Low or high). The alarm buzzer is started, and the alarm range at the virtual gauge starts to blink (See 5.2.1 a). This is a so called "Not acknowledged" alarm. This kind of alarm also causes the appropriate alarm lamp (One of the Alarm Panel Buttons) at the system panel to blink.



The user can switch off the alarm buzzer using the Alarm Buzzer button, but this does not mean that the alarm has been acknowledged. The user must identify the alarm before it will be acknowledged. The alarm identification can be done in two ways. The quickest way is to open the Alarm Panel window using the **View | Alarm** list item from the main menu.

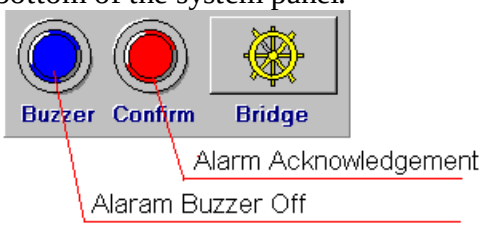


The alarm list window presents the unacknowledged alarms in red and the acknowledged in blue.



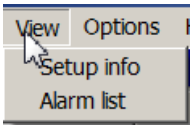
The second way to check an alarm is to click on the button which is blinking on the System Panel, which opens the Alarm Panel of the appropriate system. Sometimes, you will find that none of the lamps on this panel blink, so you should open a control panel of this system and check the virtual gauges for blinking alarm range.

After the alarm identification, the user can acknowledge it using the red button at the bottom of the system panel.

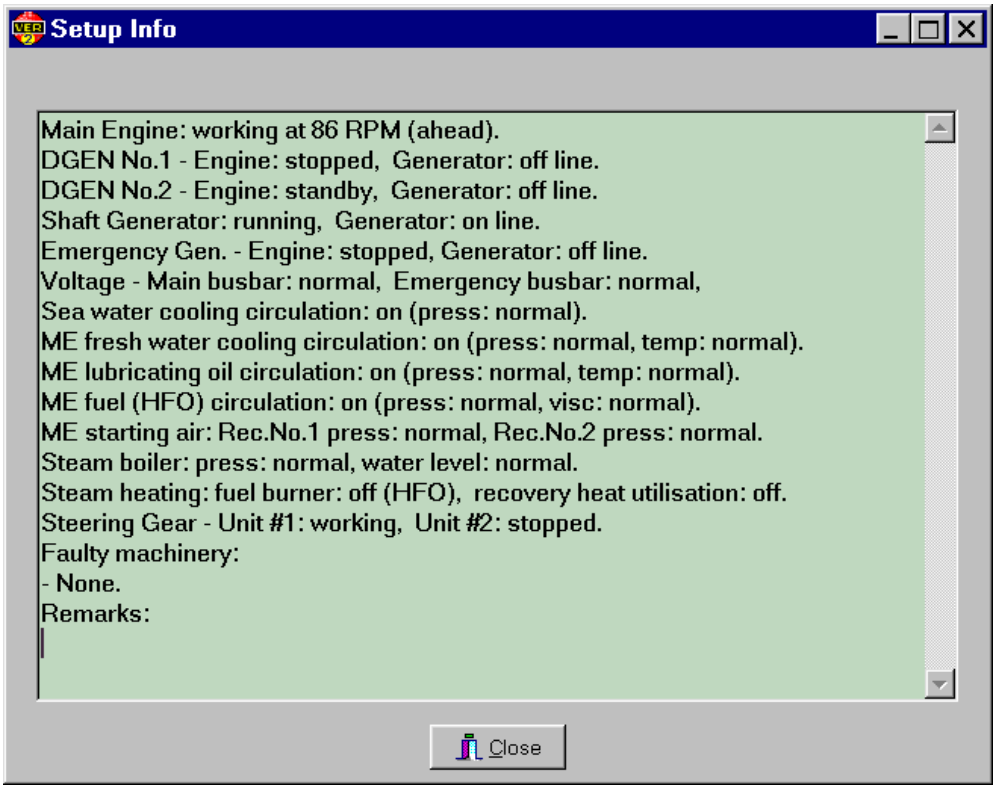


5.4 Setup Info

The Setup Info window offers a quick way to analyse the engine room current setup. This window is available in the **View | Setup info** option of the main menu.

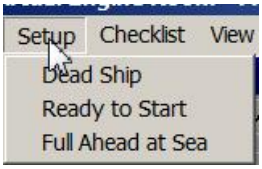


This window will be also opened any time the user tries to load or save the engine room setup. The situation overview should enable the final decision if the setup to be loaded is actually wanted or it should enable the manual edition of this information at the position 'Remarks'.



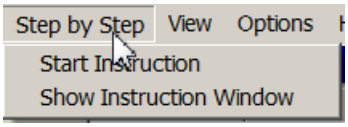
5.5 Setup Selection

The engine room complete setup can be loaded any time from the **Setup | Setup name** item in the main menu. The Setup Information window will not be shown in this case.

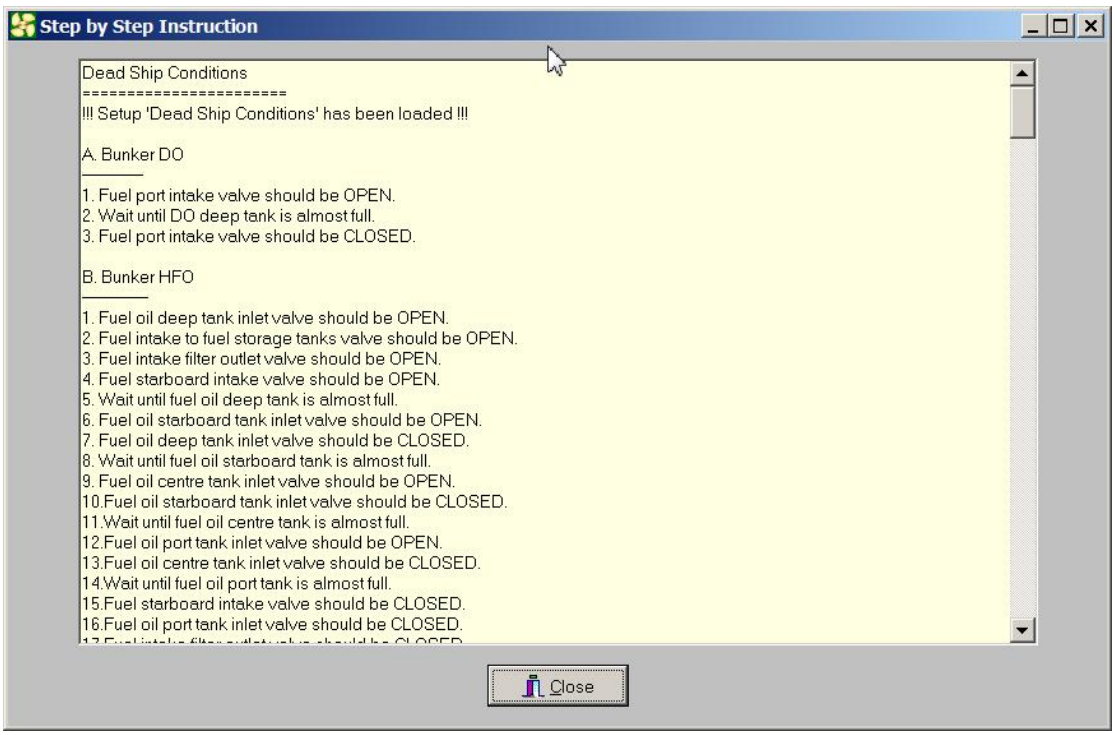


5.6 Step by Step Instruction

Opening the Step by Step Instruction can be done simply by selecting **Start Instruction** Item from the **Step by Step** menu.



Starting the instruction causes the special Step by Step Instruction window to be open automatically.



This window shows the full list of the operations which have to accomplished in order to bring the engine room from Dead Ship conditions to Full Ahead at sea. The execution of the instruction can be stopped any time but the obtained results (engine room status) cannot be saved for a future continuation.

Here is the complete list of step by step instructions.

Dead Ship Conditions
==========
!!! Setup 'Dead Ship Conditions' has been loaded !!!

A. Bunker DO

..... Go to Power Plant
1. Main switchboard shore connection breaker position should be set at ON.
..... Go to Fuel System
2. Fuel port intake valve should be OPEN.
3. Wait until DO deep tank is almost full.
4. Fuel port intake valve should be CLOSED.

B. Bunker HFO
----

1. Fuel oil deep tank inlet valve should be OPEN.
2. Fuel intake to fuel storage tanks valve should be OPEN.
3. Fuel intake filter outlet valve should be OPEN.
4. Fuel starboard intake valve should be OPEN.
5. Wait until fuel oil deep tank is almost full.
6. Fuel oil starboard tank inlet valve should be OPEN.
7. Fuel oil deep tank inlet valve should be CLOSED.
8. Wait until fuel oil starboard tank is almost full.
9. Fuel oil centre tank inlet valve should be OPEN.
10. Fuel oil starboard tank inlet valve should be CLOSED.
11. Wait until fuel oil centre tank is almost full.
12. Fuel oil port tank inlet valve should be OPEN.
13. Fuel oil centre tank inlet valve should be CLOSED.
14. Wait until fuel oil port tank is almost full.
15. Fuel starboard intake valve should be CLOSED.
16. Fuel oil port tank inlet valve should be CLOSED.
17. Fuel intake filter outlet valve should be CLOSED.
18. Fuel intake to fuel storage tanks valve should be CLOSED.

C. Bunker Lub. and Cyl. Oil

..... Go to Lubricating System
1. ME lub. oil tank #1 refilling valve should be OPEN.
2. ME lub. oil system intake valve should be OPEN.
3. ME lub. oil tank #2 refilling valve should be OPEN.
4. Wait until ME lub. oil tank #1 is almost full.
5. ME lub. oil tank #1 refilling valve should be CLOSED.
6. Wait until ME lub. oil tank #2 is almost full.
7. ME lub. oil system intake valve should be CLOSED.
8. ME lub. oil tank #2 refilling valve should be CLOSED.
10. DG lub. oil system intake valve should be OPEN.
11. DG lub. oil tank refilling valve should be OPEN.
12. Wait until DG lub. oil tank is almost full.
13. DG lub. oil system intake valve should be CLOSED.
14. DG lub. oil tank refilling valve should be CLOSED.
15. ME cylinder oil tank refilling valve should be OPEN.
16. Wait until ME cylinder oil tank is almost full.
17. ME cylinder oil tank refilling valve should be CLOSED.

D. Bunker Fresh Water

..... Go to Steam System
1. Hot well refilling valve should be OPEN.
2. Wait until hot well refilling tank is almost full.
3. Hot well refilling valve should be CLOSED.
..... Go to Cooling System
4. FW gravity tank refilling valve should be OPEN.
5. Wait until FW gravity tank is almost full.
6. FW gravity tank refilling valve should be CLOSED.

E. Fill DG Start Air Receiver

..... Go to Compressed Air System
1. DG start air receiver refilling valve should be OPEN.
2. Emergency compressor should be switched ON.
3. Wait until DG starting air pressure is higher than 2.5 MPa.
4. Emergency compressor should be switched OFF.

F. Fill DO Service Tank

..... Go to Fuel System
1. DO deep tank suction valve should be OPEN.
2. DO service tank refill valve should be OPEN.
3. Click on DO hand pump symbol until DO service tank is almost full.

G. Start First DG

..... Go to Cooling System
1. Port side kingston valve should be OPEN.
..... Go to Compressed Air System
2. DG start air receiver drain valve should be OPEN.
3. DG start air receiver drain valve should be CLOSED.
4. DG start air receiver main valve should be OPEN.
..... Go to Power Plant
5. DG1 start air inlet valve should be OPEN.
6. DG1 fuel inlet valve should be OPEN.
7. DG1 pre-lubricating pump switch position should be set at ON.
8. DG1 pre-lubricating pump switch position should be set at OFF.
9. DG1 mode switch position should be set at MANUAL.
10. DG1 start button should be PRESSED until DG is started.

H. Connect First DG to Busbars
----
1. Generator synchronization selector should be set at DG1.
2. DG1 stator preheating switch position should be set at ON.
3. DG1 stator preheating switch position should be set at OFF.
4. Main switchboard shore connection breaker position should be set at OFF.
5. DG1 main breaker button position should be set at PRESSED.
..... Go to Cooling System
6. DG sea water pump #1 switch position should be set at ON.
7. DG sea water pump #2 switch position should be set at STANDBY.

I. Prepare Standby DG

..... Go to Compressed Air System
1. Start air receiver #1 auxiliary air valve should be OPEN.
2. DG start air system refilling valve should be OPEN.
..... Go to Power Plant
3. DG2 fuel inlet valve should be OPEN.
4. DG2 start air inlet valve should be OPEN.
5. DG2 stator pre-heating switch position should be set at STANDBY
6. DG2 pre-lubricating pump switch position should be set at AUTO.
7. DG2 start mode switch position should be set at AUTO.
8. DG standby selection switch position should be set at DG2.

J. Start SW Cooling

..... Go to Cooling System
1. Sea water pump #1 switch position should be set at ON.
2. Sea water pump #2 switch position should be set at STANDBY.

K. Start ME Compressors

..... Go to Compressed Air System
1. Start air receiver #2 refilling valve should be OPEN.
2. Start air receiver #1 refilling valve should be OPEN.
3. Start air compressor #1 switch position should be set at AUTO.
4. Start air compressor #2 switch position should be set at AUTO.

L. Fill ME Sump

..... Go to Lubricating System
1. Lub. oil transfer system L5 valve (before sump) should be OPEN.
2. Lub. oil transfer system L3 valve (before separator) should be OPEN.
3. Lub. oil transfer system L1 valve (after suction from tanks) should be OPEN.
4. ME lub. oil tank #1 suction valve should be OPEN.
5. Wait until the half of ME sump is filled with LO.
6. ME lub. oil tank #1 suction valve should be CLOSED.
7. Lub. oil transfer system L1 valve should be CLOSED.
8. Lub. oil transfer system L3 valve should be CLOSED.

M. Fill Boiler Hot Well

..... Go to Steam System
1. Hot well refilling pump suction valve should be OPEN.
2. Hot well refilling pump switch position should be set at ON.
3. Wait until hot well is almost full (in upper alarm range).
4. Hot well refilling pump switch position should be set at OFF.

N. Fill Aux. Boiler

----

1. Auxiliary boiler venting valve should be OPEN.
2. Auxiliary boiler feed valve #1 should be OPEN.
3. Auxiliary boiler feed pump #1 switch position should be set at ON.
4. Wait until water level in the boiler is in the normal range.
5. Auxiliary boiler feed pump #1 switch position should be set at OFF.

O. Start Aux. Boiler

----

1. Auxiliary boiler burner fuel inlet valve should be OPEN.
2. Auxiliary boiler feed pump #1 switch position should be set at AUTO.
3. Auxiliary boiler burner switch position should be set at AUTO.
4. Wait until steam pressure in the boiler starts to rise.
5. Auxiliary boiler venting valve should be CLOSED.
6. Wait until steam pressure in the boiler is in the normal range.
7. Auxiliary boiler main steam valve should be OPEN.

P. Synchronise Second DG

..... Go to Power Plant
1. DG2 pre-lubricating pump switch position should be set at OFF.
2. DG2 mode switch position should be set at MANUAL.
3. DG2 start button position should be PRESSED until DG2 starts.
4. Generator synchronization selector should be set at DG2.
5. Synchronization mode switch position should be set at AUTO.
6. Automatic generator synchronization on button should be set PRESSED until Auto LED blinks.

Q. Prepare HFO Supply

..... Go to Fuel System
1. Fuel oil centre tank suction valve should be OPEN.
2. Fuel oil starboard tank suction valve should be OPEN.
3. Fuel transfer pumps suction from fuel staorage tanks valve should be OPEN.
4. Fuel transfer pumps discharge to fuel settling tank should be OPEN.
5. Fuel oil settling tank no.2 inlet valve should be OPEN.
6. Fuel transfer pump no.1 switch position should be set at ON.
7. Fuel oil settling tank no.1 inlet valve should be OPEN.

8. Wait until fuel oil settling tank no.2 is almost full.
9. Fuel oil settling tank no.2 inlet valve position should be CLOSED.
10.Wait until fuel oil settling tank no.1 is almost full.
11.Fuel transfer pump no.1 switch position should be set at OFF.
12.Fuel oil settling tank no.1 inlet valve should be CLOSED.
13.Fuel transfer pumps discharge to fuel settling tank should be CLOSED.
14.Fuel transfer pumps suction from oil collection tank valve should be CLOSED.
15.Fuel oil centre tank suction valve position should be CLOSED.
16.Fuel oil starboard tank suction valve position should be CLOSED.
17.Fuel oil settling tank no.1 suction valve should be OPEN.
18.HFO serv. tank refill valve should be OPEN.
19.Fuel oil purifier no.1 heating steam inlet valve should be OPEN.
20.Fuel oil purifier no.2 heating steam inlet valve should be OPEN.
19.Fuel oil purifier no.1 switch position should be set at STANDBY.
20.Fuel oil purifier no.2 switch position should be set at STANDBY.
21.Wait until HFO serv. tank is almost full.
22.Fuel supply pump #1 switch position should be set at ON.
23.Fuel supply pump #2 switch position should be set at STANDBY.
24.Fuel circulating pump #1 switch position should be set at ON.
25.Fuel circulating pump #2 switch position should be set at STANDBY.
26. Auxiliary boiler fuel kind selection valve position should be set to HFO.

R. Prepare ME cooling and lubricating

..... Go to Cooling System
1. FW pump #1 switch position should be set at ON.
2. FW pump #2 switch position should be set at STANDBY.
3. FW pre-heater switch should be set at ON.
..... Go to Lubricating System
4. ME cylinder oil service tank refilling valve position should be OPEN.
5. Cyl. oil pump switch should be set at ON.
6. Wait until ME cylinder oil service tank is almost full.
7. Cyl. oil pump switch should be set at OFF.
8. ME lubricators refilling valve position should be OPEN.
9. ME LO pump #1 switch position should be set at ON.
10.ME LO pump #2 switch position should be set at STANDBY.
11.LO pre-heater switch should be set at ON.

S. Prepare Compressed Air System

..... Go to Compressed Air System
1. Start air receiver #1 drain valve should be OPEN.
2. Start air receiver #2 drain valve should be OPEN.
3. Start air receiver #1 drain valve should be set at CLOSED.
4. Start air receiver #2 drain valve should be set at CLOSED.
5. Start air receiver #1 auxiliary air valve should be OPEN.
6. Start air receiver #1 control air valve should be OPEN.
7. Start air receiver #1 main delivery valve should be OPEN.
8. Start air receiver #2 auxiliary air valve should be OPEN.
9. Start air receiver #2 control air valve should be OPEN.
10.Start air receiver #2 main delivery valve should be OPEN.
11.DG start air receiver refilling valve should be OPEN.
12.Emergency stop air delivery valve should be OPEN.
13.Control air delivery valve should be OPEN.
14.Air distributor inlet valve should be OPEN.

T. Prepare ME

..... Go to Bridge
3. Bridge telegraph Standby switch position should be set at ON.
..... Go to Main Engine
4. ME telegraph Standby switch position should be set at ON.
5. Lubricator handle position should be set at HIGHER.
6. ME indicator valve #1 should be OPEN.
7. ME indicator valve #2 should be OPEN.
8. ME indicator valve #3 should be OPEN.
9. ME indicator valve #4 should be OPEN.
10.ME indicator valve #5 should be OPEN.
11.ME indicator valve #6 should be OPEN.
12.ME indicator valve #7 should be OPEN.
13.ME turning gear motor should be set at ASTERN.
14.ME turning gear motor should be set at OFF.
15.ME turning gear should be set at DISENGAGED.
..... Go to Compressed Air System
16.ME starting valve should be OPEN.
..... Go to Bridge
17.Bridge telegraph position should be set at DEAD SLOW AHEAD.
..... Go to Main Engine
18.ME telegraph position should be set at DEAD SLOW AHEAD.
19.Control lever position should be set at START.
20.Control lever position should be set at STOP.
..... Go to Bridge
21.Bridge Telegraph position should be set at STOP
..... Go to Main Engine
22.ME Telegraph position should be set at STOP
23.ME indicator valve #1 should be CLOSED.
24.ME indicator valve #2 should be CLOSED.
25.ME indicator valve #3 should be CLOSED.
26.ME indicator valve #4 should be CLOSED.
27.ME indicator valve #5 should be CLOSED.
28.ME indicator valve #6 should be CLOSED.
29.ME indicator valve #7 should be CLOSED.
..... Go to Compressed Air System
30.ME slow turning air valve should be OPEN.
..... Go to Main Engine
31.Auxiliary blower operation mode switch position should be set at AUTO.
..... Go to Miscell/Steering Gear System
32.Steering Gear Pump #1 Power Switch position should be set at ON.
33.Steering Gear Pump #2 Power Switch position should be set at ON.
34.Steering Gear Pump #1 Control Mode Switch position should be set at REMOTE.
35.Steering Gear Pump #2 Control Mode Switch position should be set at REMOTE.
..... Go to Bridge
36.Steering Gear Pump #1 Operation Mode Switch position should be set at ON.
37.Steering Gear Pump #2 Operation Mode Switch position should be set at ON.

U. Start ME

..... Go to Bridge
1. Bridge telegraph position should be set at DEAD SLOW AHEAD.
..... Go to Main Engine
2. ME telegraph position should be set at DEAD SLOW AHEAD.
3. Control lever position should be set at START.
4. Wait until engine shaft speed reaches 40 RPM.
5. Control lever position should be set above 1.5.

W. Set ME Manoeuvring Full Ahead Speed

..... Go to Bridge
1. Bridge telegraph position should be set at FULL AHEAD.
..... Go to Main Engine
2. ME telegraph position should be set at FULL AHEAD.
3. Control lever position should be set at 5.5.

X. Set ME Navigational Full Ahead Speed

..... Go to Bridge
1. Bridge telegraph Navig. Full switch position should be set at ON.
..... Go to Main Engine
2. ME telegraph Navig. Full switch position should be set at ON.
3. Lubricator Handle position should be set at NORMAL.
..... Go to Power Plant
4. Generator synchronization selector should be set at SG.
5. Automatic synchronization ON button should be PRESSED until Auto LED blinks.
6. Wait until shaft generator is connected to bus bars.
7. Generator synchronization selector should be set at DG2.
8. Automatic synchronization OFF button should be PRESSED until Auto LED blinks.
9. Wait until DG2 is disconnected from bus bars.
10.Generator synchronization selector should be set at DG1.
11.Automatic synchronization OFF button should be PRESSED until Auto LED blinks.
12.Wait until DG1 is disconnected from bus bars.
13.DG2 stop button should be PRESSED.
14.DG2 start mode switch position should be set at AUTO.
15.DG2 pre-lubricating pump pwitch position should be set at AUTO.
16.Stand-by selection switch position should be set at DG2.
17.DG1 Stop button should be PRESSED.
18.DG1 start mode switch position should be set at OFF.
19.DG1 fuel inlet valve should be CLOSED.
20.DG1 start air inlet valve should be CLOSED.
..... Go to Cooling System
21.FW pre-heater switch should be set at OFF.
..... Go to Main Engine
22.Control lever position should be set at 6.5.

Y. Start Heat Recovery Steam System
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1. Control lever position should be set at 7.1.
2. Wait until engine shaft speed reaches 85 RPM.
..... Go to Steam System
3. Auxiliary Boiler Fuel Kind Selection valve should be set at DO.
4. HR circulating pump water inlet valve should be OPEN.
5. HR steam outlet valve should be OPEN.
6. HR circulating pump #1 switch position should be set at AUTO.
7. Auxiliary boiler burner switch position should be set at AUTO.

Z. Set Again ME Manoeuvring Full Ahead Speed

..... Go to Bridge
1. Bridge telegraph Stand By switch position should be set at ON.
..... Go to Main Engine
2. ME telegraph Stand By switch position should be set at ON.
..... Go to Steam System
3. HR Circulating Pump #1 Switch position should be set at OFF.
4. HR Circulating Pump Water Inlet valve should be set at CLOSED.
5. HR Steam Outlet valve should be set at CLOSED.
..... Go to Power Plant
6. DG1 fuel inlet valve should be OPEN.
7. DG1 start air inlet valve should be OPEN.

8. DG1 pre-lubricating pump switch position should be set at ON.
9. DG1 pre-lubricating pump switch position should be set at OFF.
10.DG1 start mode switch position should be set at MANUAL.
11.DG1 start button should be PRESSED until DG is started.
12.Generator Synchronization Selector should be set at DG1.
13.Automatic synchronization ON button should be PRESSES until Auto LED blinks.
14.Wait until DG1 is connected to bus bars.
15.Generator synchronization selector should be set at SG.
16.Automatic synchronization OFF button should be PRESSES until Auto LED blinks.
..... Go to Main Engine
17.Control Lever position should be set at 4.8.
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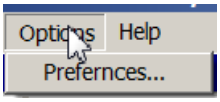
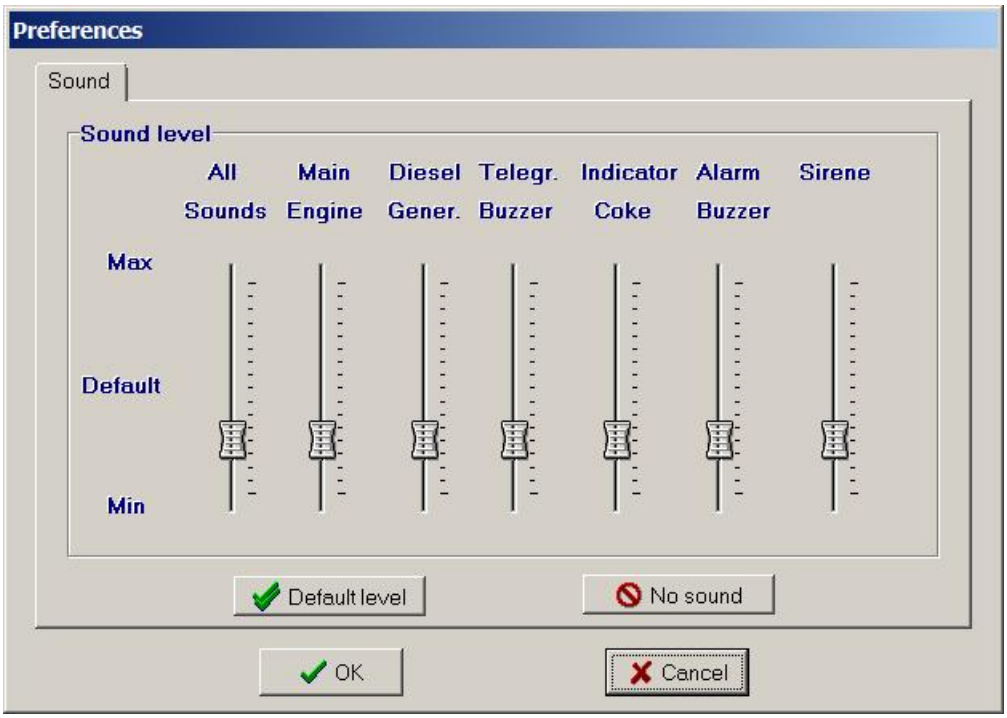
5.7 Preferences

The Preferences item from Options submenu opens the dialog window with several settings that can be changed.



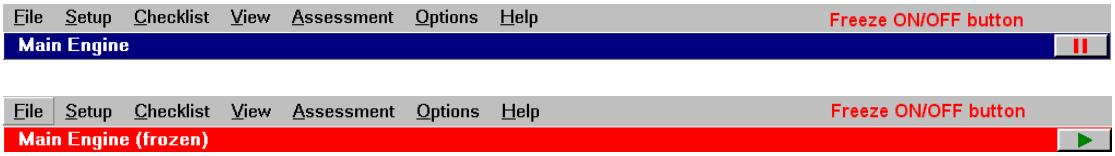
The Sound tab is nothing else, but the mixing table with several sliders. That on the extreme left is the master slider and when it is moved, all other sliders move the same way. However, the user can also customise every single channel level according to his individual preferences.



5.8 Freezing Simulator

The VER_FREE simulator allows the user to freeze the simulation. This option is very useful at the early stage of the training when a trainee needs more time to analyse the situation.

The freeze mode can be switched ON and OF by clicking the button in the upper right part of the screen.



The System Window title bar will blink (red and navy) when the simulation is frozen. Please keep in mind that 'to freeze' the simulation means that not only the model calculation is paused but also all controls are disabled. The user can still switch between the different systems, view the alarms, view the log and inspect active faults but many menu items are disabled when the simulation is frozen.

5.9 Help

The on-line help is available from Help submenu.

Interesting engine animation can be seen in the **Help | About** window.