

SHIP ENGINE ROOM SIMULATOR (SERS)

Version 1.1

USER MANUAL

VOLUME I: SOFTWARE DESCRIPTION



GDS Engineering R&D, Inc.

(GDS Mühendislik ARGE San. Tic. Ltd. Şti.)

1 December 2020

IMPORTANT NOTICE

License agreements describe the users of the GDS SERS Users. The User Manual is part of the software and license; therefore, the SERS User Manual may not be disclosed to third party persons, company or organizations.

FOREWORD

This document is for use along with the GDS Ship Engine Room Simulator (SERS). We encourage students using this document while running the simulator to have a better understanding of the engine room systems, operations and other specifics. This manual applies to the version 1.1 of the SERS software.

Please send your inquiries or questions to GDS Engineering R&D about the use of this document:

GDS Engineering R&D

SERS Team

www.GlobalDynamicSystems.com

Environmental Awareness Notice

GDS Team would be very pleased if the user manual used electronically and not printed to a hardcopy paper in order to reduce the environmental issues that we encounter more than any other times in this century.

DOCUMENT CHANGELOG

Document Change Log		
Date	Version Number	Information
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1. INTRODUCTION

1.1 Scope

Maritime training institutions all over the world started recognizing the value of simulation systems as training as well as evaluation of competence level tool. The International Maritime Organization (IMO), the highest international maritime body, has officially promoted the use of simulators since 2000s. Maritime Training & Education (MET) institutions globally started using various type of Engine Room Simulators (ERS).

GDS Engineering R&D is a research and development company, established by the academicians employed at Istanbul Technical University Maritime Faculty, Tuzla, Istanbul.

The aim of the GDS Ship Engine Room Simulator aim is to provide a simulation platform including all required engines, systems, machinery and components for use by the Maritime Education and Training (MET) in their IMO STCW Trainings. SERS is developed to meet the simulator training requirements as specified by the IMO STCW, updated in 2010 (with Manila Amendments). Do not hesitate to contact with the SERS Development Team on how to arrange Training Curricula to meet the IMO requirements.

1.2 Overview of the SERS User Manuals

This document, **SERS User Manual Vol I (Software Description)**, [describes the SERS software](#) with the SERS Graphical User Interface (GUI) Panels accessed from the SERS Main Graphical User Interface (GUI) Panel. This manual assumes that the software is installed and the users are created following the instructions described in **SERS User Manual Vol III**. All software functions are described using GUI panels in this document.

SERS User Manual Volume II (Engine Room Operations), includes the [operational instructions](#) on how to operate the engine room systems and machinery using the SERS.

SERS User Manual Vol III (Installation & Configuration) describes the [installation and the configuration](#) of the software and hardware items

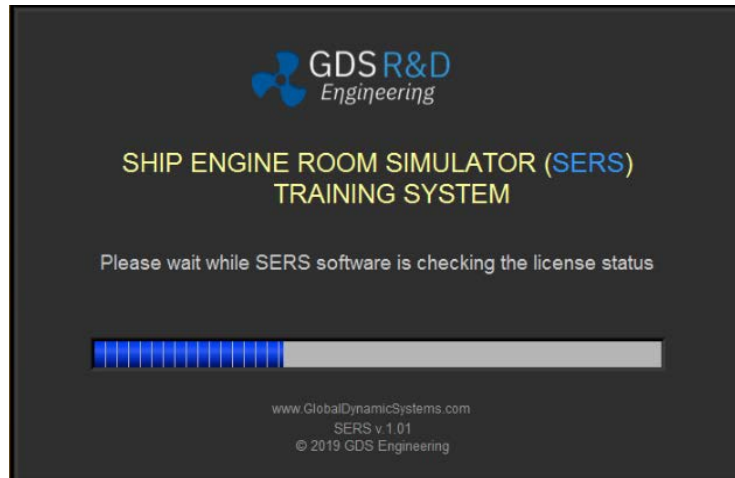
SERS User Manual Volume IV (Instructor's Manual) includes [guides and information for the instructors](#) to utilize SERS in their trainings according to their specific training objectives.

Refer to “**SERS Philosophy Document**” [for selecting the configuration of the SERS](#) for your training objectives. Then use Vol. III for the proper installation of the SERS and reading the configuration guidelines.

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2. STARTING THE SERS

2.1 Initialization and Login



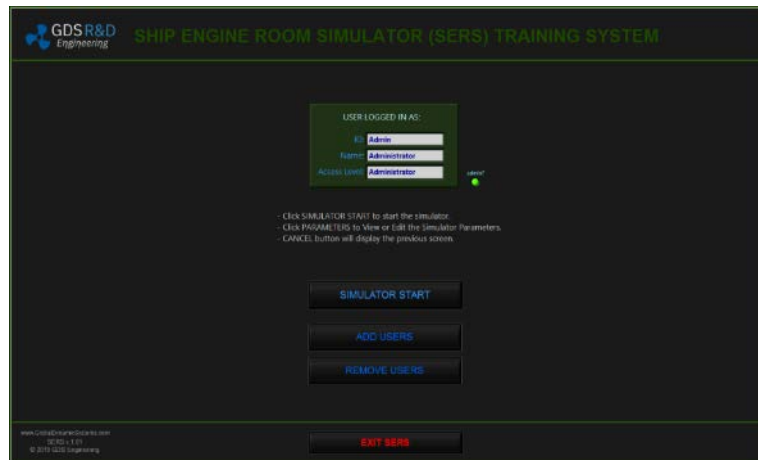
Initialization Page

- Start the software from the desktop/start menu icon.
- Simulator will check the license status at this step.
- This manual assumes that the registration and licensing steps, described in SERS User Manual Vol. III, completed successfully.



Login Page

- After loading, the SERS software displays the Login Page.
- Select your profile under SERS USERS list.
- Type your password.
- Click LOGIN TO SIMULATOR.



User Options and Starting Page

- If logged in as Administrator, User Options Page is displayed. Follow the steps described in User Manual Vol. III for adding or removing the users.
- If not logged in as Administrator, the software will display the Initial Ship Conditions Page.

2.2 Starting the SERS with the Ship's Initial Conditions

SERS GUIP # 1400
SHIP ENGINE ROOM SIMULATOR (SERS) TRAINING SYSTEM


Start SERS Training Session:

1. Select an Initial Condition
2. Click START TRAINING SESSION to begin. Or click RESET to re-select the SECENARIO.
3. Clicking EXIT will allow for exiting from the SERS program.

1. Select SERS Configuration:

Training Setup
Record for Debriefing

Workstation

2. Select Ship's Initial Condition:

1: Cold Ship (Prepare All Systems and Engines)

2: Prepare Main Engine

3: Ready for Maneuver

4: Full Ahead (On Maneuver)

5: Full Ahead (In Navigation)

6: Anchorage

3. Start Training Session or Reset:

Initial Condition Selected:

Initial Condition is not selected!

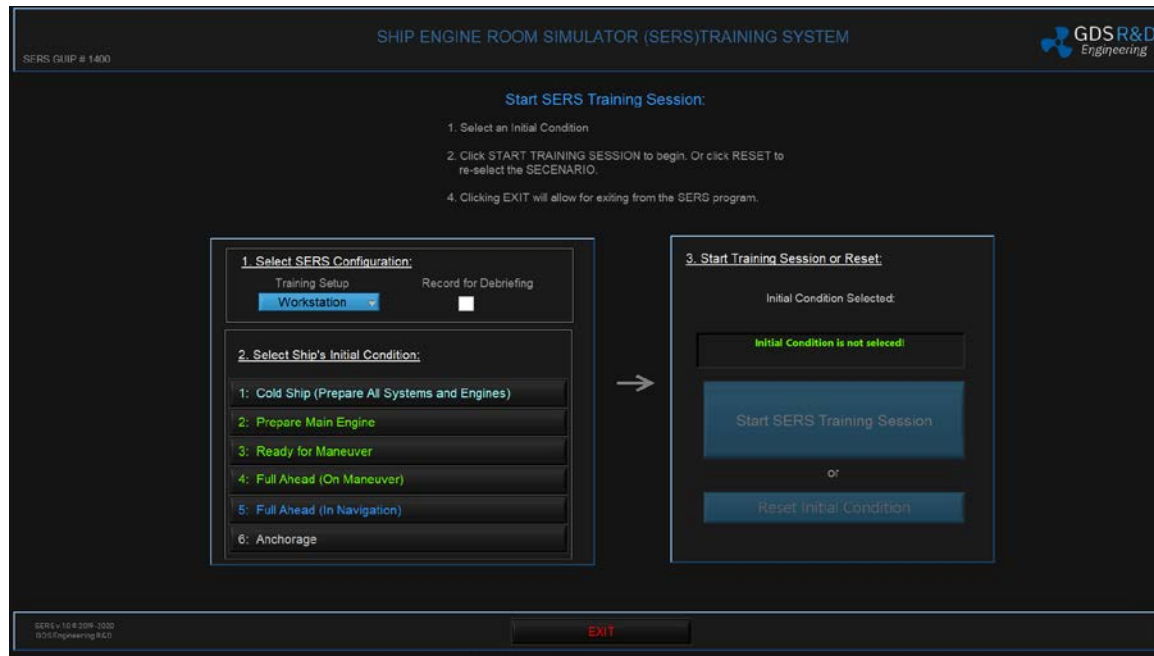
Start SERS Training Session

or

Reset Initial Condition

EXIT

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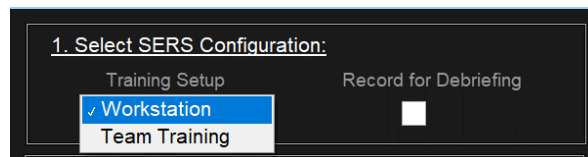


Initial Condition Page

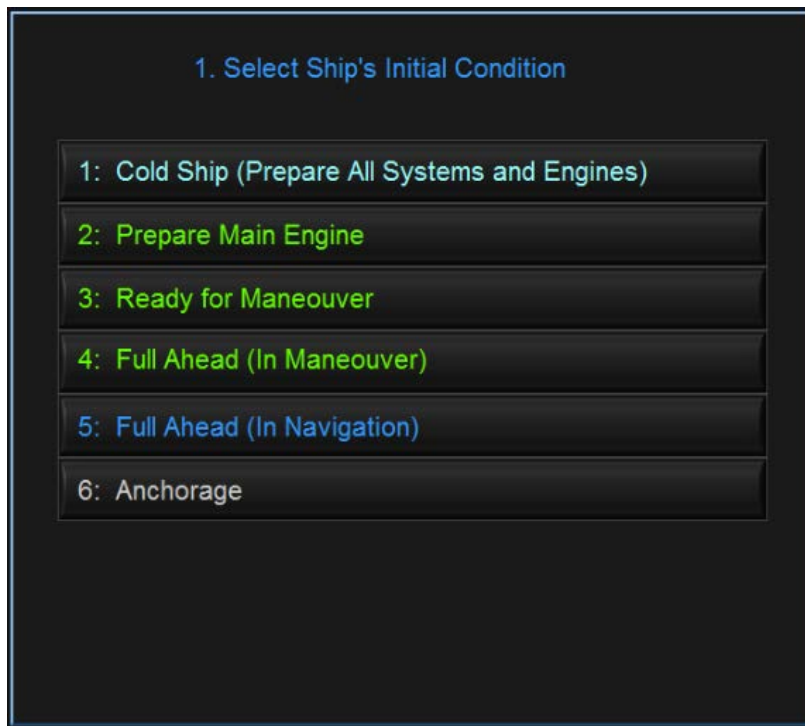
The simulator start button will lead you to this page. There are three consecutively ordered section exist on this page as the following:

- Select SERS Configuration
- Select Ship's Initial Condition
- Starting Training Session or Reset

1. If this is an individual training, set the Training Setup to "Workstation". "Team Training" requires SERS configuration with hardware and distributed displays configuration. Refer to SERS User Manual Vol III (Installation & Configuration) for setting the SERS system to work as in either "Workstation" or "Team Training" configuration.



2. Select “Record for Debriefing” selection box if there will be a debriefing session after the completion of the training. Please note that setting this check box will allow for capturing a PNG type image file for each of the user actions and save it under the Documents folder automatically in a chronological order.
3. Select Initial Condition.
4. Click START TRAINING SESSION to begin. Or click RESET to re-select the Initial Condition.
5. Clicking EXIT will allow for exiting from the SERS program.

**01. Cold Ship:**

Refers to the situation for no system is running.

02. Prepare Main Engine:

Refers to the situation that one diesel generator is running and supplying only main and emergency bus bar.

03. Ready for Maneuver:

Refers to main engine and relation auxiliary system are running, but no load on main engine.

04. Full Ahead (On Maneuver):

Refers to main engine telegraph position is at full ahead (on maneuver). Moreover, two generators are parallel and the other generator is stand-by.

05. Full Ahead (In Navigation):

Refers to main engine telegraph position is at full ahead (in navigation). Moreover, shaft generator supplies the main and emergency bus bars. (And additional generators are parallel depending on reefer containers.)

06. Anchorage:

Refers to main engine is stopped, one generator is supplying main and emergency bus bar, and additional generators are parallel depending on reefer containers.)

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3. SIMULATED PLATFORM

This version of the SERS simulates machinery and systems for a typical container ship. For that reason, following are included:

- Reefers Panel
- 3 Diesel Generators
- One Shaft Generator
- One Bow Thruster with High Voltage System

as additional to typical Engine Room machinery and systems.

Also, notice that the following training functions are excluded in this version of the SERS:

- Marine Steam Turbines
- Marine Gas Turbines
- Electrical Propulsion

3.1 The Ship

SERS simulates a container ship with the following general characteristics:

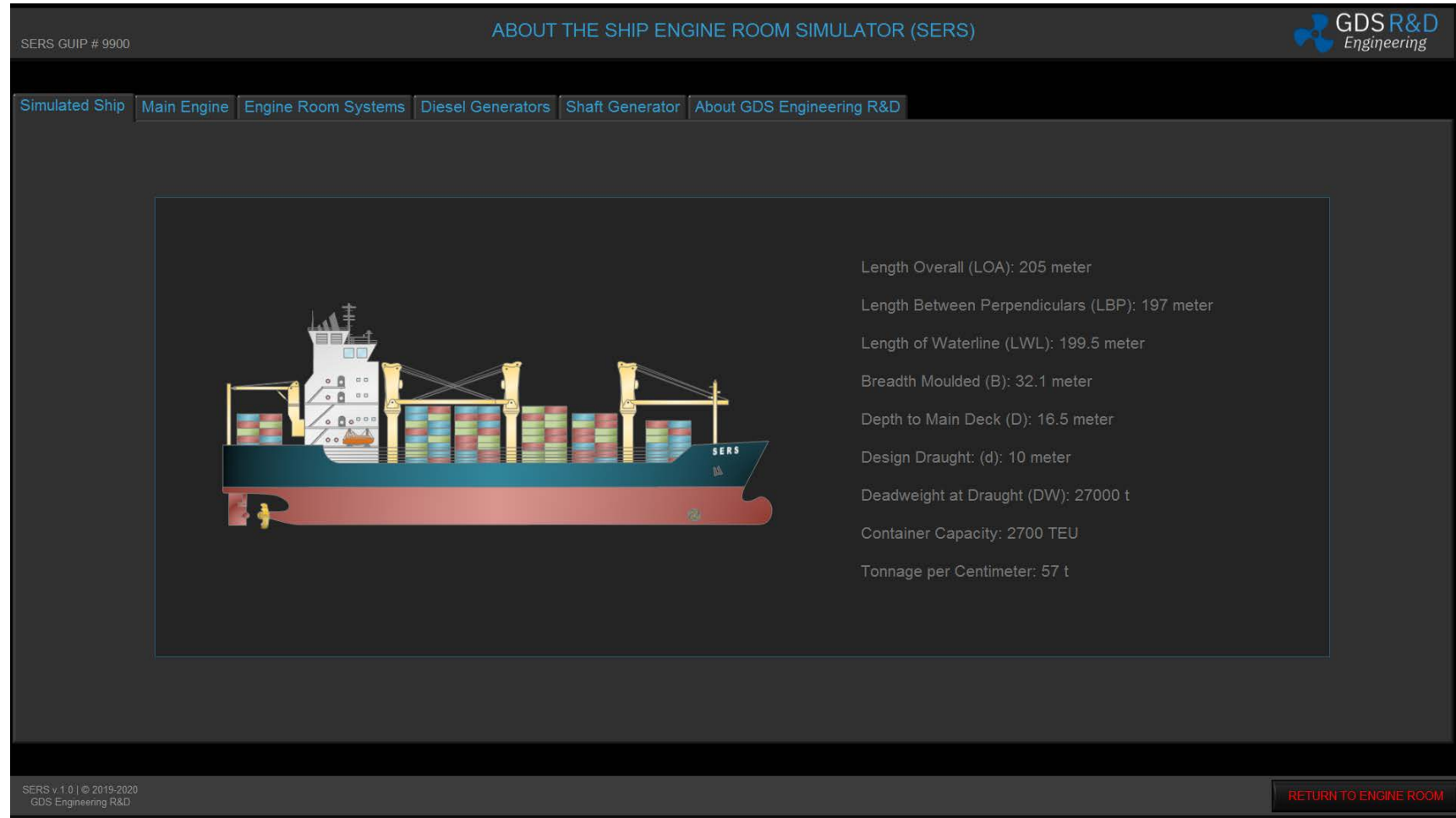


Figure 1: SERS Panel: “About the Engine Room Simulator (SERS)” – “Simulated Ship” Tab.

General characteristics are also listed in Table 1.

Table 1: Simulated Ship's General Characteristics.

Characteristics	Value
Length Overall (LOA)	205 meters
Length Between Perpendiculars (LBP)	197 meters
Length of Waterline (LWL)	199.5 meters
Breadth Moulded (B)	32.1 meters
Depth to Main Deck (D)	16.5 meters
Design Draught (d)	10 meters
Deadweight at Draught (DW)	35500 m3
Container Capacity	2700 TEU
Tonnage per Centimeter	57 tons
Ballast Tank Capacity (total)	8938 tons
Displacement	48000 tons

3.2 Ship Construction

The vessel is full containership with 4 deck cranes (3 cranes on main deck, 1 crane on aft deck). The engine is situated in the aft of the ship, connected with a right handed fixed blade propeller. Vessel is designed for unrestricted service in winter, temperate, and tropical zones. She is single screw, higher tensile steel constructed containership equipped 40' cell guides in the holds, raked stem and transom stern. Accommodation on aft frame spacing is 800 mm. 6 high of container on deck and in holds, 13 rows across the deck.

3.3 The Main Engine (ME)

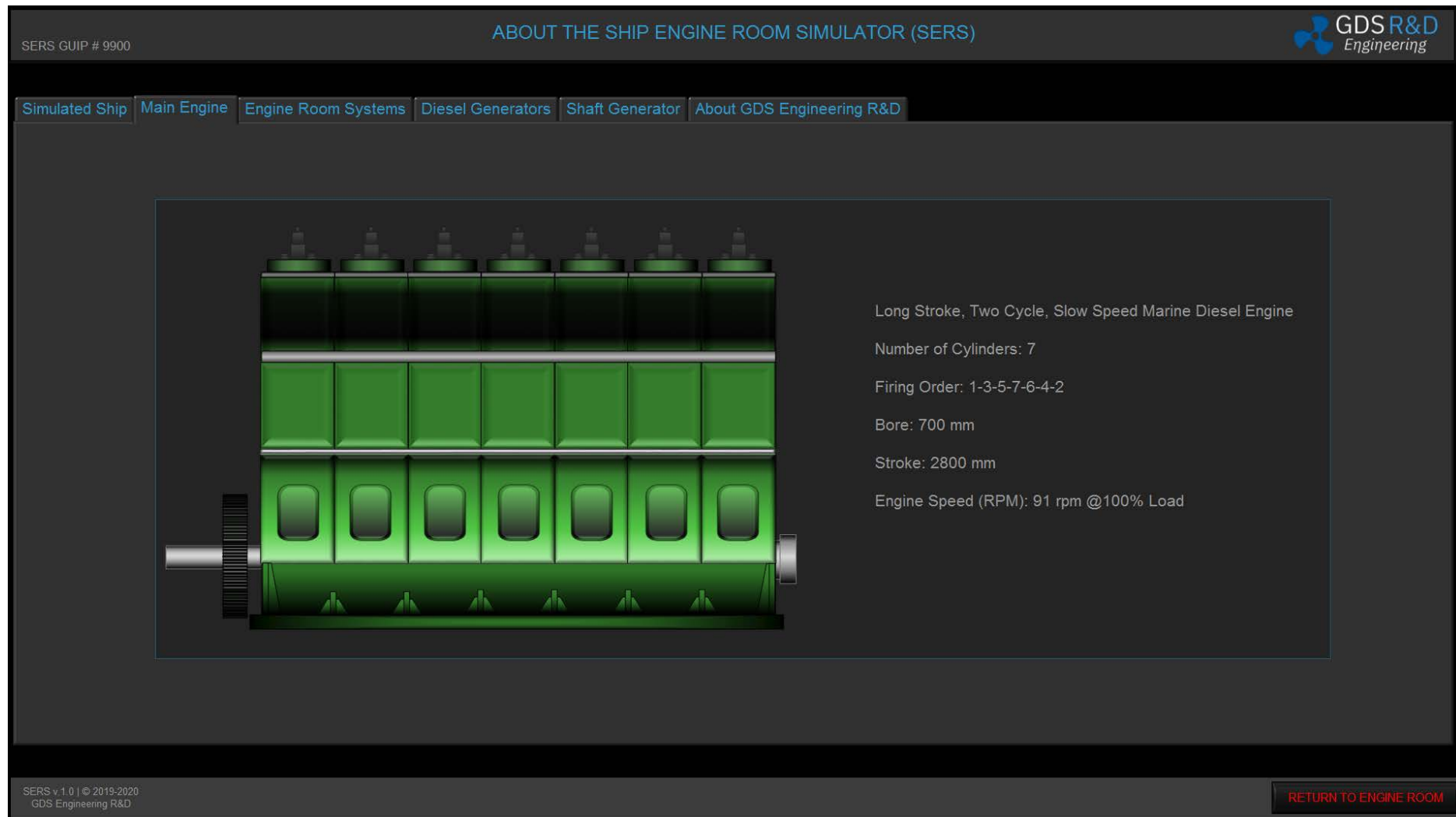


Figure 2: SERS Panel: “About the Engine Room Simulator (SERS)” – “Main Engine” Tab.

The main engine is a two stroke marine diesel engine with seven cylinders, two turbochargers and two auxiliary blowers. Main engine also coupled with a shaft generator for generating electricity in navigation speeds.

General characteristics of the main engine is as follows:

- ✓ Long Stroke Slow Speed Marine Diesel Engine
- ✓ Number of Cylinders : 7
- ✓ Firing Order : 1-3-5-7-6-4-2
- ✓ Bore : 700 mm
- ✓ Stroke : 2800 mm
- ✓ Engine rpm : 91.5 rpm @100% load

Some other important characteristics of the main engine is as follows:

- ✓ Fuel Oil Consumption (kg/h) : 3875.90 kg/h @100% load
- ✓ Specific Fuel Oil Consumption (SFOC) : 187.45 g/kW-h @100% load
- ✓ Maximum Combustion Pressure (P_{max}) : 150.74 bar @100% load
- ✓ Compression Pressure (P_{comp}) : 135.08 bar @100% load
- ✓ Mean Effective Pressure : 18.5 bar @100% load
- ✓ Fuel Pump Index : 91.30 mm @100% load
- ✓ Exhaust Temperature Cylinder Outlet (Average) : 371.80 °C @100% load
- ✓ Turbochargers Exhaust Inlet Temperature : 437.20 °C @100% load
- ✓ Turbochargers Exhaust Outlet Temperature : 245.21 °C @100% load
- ✓ Turbocharger 1 Speed : 15500 rpm @100% load
- ✓ Turbocharger 2 Speed : 15500 rpm @100% load
- ✓ Scavenge Air Temperature : 44.70 °C @100% load
- ✓ Scavenge Air Pressure : 2.88 bar @100% load
- ✓ Turbocharger Gas Inlet Pressure : 2.60 bar @100% load

3.4 Engine Room Systems

SERS GUIP # 9900
ABOUT THE SHIP ENGINE ROOM SIMULATOR (SERS)


Simulated Ship
Main Engine
Engine Room Systems
Diesel Generators
Shaft Generator
About GDS Engineering R&D

ME Control (Bridge, ECR, Local)	ME Bearings	440 V Emg. Distribution Network	Ballast Tanks & Transfer
Sea Water Main Cooling	Exhaust Gas Denoxification	220 V Distribution Network	Bow Thruster
Fresh Water Cooling	Fresh Water Generator (FWG)	24 V DC Distribution Network	Emergency Response Panel
Compressed Air	FW System and Hydrophore	Electrical Consumers	Main Fire Fighting
Combined Boiler	Electrical Power Plant	LO Separators	CO ₂ Fixed Fire Installation
ME Lubrication Oil	Diesel Generator 1	LO Tanks & Transfer	
ME Fuel	Diesel Generator 2	MDO Tanks & Transfer	
Stern Tube	Diesel Generator 3	HFO Tanks & Transfer	
Steering Gear	ECR Panels: Power Generators	HFO Separators	
ME Air Start & Maneuvering	ECR Panels: Pumps & Compressors	Oily Water Separator (OWS)	
Ship Propulsion	ECR Panels: Circuit Breakers	Grey Water & Sewage Treatment	
Turbochargers & Manifolds	440 V Distribution Network	Refrigeration Plant	

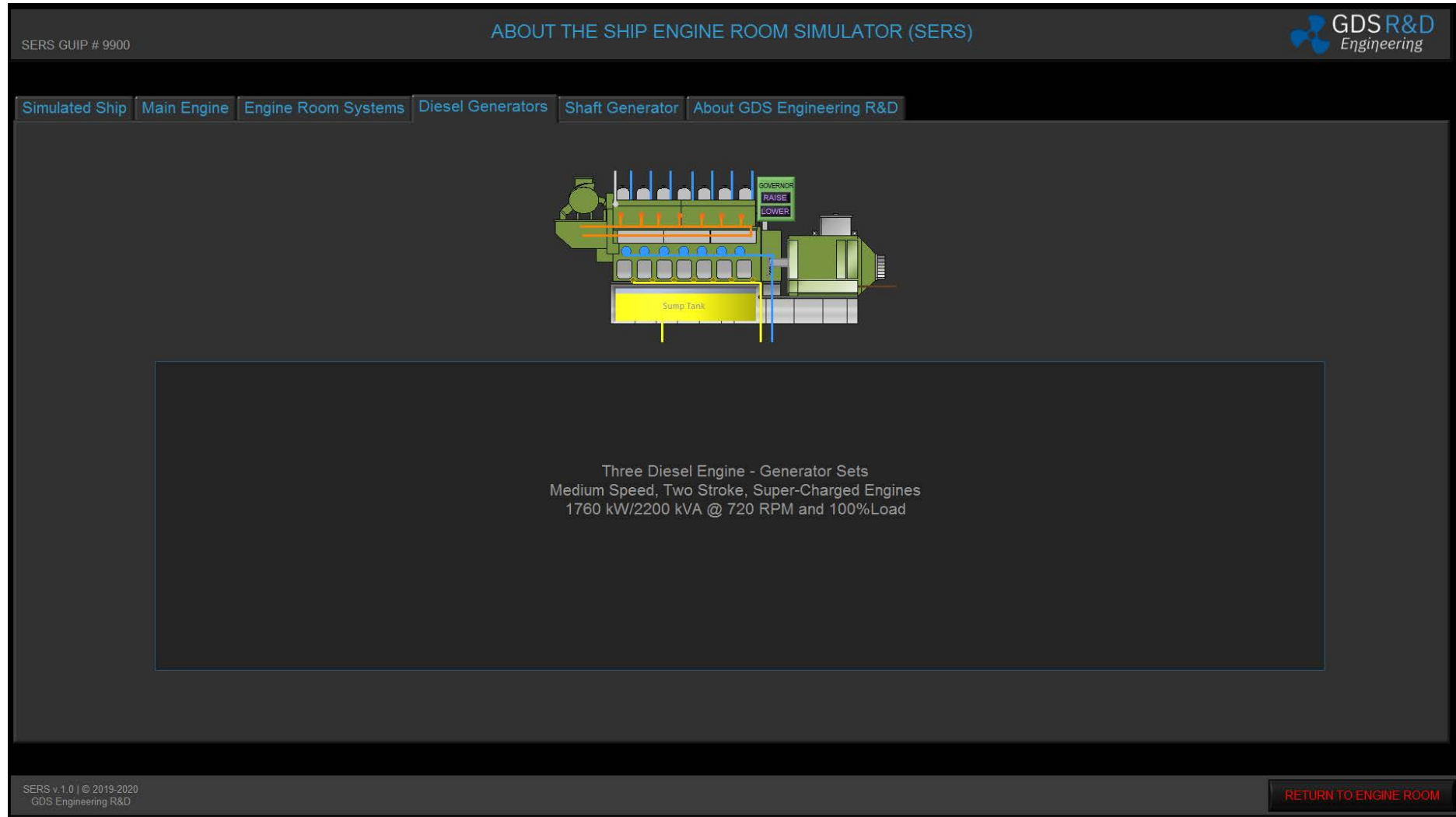
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RETURN TO ENGINE ROOM

Engine Room Systems simulated in SERS are listed below. Each of these systems has its own Graphical User Interface (GUI) Panels, all accessed from the SERS Main GUI Panel. Each of the following GUI windows is titled with a specific GUI Panel (GUIP) number.

- 2000: ME Control (Bridge)
- 2100: ME Control (ECR)
- 2200: ME Local Control & Systems
- 3000: Sea Water Main Cooling
- 3100: Fresh Water Cooling
- 3200: Compressed Air
- 3300: Combined Boiler
- 3400: ME Lubrication Oil
- 3500: ME Fuel
- 3600: Stern Tube
- 3700: Steering Gear
- 3800: ME Air Start & Maneuvering
- 4000: Main Engine (ME)
- 4600: Ship Propulsion
- 4650: Turbochargers & Manifolds
- 4700: ME Bearings
- 4750: Exhaust Gas Denoxification
- 4800: FW Generator (FWG)
- 4900: FW System and Hydrophore
- 5000: Electrical Power Plant
- 5100: Diesel Generator 1
- 5200: Diesel Generator 2
- 5300: Diesel Generator 3
- 5400: ECR Panels: Generators
- 5450: ECR Panels: Pumps & Compressors
- 5500: ECR Panels: Circuit Breakers
- 5600: 440 V Distribution Network
- 5650: 440 V Emg. Distribution Network
- 5700: 220 V Distribution Network
- 5750: 24 VDC Distribution Network
- 5800: Reefer Sections Power Panel
- 5900: Electrical Consumers List
- 6000: LO Separator
- 6100: LO Tanks & Transfer
- 6200: MDO Tanks & Transfer
- 6300: HFO Tanks & Transfer
- 6400: HFO Separators
- 6500: Oily Water Separator (OWS)
- 6600: Gray Water & Sewage Treatment
- 7000: Ballast Tanks and Transfer
- 7100: Bow Thruster
- 7200: Refrigeration Plant
- 7400: Emergency Response Panel
- 7500: Main Fire Fighting
- 7600: CO₂ Fixed Fire Installation
- 1600: Ship Parameters
- 8000: Alarms Panel
- 9000: Parameter Plots
- 9100: Symbols, Units and Acronyms
- 9900: About SERS
- 1500: Instructor's Station GUI Panel

Note: Section 4 of this manual describes each of these GUI Panels with a captured picture of a panel view.

3.5 Electrical Power Generators



There are three Diesel Generators (DGs) with the following specifications

Medium Speed, Two Stroke, 7-cylinders, Supercharged Engines

1760 kW/2200 kVA @720 rpm and 100% Load

3.6 Shaft Generator

SERS GUIP # 9900

ABOUT THE SHIP ENGINE ROOM SIMULATOR (SERS)



Simulated Ship

Main Engine

Engine Room Systems

Diesel Generators

Shaft Generator

About GDS Engineering R&D

SG Speed



735





SG



Shaft Generator system utilized in SERS is a Power Take-Off (PTO) with a Constant Frequency Electrical (CFE) type.

1760 kW/2200 kVA @ 720 RPM and 100%Load

This Shaft Generator is suitable for the ship propulsion with a Fixed Pitch Propeller (FPP).

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RETURN TO ENGINE ROOM

Shaft Generator System utilized in SERS is a Power Take-Off (PTO) with a Constant Frequency Electrical (CFE) type, which is suitable for ships with Fixed Pitch Propeller (FPP).

The PTO/CFE slow running alternator is installed as a tank-top mounted aft end SMG/CFE solution with the rotor integrated on the intermediate propeller shaft.

The PTO/CFE generates electric power with constant electrical frequency over a wide engine speed range. The shaft generators can be used in combination with fixed pitch propellers and continuous operation in parallel with Diesel Generators. The alternator generates a three-phase alternating current with a varying frequency that corresponds to the propeller speed.

DMG/CFE is able to operate in parallel with the Diesel Generators and serve full rated electrical power output when the speed of the Main Engine is between 75% and 105%.

The total efficiency of the slow running is 90%

3.7 About the Simulator Developer

About the Ship Engine Room Simulator (SERS)



Simulated ShipMain EngineEngine Room SystemsDisel GeneratorsAbout GDS Engineering R&D

SERS was developed by

GDS ENGINEERING R&D

GDS Engineering R&D, is an international company, established for developing SERS and similar software and systems in maritime education and training (MET).

GDS version of the ERS simulates all engines, systems, and control panels found in the engine room as well as engine control room of a typical commercial container type cargo ship.

Visit the company website for additional product information and to obtain information about our other or upcoming products and new versions of SERS.

Company website also provides user guides and additional material to better understand the ship engine room systems.

<http://www.GlobalDynamicSystems.com>

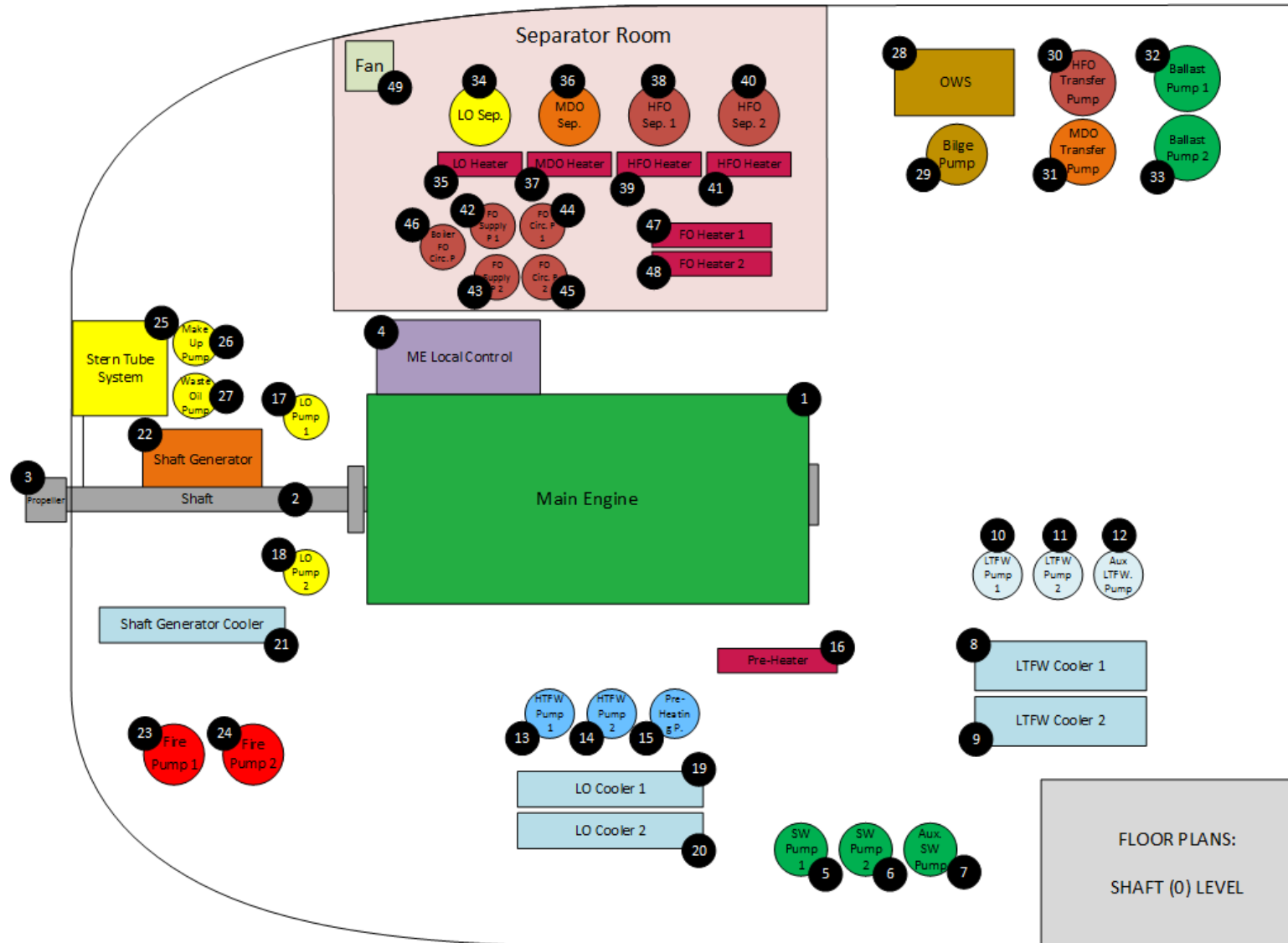
SERS v.1.01, © 2019-2020
GDS Engineering R&D

RETURN TO ENGINE ROOM

3.8 Machinery and Equipment Simulated in the SERS Software

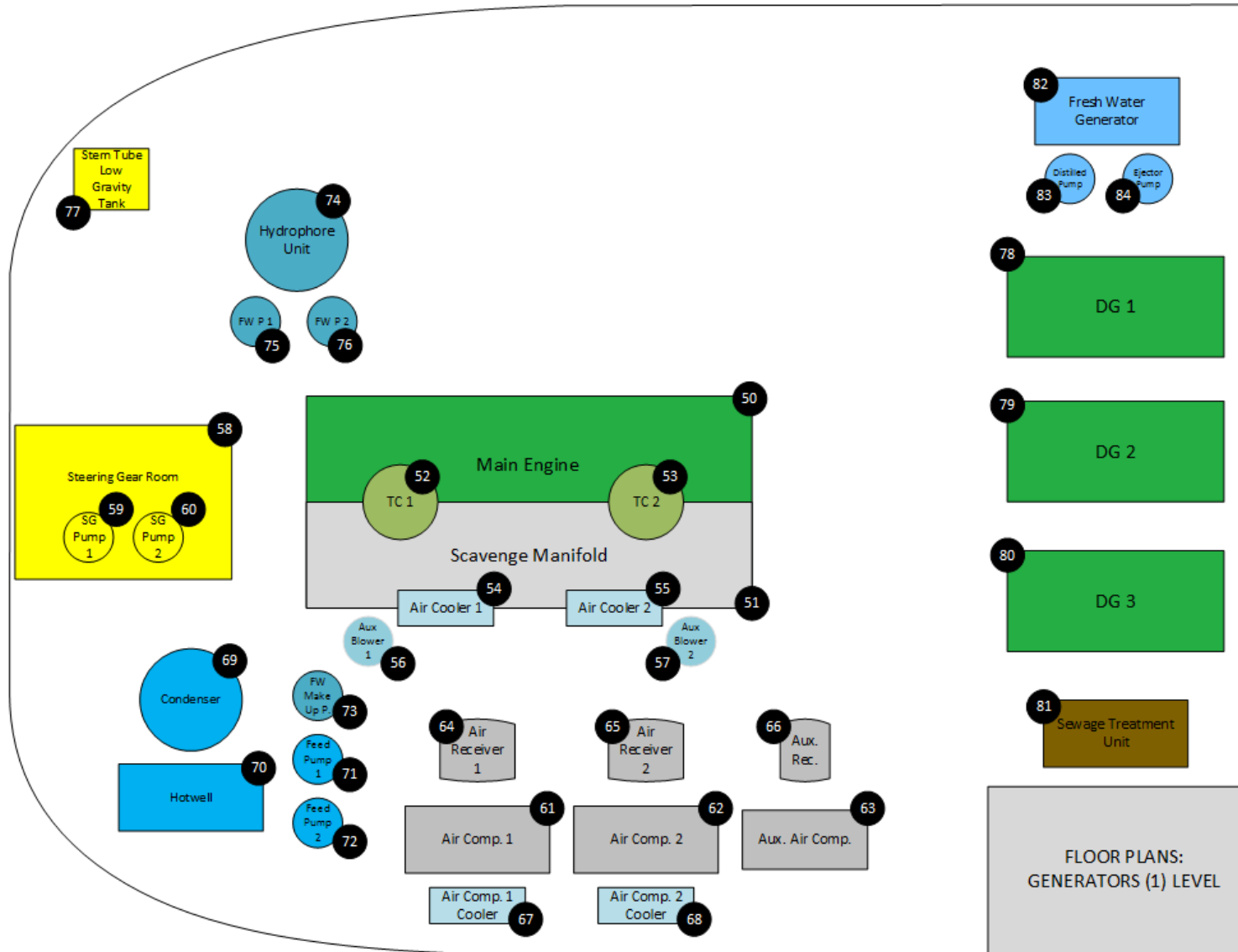
3.8.1 Shaft Level / ME Pumps Level – Item's List and General Arrangement

1 Main Engine	14 HTFW Pump 2	27 Waste Oil Pump	40 HFO Separator 2
2 Shaft	15 Preheating Pump	28 Oily Water Separator	41 HFO Heater 2
3 Propeller	16 Preheater	29 Bilge Pump	42 FO Supply Pump 1
4 ME Local Control	17 LO Pump 1	30 HFO Transfer Pump	43 FO Supply Pump 2
5 SW Pump 1	18 LO Pump 2	31 MDO Transfer Pump	44 FO Circulation Pump 1
6 SW Pump 2	19 LO Cooler 1	32 Ballast Pump 1	45 FO Circulation Pump 2
7 Aux. SW Pump	20 LO Cooler 2	33 Ballast Pump 2	46 Boiler FO Circulation Pump
8 LTFW Cooler 1	21 Shaft Generator Cooler	34 LO Separator	47 FO Heater 1
9 LTFW Cooler 2	22 Shaft Generator	35 LO Heater	48 FO Heater 2
10 LTFW Pump 1	23 Fire Pump 1	36 MDO Separator	49 Separator Room Exhaust Fan
11 LTFW Pump 2	24 Fire Pump 2	37 MDO Heater	
12 Aux. LTFW Pump	25 Stern Tube System	38 HFO Separator 1	
13 HTFW Pump 1	26 Make Up Pump	39 HFO Heater 1	



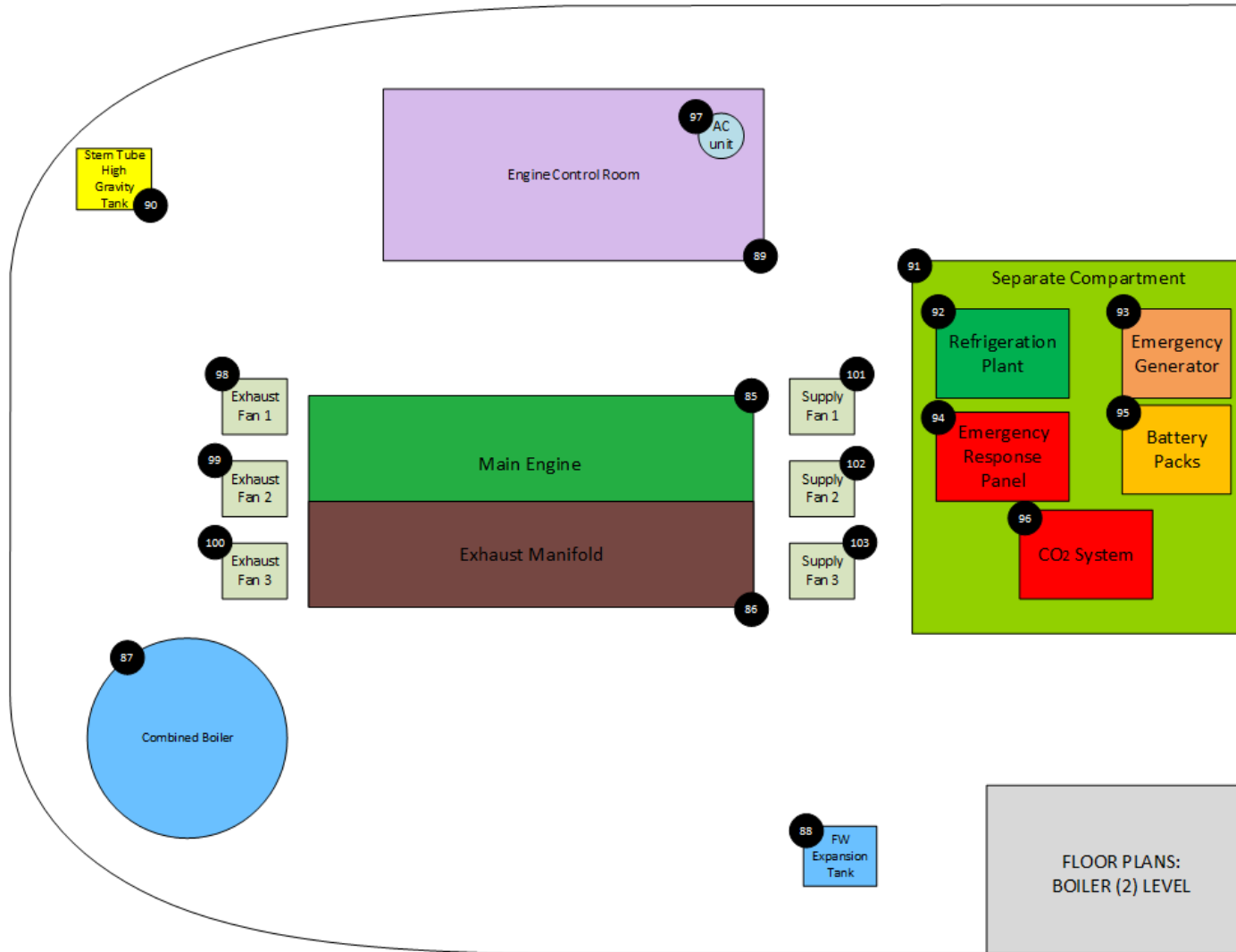
3.8.2 ME Upper Section / Generators Level – Item's List and General Arrangement:

50 Main Engine	60 Steering Gear Pump 2	70 Hotwell	80 Diesel Generator 3
51 Scavenge Manifold	61 Air Compressor 1	71 Feed Pump 1	81 Sewage Treatment Unit
52 Turbocharger 1	62 Air Compressor 2	72 Feed Pump 2	82 Fresh Water Generator
53 Turbocharger 2	63 Aux. Air Compressor	73 FW Make Up Pump	83 Distilled Pump
54 Air Cooler 1	64 Air Receiver 1	74 Hydrophore Unit	84 Ejector Pump
55 Air Cooler 2	65 Air Receiver 2	75 FW Pump 1	
56 Aux. Blower 1	66 Aux. Receiver	76 FW Pump 2	
57 Aux. Blower 2	67 Air Compressor 1 Cooler	77 Stern Tube Low Gravity Tank	
58 Steering Gear Room	68 Air Compressor 2 Cooler	78 Diesel Generator 1	
59 Steering Gear Pump 1	69 Condenser	79 Diesel Generator 2	



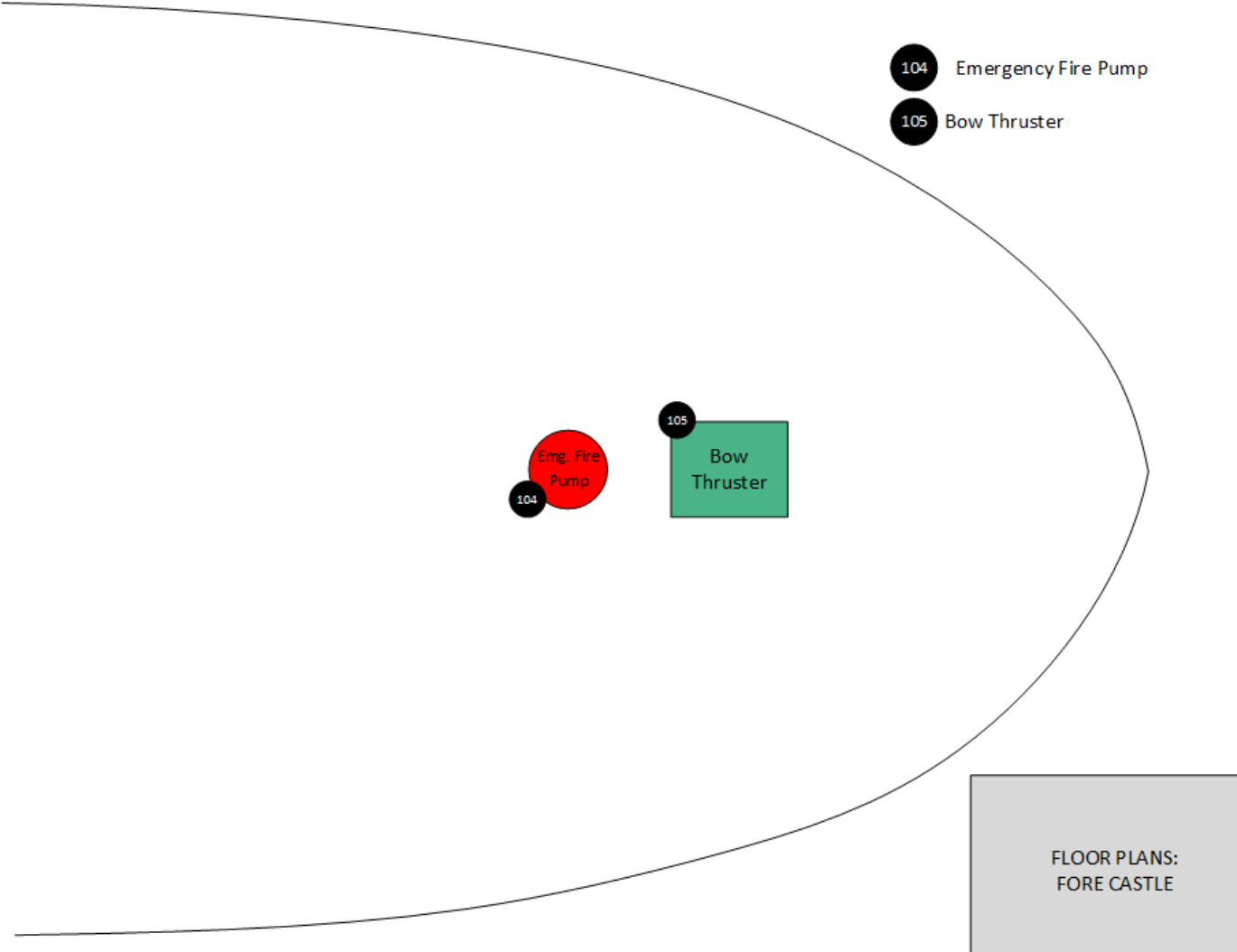
3.8.3 Combined Boiler / Separate Compartment Level – Item's List and General Arrangement:

85 Main Engine	90 Stern Tube High Gravity Tank	95 Battery Packs	100 Exhaust Fan 3
86 Exhaust Manifold	91 Separate Compartment	96 CO2 System	101 Supply Fan 1
87 Combined Boiler	92 Refrigeration Plant	97 Air Condition Unit	102 Supply Fan 2
88 FW Expansion Tank	93 Emergency Generator	98 Exhaust Fan 1	103 Supply Fan 3
89 Engine Control Room	94 Emergency Response Panel	99 Exhaust Fan 2	



FLOOR PLANS:
BOILER (2) LEVEL

3.8.4 Fore Castle Level



3.9 Specifications of the Equipment Used in the SERS

3.9.1 Pumps & Compressors

Pieces	Component Name	Location (SERS GUI Panel #)	Type	Capacity & Total Head or Discharge Pressure	Motor Output kW x RPM (min ⁻¹)
2	Main SW Pumps	SW Main Cooling (SERS #3000)	Centrifugal	Flowrate: 800 m ³ /h Head: 31 m	55 kWx1750
1	Aux. SW Pump	SW Main Cooling (SERS #3000)	Centrifugal	Flowrate: 580 m ³ /h Head: 29.8 m	38 kWx1750
2	HTFW Pumps	FW Cooling (SERS #3100)	Centrifugal	Flowrate: 170 m ³ /h Head: 30 m	17.3 kWx1750
1	Aux. HTFW Pump	FW Cooling (SERS #3100)	Centrifugal	Flowrate: 120 m ³ /h Head: 20 m	6.4 kWx1750
2	LTFW Pumps	FW Cooling (SERS #3100)	Centrifugal	Flowrate: 380 m ³ /h Head: 25 m	21.7 kWx1770
1	Aux. LTFW Pumps	FW Cooling (SERS #3100)	Centrifugal	Flowrate: 260 m ³ /h Head: 20 m	11.6 kWx1750
1	Fuel Circulating Pump	Combined Boiler (SERS #3300)	Gear	Flowrate: 4 m ³ /h	1.5 kWx1200
1	FW Make Up Pump	Combined Boiler (SERS #3300)	Centrifugal	Flowrate: 42 m ³ /h	7.5 kWx3600
2	Feed Pumps	Combined Boiler (SERS #3300)	Centrifugal	Flowrate: 50 m ³ /h	35.5 kWx3600
2	LO Pumps	ME Lubrication Oil (SERS #3400)	Gear	Flowrate: 330 m ³ /h Head: 5.2 bar	40.3 kWx1800
2	Supply Pumps	ME Fuel (SERS #3500)	Gear	Flowrate: 4.6 m ³ /h Head: 5.5 bar	2.5 kWx1200

Pieces	Component Name	Location (SERS GUI Panel #)	Type	Capacity & Total Head or Discharge Pressure	Motor Output kW x RPM (min ⁻¹)
2	Circulation Pumps	ME Fuel (SERS #3500)	Gear	Flowrate: 8.3 m ³ /h Head: 14.1 bar	5.7 kWx1200
1	Make Up Pump	Stern Tube (SERS #3600)	Gear	Flowrate: 5.76 m ³ /h	0.4 kWx1100
1	Waste Oil Pump	Stern Tube (SERS #3600)	Gear	Flowrate: 5.76 m ³ /h	0.4 kWx1100
2	SG Pumps	Steering Gear (SERS #3700)	Gear	Disch. Press. : 75 bar	18.6 kWx1800
1	Urea Pump	Exhaust Gas Denoxification (SERS #4750)	Centrifugal	Flowrate: 2 m ³ /h	0.4 kWx1700
1	Ejector Pump	Fresh Water Generator (SERS #4800)	Centrifugal	Flowrate: 48 m ³ /h Disch. Press. : 42 m	15 kWx3600
1	Distillation Pump	Fresh Water Generator (SERS #4800)	Centrifugal	Flowrate: 7 m ³ /h Head: 50 m	1.7 kWx3600
2	FW Pumps	FW Systems & Hydrophore (SERS #4900)	Centrifugal	Flowrate: 30 m ³ /h Head: 50 m	3.7 kWx3600
1	LO Priming Pump	Diesel Generator 1 (SERS #5100)	Gear	Head: 4.5 bar	1.4 kWx1800
1	Fuel Pump	Diesel Generator 1 (SERS #5100)	Gear	Head: 8.6 bar	1.4 kWx1800
1	SW Pump	Diesel Generator 1 (SERS #5100)	Gear	Head: 2.5 bar	1.4 kWx1800
1	LO Pump	Diesel Generator 1 (SERS #5100)	Gear (Attached)	Head: 4.5 bar	-
1	FW Pump	Diesel Generator 1 (SERS #5200)	Gear (Attached)	Head: 2.5 bar	-
1	LO Priming Pump	Diesel Generator 2 (SERS #5200)	Gear	Head: 4.5 bar	1.4 kWx1800
1	Fuel Pump	Diesel Generator 2 (SERS #5200)	Gear	Head: 8.6 bar	1.4 kWx1800
1	SW Pump	Diesel Generator 2 (SERS #5200)	Gear	Head: 2.5 bar	1.4 kWx1800

Pieces	Component Name	Location (SERS GUI Panel #)	Type	Capacity & Total Head or Discharge Pressure	Motor Output kW x RPM (min ⁻¹)
1	LO Pump	Diesel Generator 2 (SERS #5200)	Gear (Attached)	Head: 4.5 bar	-
1	FW Pump	Diesel Generator 2 (SERS #5200)	Gear (Attached)	Head: 2.5 bar	-
1	LO Priming Pump	Diesel Generator 3 (SERS #5300)	Gear	Head: 4.5 bar	1.4 kWx1800
1	Fuel Pump	Diesel Generator 3 (SERS #5300)	Gear	Head: 8.6 bar	1.4 kWx1800
1	SW Pump	Diesel Generator 3 (SERS #5300)	Gear	Head: 2.5 bar	1.4 kWx1800
1	LO Pump	Diesel Generator 3 (SERS #5300)	Gear (Attached)	Head: 4.5 bar	-
1	FW Pump	Diesel Generator 3 (SERS #5300)	Gear (Attached)	Head: 2.5 bar	-
1	Feed Pump	LO Separator (SERS #6000)	Gear	Flowrate: 2.5 m ³ /h Disch. Press. :3.5 bar	1.5 kWx1200
1	LO Transfer Pump	LO Tanks & Transfer (SERS #6100)	Gear	Flowrate: 10 m ³ /h Head: 4 bar	3.7 kWx1200
1	Cyl. Oil Transfer Pump	LO Tanks & Transfer (SERS #6100)	Gear	Flowrate: 10 m ³ /h Head: 2.6 bar	2.9 kWx1200
1	MDO Transfer Pump	MDO Tanks & Transfer (SERS #6200)	Gear	Flowrate: 5 m ³ /h Head: 4 bar	3.7 kWx1200
1	Feed Pump	MDO Tanks & Transfer (SERS #6200)	Gear	Flowrate: 2.3 m ³ /h Disch. Press. : 3.5 bar	2 kWx1200
1	HFO Transfer Pump	HFO Tanks & Transfer (SERS #6300)	Gear	Flowrate: 35 m ³ /h Head: 4 bar	15.7 kWx1200
2	Feed Pumps	HFO Separators (SERS #6400)	Gear	Flowrate: 2.3 m ³ /h Disch. Press. : 3.5 bar	2.5 kWx1200

Pieces	Component Name	Location (SERS GUI Panel #)	Type	Capacity & Total Head or Discharge Pressure	Motor Output kW x RPM (min ⁻¹)
1	Oily Water Separator Pump	Oily Water Separator (SERS #6500)	Centrifugal	Flowrate: 5 m ³ /h Disch. Press. : 30 m	7.3 kWx1800
1	Bilge Pump	Oily Water Separator (SERS #6500)	Centrifugal	Flowrate: 5 m ³ /h Disch. Press. : 45 m	2.2 kWx1200
1	Sewage Treatment Unit Discharge Pump	Gray Water & Sewage Treatment (SERS #6600)	Centrifugal	Flowrate: 21.5 m ³ /h Disch. Press. : 33 m	1.5 kWx1200
1	Sewage Tank Discharge Pump	Gray Water & Sewage Treatment (SERS #6600)	Centrifugal	Flowrate: 4 m ³ /h Head: 20 m	1.5 kWx1200
1	Gray Water Tank Discharge Pump	Gray Water & Sewage Treatment (SERS #6600)	Centrifugal	Flowrate: 4 m ³ /h Head: 20 m	1.5 kWx1200
2	Ballast Pumps	Ballast Tanks & Transfer (SERS #7000)	Centrifugal	Flowrate: 420 m ³ /h Head: 28 m	36.1 kWx1200
2	Fire Pumps	Main Fire Fighting (SERS #7500)	Centrifugal	Head: 90 m	70 kWx1800
1	Emergency Fire Pump	Main Fire Fighting (SERS #7500)	Centrifugal	Head: 75 m	35 kWx1800
2	Air Compressor	Compressed Air (SERS #3200)	Vertical	Flowrate: 145 m ³ /h Disch. Press. : 40 bar	50 kWx1800
1	Aux. Air Compressor	Compressed Air (SERS #3200)	Vertical	Flowrate: 145 m ³ /h Disch. Press. : 40 bar	26 kWx1800
1	Refrigeration Compressor	Refrigeration Plant (SERS #6700)	Vertical	Disch. Press. : 20 bar	12.3 kWx3450

3.9.2 Heat Exchangers Specifications

Number	Component Name	Location (SERS GUI Panel #)	Type	Heat Transfer Area
2	LTFW Coolers	Sea Water Main Cooling (SERS #3000) Fresh Water Cooling (SERS #3100)	Plate	13.2 m ²
2	Air Cooler	Fresh Water Cooling (SERS #3100) Turbochargers & Manifolds (SERS #4650)	Plate	10 m ²
2	LO Cooler	Fresh Water Cooling (SERS #3100) ME Lubrication Oil (SERS #3400)	Plate	184.5 m ²
2	Air Compressor Cooler	Fresh Water Cooling (SERS #3100) Compressed Air (SERS #3200)	Plate	1.3 m ²
1	ECR Air Condition Cooler	Fresh Water Cooling (SERS #3100)	Plate	3.5 m ²
1	Shaft Generator LO Cooler	Fresh Water Cooling (SERS #3100)	Plate	2.2 m ²
1	Preheater	Fresh Water Cooling (SERS #3100)	Plate Core (Harrison Type)	1.44 m ²
2	FO Heater	ME Fuel (SERS #3500)	Tube	3.41 m ²
1	DG 1 LO Cooler	Diesel Generator 1 (SERS #5100)	Plate	4 m ²
1	DG 1 FW Cooler	Diesel Generator 1 (SERS #5100)	Plate	2.45 m ²
1	DG 1 Air Cooler	Diesel Generator 1 (SERS #5100)	Plate	3 m ²
1	DG 2 LO Cooler	Diesel Generator 2 (SERS #5200)	Plate	4 m ²

1	DG 2 FW Cooler	Diesel Generator 2 (SERS #5200)	Plate	2.45 m ²
1	DG 2 Air Cooler	Diesel Generator 2 (SERS #5200)	Plate	3 m ²
1	DG 3 LO Cooler	Diesel Generator 3 (SERS #5300)	Plate	4 m ²
1	DG 3 FW Cooler	Diesel Generator 3 (SERS #5300)	Plate	2.45 m ²
1	DG 3 Air Cooler	Diesel Generator 3 (SERS #5300)	Plate	3 m ²
1	LO Separator Heater	LO Separator (SERS #6000)	Plate Core (Harrison Type)	0.48 m ²
1	MDO Separator Heater	MDO Tanks & Transfer (SERS #6200)	Plate Core (Harrison Type)	0.28 m ²
2	HFO Separators Heater	HFO Separator (SERS #6400)	Plate Core (Harrison Type)	0.98 m ²

3.9.3 Tanks

HEAVY FUEL OIL	: 3664.66 m ³	(6 tanks %100 volume)
MARINE DIESEL OIL	: 332.12 m ³	(4 tanks %100 volume)
LUBRICATING OIL	: 389.55 m ³	(7 tanks)
FRESHWATER	: 235.00 m ³	(2 tanks)
BALLAST WATER	: 9161.45 m ³	(8 tanks)
SEWAGE	: 30.60 m ³	(1 tank)
BILGE	: 46.10 m ³	(1 tank)
SLUDGE	: 242.00 m ³	(1 tank)

3.9.4 Emergency Generator

NUMBER : 1 set AC Emergency Generator
OUTPUT : 350 kVA, 720 rpm, 3-60 Hz/450V

3.9.5 Combined Boiler

NUMBER : 1 fire tube boiler, 1 economizer
CAPACITY : 2500 kW
STEAM PRESSURE : 7 bar

3.9.6 Propeller

TYPE : Fixed 5 blades propeller

DIMENSIONS : Diameter: 7600 mm. Weight: 42400 kg

MATERIAL : Special Nickel Aluminum Bronze

3.9.7 Steering Gear

TYPE	: Electrohydraulic Rotary Type Steering Gear
RUDDER ANGLE	: 45 degrees max.
TORQUE	: 2500 kNm
PRESSURE	: 75 bar
MOMENT	: 2000 kNm

3.9.8 Other Machinery and Components in the Engine Room

Fresh Water Generator:

CAPACITY : 20 m³ / day at full load

Engine Room Fans

TYPE : Vertical, Axial Flow (4 sets)

CAPACITY : 1200 m³/min x 0.4 kPa x 1800 rpm

OUTPUT : 5.9 kW

3.9.9 Fire Fighting Equipment

CO2 Fixed Fire Installation:

- For Engine Room High Pressure CO₂ System
- Main Engine pistons undersides, Separator room, steering gear room are protected by CO₂ systems

Main Fire Fighting System:

Main firefighting system includes:

- 2 Fire Pumps which supplies the Fire Line and General Service Line
- Emergency Fire Pump with Emergency Suction Sea Chest

3.9.10 Deck Machinery and Systems

Cargo Capacity:

Designed to carry containers of ISO types, container nominal intake capacity 2764 TEU's and 14 tons' homogenous container intake capacity 2054 TEU's 45% VCG.

IN HOLDS : 1000 TEU's (484x40' + 32x20')

ON DECK : 1764 TEU's (866x40' + 32x20')

TOTAL CAPACITY : 2764 TEU's (1350x40' + 64x20')

Holds are suitable for heights of 2 HC + 4 BX

45' container capacity: 484x45' + 72 FUE

Total 400 pcs reefer container (300 on deck, 100 in holds)

4.5 KVA of each reefer with 0.85 power factor.

Holds and Hatch Covers:

Numbers of Holds 5 Holds with 10 Hatches. Holds are fully fitted with 408 cell guides. Maximum weight of panel including twist locks and turnbuckles is 33.5 tones.

Deck Cranes

NUMBERS : Total 4 sets

POWER CONSUMPTION : 60 kW max/each

CRANE NO 1, 2, AND 3 (3 Sets) : KL 45 t/40 t-27.5 m / 30 m

Electro-Hydraulic driven cranes with luffing wire

Min-Max Outreach : 3.5 meters to 30 meters

Lifting Capacity : 45 T at 27.5 m/40 T at 30 m

CRANE NO 4 (1 Set) : HL 35 t/30 t-27 m/29.5 m

Electro-Hydraulic driven crane with hydraulic cylinders

Min-Max Outreach : 3.5 meters to 29.5 meters

Lifting Capacity : 35 T at 27 m/30 T at 29.5 m

Bow Thruster / High Voltage System:

TYPE : Driven by electrical motor and hydraulic system, Controllable Pitch Propeller (CPP) type

POWER : 1100 kW

PROPELLER SPEED : 270 RPM

INTERNAL GEAR RATIO : 11/48

ELECTRIC MOTOR/DRIVE SYSTEM : AUTO TRANSFORMER STARTER UNIT

- Voltage: 6600 V.
- 3 Phase, 60 Hz.
- Number of Poles: 6
- Efficiency: %94.5
- Power Factor: 0.86
- Speed: 1178 RPM
- Insulation Class: F, Nema Design: B

VACUUM CIRCUIT BREAKER : 11-33 kV, 10^{-4} Torr.

TRANSFORMER : 3 Phase, 60 Hz., 440 V / 6600 V, Efficiency: %96, C: 0.9

Anchors & Equipment:

ANCHOR	: 2 sets of bower anchors 7884 kg
CHAIN	: 78 mm 2x (12x27.5 meters), Grade K3
SHACKLES	: 12 shackles at Starboard/12 shackles at port
SPEED	: 9 meters/min, shackle/3 min

Anchor Winches & Wrappings:**FORECASTLE DECK**

- 2 sets of anchoring and mooring winches each with two split of drums and warping head for 78mm chain cable
- 289 kN nominal pull

POOP DECK

- 2 sets of mooring winches with 2 split drums
- 15-30 m/min mooring drum speed
- 200 kN nominal pull

Navigation Units:

- Autopilot
- Gyro
- Echo Sounder
- Speed Log
- Radars (2 sets)
- Radar Pilot
- VDR
- GPS
- Inmarsat-C (2 pcs)
- DSC VHF (2 sets)
- Inmarsat Comm.
- Navtex
- MF/HF
- AIS
- Weather Fax
- SSAS

Life Saving Equipment

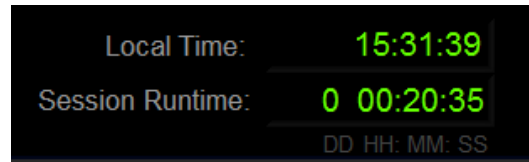
- Vessel is SOLAS type survival equipped for 30 persons
- One totally closed GRP Motor Lifeboat and Rescue Boat on portside, for 30 persons
- One totally closed GRP Motor Lifeboat and Rescue Boat on starboard side, for 30 persons
- Four sets of inflatable life raft for 16 persons/each life raft, two at each side at 2nd deckhouse deck.
- One inflatable life raft for 6 persons on forecastle deck

4. SERS GRAPHICAL USER INTERFACE (GUI) PANELS

4.1 MAIN USER PANEL (GUI PANEL #1000)



4.1.1 Description of Screen Objects



Time: Provides the current (local) time information.

Session Runtime: Indicates the time passed since the start of the current session.



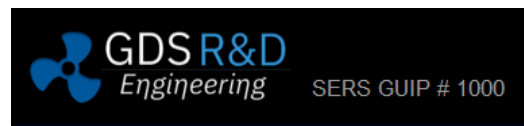
Company Logo

Represents the company logo:

English: GDS Engineering R&D, Inc.

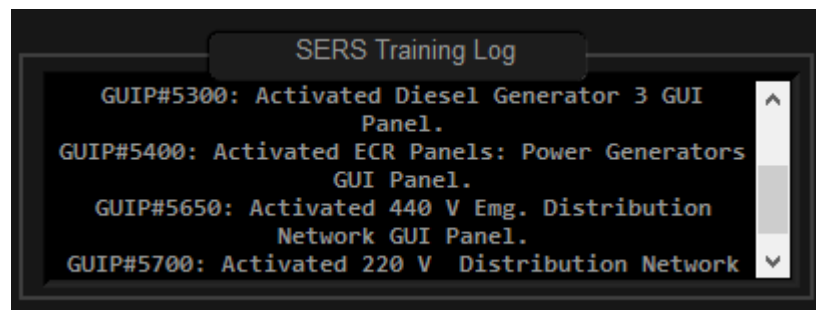
Turkish: GDS Mühendislik ARGE San Tic. Ltd. Şti.

where GDS stands for Global Dynamic Systems



SERS GUI Panel Number

Each of the SERS GUI panels provide a unique identifier on top left corner of the panel. User manuals refer to the GUI panel with this number.



Status Log

The Status Log (or SERS Training Log) indicates the initial condition at first, then displays the name of the last accessed GUI Panel. Training Log details are recorded into a text file, which can be found in the following user directory: “\Documents\LabVIEW Data\SERSData\Reports”.

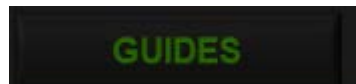
The log file is recorded for each user for each day and includes all user activities, recorded in a historic time order with timestamp. This feature allow for performing a detail analysis of the user actions when recorded for specific exercises.



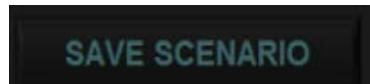
Alarms Panel includes:

- Visual Alarms indicator
- Alarm Silence button
- Alarm List button, which displays the Alarms GUI Panel when clicked. ALARMS GUI Panel provides an ALARM LOG and list of all active alarms.

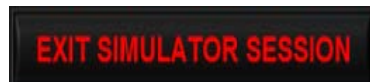
When an alarm has been risen, alarm panel warns the trainee with Visual Alarms indicator and provides audible alarm. The alarm will be muted when the ALARM SILENCE button is pressed, but the problem/malfunction will remain. Student/Trainee should acknowledge the malfunction at identify malfunctions page.



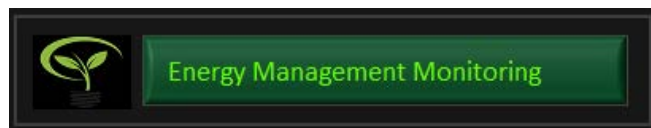
The guides Button at the main panel, includes general information about systems. This is a function that will be added in the upcoming versions of the SERS software; therefore, this button is currently displayed as grayed out and disabled.



Student/Trainee can save scenario, therefore he/she can resume training later.



Simulator will be ended when the exit simulator session button is pressed. Student/Trainee will be returned to the Starting Simulator page.

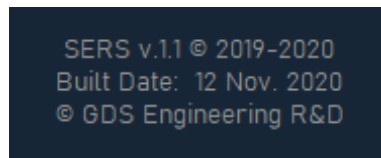


Energy Management Monitoring Button allows access to Energy Management Monitoring GUI Panel (GUIP #8800). Energy Management Monitoring GUI Panel includes several parameters as Main Engine Power Losses (according to the Heat Balance Calculations), ME Fuel Consumption, Energy of Fuel, Main Engine Power Efficiency etc. For example of Heat Balance Calculations see User Manual Vol. II



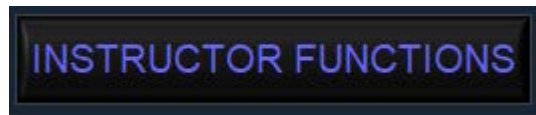
Create Malfunction / Identify Malfunction Buttons

Malfunctions can be created or identified using these buttons. Create Malfunction Button allows access to Create & Inject Malfunctions GUI Panel (GUIP #8200). Identify Malfunction Button allows access to Identify & Acknowledge Malfunctioning Components GUI Panel (GUIP #8500).



Version Description

Version Description area that is placed beside the ME animation provides information about the SERS version and built date for configuration and quality management.



Instructor Functions Button

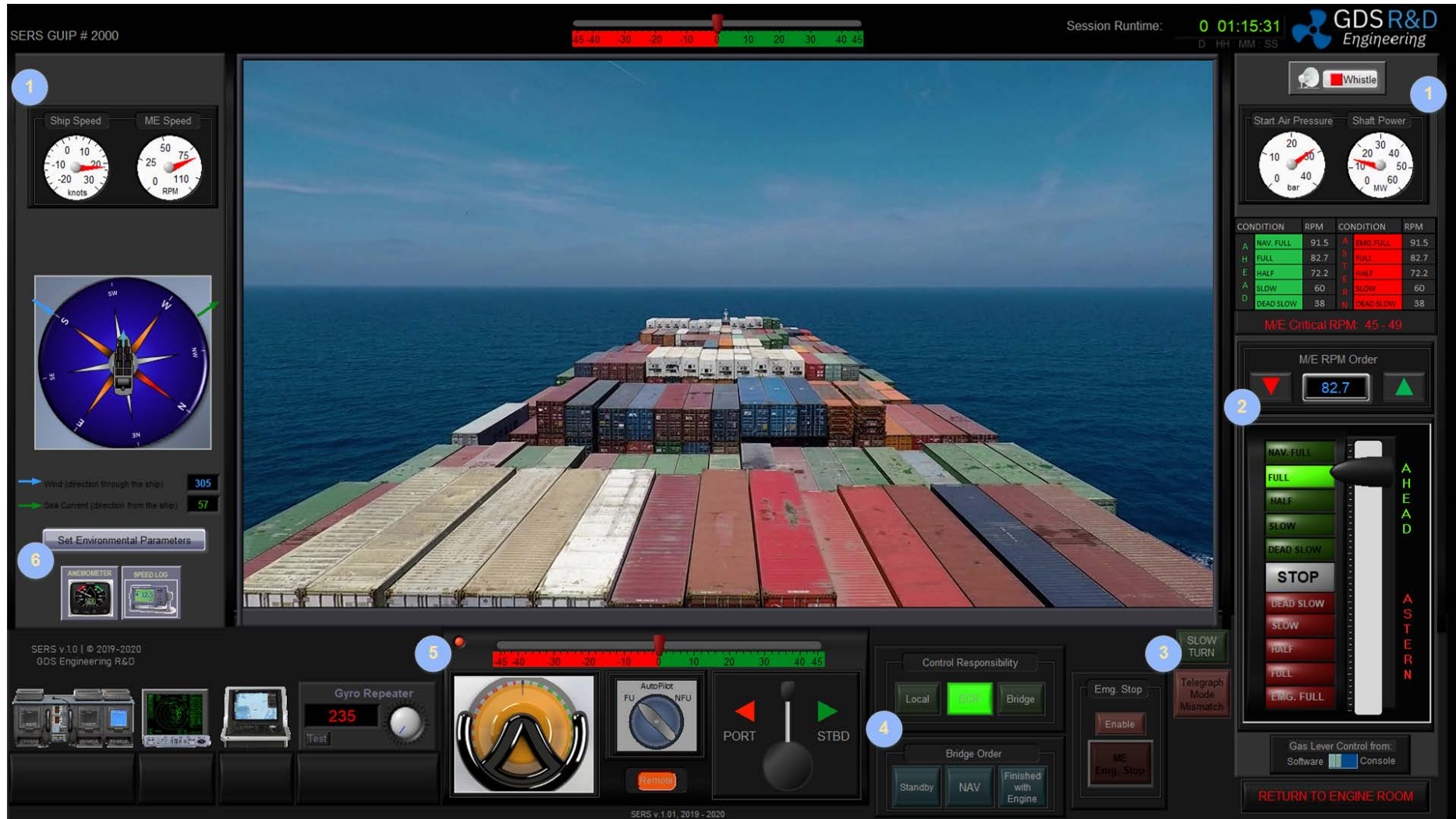
Instructor Functions Button allows access to SERS Instructor Functions GUI Panel (GUIP #8100). Instructor can monitor and inject malfunction at the trainee's stations.

4.1.2 SERS GUI Panels List and Codes

Each of the SERS GUI Panels, which can be accessed from the SERS Main GUI Panel (#1000) are coded for referencing in all of the SERS User Manuals. These codes are listed in below table. Notice that the panel order listed herein matches to the order found on the SERS Main GUI Panel.

- SERS GUIP #2000: ME Control (Bridge)
- SERS GUIP #2100: ME Control (ECR)
- SERS GUIP #2200: ME Local Control & Systems
- SERS GUIP #3000: Sea Water Cooling System
- SERS GUIP #3100: Fresh Water Cooling
- SERS GUIP #3200: Compressed Air
- SERS GUIP #3300: Combined Boiler
- SERS GUIP #3400: ME Lubrication Oil
- SERS GUIP #3500: ME Fuel
- SERS GUIP #3600: Stern Tube
- SERS GUIP #3700: Steering Gear
- SERS GUIP #3800: ME Air Start & Maneuvering
- SERS GUIP #4000: Main Engine (ME)
- SERS GUIP #4600: Ship Propulsion
- SERS GUIP #4650: Turbochargers & Manifolds
- SERS GUIP #4700: ME Bearings
- SERS GUIP #4750: Exhaust Gas Denoxification
- SERS GUIP #4800: FW Generator (FWG)
- SERS GUIP #4900: FW System and Hydrophore
- SERS GUIP #5000: Electrical Power Plant
- SERS GUIP #5100: Diesel Generator 1
- SERS GUIP #5200: Diesel Generator 2
- SERS GUIP #5300: Diesel Generator 3
- SERS GUIP #5400: ECR Panels: Generators
- SERS GUIP #5450: ECR Panels: Pumps & Compressors
- SERS GUIP #5500: ECR Panels: Circuit Breakers
- SERS GUIP #5600: 440 V Distribution Network
- SERS GUIP #5650: 440 V Emergency (Emg.) Distribution Network
- SERS GUIP #5700: 220 V Distribution Network
- SERS GUIP #5750: 24 V DC Distribution Network
- SERS GUIP #5800: Reefer Sections Power Panel
- SERS GUIP #5850: High Voltage Bus Bar / Transformer
- SERS GUIP #5860: Vacuum Circuit Breaker Control Panel
- SERS GUIP #5900: Electrical Consumers List
- SERS GUIP #6000: LO Separator
- SERS GUIP #6100: LO Tanks & Transfer
- SERS GUIP #6200: MDO Tanks, Separator & Transfer
- SERS GUIP #6300: HFO Tanks & Transfer
- SERS GUIP #6400: HFO Separators
- SERS GUIP #6500: Oily Water Separator (OWS)
- SERS GUIP #6600: Gray Water & Sewage Treatment
- SERS GUIP #7000: Ballast Tanks and Transfer
- SERS GUIP #7100: Bow Thruster
- SERS GUIP #7200: Refrigeration Plant
- SERS GUIP #7400: Emergency Response Panel
- SERS GUIP #7500: Main Fire Fighting
- SERS GUIP #7600: CO₂ Fixed Fire Installation
- SERS GUIP #1600: Ship Parameters
- SERS GUIP #8000: Alarms Panel
- SERS GUIP #9000: Parameters Plant
- SERS GUIP #9100: Symbols, Units & Acronyms
- SERS GUIP #9900: About SERS
- SERS GUIP #1500: Instructor's Station GUI Panel

4.2 ME CONTROL (BRIDGE) (GUI PANEL # 2000)



4.2.1 Table of Screen Objects

Number	Description	Number	Description
1	Indicators Panel	4	Control Responsibility and Bridge Order
2	Throttle Lever	5	Steering Wheel Panel
3	Emergency Stop Panel, Telegraph Mismatch & Slow Turn	6	Set Environmental Parameters Button

- Indicators Panel includes:
 - Ship Speed and ME Speed Indicator
 - Start Air Pressure Gauge and Shaft Power Indicator
- Commands the ship speed via increasing/decreasing main engine rpm.
- Emergency Stop:** The emergency stop can be activated from Bridge or Engine Control Room. This button should only be pressed when normal ways (i.e. by using telegraph) is not responding. However, do not have the impression that the button must be pressed just there is an emergency like imminent, grounding, allusion or collision etc. If the engine cannot be stopped by normal ways and is required to be stopped, then the emergency stop button can be pressed. Manual emergency shutdown can be operated from any position (Bridge or ECR) regardless of the control position for operating the main engine.
Telegraph Mode Mismatch indicator lits when the Bridge and Engine Control Room Telegraphs are not in the same position.
Slow Turn button provides to check the engine start system by slow turning the Main Engine. Slow turning bypasses, the main air start valve and provides sufficient air and therefore turns to engine slowly to prevent damage in case of water or fuel accumulated on the piston due to leakage. The process for Slow Turn is depicted and shown in detail in User Manual Vol. II Section 6.2.
- Choices of main engine control. There are three place to control the main engine:
 - Local Control
 - ECR Control
 - Bridge Control
 Bridge order panel provides communication between bridge and engine control room for main engine status. Three status of the main engine:
 - Stand-by means that the main engine is ready for maneuvering.
 - Navigation (NAV) indicates the main engine is ready for navigation.
 - Finished with Engine means that the main engine operation is no longer required when ship anchored or approached the port.
- Steering wheel panel includes:
 - Follow up Steering Controller
 - Steering Control Mode Switch
 - Follow up (FU)

This is the normal method of steering and involves the feedback of steering angle to the helm. This is suited to both manual and automatic operation. The ship heading may be set into the autopilot, which can compare the actual to desired heading and adjust the rudder angle to suit.

- ii. Autopilot
It is a method used in ships at navigation, after the new route of the ship is piloted with an electronic device, the steering gear system turns the ship to the port or the starboard to bring the ship to the desired route.
 - iii. Non Follow up (NFU)
Normally used for back up purposes only. Consists of a single lever per steering gear unit, by moving the lever in on direction the rudder will begin to turn, the rudder will continue to turn until the lever is released or it reaches the limit of its operation
 - c. Rudder Indicator
 - d. Non Follow up Steering Controller
6. Environmental Parameters can be changed with this GUI.

4.3 ENGINE CONTROL ROOM (GUI PANEL # 2100)



4.3.1 Table of Screen Objects

Number	Description	Number	Description
1	Aux. Blowers, ER Fans, and ME Indicators Panel	7	Telegraph Mismatch, Wrong Way & Crash Astern
2	Main Engine Load and Fuel Index Indicator	8	Thermal Load Program Panel
3	Main Engine RPM Control Panel	9	Gas Lever Control Switch Panel
4	Control Responsibility Panel and Bridge Order Indicator	10	Display Alarms List Button & Alarm Indicators
5	Control Mode Selection and RPM Limiter Panel	11	Main Engine Status Panel
6	Emergency Stop, Camshaft Position, Turning Gear Panel	12	Main Engine Shut/Slow Down Alarms

1. Auxiliary Blowers, Engine Room Fans, and Indicators Panel includes:
 - a. Ship Speed Indicator
 - b. Propeller RPM Indicator
 - c. Shaft Power Indicator
 - d. Scavenge Air Pressure Gauge
 - e. Start Air Pressure Gauge
 - f. Control Air Pressure Gauge
 - g. Main Engine LO Inlet Pressure Gauge
 - h. Main Engine LO Inlet Temperature Gauge
 - i. Main Engine FO Inlet Pressure Gauge
 - j. Main Engine FO Inlet Temperature Gauge
 - k. Fuel Oil Flowmeter
 - l. Engine Room Supply and Exhaust Fans Control Panel
 - m. Main Engine HTFW Inlet Temperature Gauge
 - n. Main Engine HTFW Outlet Temperature Gauge
 - o. Auxiliary Blower Control Panel controls auxiliary blowers in manual and auto mode. When the user clicks the start button, auxiliary blowers will start at manual mode. They cut in/cut out automatically in auto mode.
2. Main engine load is a function of efficiency. Load factor also correlate with Specific Fuel Oil Consumption (SFOC), so that load indicator is important for efficient operation of main engine. The indicator shows fuel rack position. Fuel rack adjust the fuel pump plunger which determines the amount of fuel going to the cylinder. Angle of the plunger helix adjusted by the rack, determines amount of fuel to be injected.
3. Sets and commands the ship speed via increasing or decreasing of main engine rpm. When the gas lever at requested 91,5 RPM (MCR) position, user can use Speed Adjustment Buttons.

4. Choices of main engine control. There are three places to control the main engine:

- a. Local Control
- b. ECR Control
- c. Bridge Control

Bridge order panel provides communication between bridge and engine control room for main engine status. Three status of main engine:

- a. Stand-by means that the main engine is ready for maneuvering.
- b. Navigation (NAV) indicates the main engine is ready for navigation.
- c. Finished with engine means that the main engine operation is no longer required when ship anchored or approached the port.

5. Control Mode consists:

- a. RPM Control Main Engine RPM can be controlled. In this mode, RPM will remain constant, and changes in Weather Conditions, Shaft Generator Status etc. will affect the Main Engine Load. RPM set value can be changed from RPM Limiter Panel.
- b. Load Control Main Engine Load can be controlled. In this mode, load will remain constant, and changes in Weather Conditions, Shaft Generator Status etc. will affect the Main Engine RPM.

6. Stops the main engine at emergency situations. Enable button provides pushing of the emergency stop button. Camshaft position determines the rotation of main engine. Turning Gear Indicator Panel shows Turning Gear is ENGAGED or DISENGAGED. Turning Gear can be engaged or disengaged from the ME Local Control & Systems (GUI Panel #2200).

7. Telegraph Mode Mismatch indicator is lit when the Bridge and Engine Control Room Telegraphs are not in the same position.

Wrong Way indicator is lit when the camshaft is in the wrong direction while telegraph is set in the opposite direction.

Crash Astern indicator indicates the ME operation mode is changed to Crash Astern mode. In this mode, ME control system sequentially implements slowing down, stopping, and running the engine at Full Astern speeds. Perform Crash-Maneuvering procedure to avoid risk of the ship colliding in emergencies. In this type of maneuvering, the ME assumes high loads applying high level of stresses to the structural elements, such as piston pin, camshaft, and bearings. For the details of the Crash-Maneuvering process, review Section 6.4 of the User Manual Vol. II.

8. "Thermal Load Program" has two objects as follows:

- a. "Active" indicator is lit when thermal load program is activated by the ME control system.
- b. "Override" control is activated by the user to override the thermal load program.

9. ME Gas Lever may be controlled from Software (SERS GUI Panel #2100) or from a hardware gas lever component. SERS allows for addition of ME Control Console hardware set. For further information about the addition and use of the ME Control Console hardware, refer to SERS User Manual Volume III Installation & Configuration.

10. The user can access Alarms GUI Panel via Display Alarm List Button. Alarm Indicators show whether Alarm and Fire Alarm occur.

11. Main Engine Status Panel includes:

- a. Engine Ready
- b. Engine Running
- c. Main Engine Slow Down
- d. Main Engine Shut Down
- e. Main Engine Failed
- f. Main Engine Slow Down Prewarning
- g. Main Engine Shut Down Prewarning

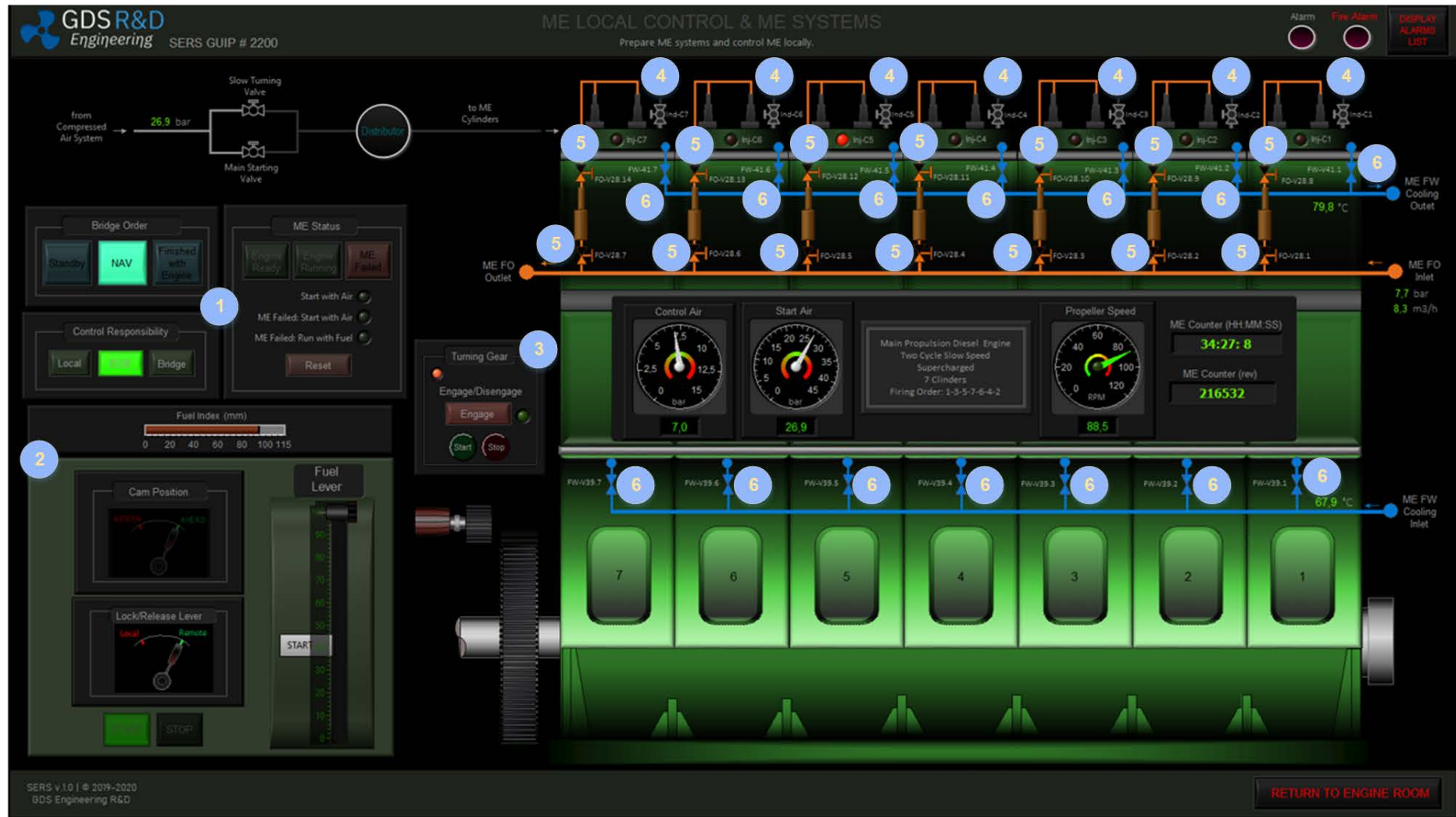
12. The malfunctions that may cause Main Engine **shut down** are listed below:

- a. LO Pressure Low
- b. Thrust Bearing Temperature High
- c. Overspeed

The malfunctions that may cause Main Engine **slow down** are listed below:

- a. LO Pressure Low
- b. LO Temperature High
- c. Cooling Water Outlet Temperature High
- d. Exhaust Temperature Deviation High
- e. Oil Mist
- f. Thrust Bearing Temperature High
- g. Main Bearing Temperature High

4.4 MAIN ENGINE LOCAL SYSTEMS & CONTROL (GUI PANEL # 2200)



4.4.1 Table of Screen Objects

Number	Description	Number	Description
1	Control Responsibility, Bridge Order, and ME Status Panel	4	Indicator Cocks
2	Local Control Panel	5	High Pressure FO Pumps Inlet and Outlet Valves
3	Turning Gear Control Panel	6	Fresh Water Inlet and Outlet Valves

1. Control Responsibility, Bridge Order, and ME Status Panel includes:
 - a. Bridge Order Indicator provides communication between bridge and control room for main engine mode. Three mode of main engine:
 - i. Standby means that the main engine ready for maneuvering.
 - ii. Navigation (NAV) indicates the main engine ready for navigation.
 - iii. Finished with engine means that the main engine is no longer required.
 - b. Control Responsibility Panel is used for transferring of the responsibility of the main engine control between Bridge, ECR, and Local provided. Control Responsibility Panel includes:
 - i. Bridge Control
 - ii. ECR Control
 - iii. Local Control
 - c. Main Engine Status includes:
 - i. Engine Ready
 - ii. Engine Running
 - iii. Start with Air
 - iv. ME Failed: Start with Air
 - v. ME Failed: Run with Fuel
 - vi. Reset Button
2. Local Control Panel includes:
 - a. Fuel Index Indicator
 - b. Camshaft Position Panel
 - i. Ahead
 - ii. Astern
 - c. Lock/Release Lever Panel
 - i. Local
 - ii. Remote

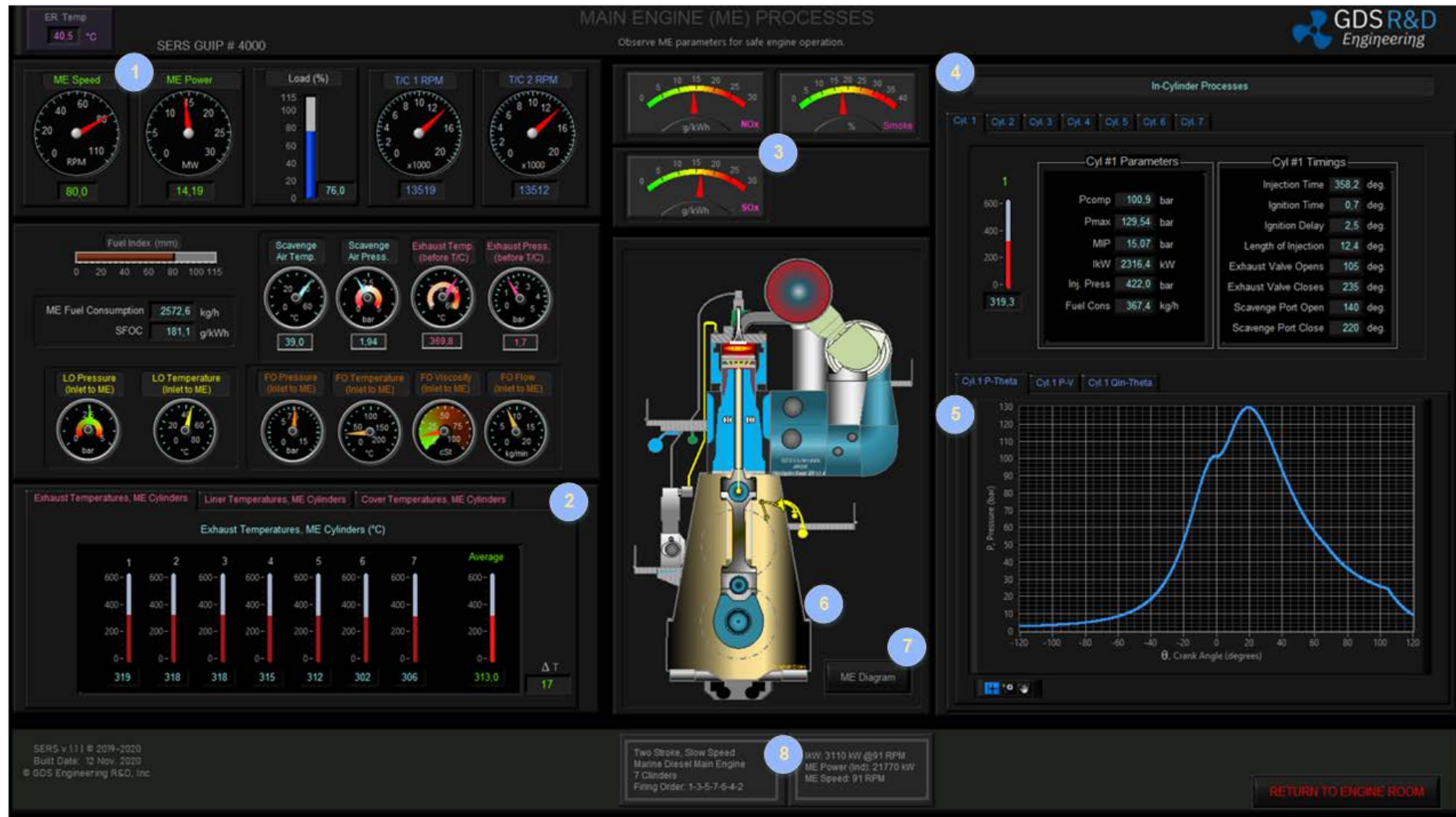
Local mode is used for controlling the Main Engine Locally.
Remote mode is used for controlling the Main Engine Remotely.

- d. Start/Stop Button Main Engine can be started or stopped from this panel locally.
 - e. Local Telegraph and Fuel Lever Local Telegraph and Fuel Lever provides commanding the ship speed via increasing or decreasing Main Engine Load. Local Telegraph and Fuel Lever is Load Limiter.
 - f. Local Telegraph and Fuel Lever provides commanding the ship speed via increasing or decreasing main engine rpm. Fuel lever commands the fuel rack to adjust the amount of fuel inlet to the cylinders.
3. The turning gear is a reversible electric motor, which drives a worm gear, which can be connected with the toothed flywheel to rotate the main engine. It is also enables positioning for overhaul or examination. The engagement and disengagement of the turning gear is accomplished by turning the gear control panel. Click Engage/Disengage button and then start the turning gear for pre-lubrication or cooling procedure of main engine. Before starting the turning gear, indicator cocks must be opened. The user can observe the air outlet of the cylinder at indicator cocks.
 4. The indicator cocks are opened when the engine is being turned over by the turning gear and when being started for the first time after being shut down to blow out any water of debris from the cylinder.
 5. High pressure FO pumps inlet and valves allow the fuel flow into the cylinders. (FO-V28.1, FO-V28.2, FO-V28.3, FO-V28.4, FO-V28.5, FO-V28.6, FO-V28.7, and V28.8, V28.9, V28.10, V28.11, V28.12, V28.13, V28.14)
 6. Fresh water inlet and valves allow the fresh water flow around the liner. (FW-V39.1, FW-V39.2, FW-V39.3, FW-V39.4, FW-V39.5, FW-V39.6, FW-V39.7 and FW-V41.1, FW-V41.2, FW-V41.3, FW-V41.4, FW-V41.5, FW-V41.6, FW-V41.7)

4.4.2 Valve Numbering

Number	Description	Number	Description
Ind-C1	No.1 Cylinder Indicator Cock	FO-V28.12	No.5 High Pressure FO Pump Outlet Valve
Ind-C2	No.2 Cylinder Indicator Cock	FO-V28.13	No.6 High Pressure FO Pump Outlet Valve
Ind-C3	No.3 Cylinder Indicator Cock	FO-V28.14	No.7 High Pressure FO Pump Outlet Valve
Ind-C4	No.4 Cylinder Indicator Cock	FW-V39.1	No.1 Cylinder FW Inlet Valve
Ind-C5	No.5 Cylinder Indicator Cock	FW-V39.2	No.2 Cylinder FW Inlet Valve
Ind-C6	No.6 Cylinder Indicator Cock	FW-V39.3	No.3 Cylinder FW Inlet Valve
Ind-C7	No.7 Cylinder Indicator Cock	FW-V39.4	No.4 Cylinder FW Inlet Valve
FO-V28.1	No.1 High Pressure FO Pump Inlet Valve	FW-V39.5	No.5 Cylinder FW Inlet Valve
FO-V28.2	No.2 High Pressure FO Pump Inlet Valve	FW-V39.6	No.6 Cylinder FW Inlet Valve
FO-V28.3	No.3 High Pressure FO Pump Inlet Valve	FW-V39.7	No.7 Cylinder FW Inlet Valve
FO-V28.4	No.4 High Pressure FO Pump Inlet Valve	FW-V41.1	No.1 Cylinder FW Outlet Valve
FO-V28.5	No.5 High Pressure FO Pump Inlet Valve	FW-V41.2	No.2 Cylinder FW Outlet Valve
FO-V28.6	No.6 High Pressure FO Pump Inlet Valve	FW-V41.3	No.3 Cylinder FW Outlet Valve
FO-V28.7	No.7 High Pressure FO Pump Inlet Valve	FW-V41.4	No.4 Cylinder FW Outlet Valve
FO-V28.8	No.1 High Pressure FO Pump Outlet Valve	FW-V41.5	No.5 Cylinder FW Outlet Valve
FO-V28.9	No.2 High Pressure FO Pump Outlet Valve	FW-V41.6	No.6 Cylinder FW Outlet Valve
FO-V28.10	No.3 High Pressure FO Pump Outlet Valve	FW-V41.7	No.7 Cylinder FW Outlet Valve
FO-V28.11	No.4 High Pressure FO Pump Outlet Valve		

4.5 MAIN ENGINE PROCESS (GUI PANEL # 4000)



4.5.1 Table of Screen Objects

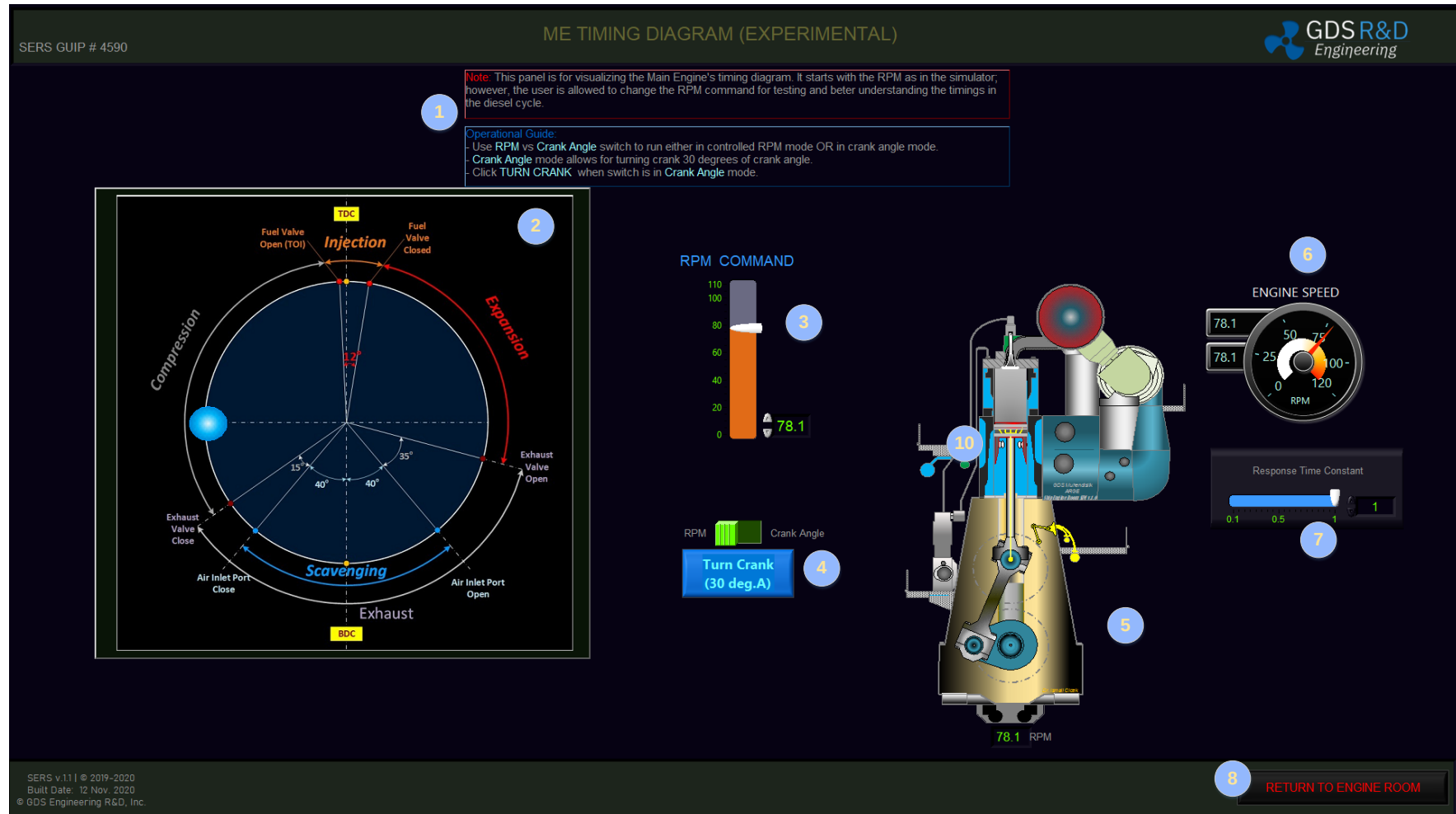
Number	Description	Number	Description
1	Main Engine Parameters	5	ME Diagrams Panel
2	ME Cylinders Temperatures Indicator Panel	6	ME Animation View
3	SO _x , NO _x , and Smoke Indicators	7	Main Engine Timing Diagram Access Button
4	ME Cylinders Parameters Panel	8	ME Identification Labels

1. Main Engine Parameters that are displayed on this panel includes:
 - a. Main Engine RPM Indicator
 - b. Main Engine Power Indicator
 - c. Load Indicator
 - d. Turbochargers RPM Indicator
 - e. Fuel Index Indicator
 - f. ME Fuel Consumption (kg/h)
 - g. SFOC (g/kWh)
 - h. Scavenge Air Temperature and Pressure Gauge
 - i. Exhaust Gas Temperature Gauge (before Turbochargers)
 - j. Exhaust Gas Pressure Gauge (before Turbochargers)
 - k. LO Temperature and Pressure Gauges at Inlet to Main Engine
 - l. Fuel Oil Temperature and Pressure Gauges and Viscometer
 - m. Fuel Oil Flowmeter
2. Main Engine Cylinders Temperatures Indicator Panel includes:
 - a. **Exhaust Gas Temperatures (ME Cylinders) Indicator Panel** shows the exhaust gas temperature of each cylinder, average exhaust gas temperature, and temperature deviation (ΔT) from mean value.
 - b. **Liner Temperatures (ME Cylinders) Indicator Panel** is activated by pressing on its tab, which displays the liner temperature for each cylinder as well as the deviation (ΔT) from mean value
 - c. **Cover Temperatures (ME Cylinders) Indicator Panel** is activated by pressing on its tab, which displays the cover temperature for each cylinder as well as the deviation (ΔT) from mean value
3. SO_x content indicator shows the SO_x content in exhaust gas at the outlet of the exhaust manifold. NO_x Content Indicator shows the NO_x content in exhaust gas at the outlet of the exhaust manifold. Smoke content indicator shows the smoke content in exhaust gas at the outlet of the exhaust manifold.

4. In a cylinder, some parameters indicate main engine's condition and performance. It is important to optimize the engine's fuel efficiency and verification of the optimization's effect. In-cylinder process panel shows the parameters and timing of each cylinder.
 - a. Cylinder Parameters:
 - i. P_{comp} Compression Pressure refers to the pressure before ignition.
 - ii. P_{max} Maximum Pressure refers to the pressure after ignition.
 - iii. MIP Mean Indicated Pressure, which on acting upon the piston performs the same works as the actual pressure on the operating cycle.
 - iv. I_{kw} Indicated kilowatt is the generated indicated power from a cylinder.
 - v. Inj. Press. Injection Pressure is the pressure during an injection.
 - vi. Fuel Cons. Fuel consumption of the cylinder kilograms per hour.
 - b. Cylinder Timings:
 - i. Injection Time is the time of when the fuel is injected into the cylinder, which alters when the combustion takes place. Injection timing is usually balanced to get as much power as possible, while still remaining in legal limits for emissions.
 - ii. Ignition Time refers to the time, relative to the current piston position and crankshaft angle, of the starting controlled combustion in the combustion chamber.
 - iii. Ignition Delay is the time of the lag between start of injection and start of the combustion. The ignition delay is too important for the combustion process, thermal performance, and emissions of the main engine.
 - iv. Length of Injection means the interval of injection between starting and endings.
 - v. Exhaust valve opens refers to the crankshaft position, as degree, and the time of exhaust valve opens.
 - vi. Exhaust valve closes refers to the crankshaft position, as degree, and the time of exhaust valve closes.
 - vii. Scavenge Port Open refers timing, relative to the current piston position and crankshaft angle, of the scavenge port opens.
 - viii. Scavenge Port Close refers timing, relative to the current piston position and crankshaft angle, of the inlet scavenge closes.
5. Main Engine Diagram Panel shows the P- θ , P-V, and Q_{in} - θ diagram for each cylinder.
 - a. P- θ diagram which is used to describe corresponding changes in pressure and crank angle for each cylinder.
 - b. P-V diagram which is used to describe corresponding changes in pressure and crank angle for each cylinder.
 - c. Q_{in} - θ diagram which is used to describe corresponding changes in energy input and crank angle for each cylinder.
6. Main Engine's animation is displayed in this area. The turn speed is in synchronization with the actual ME RPM.
7. Main engine diagram button access to the two-stroke diesel engine process simulation demonstration screen. Main engine process screen shows timing diagram and cylinder process of main engine. Crank angle and rpm switch either to run in controlled rpm mode or crank angle mode. Crank angle mode allows for turning crank 30 degrees of crank angle.
8. ME Identification Labels displays the specifics to the main engine modeled in the SERS software. ME Identification Labels include:
 - a. Main Engine Description
 - b. Number of Cylinder and firing order
 - c. Indicated Power of each cylinder and main engine
 - d. ME Speed

4.6 MAIN ENGINE TIMING DIAGRAM PANEL (GUI PANEL # 4590)

Accessed from ME Parameters Panel (#4000), ME Timing Diagram Panel is an experimental simulation, which animates the location of the timing. Timing diagram and engine animation in this panel are synchronized and both engine animation and the timing diagram turn speeds are controlled with the RPM command. Because it is for experimental purpose, the changes in this window does not affect the SERS simulator.

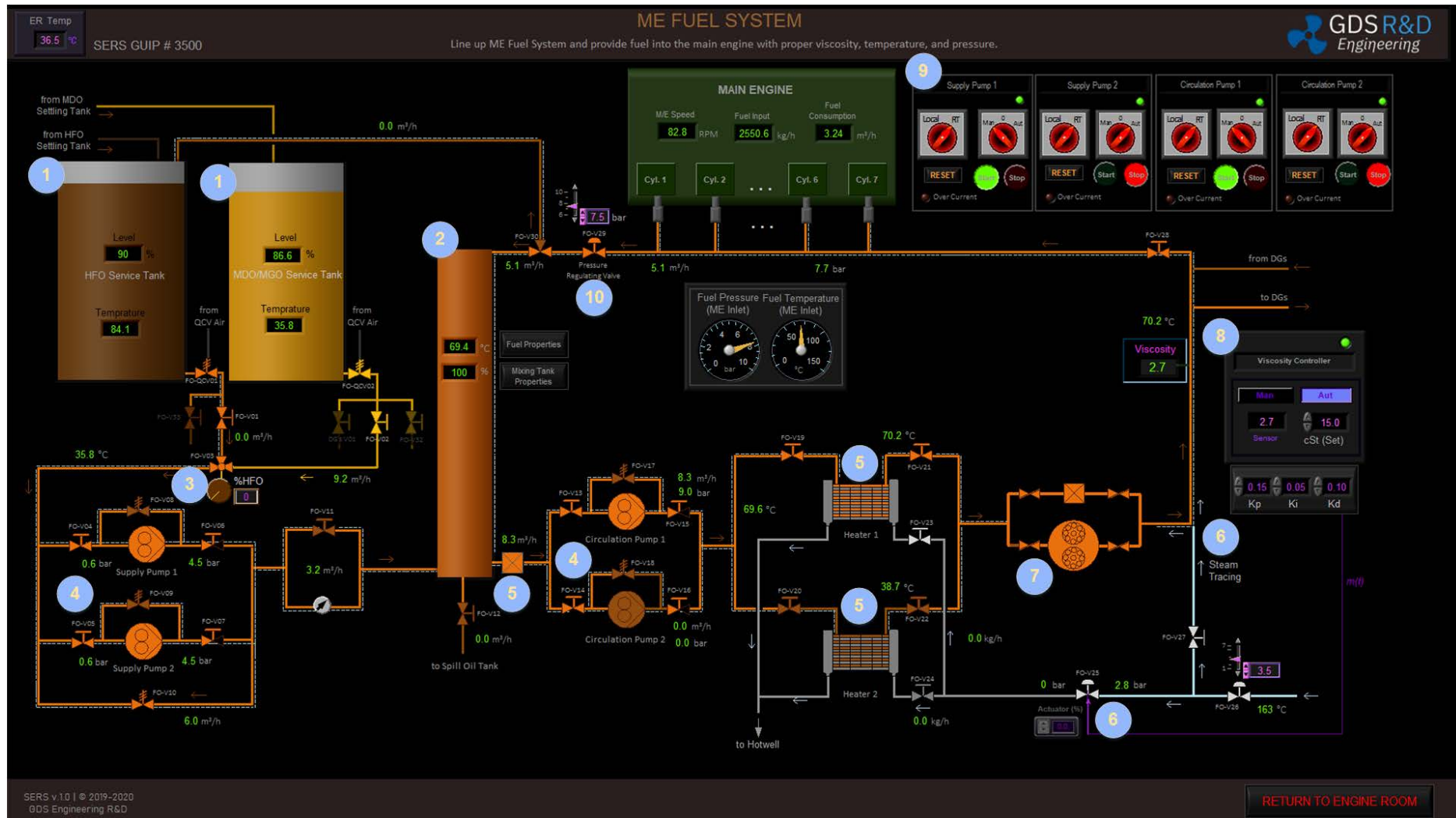


4.6.1 Table of Screen Objects

Number	Description	Number	Description
1	Instructions	5	ME Animation
2	Timing Diagram	6	RPM Gauge
3	RPM Command	7	Response Time Constant
4	Control Type	8	RETURN TO ENGINE ROOM button

1. Instructions area displays the general information on how to use this experimental timing diagram simulation in this panel.
2. Timing Diagram shows the opening and closing time of; air inlet port, fuel and exhaust valves.
3. RPM Command is a control for changing the speed of both timing diagram and engine animation.
4. Control Type allows for selecting the control to be for RPM or Crank Angle. When switched to Crank Angle, timing diagram and engine animations stop and they both move 30 degrees of angle for each click on Turn Crank Angle button.
5. ME Animation shows a turning animation of engine depending on the ME RPM or crank angle selected.
6. RPM Gauge show the RPM command and actual RPM of the animated timing diagram and engine.
7. Response Time Constant changes the response dynamics of the animation speeds to the controlled variable change.
8. RETURN TO ENGINE ROOM button allows for quitting from this panel and displays the SERS Main GUI Window (#1000).

4.7 MAIN ENGINE FUEL SYSTEM (GUI PANEL # 3500)



4.7.1 Table of Screen Objects

Number	Description	Number	Description
1	HFO and MDO Service Tanks	6	Steam Control Valve and Steam Tracing Line
2	Mixing Tank	7	Automatic Backflushing Filter
3	HFO/MDO Mixing Valve	8	Viscosity Controller Panel
4	Fuel Supply and Circulating Pumps	9	Fuel Oil Pumps Control Panel
5	Filter and Heaters	10	Pressure Regulating Valve

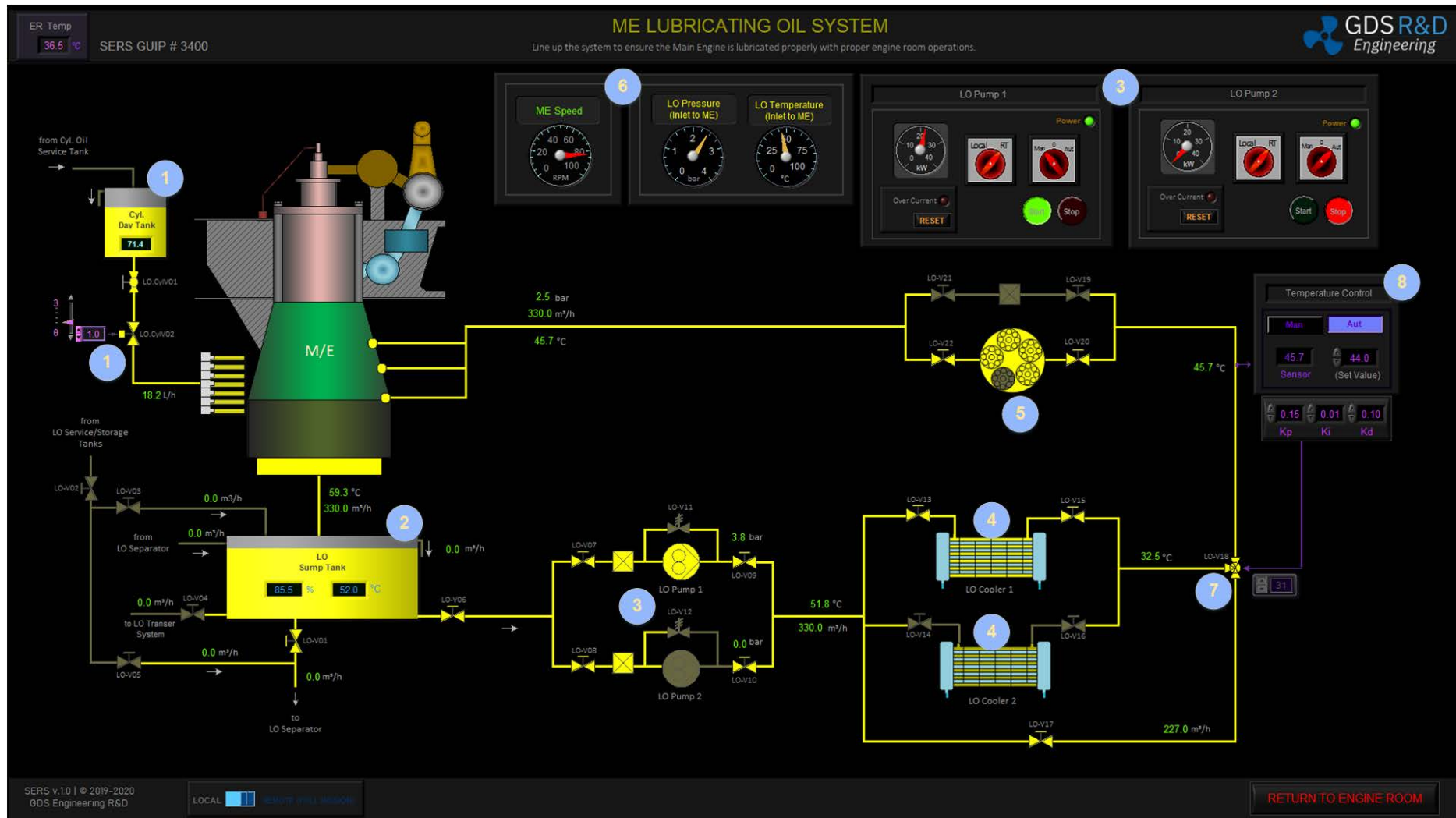
- HFO and MDO service tanks contain only the required quality of fuel ready for immediate use. HFO and MDO Service Tanks used onboard, necessary for propulsion and generator systems, are to be provided.
- Then the fuel passes to the mixing tank where it mixes with fuel returned from the engine. The mixing tank is fitted drain line which is sending fuel to spill oil tank. Fuel properties button shows temperature-dependent graph of fuel viscosity and density. Mixing tank properties button shows the time-dependent graph of the temperature, density and viscosity of the fuel in the mixing tank.
- HFO/MDO mixing valve allows the mixing of HFO and MDO. Mixing valve uses during change-over operation.
- Fuel passes through the mixing valve before suction by supply pumps. Supply pumps supply the fuel through the mixing tank. Fuel circulating pumps provide a reliable supply of fuel. Circulating pumps take suction, pumping the fuel through the heaters and then automatic backflushing filter to the main engine fuel system.
- The filter usually employs a mesh screen, an assembly of closely packed metal plates or wire coils which effectively block all the smallest particles. It is fitted on the outlet of the mixing tank. The fuel oil heater is used to heat fuel oils to a desired operating temperature. Heaters includes fuel oil inlet/outlet lines and steam inlet/outlet lines. Fuel oil is heated by steam supply at heater.
- Steam control valve regulates steam flow according to fuel viscosity. While Heavy Fuel Oil (HFO) is used as fuel in the ME Fuel System lines, as addition to the HFO Heaters, HFO can also be heated up using the steam tracing lines. This will help storing the heat losses in the FO pipes and mixing tank. Also, in case of the HFO existing in the pipes before lining up the FO Systems, steam tracing lines must be used to heat up the HFO existing in the FO pipes to lower its viscosity before the FO Pumps are started. Steam Tracing Line supplies below components and lines (pipes):
 - HFO Service Tank Outlet Line
 - Supply Pumps Suction Lines
 - By-pass Line
 - Supply Pumps Discharge Lines
 - Mixing Tank Inlet Line
 - Mixing Tank
 - Circulation Pumps Suction Lines
 - Circulation Pumps Discharge Lines
 - FO Heaters Inlet and Outlet Lines
 - Backflushing Filter Outlet Line
 - Main Engine FO Inlet Line
 - Recirculation Line

7. Automatic Backflushing filter, when the pressure difference increases, an indication of filter getting clogged, the auto system disables one of the filters for cleaning process, rest of the filters will continue the filtering process and this cycle repeats on. The automatic backflushing filter takes place with the help of the electric motor connected to the shaft, which cleans the filter by compressed air.
8. Viscometer takes continuous sample of the fuel at a constant rate through a fine capillary tube. As the flow through the tube is laminar, pressure drop across the tube is proportional to viscosity. Viscosity controller regulates the supply of fuel heating steam through a control valve.
9. Fuel Oil Pumps can be operated from the control panel. Power light indicates whether electrical supply reaches the panel. If switch position is at “0” position, pumps will not operate. If switch position is at “MANUAL” pumps can be operated if user click the start button. If switch position is at “AUTO” pumps operate according to the system pressure in-line. If pressure decrease, pumps will operate automatically.
10. Pressure regulating valve ensures a constant pressure supply to the engine. Pressure regulating valve setting value can be changed from control unit. Thus, tension of spring will be changed.

4.7.2 Valve Numbering

Number	Description	Number	Description
FO-QCV01	HFO Service Tank Quick Closing Valve	FO-V15	Circulation Pump 1 Discharge Valve
FO-QCV02	MDO Service Tank Quick Closing Valve	FO-V16	Circulation Pump 2 Discharge Valve
FO-V01	HFO Service Tank Outlet Valve	FO-V17	Circulation Pump 1 Relief Valve
FO-V02	MDO Service Tank Outlet Valve	FO-V18	Circulation Pump 2 Relief Valve
FO-V03	Mixing Valve	FO-V19	Heater 1 FO Inlet Valve
FO-V04	Supply Pump 1 Suction Valve	FO-V20	Heater 2 FO Inlet Valve
FO-V05	Supply Pump 2 Suction Valve	FO-V21	Heater 1 FO Outlet Valve
FO-V06	Supply Pump 1 Discharge Valve	FO-V22	Heater 2 FO Outlet Valve
FO-V07	Supply Pump 2 Discharge Valve	FO-V23	Heater 1 Steam Inlet Valve
FO-V08	Supply Pump 1 Relief Valve	FO-V24	Heater 2 Steam Inlet Valve
FO-V09	Supply Pump 2 Relief Valve	FO-V25	FO Viscosity Control Valve
FO-V10	Supply Pumps Recirculation Valve	FO-V26	Steam Pressure Regulating Valve
FO-V11	FO Flowmeter By-Pass Valve	FO-V27	Steam Tracing Valve
FO-V12	Mixing Tank Drain Valve	FO-V28	ME FO Shutoff Valve
FO-V13	Circulation Pump 1 Suction Valve	FO-V29	FO Pressure Regulating Valve
FO-V14	Circulation Pump 2 Suction Valve	FO-V30	FO Recirculation Valve

4.8 MAIN ENGINE LUBRICATING OIL SYSTEM (GUI PANEL # 3400)



4.8.1 Table of Screen Objects

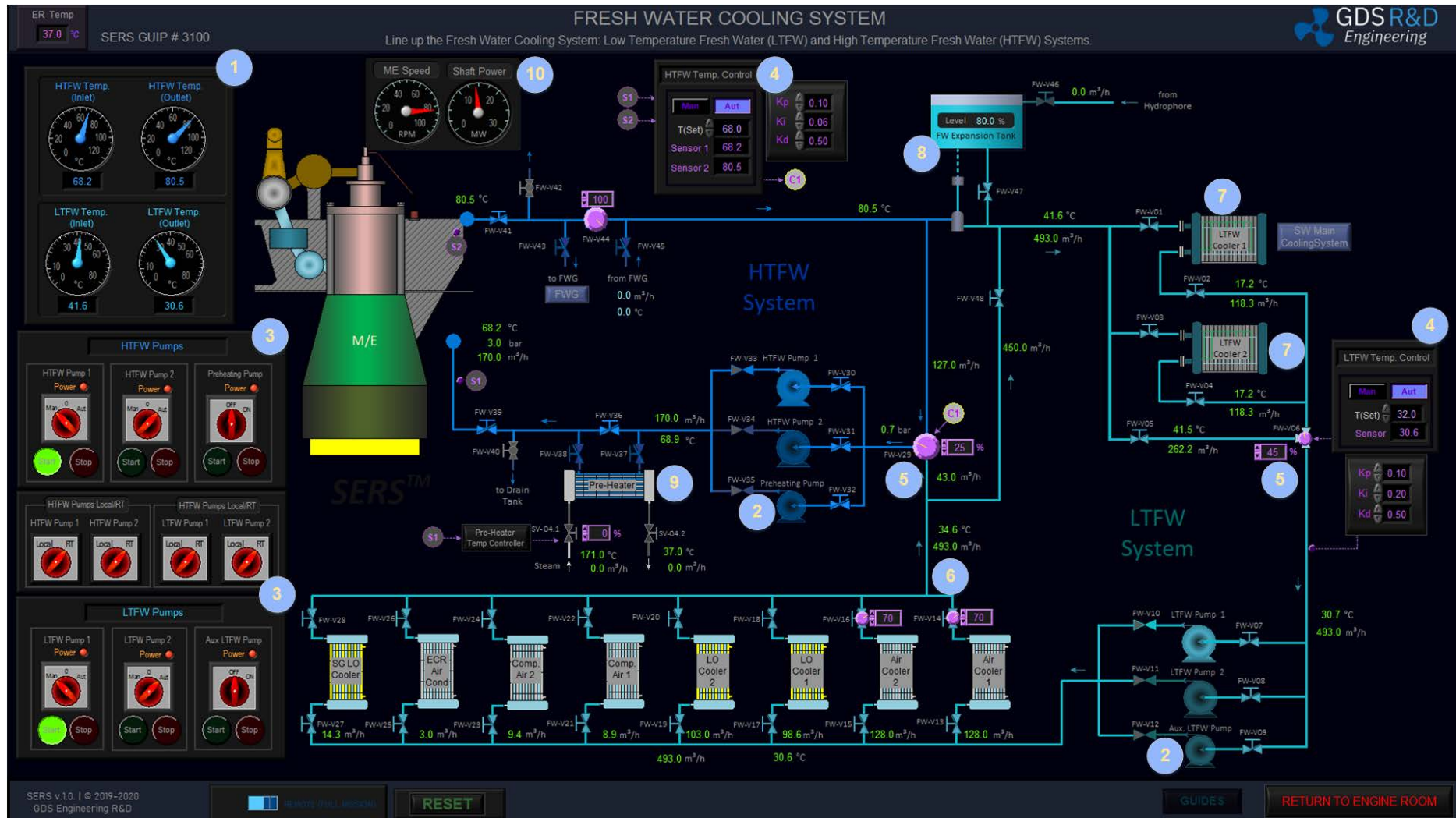
Number	Description	Number	Description
1	Cylinder Oil Day Tank and Flow Regulating Valve	5	Automatic Backflushing Filter
2	LO Sump Tank	6	Main Engine Parameters
3	LO Pumps and Control Panels	7	Mixing Valve
4	LO Coolers	8	Temperature Control Panel

1. Cylinder oil day tank contains cylinder oil for ready to use in main engine cylinders. Cylinder oil day tank contains a digital level gauge, air vent, and oil spill pipe. Cylinder oil day tank can be filled up from cylinder oil service tank at Lubricating Oil Tanks and Transfer System. Cylinder oil flow regulating controller actuates regulating valve for regulating of cylinder oil flow.
2. Sump tank is located under the main engine in the double bottom and is surrounded by cofferdams. Sump tank consists of a digital level gauge, sounding pipe, air vent, temperature indicator, and oil spill pipe.
3. The main lubricating oil system is supplied by two pumps, one of them will be operating and the other is on standby, set for "AUTO" mode at control panel. LO Pumps can be operated from the control panel. Power light, indicates whether electrical supply reaches the panel. If switch position is at "0" position, pumps will not operate. If switch position is at "MANUAL" pumps can be operated if user click the start button. If switch position is at "AUTO" pumps operate according to the system pressure in-line. If pressure decrease, pumps will operate automatically. Local/Remote switch determines the pumps mode. If switch position at "LOCAL" Mode, pumps can be started locally from the local control panel. If switch position is at "REMOTE (RT)" Mode, pumps can be started remotely from ECR Panels: Pumps & Compressor GUI Panel (GUIP#5450).
4. LO is cooled with LTFW at coolers. Main LO Coolers include lubricating oil inlet/outlet valves and LTFW inlet/outlet lines. (LTFW Inlet and Outlet Valves can be opened or closed from Main Engine Fresh Water Cooling System GUI Panel #3100.)
5. Automatic Backflushing filter, when the pressure difference increases, an indication of filter getting clogged, the auto system disables one of the filters for cleaning process, rest of the filters will continue the filtering process and this cycle repeats on. The automatic backflushing filter takes place with the help of the electric motor connected to the shaft, which cleans the filter by compressed air.
6. Main Engine Parameters includes:
 - a. Main Engine rpm
 - b. LO Pressure and Temperature at inlet of Main Engine.
7. Control panel actuates mixing valve. Mixing valve allows the flows from bypass line or coolers outlet lines. In this way lubricating oil temperature can have kept constant in the system.
8. Temperature of lubricating oil can be controlled with control panel. Control panel includes K_p , K_i , and K_d controller parameters. The gain values; K_p , K_i , and K_d , proportional, integrative, and derivative, respectively, affect how fast or slow the system is controlled and the system responds to the controller. Large values may give instable response, therefore, these parameters should be changed with caution.

4.8.2 Valve Numbering

Number	Description	Number	Description
LO.CylV01	Cyl. Oil Day Tank Outlet Valve	LO-V11	LO Pump 1 Relief Valve
LO.CylV02	Cyl. Oil Adjustment Valve	LO-V12	LO Pump 2 Relief Valve
LO-V01	Sump Tank Separator Outlet Valve	LO-V13	LO Cooler 1 Inlet Valve
LO-V02	Sump Tank Fill-Up Valve	LO-V14	LO Cooler 2 Inlet Valve
LO-V03	Sump Tank Inlet Valve (from Tanks)	LO-V15	LO Cooler 1 Outlet Valve
LO-V04	Sump Tank Transfer System Outlet Valve	LO-V16	LO Cooler 2 Outlet Valve
LO-V05	LO Separator Feed Valve	LO-V17	LO By-Pass Valve
LO-V06	LO Sump Tank Outlet Valve	LO-V18	LO Temperature Control Valve
LO-V07	LO Pump 1 Suction Valve	LO-V19	LO By-Pass Filter Inlet Valve
LO-V08	LO Pump 2 Suction Valve	LO-V20	LO Backflushing Inlet Valve
LO-V09	LO Pump 1 Discharge Valve	LO-V21	LO By-Pass Filter Outlet Valve
LO-V10	LO Pump 2 Discharge Valve	LO-V22	LO Backflushing Outlet Valve

4.9 MAIN ENGINE FRESH WATER COOLING (HTFW & LTFW) SYSTEM (GUI PANEL # 3100)



4.9.1 Table of Screen Objects

Number	Description	Number	Description
1	Indicators Panel	6	Auxiliary System Coolers
2	LTFW & HTFW Pumps	7	LTFW Coolers
3	LTFW & HTFW Pumps Control Panels	8	Fresh Water Expansion Tank
4	LTFW & HTFW Temperature Control Panels	9	Preheater
5	LTFW & HTFW Temperature Control Valves	10	ME Speed & Shaft Power Indicators

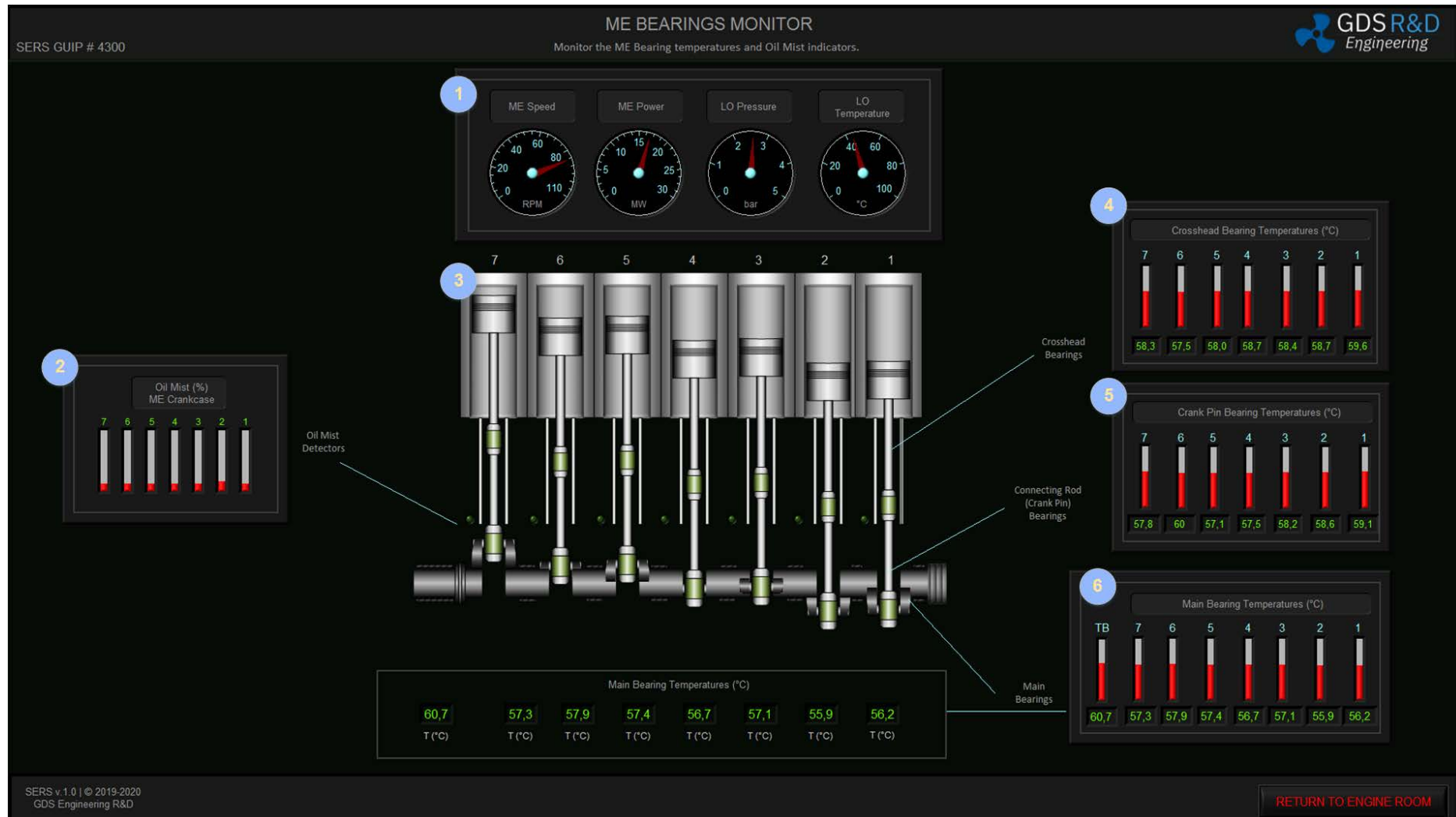
- Indicator Panel includes:
 - HTFW Inlet and Outlet Temperature
 - LTFW Inlet and Outlet Temperature
- Low Temperature Fresh Water (LTFW) Pumps supply auxiliary coolers with LTFW. The Auxiliary Low Temperature Fresh Water (LTFW) Pump also supply auxiliary coolers with LTFW. Emergency generator also supplies Aux. LTFW pump. HTFW Pumps supply the main engine with HTFW. The Preheating Pump supplies main engine with HTFW. Emergency generator also supplies the Preheating Pump. Therefore, this pump is using for preheating.
- LTFW and HTFW Pumps can be operated from the control panel. Power light indicates whether electrical supply reaches the panel. If switch position is at "0" position, pump will not operate. If switch position is at "MANUAL" pump can be operated when user clicks the start button. If switch position is at "AUTO" pump operates according to the system pressure in-line. If pressure decrease, pump will operate automatically. Local/Remote switch determines the pumps mode. If switch position is at "LOCAL" Mode, pumps can be started locally from the local control panel. If switch position is at "REMOTE (RT)" Mode, pumps can be started remotely from ECR Panels: Pumps & Compressor GUI Panel (GUIP#5450). (Preheating and Aux. LTFW Pump can be operated only from local control panels.)
- Temperature of LTFW and HTFW can be controlled with control panel. Control panel actuates LTFW and HTFW Temperature Control Valve. In this way LTFW and HTFW temperature can be kept constant in the system. Control panel includes K_p , K_i , and K_d controller parameters. The gain values; K_p , K_i , and K_d , proportional, integrative, and derivative, respectively, affect how fast or slow the system is controlled and the system responds to the controller. Large values may give instable response, therefore, these parameters should be changed with caution.
- LTFW and HTFW Control Valve regulates the flow of by-pass and cooler/main engine outlet lines. In this way HTFW and LTFW temperature can have kept constant in the system.
- Auxiliary System Coolers includes:
 - Air Cooler 1 and 2
 - LO Cooler 1 and 2
 - Compressed Air Cooler 1 and 2
 - ECR Air Condition and SG LO Cooler
- The central cooling water system is characterized by having two coolers cooled by sea water, and by the other coolers being cooled by central cooling water. By-pass line and Temperature Control Valve will keep the temperature of LTFW constant.

8. The loss in the closed circuit of the central cooling fresh water system is continuously compensated by the expansion tank which also absorbs the effects of pressure increase, which is caused by thermal expansion. Deaerator is located under the expansion tank. Deaerator is a device which releases oxygen and dissolved gasses from the freshwater.
9. Preheater is using for raising the temperature of the main engine. During the warming up the main engine heating with HTFW which is heated by steam at preheating unit. Steam inlet valve is automatically adjusted according to the main engine. Preheater Steam Outlet Valve is an adjustable valve. When the Preheater Temperature Control is at Auto Mode, steam outlet valve position will be changed automatically according to the main engine inlet temperature. Preheater control mode can be changed via clicking to the Preheater Temperature Controller Button. Preheater Temperature Control GUI Panel, also shows the Main Engine Temperature in a time dependent graphic, and valve position in a time dependent graphic.
10. ME RPM indicator shows rpm of the main engine. Shaft power indicator shows output of the shaft.

4.9.2 Valve Numbering

Number	Description	Number	Description	Number	Description
FW-V01	LTFW Cooler 1 FW Inlet Valve	FW-V18	LO Cooler 1 FW Outlet Valve	FW-V35	Preheating Pump Discharge Valve
FW-V02	LTFW Cooler 1 FW Outlet Valve	FW-V19	LO Cooler 2 FW Inlet Valve	FW-V36	Preheater By-Pass Valve
FW-V03	LTFW Cooler 2 FW Inlet Valve	FW-V20	LO Cooler 2 FW Outlet Valve	FW-V37	Preheater FW Inlet Valve
FW-V04	LTFW Cooler 2 FW Outlet Valve	FW-V21	Comp. Air Cooler 1 FW Inlet Valve	FW-V38	Preheater FW Outlet Valve
FW-V05	LTFW By-Pass Valve	FW-V22	Comp. Air Cooler 1 FW Outlet Valve	SV-04.1	Preheater Steam Inlet Valve
FW-V06	LTFW Temperature Control Valve	FW-V23	Comp. Air Cooler 2 FW Inlet Valve	SV-04.2	Preheater Steam Outlet Valve
FW-V07	LTFW Pump 1 Suction Valve	FW-V24	Comp. Air Cooler 2 FW Outlet Valve	FW-V39	HTFW ME Inlet Valve
FW-V08	LTFW Pump 2 Suction Valve	FW-V25	ECR Air Cond. Cooler FW Inlet Valve	FW-V40	HTFW Drain Valve
FW-V09	Aux. LTFW Pump Suction Valve	FW-V26	ECR Air Cond. Cooler FW Outlet Valve	FW-V41	HTFW ME Outlet Valve
FW-V10	LTFW Pump 1 Discharge Valve	FW-V27	SG LO Cooler FW Inlet Valve	FW-V42	HTFW Vent Valve
FW-V11	LTFW Pump 2 Discharge Valve	FW-V28	SG LO Cooler FW Outlet Valve	FW-V43	FWG FW Inlet Valve
FW-V12	Aux. LTFW Pump Discharge Valve	FW-V29	HTFW Temperature Control Valve	FW-V44	FWG FW By-Pass Valve
FW-V13	Air Cooler 1 FW Inlet Valve	FW-V30	HTFW Pump 1 Suction Valve	FW-V45	FWG FW Outlet Valve
FW-V14	Air Cooler 1 FW Outlet Valve	FW-V31	HTFW Pump 2 Suction Valve	FW-V46	FW Expansion Tank Fill-Up Valve
FW-V15	Air Cooler 2 FW Inlet Valve	FW-V32	Preheating Pump Suction Valve	FW-V47	FW Expansion Tank Outlet Valve
FW-V16	Air Cooler 2 FW Outlet Valve	FW-V33	HTFW Pump 1 Discharge Valve	FW-V48	HTFW Recirculation By-Pass Valve
FW-V17	LO Cooler 1 FW Inlet Valve	FW-V34	HTFW Pump 2 Discharge Valve		

4.10 MAIN ENGINE BEARINGS MONITORING (GUI PANEL # 4700)

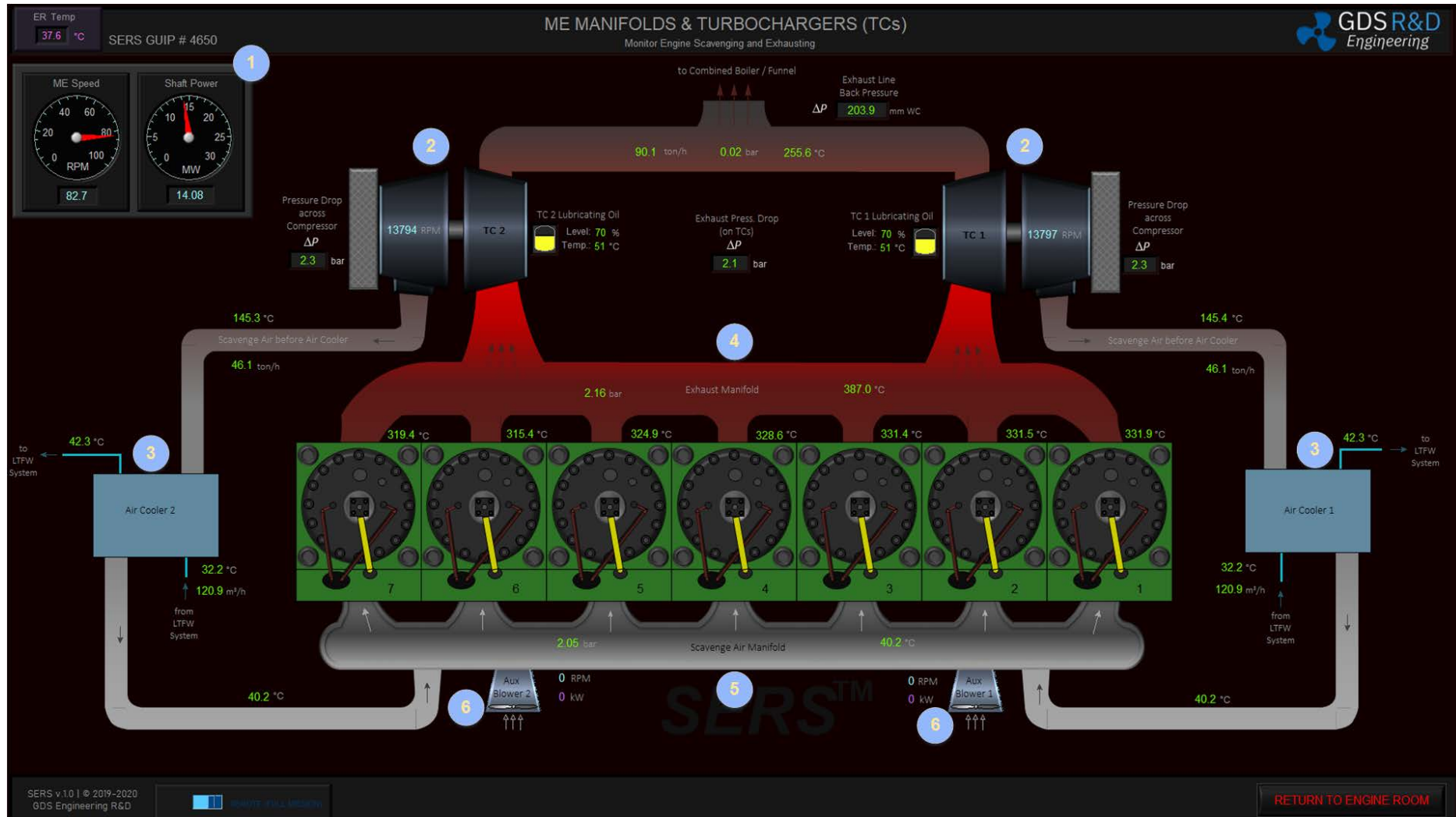


4.10.1 Table of Screen Objects

Number	Description	Number	Description
1	Indicators Panel	4	Crosshead Bearings Temperature Panel
2	Oil Mist Multiplexer Panel	5	Crankpin Bearings Temperature Panel
3	ME Cylinders and Bearings Overview	6	Main Journal Bearings Temperature Panel

1. Indicators Panel includes:
 - a. Main Engine RPM Indicator
 - b. Shaft Power Indicator
 - c. Main LO Pressure Gauge
 - d. Main LO Temperature Gauge
2. The presence of an oil mist in the crankcase is the result of oil vaporization caused by a hot spot. Explosive conditions can result if a buildup of oil mist allowed. The oil mist detector uses photoelectric cells to measure small increases in oil mist. A motor driven fan continuously draws samples of crankcase oil mist through a measuring tube. An increased meter reading and alarm will result, if any crankcase sample contains excessive mist when compared to either clean air or the other crankcase compartments.
3. ME Cylinders and Bearings Overview indicates:
 - a. Oil Mist at Crankcase and Oil Mist Detector Location
 - b. Crosshead Bearing Temperature and Crosshead Bearing Location
 - c. Connecting Rod Temperature and Crankpin Bearing Location
 - d. Main Journal Bearing Temperature and Location
4. Crosshead Bearings Temperature Panel indicates the crosshead bearings temperature.
5. Crankpin Bearings Temperature Panel indicates the crankpin bearings temperature.
6. Main Journal Bearing Temperature Panel indicates the main journal bearings temperature.

4.11 MAIN ENGINE MANIFOLDS & TURBOCHARGERS (GUI PANEL # 4650)

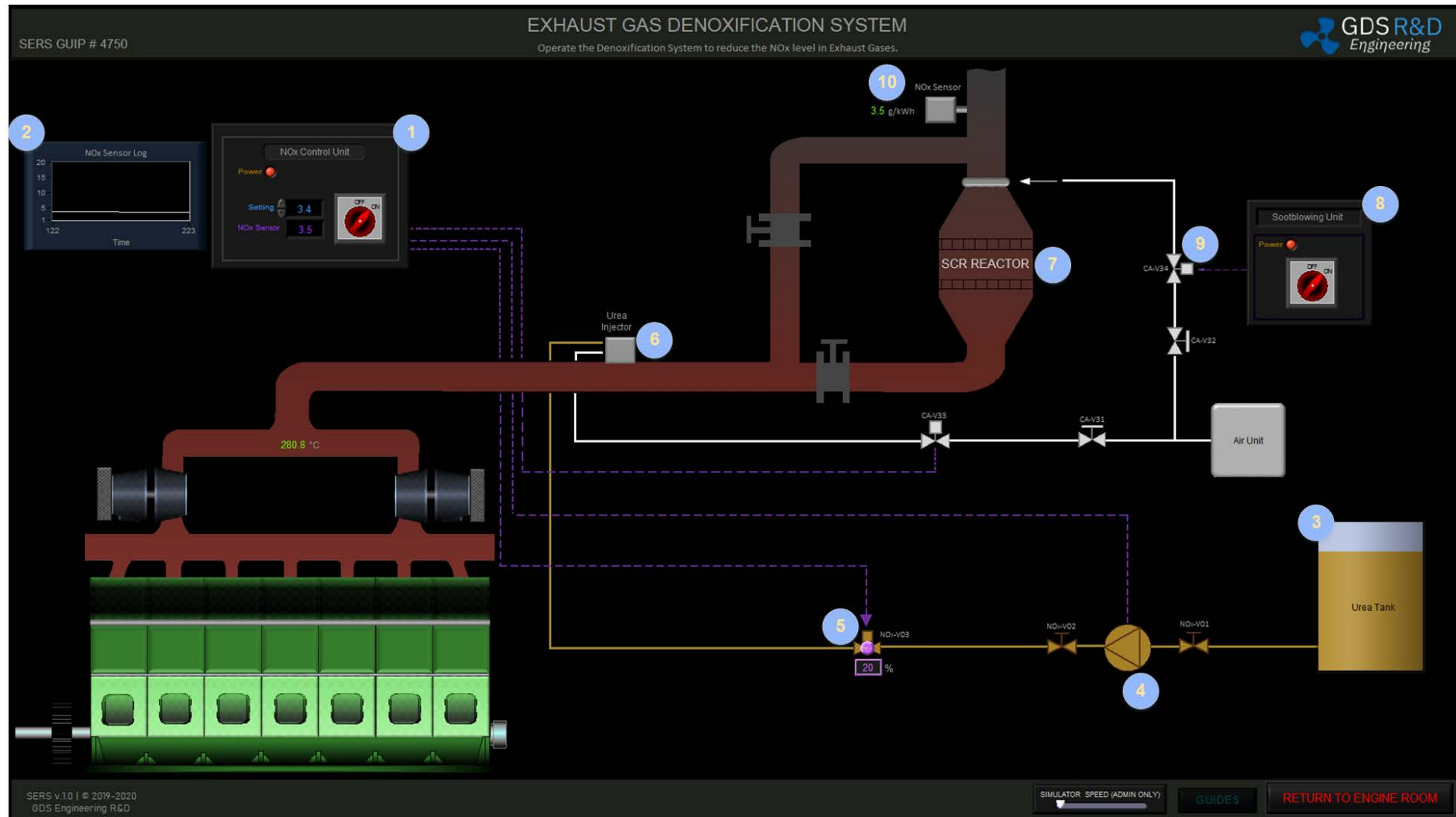


4.11.1 Table of Screen Objects

Number	Description	Number	Description
1	Indicators Panel	4	Exhaust Manifold
2	Turbochargers	5	Scavenge Air Manifold
3	Air Coolers	6	Auxiliary Blowers

- Indicators Panel includes:
 - Main Engine RPM Indicator
 - Shaft Power Indicator
- The Turbine is driven by exhaust gases from the engine and rigidly coupled to a centrifugal air compressor. Thus main engine efficiency and power increases. Following parameters are shown with indicators for Turbochargers (TCs):
 - Internal Lubricating Oil Level and Temperature Indicators
 - TC RPM indicators
 - Pressure Drop across Compressor (ΔP) Indicator
 - Exhaust Gas Pressure Drop on Turbochargers (ΔP) Indicator
- Air coolers** (charge air cooler) uses to cool and therefore, increase the specific density of air prior to combustion in main engine. Air Coolers LTFW Inlet and Outlet Valves can be opened or closed from the Main Engine Fresh Water Cooling System GUI Panel (GUIP #3100).
- Exhaust Line to Economizer provides the following variables displayed on top of this GUI Panel:
 - Flow Rate
 - Temperature
 - Pressure
 - Exhaust Line Backpressure
- Scavenge section provides the following parameters indicators:
 - Flow Rate
 - Charge Air temperature
 - Temperatures (FW and Charge Air inlets and outlets) for Air Coolers.
 - Scavenge Air Manifold Pressure
 - Scavenge Air Manifold Temperature.
- Auxiliary Blowers:** On two-stroke diesels, electrical-driven **auxiliary blowers** are usually provided because the exhaust gas-driven turbocharger cannot provide enough air at low engine speed. Auxiliary blowers are internal parts of the main engine. Auxiliary Blowers can be operated from the ME Control (ECR) GUI Panel (GUIP #2100).

4.12 EXHAUST GAS DENOXIFICATION SYSTEM (GUI PANEL # 4750)



4.12.1 Table of Screen Objects

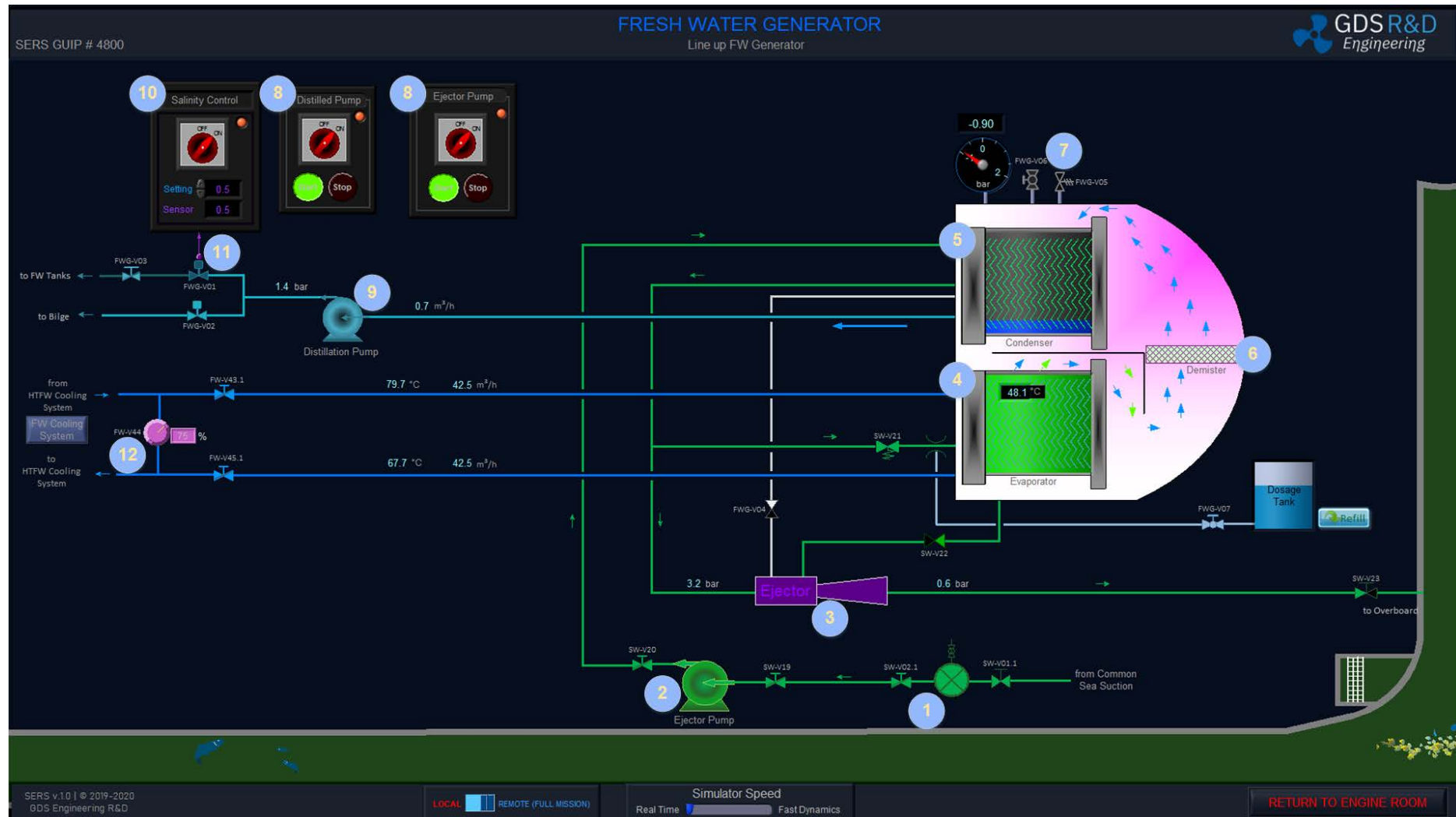
Number	Description	Number	Description
1	NO _x Control Unit Panel	6	Urea Injector
2	NO _x Sensor Log Panel	7	Selective Catalytic Reduction (SCR) Reactor
3	Urea Tank	8	Soot Blowing Unit Control Panel
4	Urea Pump	9	Soot Blowing Air Control Valve
5	Urea Dosing Control Valve	10	NO _x Sensor

1. Amount of NO_x exhaust gas outlet can be controlled from this panel. Control unit panel actuates urea control valve, urea dosing pump and air control valve.
2. The NO_x Sensor Log shows amount of NO_x based on time.
3. The SCR system requires a continuous supply of reducing agent to reduce the nitrogen oxide emissions. Urea tank, stores the urea for using reducing of NO_x.
4. The urea pump unit transfers the urea from the tank to the dosing system and maintains a sufficient pressure in the urea lines.
5. Urea dosing control valve defines the correct urea dosing rate for the injection system and adjusts the urea flow according to the amount of NO_x.
6. The reducing agent is sprayed into the exhaust gas duct and mixed with exhaust gas before it enters the reactor. The urea injection is performed using compressed air.
7. The Selective Catalytic Reduction (SCR) Reactor is a steel casing consisting of an inlet and outlet cone, catalyst layers, a steel structure for supporting the catalyst layers and a soot blowing system.
8. The reactor is equipped with a soot blowing system for keeping the catalyst elements clean. Soot Blowing Control Unit Panel actuates the soot blowing compressed air control valve. When starting the soot blowing unit, compressed air cleans the catalyst element at the reactor.
9. Soot Blowing Air Control Valve, controls the amount of air according to the dirtiness of catalyst layers.
10. The NO_x Sensor is a detecting device which detects the amount of NO_x in exhaust gases.

4.12.2 Valve Numbering

Number	Description	Number	Description
NO _x -V01	Urea Pump Suction Valve	CA-V32	Sootblowing Air Inlet Valve
NO _x -V02	Urea Pump Discharge Valve	CA-V33	Compressed Air Pressure Control Valve
NO _x -V03	Urea Amount Control Valve	CA-V34	Sootblowing Air Pressure Control Valve
CA-V31	Compressed Air Urea Injector Inlet Valve		

4.13 FRESH WATER GENERATOR (FWG) (GUI PANEL # 4750)



4.13.1 Table of Screen Objects

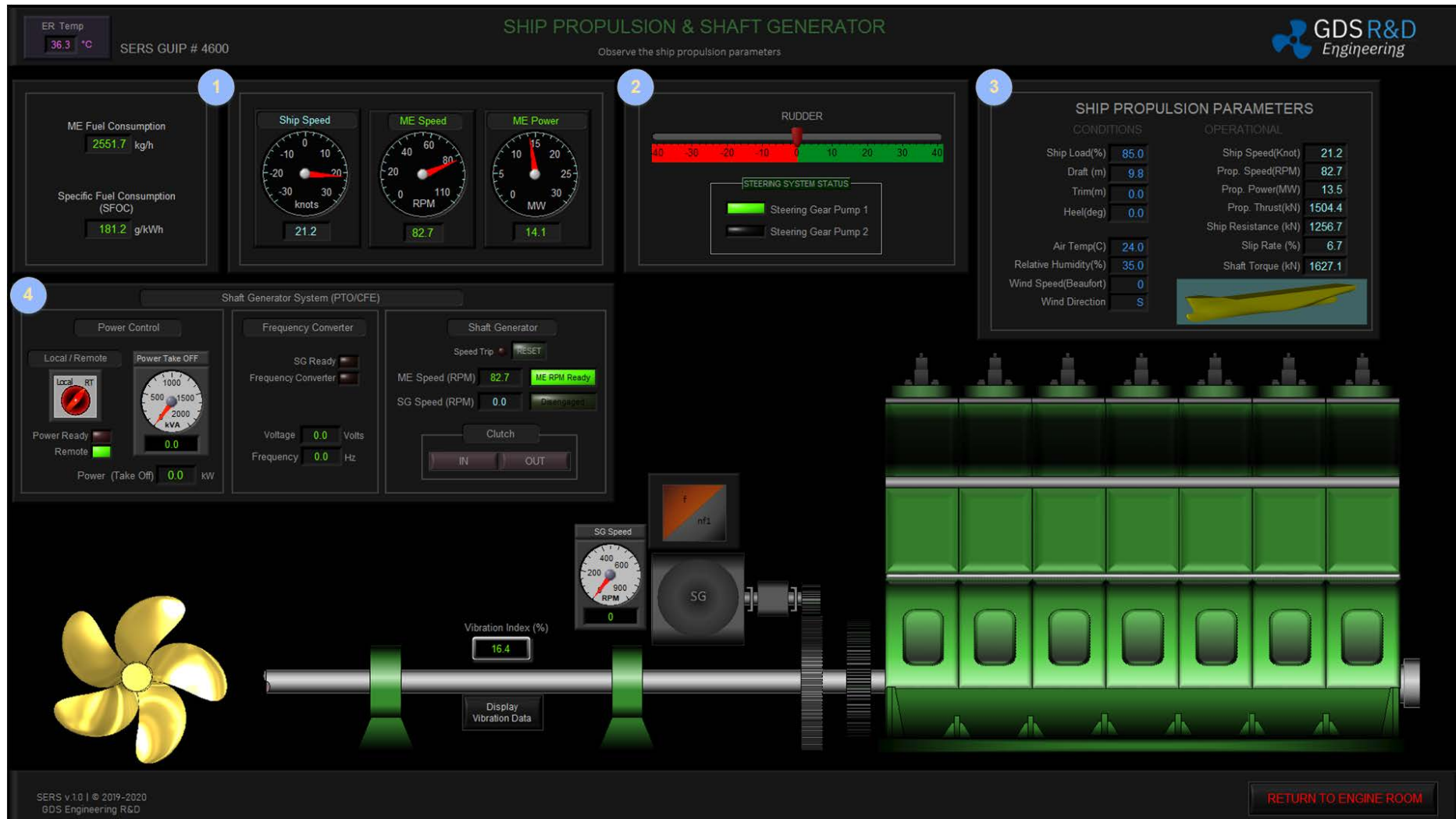
Number	Description	Number	Description
1	Fresh Water Generator Filter	7	Vacuum Gauge, Vacuum Breaker and Safety Valve
2	Ejector Pump	8	Distilled and Ejector Pump Control Panels
3	Ejector	9	Distilled Pump
4	Evaporator	10	Salinity Control Panel
5	Condenser	11	Distilled Water Discharge Valve
6	Demister	12	Jacket Water By-pass Valve

1. Fresh Water Generator Filter is physical barriers used to withhold impurities found in the sea water being pumped. Double protection is provided with Sea Chest Filters and Fresh Water Generator Filter.
2. The ejector pump supplies sea water from sea chest, through ejector and discharge valve again. All of sea water pumped by the ejector pump is not discharged overboard, some of sea water is sent to the evaporator at the bottom of the fresh water generator via feed valve.
3. Vacuum is maintained in the system by ejector. Through a suction process the ejector removes the air and the excessive water from inside the casing.
4. The feed water (sea water) is sent to the evaporator via the ejector pump to evaporate.
5. The vapor generated by the boiling of sea water in the evaporator, condenses in the condenser.
6. Demister allows vapor to pass through but holds water drops (prevent it from going to condenser).
7. The vacuum gauge indicates vacuum in the casing. The vacuum breaker valve is a valve used to adjust the vacuum in the fresh water generator. Safety valve protects the system from excessive pressure in case of increased pressure
8. Distilled and ejector pumps can be operated from the control panel. Power light, indicates whether electrical supply reached the panel. If switch position is at "OFF" position, pump will not operate. If switch position is at "ON" pump can be operated when the user clicks start button.
9. The distilled pump takes distilled water from the condenser and discharges it into the fresh water tanks.
10. Salinity Control, is an instrument which measures and indicates the amount of sodium chloride, expressed in parts per million, in a given sample of water. According to the samples and setting value, opens or closes salinity control valve.
11. Distilled water discharge valve is a solenoid operated valve which is allows distilled water through fresh water tank or bilge according to salinity of water.
12. Jacket water by-pass valve regulates the amount of jacket water evaporator inlet. By-pass valve can be controlled at Main Engine Fresh Water Cooling System GUI Panel (GUIP #3100).

4.13.2 Valve Numbering

Number	Description	Number	Description
SW-V01.1	Fresh Water Generator Filter Inlet Valve	FW-45.1	Jacket Water Outlet Valve
SW-V02.1	Fresh Water Generator Filter Outlet Valve	FWG-V01	Distillation Pump Discharge Valve to FW Tanks
SW-V19	Ejector Pump Suction Valve	FWG-V02	Distillation Pump Discharge Valve to Bilge Tank
SW-V20	Ejector Pump Discharge Valve	FWG-V03	FW Tanks Fill-Up Valve
SW-V21	Evaporator SW Inlet Valve	FWG-V04	Vacuum Valve
SW-V22	Evaporator SW Outlet Valve	FWG-V05	Safety Valve
SW-V23	Overboard Valve	FWG-V06	Vacuum Breaker Valve
FW-V43.1	Jacket Water Inlet Valve	FWG-V07	Dosage Tank Outlet Valve
FW-V44	FWG FW By-Pass Valve		

4.14 SHIP PROPULSION SYSTEM & SHAFT GENERATOR (GUI PANEL # 4600)

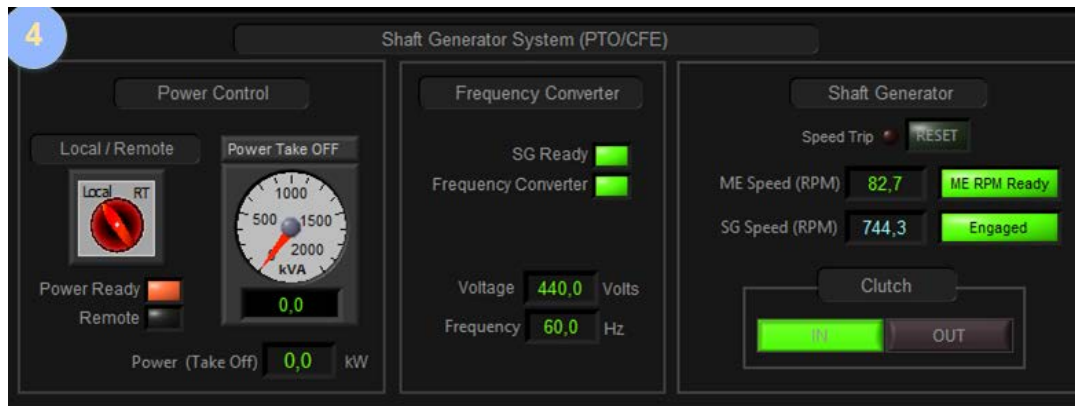


4.14.1 Table of Screen Objects

Number	Description	Number	Description
1	Main Engine Parameters	3	Ship Propulsion Parameters
2	Rudder Indicator & Steering Gear System Status	4	Shaft Generator System (PTO/CFE) Control Panel

1. Main Indicators Panel shows parameters such as:
 - ME Fuel Consumption (kg/h)
 - Specific Fuel Oil Consumption (SFOC)
 - Ship Speed (knots)
 - ME Speed (RPM)
 - ME Power (MW)
2. Rudder indicator indicates the actual rudder position. Steering Gear system status indicates which steering gear pump is operating.
3. Ship Operational Parameters collected two different title:
 - a. Ship Conditions
 - i. Ship Load
 - ii. Ship Draft
 - iii. Ship Trim
 - iv. Ship Heel
 - v. Air Temperature
 - vi. Relative Humidity
 - vii. Wind Speed (Beaufort)
 - viii. Wind Direction
 - b. Ship Operations
 - i. Ship Speed
 - ii. Propulsion RPM
 - iii. Propulsion Power
 - iv. Propulsion Thrust
 - v. Ship Resistance
 - vi. Slip Rate
 - vii. Shaft Torque

4. Shaft Generator can be operated locally from the Shaft Generator System Control Panel. Shaft Generator System Control Panel includes:
- a. Power Control
 - i. Local/Remote Switch
 - ii. Power Ready Status
 - iii. Remote Mode Status
 - iv. Power Take Off Gauge (kW)
 - b. Frequency Converter
 - i. Shaft Generator Ready Status
 - ii. Frequency Converter Ready Status
 - iii. Voltage and Frequency Indicator
 - c. Shaft Generator
 - i. Speed Trip Indicator and Reset Button
 - ii. ME Speed (RPM) and Ready Indicator
 - iii. SG Speed (RPM) and Engage/Disengage Indicator
 - iv. Clutch In/Out Buttons



4.15 ELECTRICAL POWER PLANT (GUI PANEL # 5000)

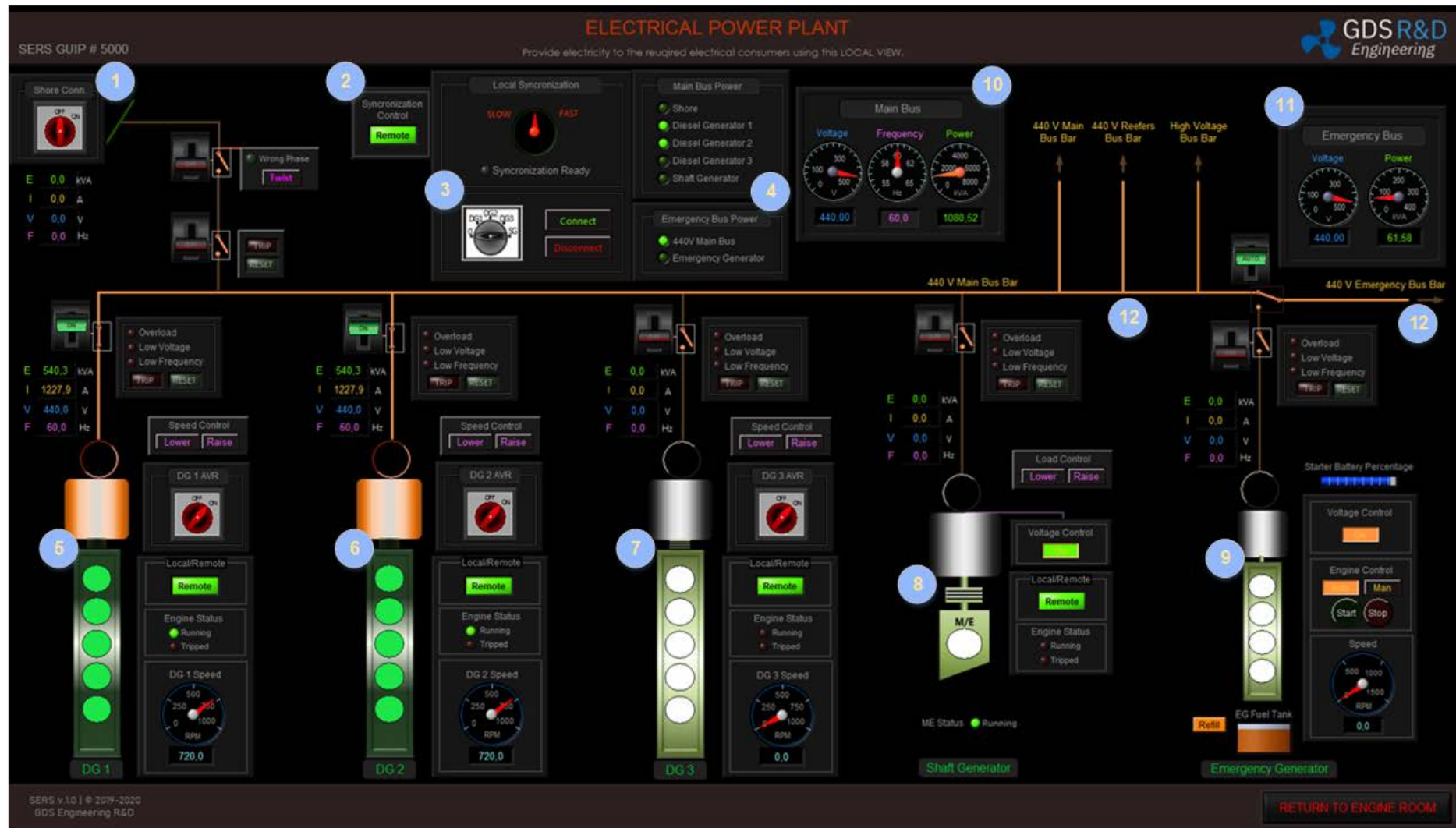


Table of Screen Objects

Number	Description	Number	Description
1	Shore Connection Switch	7	Diesel Generator 3 Layout
2	Synchronization Control Indicator	8	Shaft Generator Layout
3	Local Synchronization Panel	9	Emergency Generator Layout
4	Main and Emergency Bus Bar Panel	10	Main Bus Bar Indicators
5	Diesel Generator 1 Layout	11	Emergency Bus Bar Indicators
6	Diesel Generator 2 Layout	12	Bus Bar Lines

1. When the ship sits on the keel block in the dry dock and the water is removed from the dock to inspect the hull, generators which produce the electrical power, can no longer work due to non-supply of cooling water to the engine. To avoid overheating of moving parts of the engine, the diesel generators has to be switched off before the water is pumped out of the dry dock. Main bus bar and emergency bus bar can supply by shore power when switch position, and Circuit Breakers is at ON position.
2. Synchronization can be controlled Locally or Remotely. Synchronization Control Mode can be changed from ECR Panels: Power Generators GUI Panel (GUIP #5400). If the synchronization Control is at the Local Mode, the generators can be synchronized from the Local Synchronization Panel.
3. Synchronization panels are mainly designed and used to meet power system requirements. This panel function both manually and automatically synchronization for diesel generators, shaft generator locally. The generator to be synchronized is selected from the switch on the Local Synchronization Panel. When the synchronization ready light is on, the selected generator can be connected to the Main Bus Bar. For synchronization of the generator locally, both synchronization control and generator must be in Local Mode.
4. Main bus bar power panel shows which source supplies the main bus bar. Main bus bar can be fed with:
 - a. Shore
 - b. Diesel Generator 1
 - c. Diesel Generator 2
 - d. Diesel Generator 3
 - e. Shaft Generator

Emergency bus bar power panel shows which source supplies the emergency bus bar. Emergency bus bar can be fed with:

- a. Main Bus Bar
- b. Emergency Generator

5. Diesel Generator 1 Layout consists:

a. Diesel Generator 1 Circuit Breaker

The diesel generator 1 fed the bus bar and the circuit breaker is used to draw off the supply.

b. Diesel Generator 1 Trip Indicator Panel

i. Overload

If occur, which is in excess of the rated capacity of diesel generator, overload protection device interrupts the current flow.

ii. Low Voltage

Ensure that if the input voltage drops below certain value, or it will be cut off completely.

iii. Low Frequency

Under the frequency protection is used to protect the generator when the frequency drops below the operating frequency.

c. Diesel Generator 1 Speed Control Panel

The speed control panel controls the rpm of the diesel generator 1. In this way, diesel generator 1 frequency and load can be controlled.

d. Diesel Generator 1 Automatic Voltage Regulator Switch Panel

The function of the Automatic Voltage Regulator (AVR) is to maintain constant voltage and power line conditioning to the equipment under a wide variety of conditions, even when the utility input voltage, frequency or system load vary widely.

e. Engine Status Indicator Panel and RPM Indicator

The engine status indicator panel shows whether diesel generator 1 working or not or tripped. RPM indicator shows the rpm of the diesel generator 1.

f. Local/Remote Indicator

Local/Remote indicator indicates whether diesel generator is at LOCAL or REMOTE Mode.

6. Diesel Generator 2 Layout consists:

- a. Diesel Generator 2 Circuit Breaker
- b. Diesel Generator 2 Trip Indicator Panel
- c. Diesel Generator 2 Speed Control Panel
- d. Diesel Generator 2 Automatic Voltage Regulator Switch Panel
- e. Engine Status Indicator Panel and RPM Indicator
- f. Local/Remote Indicator

7. Diesel Generator 3 Layout consists:

- a. Diesel Generator 3 Circuit Breaker
- b. Diesel Generator 3 Trip Indicator Panel
- c. Diesel Generator 3 Speed Control Panel
- d. Diesel Generator 3 Automatic Voltage Regulator Switch Panel
- e. Engine Status Indicator Panel and RPM Indicator
- f. Local/Remote Indicator

8. Shaft Generator Layout consists:

- a. Shaft Generator Circuit Breaker
- b. Shaft Generator Trip Indicator Panel
- c. Shaft Generator Load Control Panel
- d. Shaft Generator Voltage Control Panel
- e. Shaft Generator Local/Remote Indicator
- f. Shaft Generator Status Indicator Panel

The function of the Voltage Control is to maintain constant voltage and power line conditioning to the equipment under a wide variety of conditions, even when the utility input voltage, frequency or system load vary widely.

Shaft generator status indicator panel shows whether shaft generator working or not or tripped.

9. Emergency Generator (EG) Layout consists:

- a. Emergency Generator Circuit Breaker

Emergency generator feeds the emergency bus bar and circuit breaker are used to draw off the supply.

- b. Emergency Generator Trip Indicator Panel
 - c. Start Battery Percentage Indicator
 - d. Emergency Generator Voltage Control Panel
 - e. Emergency Generator Engine Control Panel

The emergency generator can be started or be stopped from this panel in auto or manual mode. If control mode is at AUTO, emergency generator will be started automatically when emergency bus bar is not feed by any source.
- f. Emergency Generator RPM Indicator

The emergency generator rpm indicator indicates the revolution per minute of emergency generator shaft.
- g. Emergency Generator Fuel Tank

EG fuel tank contains fuel ready for immediate use on emergency generator.
- 10. Main bus bar indicators panel includes:
 - a. Voltmeter
 - b. Frequency Indicator
 - c. Power Indicator

The voltmeter shows the voltage on the Main Bus Bar in Volt unit.
The frequency indicator shows the frequency of the Main Bus Bar in Hertz unit
The power indicator shows the power on the Main Bus Bar in kilovolt-ampere unit.
- 11. Emergency bus bar indicators panel includes:
 - a. Voltmeter
 - b. Power Indicator

The voltmeter shows the voltage on the Emergency Bus Bar in Volt unit.
The power indicator shows the power on the Emergency Bus Bar in kilovolt-ampere unit.
- 12. Electrical power is conducted to the circuit breaker via bus bar lines. Electrical consumers are supplied with electrical power via electrical distribution networks. Bus bar lines are divided into:
 - a. 440 V Main Bus Bar
 - b. 440 V Reefers Bus Bar
 - c. High Voltage Bus Bar
 - d. 440 V Emergency Bus Bar

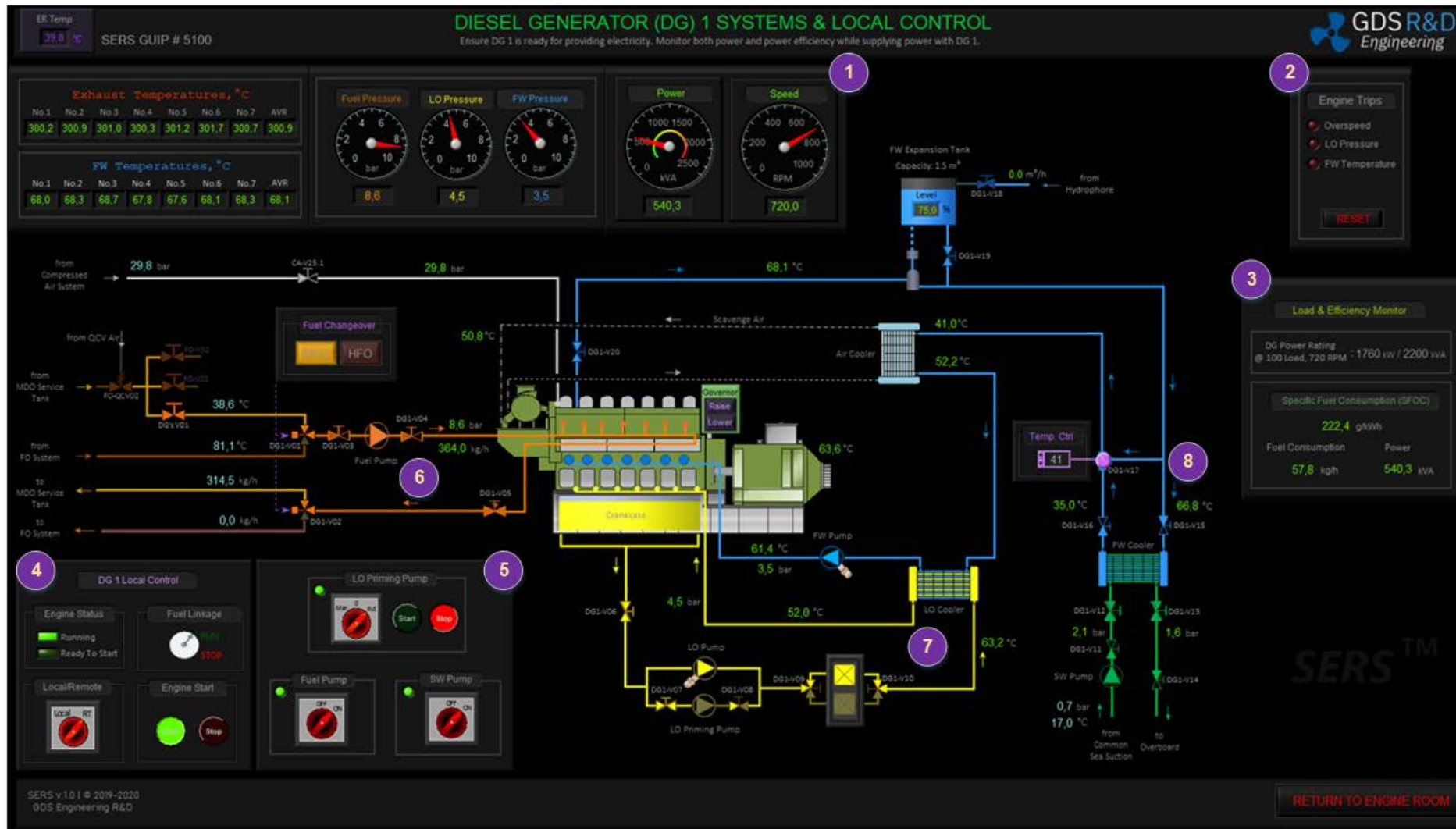
440 V, 220 V, and 24 VDC consumers are supplied with electrical power via 440 V Main Bus Bar. Electrical distribution network of the 440 V, 220 V, and 24 VDC consumers are depicted on GUIP #5600, GUIP #5700, and #5750

Reefers (Refrigerated Containers) are supplied with electrical power via 440 V Reefers Bus Bar. Reefers power distribution are depicted on GUIP #5800.

Bow Thruster is supplied with electrical power via High Voltage Bus Bar. High Voltage Bus Bar is depicted on GUIP #5850.

440 V, 220 V, and 24 VDC emergency consumers are supplied with electrical power via 440 V Emergency Bus Bar. Electrical distribution network of the 440 V, 220 V, and 24 VDC consumers are depicted on GUIP #5650, GUIP #5700, and GUIP #5750.

4.16 DIESEL GENERATOR 1 SYSTEMS & LOCAL CONTROL (GUI PANEL # 5100)



4.16.1 Table of Screen Objects

Number	Description	Number	Description
1	Diesel Generator 1 Parameters Panel	5	Diesel Generator 1 Pumps Control Panel
2	Engine Trips Panel	6	Diesel Generator 1 Fuel System Layout
3	Load & Efficiency Monitor Panel	7	Diesel Generator 1 LO System Layout
4	Diesel Generator 1 Local Control Panel	8	Diesel Generator 1 Cooling Water Layout

1. Diesel Generator 1 Parameters Panel includes:
 - a. Exhaust Gas Temperature Panel
 - b. Fresh Water Temperature Panel
 - c. Diesel Generator 1 Fuel Oil Inlet Pressure Gauge
 - d. Diesel Generator 1 Lubricating Oil Inlet Pressure Gauge
 - e. Diesel Generator Fresh Water Inlet Pressure Gauge
 - f. Diesel Generator 1 Power Indicator
 - g. Diesel Generator 1 RPM Indicator
2. Engine Trips Panel includes:
 - a. Overspeed
 - b. LO Pressure Low
 - c. FW Temperature High
3. Load and efficiency monitor panel indicates some parameters about efficiency and load of diesel generator 1 such as:
 - a. DG-1 Power Rating
 - b. SFOC and Fuel Consumption
 - c. Engine Power Output
4. Diesel Generator 1 Local Control Panel includes controls and indicators such as:
 - a. Engine Status

Engine status indicates whether diesel generator 1 operates and ready to start. If compressed air pressure, fuel pressure, LO pressure is enough and the cooling water system is operating, Ready to Start indicator will turn green.
 - b. Fuel Linkage Control

User can command fuel linkage with fuel linkage control. In this way fuel linkage allows the fuel inlet through diesel generator 1.

- c. Local/Remote Switch

If switch position is at “LOCAL” diesel generator 1 can be started from local panel. If switch position is at “REMOTE (RT)” diesel generator 1 can be started from ECR Panels: Power Generators (GUIP #5400)
 - d. Engine Start

Diesel generator can be started or stopped from this panel locally.
5. Diesel Generator 1 Pumps Control Panel includes:
- a. LO Priming Pump Control Panel

LO Priming Pump control panel, controls lubricating oil priming pump. Power light, indicates whether electrical supply reached the panel. If switch position is at “0” position, LO Priming Pump will not operate. If switch position is at “MANUAL” LO Priming Pump can be operated if user click the start button. If switch position is at “AUTO” LO Priming Pump will be operated with timer.
 - b. Fuel Oil Pump Control Panel

The FO Pump control panel, controls the fuel oil pump. If the panel supplied with electricity and switch is at ON position, fuel pump will start. If switch is at OFF position, pump will stop.
 - c. SW Pump Control Panel

Sea water Pump control panel, controls the sea water pump. If the panel supplied with electricity and switch is at ON position, pump will start. If switch is at OFF position, pump will stop.
6. Diesel Generator 1 Fuel Oil System Layout includes:
- a. Fuel Changeover Panel

Two buttons allow the user to control which type of fuel will be used in Diesel Generator 1. Fuel change-over panel controls inlet and outlet lines via three-way valves.
 - b. Diesel Generator 1 Fuel Inlet Lines

Diesel generator can be supplied with Marine Diesel Oil or Heavy Fuel Oil. Mixing Valve allows the fuel flow.

- c. Diesel Generator 2 Fuel Outlet Lines
Fuel returns Marine Diesel Oil Service Tank or Fuel Oil System in this line. Mixing Valve at inlet and outlet lines, regulates the fuel flow.
 - d. Diesel Generators Isolation Valve
Diesel Generators Isolation valve (DG's V01) is an emergency shut off valve in case of fire situation. When the Isolation Valve is closed, the fuel to the Diesel Generator 1, Diesel Generator 2, and Diesel Generator 3 is cut off.
 - e. Diesel Generator 1 Fuel Pump is supplying fuel to diesel generator high pressure fuel pumps.
 - f. Diesel Generator 1 Pressure Regulating Valve, ensures a constant pressure supply to diesel generator 1.
7. Diesel Generator 1 Lubricating Oil System Layout consists:
- a. Diesel Generator 1 Lubricating Oil Pump Unit
Diesel generator 1 lubricating oil pump unit supplies lubricating oil to the engine bearings, and cooling oil to the pistons. Lubricating oil is pumped from sump tank to the LO Cooler. Pump Unit includes priming pump and gear driven pump.
 - b. Duplex Filter
Duplex filters are combined of two simplex filter. One filter is in use while the other is ready. When the filter in use becomes dirty, the clean one is operated and the dirty one is removed.
 - c. Lubricating Oil Cooler
Low Temperature Fresh Water (LTFW) cools the Lubricating oil at LO Cooler.

8. Diesel Generator 1 Cooling Water System Layout:**a. Diesel Generator 1 Fresh Water Pump**

After cooling the diesel generator 1, the fresh water passes to a sea water circulated cooler and then into the jacket water pump. It is then pumped around the cylinder jackets and cylinder heads.

b. Diesel Generator 1 Sea Water Pump

Sea water cools Fresh water, which cools the diesel generator 1, lubricating oil and diesel generator 1 charge air. Sea water pump pumps the sea water through FW Main Cooler.

c. Diesel Generator 1 FW Cooler

Fresh water is cooled by sea water at fresh water cooler. After the cooling of fresh water, sea water discharged overboard. Fresh water cools air cooler and lubricating oil cooler.

d. Temperature Control Valve

The temperature control valve provides a constant Fresh Water temperature.

e. Diesel Generator 1 Air Cooler

Air cooler, (or the charge air cooler) is a heat exchanger is used for cooling. The specific density of air will increase with air cooler.

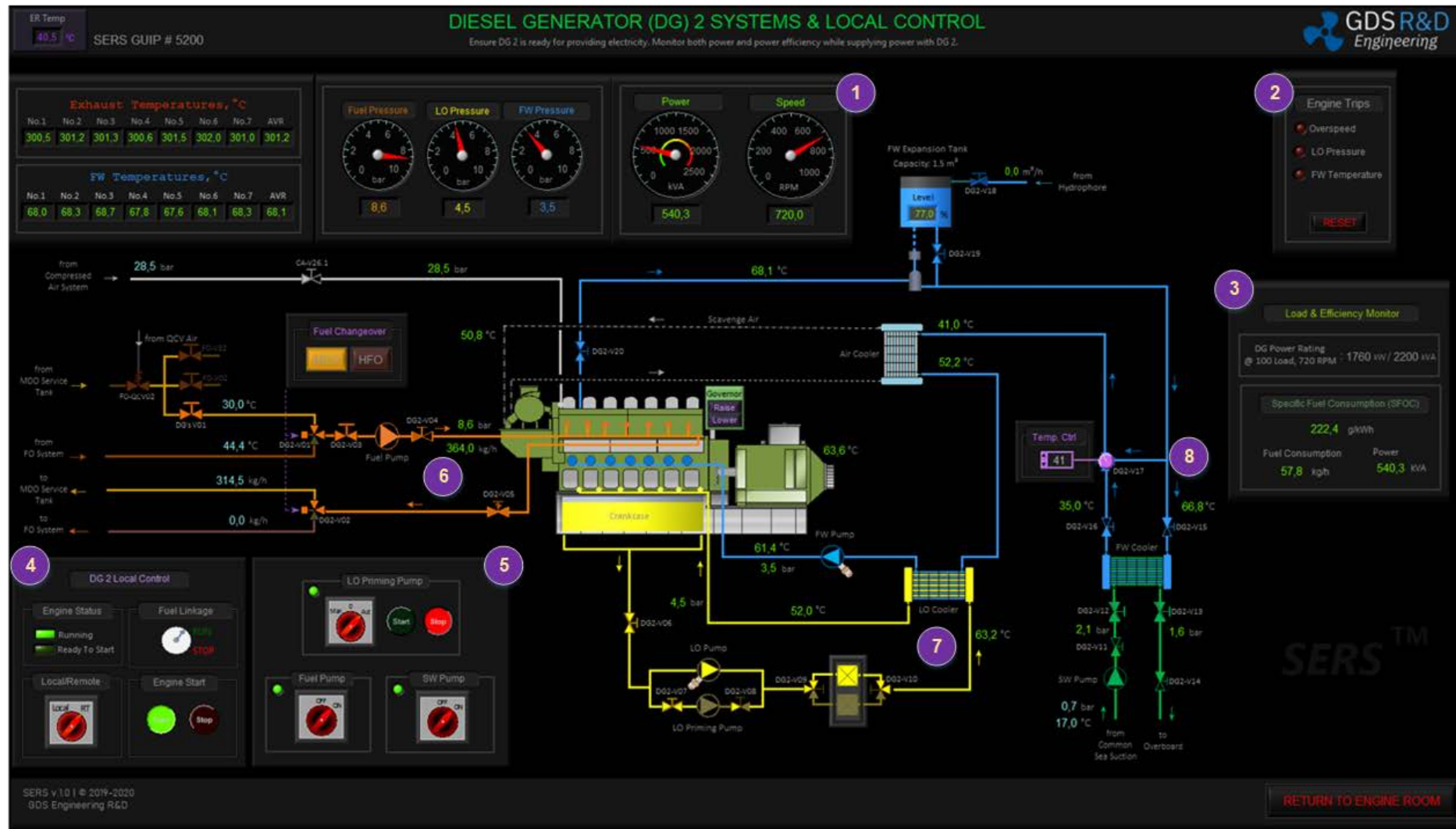
f. Diesel Generator 1 Expansion Tank

The expansion tank, which maintains a static head in the system in this way prevents the pumps from cavitation. Expansion tank supplies liquid to make up for system losses. Deaerator is located under the expansion tank. Deaerator is a device which releases oxygen and dissolved gasses from the freshwater.

4.16.2 Valve Numbering

Number	Description	Number	Description
CA-V25.1	Diesel Generator 1 Starting Air Inlet Valve	DG1-V10	Duplex Filter LO Outlet Valve
FO-QCV02	MDO Service Tank Quick Closing Valve	DG1-V11	SW Pump Discharge Valve
DG's V01	Diesel Generators Isolation Valve	DG1-V12	FW Cooler SW Inlet Valve
DG1-V01	DG 1 Fuel Changeover Valve	DG1-V13	FW Cooler SW Outlet Valve
DG1-V02	DG 1 Fuel Recirculation Valve	DG1-V14	SW Overboard Valve
DG1-V03	DG 1 Fuel Pump Suction Valve	DG1-V15	FW Cooler FW Inlet Valve
DG1-V04	DG 1 Fuel Pump Discharge Valve	DG1-V16	FW Cooler FW Outlet Valve
DG1-V05	DG 1 Fuel Pressure Regulating Valve	DG1-V17	FW Temperature Control Valve
DG1-V06	DG 1 LO Sump Tank Outlet Valve	DG1-V18	FW Expansion Tank Fill-Up Valve
DG1-V07	LO Priming Pump Suction Valve	DG1-V19	FW Expansion Tank Outlet Valve
DG1-V08	LO Priming Pump Discharge Valve	DG1-V20	DG 1 FW Outlet Valve
DG1-V09	Duplex Filter LO Inlet Valve		

4.17 DIESEL GENERATOR 2 SYSTEMS & LOCAL CONTROL (GUI PANEL # 5200)



4.17.1 Table of Screen Objects

Number	Description	Number	Description
1	Diesel Generator 2 Parameters Panel	5	Diesel Generator 2 Pumps Control Panel
2	Engine Trips Panel	6	Diesel Generator 2 Fuel System Layout
3	Load & Efficiency Monitor Panel	7	Diesel Generator 2 LO System Layout
4	Diesel Generator 2 Local Control Panel	8	Diesel Generator 2 Cooling Water Layout

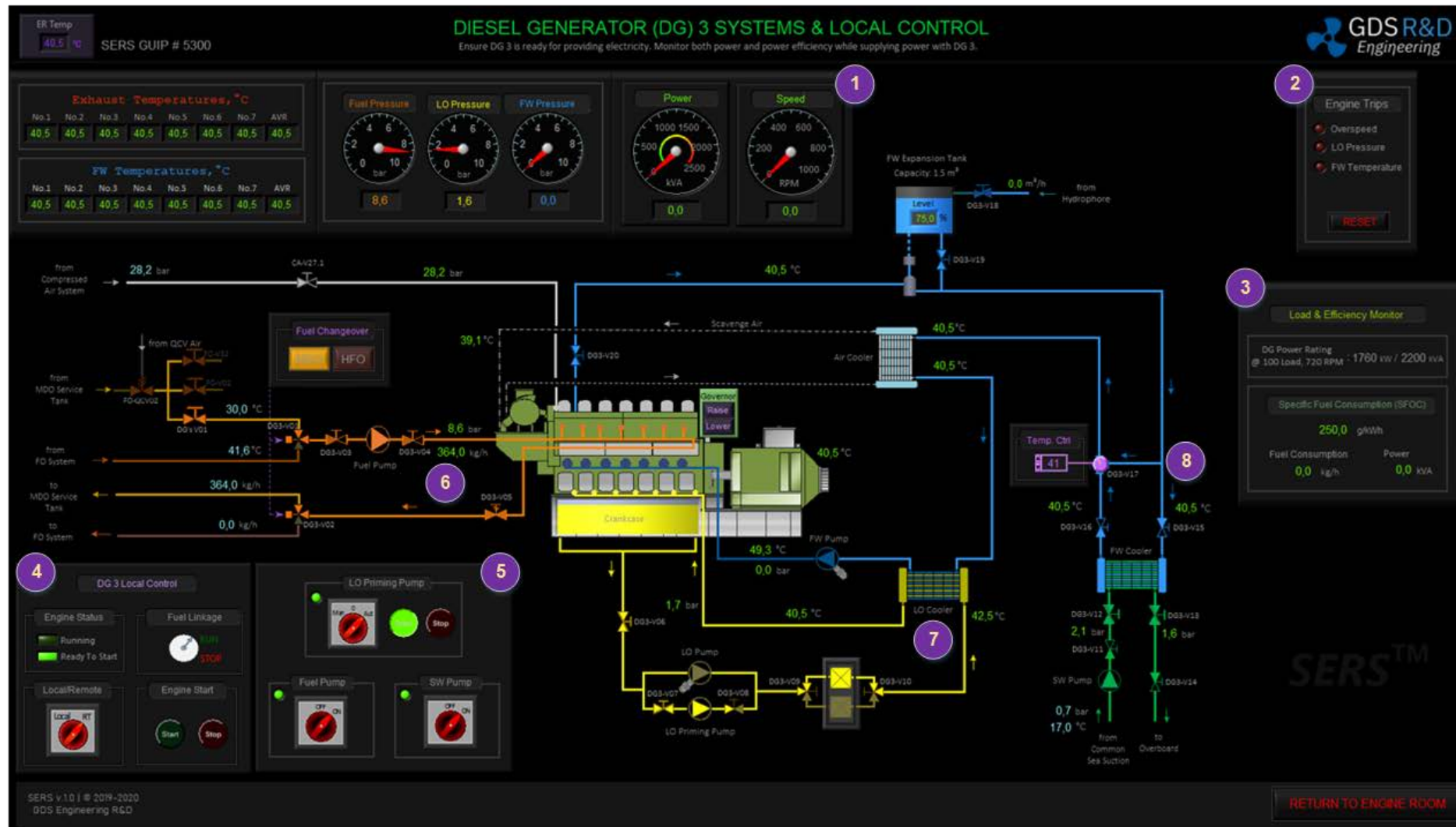
1. Diesel Generator 2 Parameters Panel includes:
 - a. Exhaust Gas Temperature Panel
 - b. Fresh Water Temperature Panel
 - c. Diesel Generator 2 Fuel Oil Inlet Pressure Gauge
 - d. Diesel Generator 2 Lubricating Oil Pressure Gauge
 - e. Diesel Generator Cooling Water Inlet Pressure Gauge
 - f. Diesel Generator 2 RPM Indicator
 - g. Diesel Generator 2 Power Indicator
2. Engine Trips Panel includes:
 - a. Overspeed
 - b. LO Pressure Low
 - c. FW Temperature High
3. Load and efficiency monitor panel indicates some parameters about efficiency and load of diesel generator 1 such as:
 - a. DG-2 Power Rating
 - b. SFOC and Fuel Consumption
 - c. Engine Power Output

4. Diesel Generator 2 Local Control Panel includes controls and indicators such as:
 - a. Engine Status
 - b. Fuel Linkage Control
 - c. Local/Remote Switch:
 - d. Engine Start/Stop Buttons
5. Diesel Generator 2 Pumps Control Panel includes:
 - a. LO Priming Pump Control Panel
 - b. Fuel Oil Pump Control Panel
 - c. SW Pump Control Panel
6. Diesel Generator 2 Fuel Oil System Layout includes:
 - a. Fuel Changeover Panel
 - b. Diesel Generator 2 Fuel Inlet Lines
 - c. Diesel Generator 2 Fuel Outlet Lines
 - d. Diesel Generator 2 Fuel Pump
 - e. Diesel Generators Isolation Valve
 - f. Diesel Generator 2 Pressure Regulating Valve
7. Diesel Generator 2 Lubricating Oil System Layout consists:
 - a. Diesel Generator 2 Lubricating Oil Pump Unit
 - b. Duplex Filter
 - c. Lubricating Oil Cooler
8. Diesel Generator 2 Cooling Water System Layout:
 - a. Diesel Generator 2 Fresh Water Pump
 - b. Diesel Generator 2 Sea Water Pump
 - c. Diesel Generator 2 FW Cooler
 - d. Temperature Control Valve
 - e. Diesel Generator 2 Air Cooler
 - f. Diesel Generator 2 Expansion Tank

4.17.2 Valve Numbering

Number	Description	Number	Description
CA-V26.1	Diesel Generator 2 Starting Air Inlet Valve	DG2-V10	Duplex Filter LO Outlet Valve
FO-QCV02	MDO Service Tank Quick Closing Valve	DG2-V11	SW Pump Discharge Valve
DG's V01	Diesel Generators Isolation Valve	DG2-V12	FW Cooler SW Inlet Valve
DG2-V01	DG 2 Fuel Changeover Valve	DG2-V13	FW Cooler SW Outlet Valve
DG2-V02	DG 2 Fuel Recirculation Valve	DG2-V14	SW Overboard Valve
DG2-V03	DG 2 Fuel Pump Suction Valve	DG2-V15	FW Cooler FW Inlet Valve
DG2-V04	DG 2 Fuel Pump Discharge Valve	DG2-V16	FW Cooler FW Outlet Valve
DG2-V05	DG 2 Fuel Pressure Regulating Valve	DG2-V17	FW Temperature Control Valve
DG2-V06	DG 2 LO Sump Tank Outlet Valve	DG2-V18	FW Expansion Tank Fill-Up Valve
DG2-V07	LO Priming Pump Suction Valve	DG2-V19	FW Expansion Tank Outlet Valve
DG2-V08	LO Priming Pump Discharge Valve	DG2-V20	DG 2 FW Outlet Valve
DG2-V09	Duplex Filter LO Inlet Valve		

4.18 DIESEL GENERATOR 3 (GUI PANEL # 5300)



4.18.1 Table of Screen Objects

Number	Description	Number	Description
1	Diesel Generator 3 Parameters Panel	5	Diesel Generator 3 Pumps Control Panel
2	Engine Trips Panel	6	Diesel Generator 3 Fuel System Layout
3	Load & Efficiency Monitor Panel	7	Diesel Generator 3 LO System Layout
4	Diesel Generator 3 Local Control Panel	8	Diesel Generator 3 Cooling Water Layout

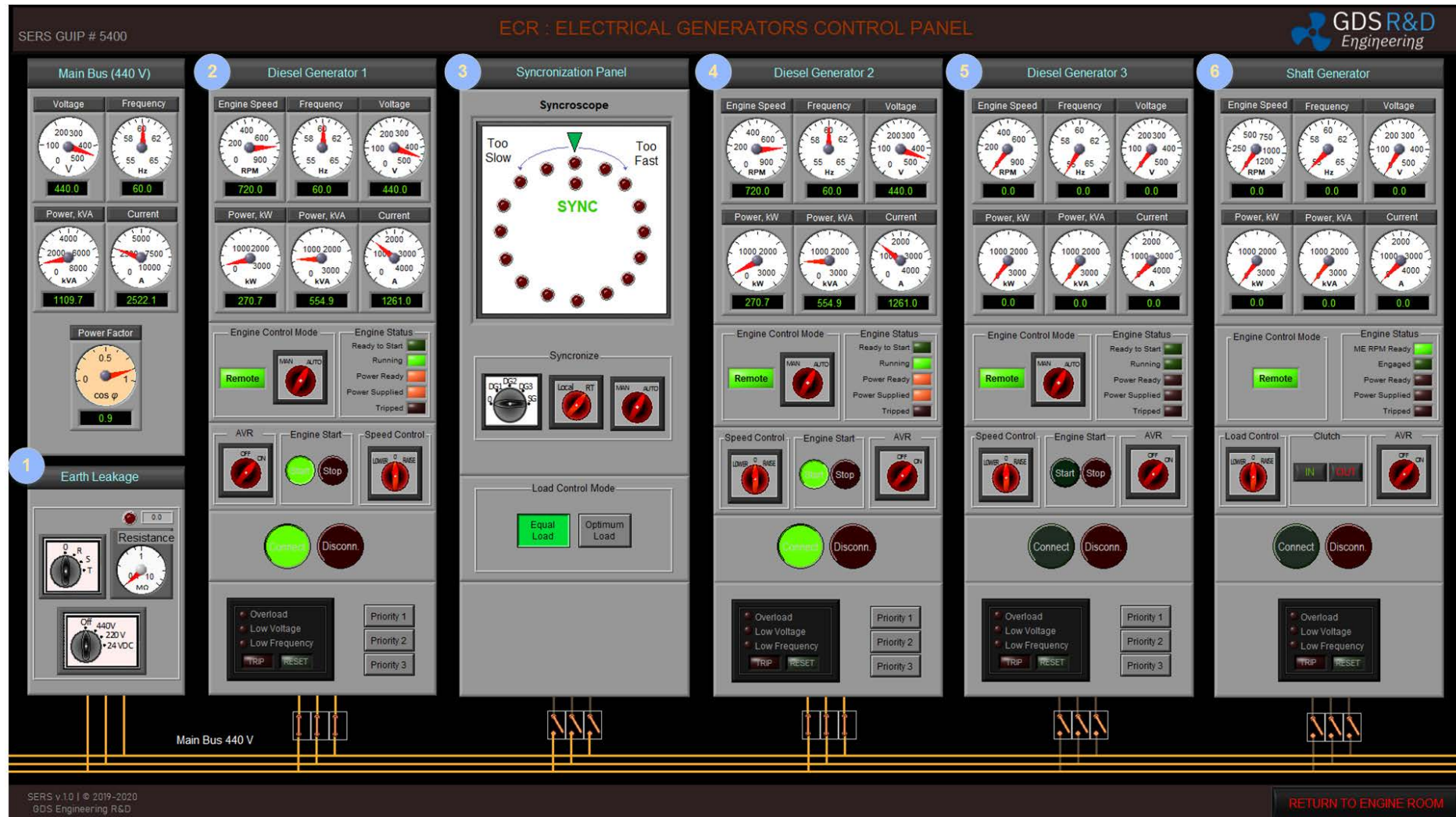
1. Diesel Generator 3 Parameters Panel includes:
 - a. Exhaust Gas Temperature Panel
 - b. Fresh Water Temperature Panel
 - c. Diesel Generator 3 Fuel Oil Inlet Pressure Gauge
 - d. Diesel Generator 3 Lubricating Oil Pressure Gauge
 - e. Diesel Generator Cooling Water Inlet Pressure Gauge
 - f. Diesel Generator 3 RPM Indicator
 - g. Diesel Generator 3 Power Indicator
2. Engine Trips Panel includes:
 - a. Overspeed
 - b. LO Pressure Low
 - c. FW Temperature High
3. Load and efficiency monitor panel indicates some parameters about efficiency and load of diesel generator 1 such as:
 - a. DG-3 Power Rating
 - b. SFOC and Fuel Consumption
 - c. Engine Power Output

4. Diesel Generator 3 Local Control Panel includes controls and indicators such as:
 - a. Engine Status
 - b. Fuel Linkage Control
 - c. Local/Remote Switch:
 - d. Engine Start
5. Diesel Generator 3 Pumps Control Panel includes:
 - a. LO Priming Pump Control Panel
 - b. Fuel Oil Pump Control Panel
 - c. SW Pump Control Panel
6. Diesel Generator 3 Fuel Oil System Layout includes:
 - a. Fuel Changeover Panel
 - b. Diesel Generator 3 Fuel Inlet Lines
 - c. Diesel Generator 3 Fuel Outlet Lines
 - d. Diesel Generator 3 Fuel Pump
 - e. Diesel Generators Isolation Valve
 - f. Diesel Generator 3 Pressure Regulating Valve
7. Diesel Generator 3 Lubricating Oil System Layout consists:
 - a. Diesel Generator 3 Lubricating Oil Pump Unit
 - b. Duplex Filter
 - c. Lubricating Oil Cooler
8. Diesel Generator 3 Cooling Water System Layout:
 - a. Diesel Generator 3 Fresh Water Pump
 - b. Diesel Generator 3 Sea Water Pump
 - c. Diesel Generator 3 FW Cooler
 - d. Temperature Control Valve
 - e. Diesel Generator 3 Air Cooler
 - f. Diesel Generator 3 Expansion Tank

4.18.2 Valve Numbering

Number	Description	Number	Description
CA-V27.1	Diesel Generator 3 Starting Air Inlet Valve	DG3-V10	Duplex Filter LO Outlet Valve
FO-QCV02	MDO Service Tank Quick Closing Valve	DG3-V11	SW Pump Discharge Valve
DG's V01	Diesel Generators Isolation Valve	DG3-V12	FW Cooler SW Inlet Valve
DG3-V01	DG 3 Fuel Changeover Valve	DG3-V13	FW Cooler SW Outlet Valve
DG3-V02	DG 3 Fuel Recirculation Valve	DG3-V14	SW Overboard Valve
DG3-V03	DG 3 Fuel Pump Suction Valve	DG3-V15	FW Cooler FW Inlet Valve
DG3-V04	DG 3 Fuel Pump Discharge Valve	DG3-V16	FW Cooler FW Outlet Valve
DG3-V05	DG 3 Fuel Pressure Regulating Valve	DG3-V17	FW Temperature Control Valve
DG3-V06	DG 3 LO Sump Tank Outlet Valve	DG3-V18	FW Expansion Tank Fill-Up Valve
DG3-V07	LO Priming Pump Suction Valve	DG3-V19	FW Expansion Tank Outlet Valve
DG3-V08	LO Priming Pump Discharge Valve	DG3-V20	DG 3 FW Outlet Valve
DG3-V09	Duplex Filter LO Inlet Valve		

4.19 GENERATOR CONTROL PANELS (GUI PANEL # 5400)



4.19.1 Table of Screen Objects

Number	Description	Number	Description
1	Main Bus & Earth Leakage Panels	4	Diesel Generator 2 Remote Control Panel
2	Diesel Generator 1 Remote Control Panel	5	Diesel Generator 3 Remote Control Panel
3	Synchronization Panel	6	Shaft Generator Panel

1. Main Bus and Earth Leakage Panels:

- Main bus supplies all consumers with diesel generators and shaft generator. Main bus panel includes voltage, frequency, power, current and power factor indicators.
- The user toggles the switch to 440 V, 220 V, or 24 V DC. Then toggles the phase switch to R, S, or, T to check the ship's electrical consumers insulation resistance to earth. Thus, the resistance in the selected line is observed.

2. Diesel generator 1 remote control panel provides control ability of diesel generator 1 remotely. Diesel generator 1 remote control panel includes:

- Diesel Generator 1 Parameters
 - Engine RPM Indicator
 - Frequency Indicator
 - Voltmeter
 - Power (kW) Indicator
 - Power (kVA) Indicator
 - Current Indicator.
- Engine Control Mode
 - Manual

Diesel Generator 1 can be connected or disconnected to the Main Bus Bar manually. If the Diesel Generator 1 is at Local Mode, connection/disconnection to the Main Bus Bar is provided from the Electrical Power Plant GUI Panel (GUIP #5000) via DG 1 Circuit Breaker. If the Diesel Generator 1 is at Remote Mode, connection/disconnection to the Main Bus Bar is provided from ECR Panels: Power Generation GUI Panel (GUIP #5400) via Connect/Disconnect Buttons on the Diesel Generator 1 Remote Panel.

ii. Auto

Diesel Generator 1 can be connected or disconnected to the Main Bus Bar automatically. If the Diesel Generator 1 is at AUTO Mode, (regardless of the Load Control Mode) will be connected to the Main Bus Bar automatically in case of Black Out. If the Diesel Generator 1 is at AUTO and Load Control Mode is at OPTIMUM LOAD, Diesel Generator 1 will be connected or disconnected to the Main Bus Bar according to the power on the Main Bus Bar. (For instance, if the power on the main bus bar is too high, diesel generator 1 will be connected to the main bus bar for prevention of Black Out situation. If the power on the main bus bar is too low, diesel generator 1 will be disconnected from the main bus bar for energy saving.)

- c. Engine Status Indicator includes:
 - i. Ready to Start Diesel Generator 1 is ready to start.
 - ii. Running Diesel Generator 1 is running but power is not ready.
 - iii. Power Ready Diesel Generator 1 is ready for connecting to the Main Bus Bar.
 - iv. Power Supplied Diesel Generator 1 is connected to the Main Bus Bar.
 - v. Tripped Diesel Generator 1 is tripped.
- d. Automatic Voltage Regulator (AVR), automatic voltage regulator can be ON remotely by the switch.
- e. Engine Start/Stop Buttons, diesel generator 1 can be started or stopped from this panel remotely.
- f. Speed Control Switch
 - i. Speed control switch controls the rpm of the diesel generator 1. In this way, diesel generator 1 frequency and load can be controlled remotely.
 - ii. If switch position is at RAISE, rpm of the diesel generator 1 will be increased. If switch position is at LOWER, rpm of the diesel generator will be decreased.
- g. Circuit Breaker Connect/Disconnect Button
- h. Diesel Generator 1 Trips Indicator
- i. Diesel Generator 1 Priority Selection Buttons (Note: Priority selection is available for the Diesel Generators. Shaft Generator is not included priority selection.) (Note: Priority Selection is available when the Diesel Generators Load Control Mode is at "Optimum Load". Priority Selection is not available when the Diesel Generators Load Control Mode is at "Equal Load".)
 - i. Priority 1 The Generator is connected to the Main Bus Bar should be Priority 1.
 - ii. Priority 2 In case of a power increase in the Main Bus Bar, the generator to be connected to the main bus bar should be Priority 2.
 - iii. Priority 3 The Generator which is not Priority 1 or Priority 2, should be Priority 3.
3. Generator synchronization is the process of matching parameters such as voltage, frequency, phase angle, phase sequence and waveform of the alternator (generator). This is done before the generator is reconnected to the main bus bar. Once a generator is synchronized with the parameters of another generator, alternator, or bus bar, the system can run smoothly again
 - a. Synchroscope is used to synchronize alternators. Synchronize means that the machine of equal frequency and voltage are operating parallel to each other. Synchroscopes are instruments that show relative frequency (speed) difference and the phase angle between the engine to be synchronized and the system voltage.
 - b. Power supply can be synchronized Locally or Remotely. First, choose a power supply to synchronize with the previously supplied main bus already. Then, select the location of synchronization. If the switch position is at LOCAL, system can be synchronized locally from Electrical Power Plant GUI Panel (GUIP #5000). If the switch position is at REMOTE, system can be synchronized remotely from ECR Panels: Power Generators GUI Panel (GUIP #5400). Finally, select the way of synchronization. If the switch is at MANUAL position, power supply can be synchronized manually by speed control or load control. If the switch is at AUTO position, power supply can be synchronized automatically.
 - c. User can select between load control modes such as:
 - i. Equal Load Control Generator sets cannot operate stable with other sources unless the loading on the generator set is controlled. When generator sets are operating together on the bus bar, they are

ii. Optimum Load Control

commonly provided with equipment to allow each diesel generators to operate at the same percentage of load on the total system. This is termed a “load sharing control system” Optimum Load Control optimizes the power of the Diesel Generators which is connected to the Main Bus Bar. If the power of the Main Bus Bar decreases, optimum load control provides disconnection of the one of the diesel generator. If the power of the Main Bus Bar increases, optimum load control provides connection of the one of the diesel generator according to the priority order and the load is being shared equally.

4. Diesel generator 2 remote control panel provides control ability for diesel generator 2 remotely. Diesel generator 2 remote control panel includes:
 - a. Diesel Generator 2 Parameters
 - b. Engine Control Mode Switches
 - c. Engine Status Indicator
 - d. Automatic Voltage Regulator (AVR)
 - e. Engine Start/Stop Buttons
 - f. Speed Control Switch
 - g. Circuit Breaker Connect/Disconnect Button
 - h. Priority Selection Buttons
 - i. Diesel Generator 2 Trips Indicator
5. Diesel Generator 3 remote control panel provides control ability for diesel generator 3 remotely. Diesel Generator 3 remote control panel includes:
 - a. Diesel Generator 3 Parameters
 - b. Engine Control Mode Switches
 - c. Engine Status Indicator
 - d. Automatic Voltage Regulator (AVR)
 - e. Engine Start/Stop Buttons
 - f. Speed Control Switch
 - g. Circuit Breaker Connect/Disconnect Button
 - h. Priority Selection Buttons
 - i. Diesel Generator 3 Trips Indicator

6. Shaft generator remote control panel provides control ability for shaft generator remotely. Shaft generator remote control panel includes:

a. Shaft generator parameters gauges

- i. Frequency Indicator
- ii. Frequency Gauge
- iii. Voltmeter
- iv. Power (kW) Indicator
- v. Power (kVA) Indicator
- vi. Current Indicator

b. Engine Control Mode Indicator

Shaft Generator can be controlled Locally or Remotely. Shaft Generator Control Mode can be Changed from Ship Propulsion & Shaft Generator GUI Panel (GUIP #4600).

c. Engine Status

i. ME RPM Ready

ME RPM Ready status indicates that the ME Speed is suitable for engaging of the Shaft Generator clutch. When the ME Speed above 76 RPM, Shaft Generator can be engaged.

ii. Engaged

Engage Status indicates that the Shaft Generator whether Shaft Generator engaged to the Main Engine.

iii. Power Ready

Shaft Generator is ready for connecting to the Main Bus Bar.

iv. Power Supplied

Shaft Generator is connected to the Main Bus Bar.

v. Tripped

Shaft Generator is tripped.

d. Load Control Switch

The Load on the Shaft Generator can be controlled via Load Control Switch. In order to control the shaft generator load manually, the load control mode should not be at Equal Load.

e. Clutch IN/OUT Buttons

If the Shaft Generator is at Remote Mode, Clutch Position can be changed from Shaft Generator Remote Panel via Clutch IN/Out Buttons.

f. Automatic Voltage Regulator (AVR)

g. Circuit Breaker Connect/Disconnect Button, shaft generator feeds the bus bar and circuit breaker are used to draw of supply. Circuit breaker control panel provides connecting or disconnecting shaft generator circuit breaker remotely.

h. Shaft Generator Trips Indicator

4.20 ECR: PUMPS & COMPRESSORS: REMOTE PANEL (GUI PANEL # 5450)



4.20.1 Table of Screen Objects

Number	Description	Number	Description
1	Compressed Air Remote Panel	6	ME FO Remote Panel
2	LTFW & HTFW Systems Remote Panels	7	Transfer Systems Remote Panel
3	ME LO Remote Panel	8	Steering Gear Remote Panel
4	Steam System Remote Panel	9	Engine Room Fans Remote Panel
5	Sea Water Main Cooling Remote Panel	10	Fire Pumps Remote Panel

1. Compressed Air Remote Panel includes:

- a. Air Receiver 1 and 2 Pressure Gauges
- b. Air Compressor 1 and 2 Remote Control Section:
 - i. MAN/AUTO Switch
 - ii. Compressor Status:
 1. Power
 2. Remote
 3. Running
 4. Trip
 - iii. Start/Stop Button

The user can observe the pressure of air receivers 1 and 2 remotely.

When in MANUAL mode, compressors work until it stopped by operators. When in AUTO mode, compressors work according to the pressure of air receivers and previously arranged value of pressure switch.

Power light indicates whether compressor fed with power. Remote light indicates whether compressor at remote or local mode. Running light indicates whether compressor running or not. Trip light indicates whether occurred any trip or not at the compressors. If the compressor at REMOTE mode, compressors can be started from the remote panel.

2. LTFW and HTFW Systems Remote Panels include:

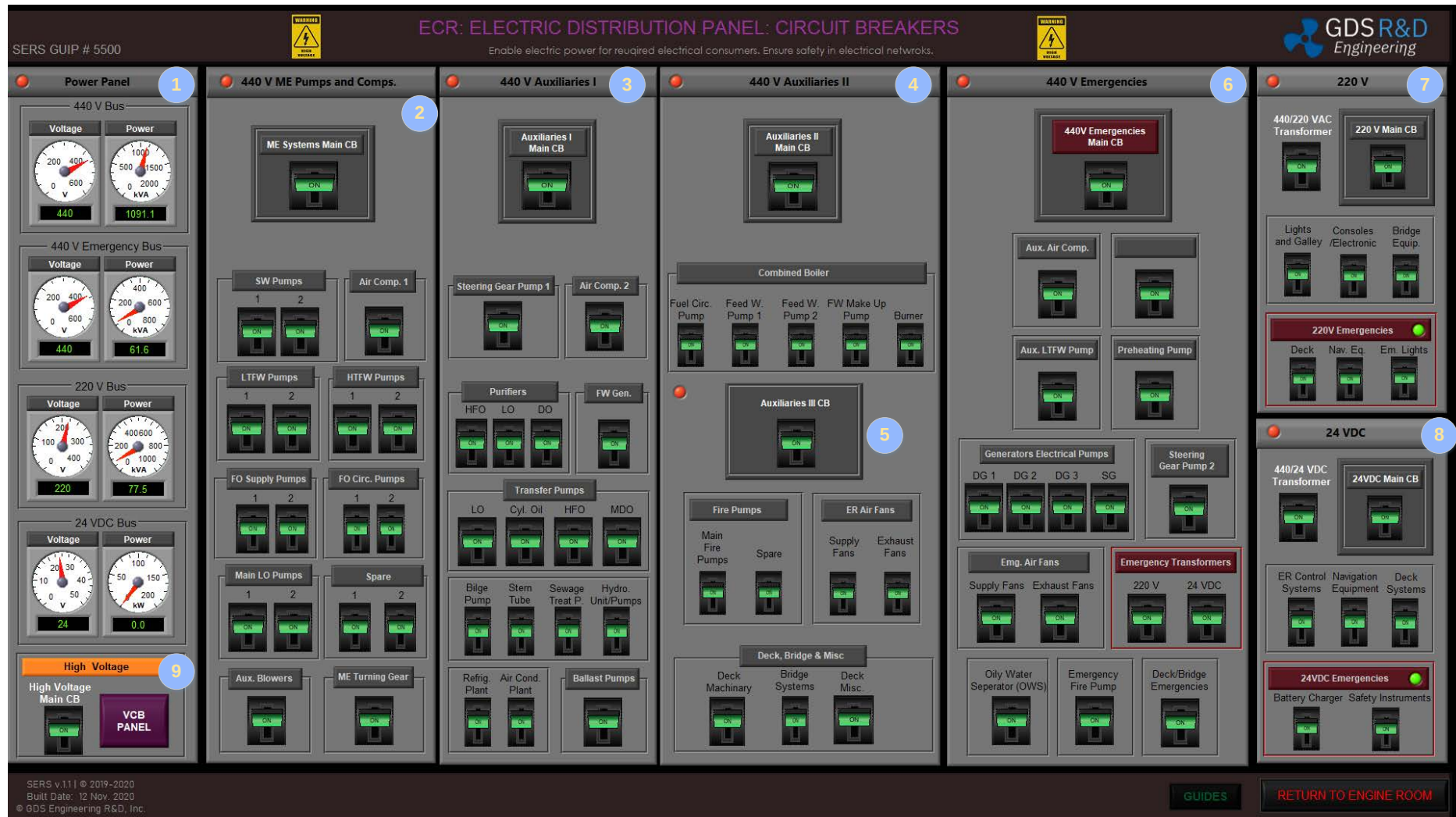
- a. LTFW and HTFW Pressure Gauge
- b. LTFW and HTFW Temperature Gauge
- c. LTFW and HTFW Pumps Remote Control Section:
 - i. MAN/AUTO Switch
 - ii. Pumps Status:
 1. Power
 2. Remote
 3. Running
 4. Trip
 - iii. Start/Stop Button

3. ME LO Remote Panel includes:
 - a. LO Pressure Gauge (ME Inlet)
 - b. LO Temperature Gauge (ME Inlet)
 - c. LO Pumps Remote Control Section:
 - i. MAN/AUTO Switch
 - ii. Pumps Status
 - iii. Start/Stop Button
4. Steam System Remote Panel includes:
 - a. Boiler Water Level Indicator
 - b. Steam Pressure Gauge
 - c. Feed Pumps Remote Control Section:
 - i. MAN/AUTO Switch
 - ii. Pumps Status
 - iii. Start/Stop Button
5. Sea Water (SW) Main Cooling Remote Panel includes:
 - a. SW Cooling Line Pressure Gauge
 - b. SW Cooling Line Temperature Gauge
 - c. SW Pumps Control Section:
 - i. MAN/AUTO Switch
 - ii. Pumps Status
 - iii. Start/Stop Button
6. ME FO Remote Panel includes:
 - a. FO Pressure Gauge (ME Inlet)
 - b. FO Temperature (ME Inlet)
 - c. FO Supply and Circulation Pumps Remote Control Sections:
 - i. MAN/AUTO Switch
 - ii. Pumps Status
 - iii. Start/Stop Button
7. Transfer Systems Remote Panel includes:
 - a. LO Transfer Pump Remote Control Section:
 - i. MAN/AUTO Switch
 - ii. Pump Status
 - iii. Start/Stop Button
 - b. MDO Transfer Pump Remote Control Section
 - c. HFO Transfer Pump Remote Control Section

Boiler Water Level Indicator shows both amount of water in the boiler and High-High Level, High Level, Low-Low Level, and Low Level alarm limits.

8. Steering Gear Remote Panel includes:
 - a. Steering Gear Pump 1 Remote Control Section:
 - i. MAN/AUTO Switch
 - ii. Pump Status
 - iii. Start/Stop Button
 - b. Steering Gear Pump 2 Remote Control Section
9. Engine Room Fans Remote Panel includes:
 - a. Supply Fans Remote Control Section:
 - i. ON/OFF Switch
 - ii. Fans Status
 - iii. Start/Stop Button
 - b. Exhaust Fans Remote Control Section
10. Fire Pumps Remote Panel includes:
 - a. Fire Pump 1 Remote Control Section:
 - i. ON/OFF Switch
 - ii. Pump Status
 - iii. Start/Stop Button
 - b. Fire Pump 2 Remote Control Section

4.21 ELECTRICAL DISTRIBUTION SYSTEM: CIRCUIT BREAKERS (GUI PANEL # 5500)



4.21.1 Table of Screen Objects

Number	Description	Number	Description
1	Power Panel	5	440 V Auxiliaries III Circuit Breaker Panel
2	440 V ME Pumps and Compressors Panel	6	440 V Emergencies Circuit Breaker Panel
3	440 V Auxiliaries I Circuit Breaker Panel	7	220 V Equipment Circuit Breaker Panel
4	440 V Auxiliaries II Circuit Breaker Panel	8	24 V DC Equipment Panel
		9	High Voltage Panel

1. Power Panel includes; 440 V Bus Indicators, 440 V Emergency Bus Indicators, 220 V Bus Indicators, and 24 V DC Bus Indicators.
2. 440 V Main Engine Pumps and Compressors Circuit Breaker (CB) Panel includes:
 - a. ME Systems Main CB
 - b. Sea Water Cooling Pumps Circuit Breakers allows electrical supply to the main sea water pumps. If circuit breaker is at ON position, sea water pumps can be started.
 - c. Air Compressor 1 CB
 - d. LTFW Pumps CB
 - e. HTFW Pumps CB
 - f. FO Supply Pumps CB
 - g. FO Circulation Pumps CB
 - h. Main LO Pumps CB
 - i. Main Engine Turning Gear CB
 - j. Auxiliary Blowers CB
3. 440 V Auxiliaries I Circuit Breaker Panel includes:
 - a. Auxiliaries I Main CB
 - b. Steering Gear Pump 1 CB
 - c. Air Compressor 2 CB
 - d. Separators (HFO, MDO, LO) CB
 - e. Fresh Water Generator CB
 - f. Transfer Pumps (LO, Cyl. Oil, HFO, MDO) CBs
 - g. Bilge Pump, Sludge Pump, Sewage Treatment Plant, and Hydrophore Unit CBs
 - h. Refrigeration and Air Condition Plant CBs
 - i. Ballast Pumps CB

4. 440 V Auxiliaries II (Boiler Pumps) Circuit Breakers Panel includes: Boiler Pumps circuit breakers which is stated at 440 V Auxiliaries II circuit breaker panel allows electrical supply to the boiler pumps. If circuit breaker is at ON position, Boiler Pumps can be started.
440 V Auxiliaries II Circuit Breaker Panel includes:
 - a. Auxiliaries II Main CB
 - b. Fuel Circulation Pump CB
 - c. Feed Water Pump 1 and 2 CBs
 - d. Fresh Water Make up Pump CB
 - e. Burner CB
5. 440 V Auxiliaries III Circuit Breaker Panel includes:
 - a. Auxiliaries III Main CB
 - b. Main Fire Pumps CB
 - c. ER Supply and Exhaust Fans CBs
 - d. Deck Machinery CB
 - e. Bridge Systems CB
 - f. Deck Miscellaneous CB
6. 440 V Emergencies Circuit Breaker Panel includes:
 - a. 440 V Emergencies Main CB
 - b. Auxiliary Air Compressor CB
 - c. Auxiliary SW Pump CB
 - d. Auxiliary LTFW Pump CB
 - e. Preheating Pump CB
 - f. Generators Electrical Pumps
 - g. Steering Gear Pump 2 CB
 - h. ER Supply and Exhaust Fans CB
 - i. 220 V and 24 V DC Emergency Transformers CB
 - j. Oily Water Separator CB
 - k. Emergency Fire Pump CB
 - l. Deck/Bridge Emergencies CB

7. 220 V Equipment Circuit Breaker Panel includes:
 - a. 440/220V Transformer CB
 - b. 220 V Main CB
 - c. Lights and Galley CB
 - d. Consoles and Electronic CB
 - e. Bridge Equipment CB
 - f. 220 V Emergencies CB for Deck, Navigation Equipment, and Emergency Lights.
8. 24 V DC Equipment Circuit Breaker Panel includes:
 - a. 440/24VDC Transformer CB
 - b. ER Control Systems CB
 - c. Navigation Equipment CB
 - d. Deck Systems CB
 - e. 24 V DC Emergencies CBs for Battery Charger and Safety Instruments
9. High Voltage Panel includes:
 - a. High Voltage Main CB
 - b. Vacuum Circuit Breaker (VCB) Panel (GUIP #5860) Quick Access Button

High voltage transformer and high voltage bus bar (GUIP #5850) are supplied with electrical power via high voltage main circuit breaker.

4.22 ELECTRICAL DISTRIBUTION: 440 V POWER NETWORK (GUI PANEL # 5600)

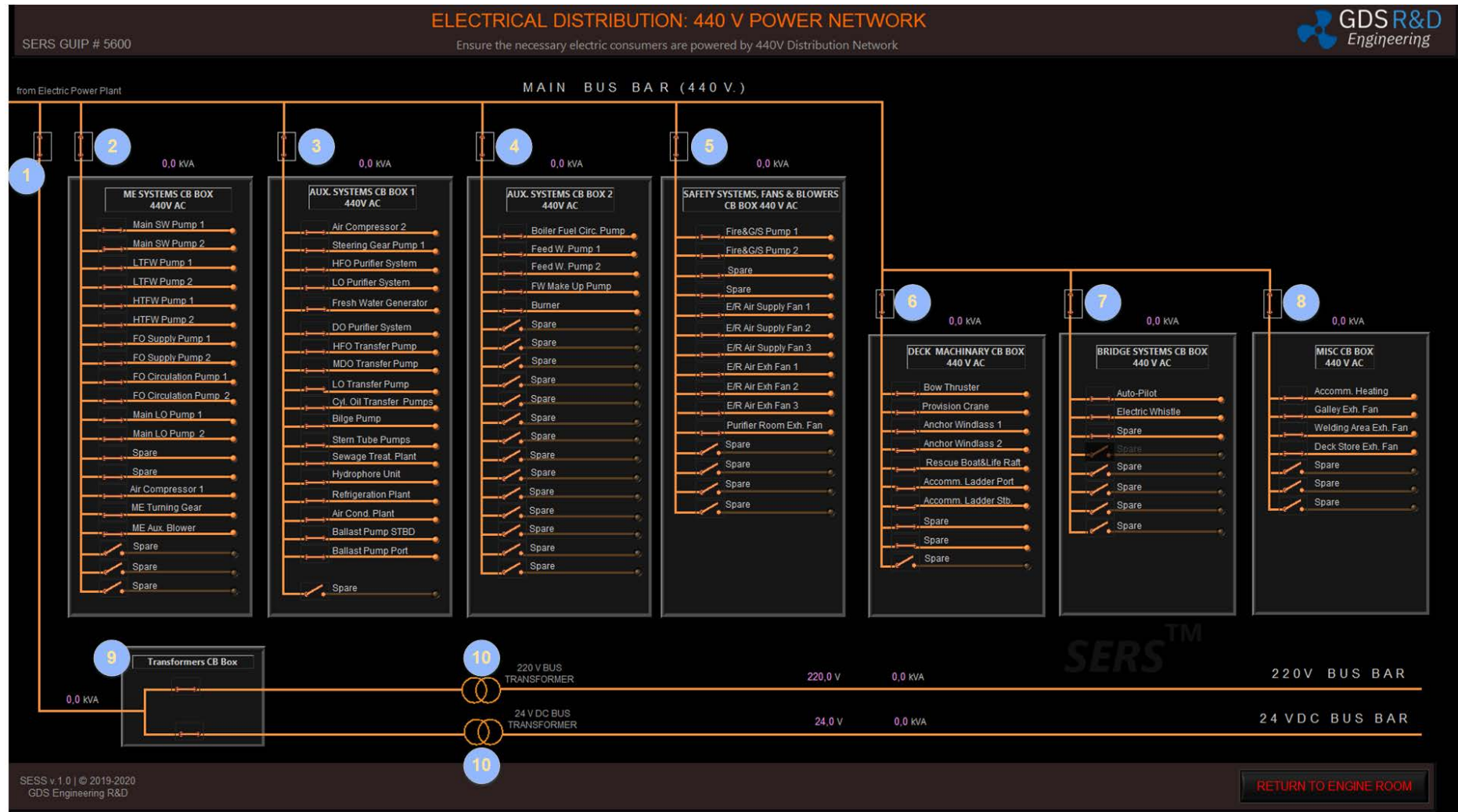


Table of Screen Objects

Number	Description	Number	Description
1	Transformer Circuit Breaker (CB) Box Main Circuit Breaker	6	Deck Machinery CB Box Main Circuit Breaker
2	ME Systems CB Box Main Circuit Breaker	7	Bridge Systems CB Box Main Circuit Breaker
3	Aux. Systems CB Box 1 Main Circuit Breaker	8	Misc. CB Box Main Circuit Breaker
4	Aux. Systems CB Box 2 Main Circuit Breaker	9	Transformer CB Box
5	Safety Systems CB Box Main Circuit Breaker	10	220 V / 24 V DC Bus Transformer

- Transformer CB Box Main Circuit Breaker allows electrical supply to the Transformer CB Box.
- Main Engine System CB Box Main Circuit Breaker allows electrical supply to the ME System CB Box.
- Aux. Systems CB Box 1 Main Circuit Breaker allows electrical supply to the Aux. Systems CB Box 1.
- Aux. System CB Box 2 Main Circuit Breaker allows electrical supply to the Aux. Systems CB Box 2.
- Safety Systems CB Box Main Circuit Breaker allows electrical supply to the Safety Systems CB Box.
- Deck Machinery CB Box Main Circuit Breaker allows electrical supply to the Deck Machinery CB Box.
- Bridge Systems CB Box Main Circuit Breaker allows electrical supply to the Bridge Systems CB Box.
- Misc. CB Box Main Circuit Breaker allows electrical supply to the Misc. CB Box.
- Transformers fed with 440 V main bus bar. Transformer Circuit Breaker Box shows electrical diagram of transformers. 220 V Bus Transformer and 24 V DC Transformer fed with Transformer Circuit Breaker Bus.
- Transformer is a device which generally consists of two windings on an iron core. An e.m.f applied to the primary winding induces an e.m.f in the secondary winding in the ratio of the number of windings on the primary and secondary. 220 V Bus transformers transforms 440 V to 220 V. 24 V DC Bus transformers transforms 440 V to 24 V DC.

4.23 ELECTRICAL DISTRIBUTION: 440 V EMERGENCY NETWORK (GUI PANEL # 5600)

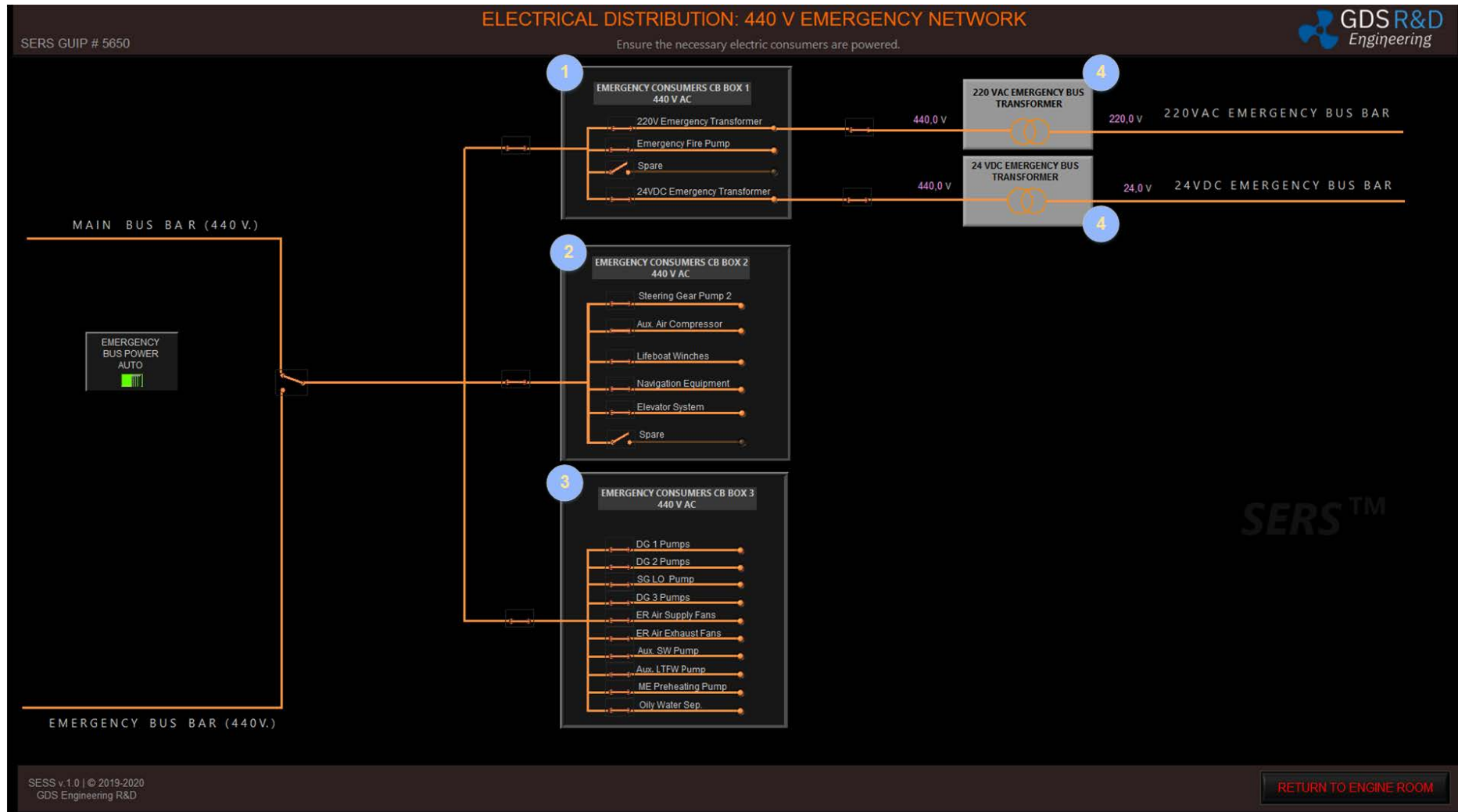


Table of Screen Objects

Number	Description	Number	Description
1	Emergency Consumers CB Box 1	3	Emergency Consumers CB Box 3
2	Emergency Consumers CB Box 2	4	220 V / 24 V DC Emergency Transformer

1. Emergency Consumers CB Box 1 fed with both 440 V main and 440 V emergency bus bar. Circuit Breaker Box shows electrical diagram of emergency consumers. Emergency Consumers Circuit Breaker Box 1 includes:
 - a. 220 V Emergency Transformer
 - b. Emergency Fire Pump
 - c. 24 V DC Emergency Transformer
2. Emergency Consumers Circuit Breaker Box 2 includes:
 - a. Steering Gear Pump 2
 - b. Auxiliary Air Compressor
 - c. Lifeboat Winches
 - d. Navigation Equipment
 - e. Elevator System
3. Emergency Consumers Circuit Breaker Box 3 includes:
 - a. Diesel Generator 1 LO Priming Pump
 - b. Diesel Generator 2 LO Priming Pump
 - c. Shaft Generator LO Priming Pump
 - d. Engine Room Air Supply Fans
 - e. Engine Room Air Exhaust Fans
 - f. Auxiliary Sea Water Pump
 - g. Auxiliary LTFW Pump
 - h. Auxiliary HTFW Pump
 - i. Bilge Water Separator
4. Transformer is a device which generally consists of two windings on an iron core. An emf applied to the primary winding induces an e.m.f in the secondary winding in the ratio of the number of windings on the primary and secondary. 220 V Emergency Bus transformers transforms 440 V to 220 V for supplying Emergency Bus Bar. 24 V DC Emergency Bus transformers transforms 440 V to 24 V DC for supplying Emergency Bus Bar.

4.24 ELECTRICAL DISTRIBUTION: 220 V NETWORK (GUI PANEL # 5700)

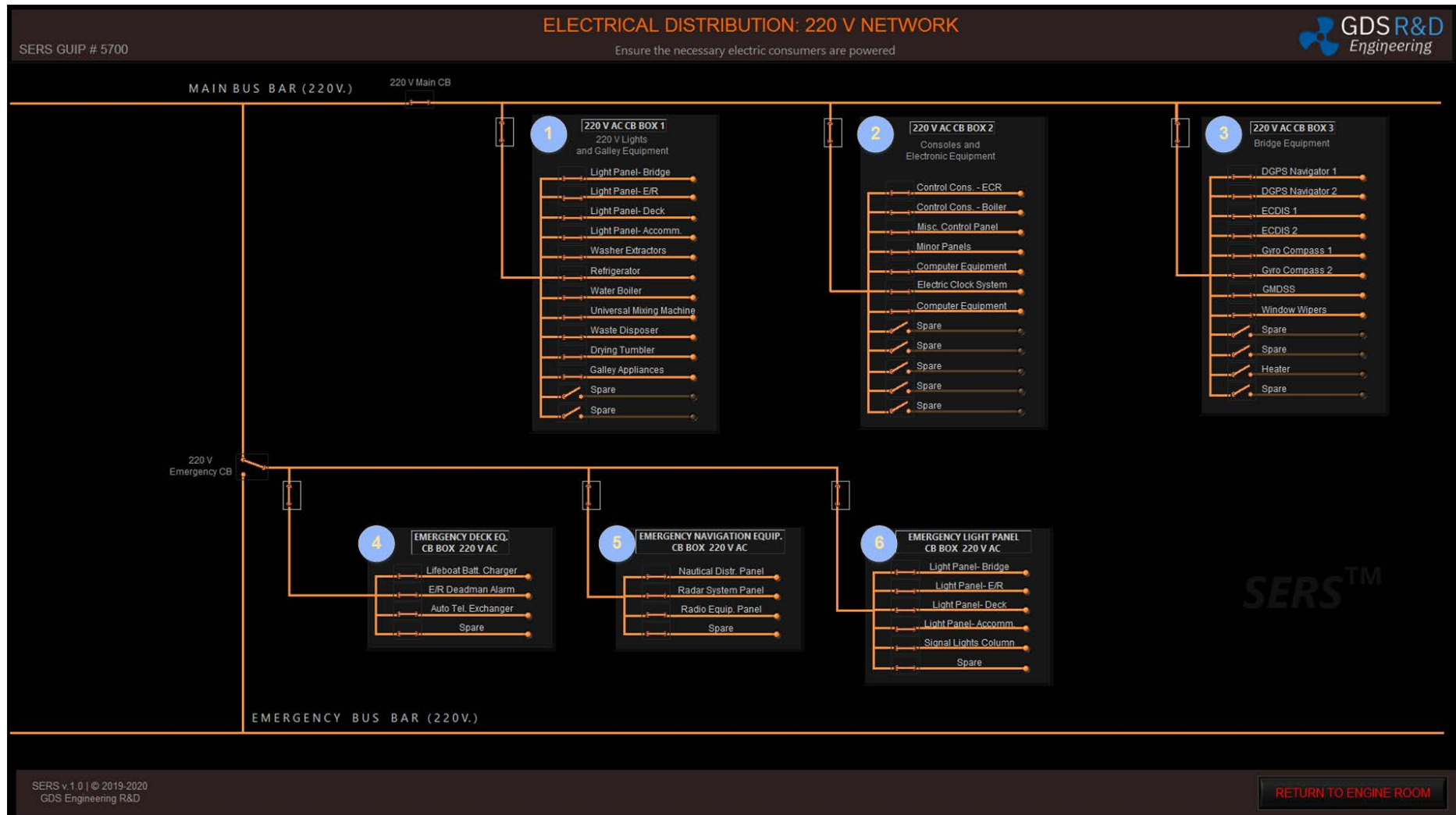


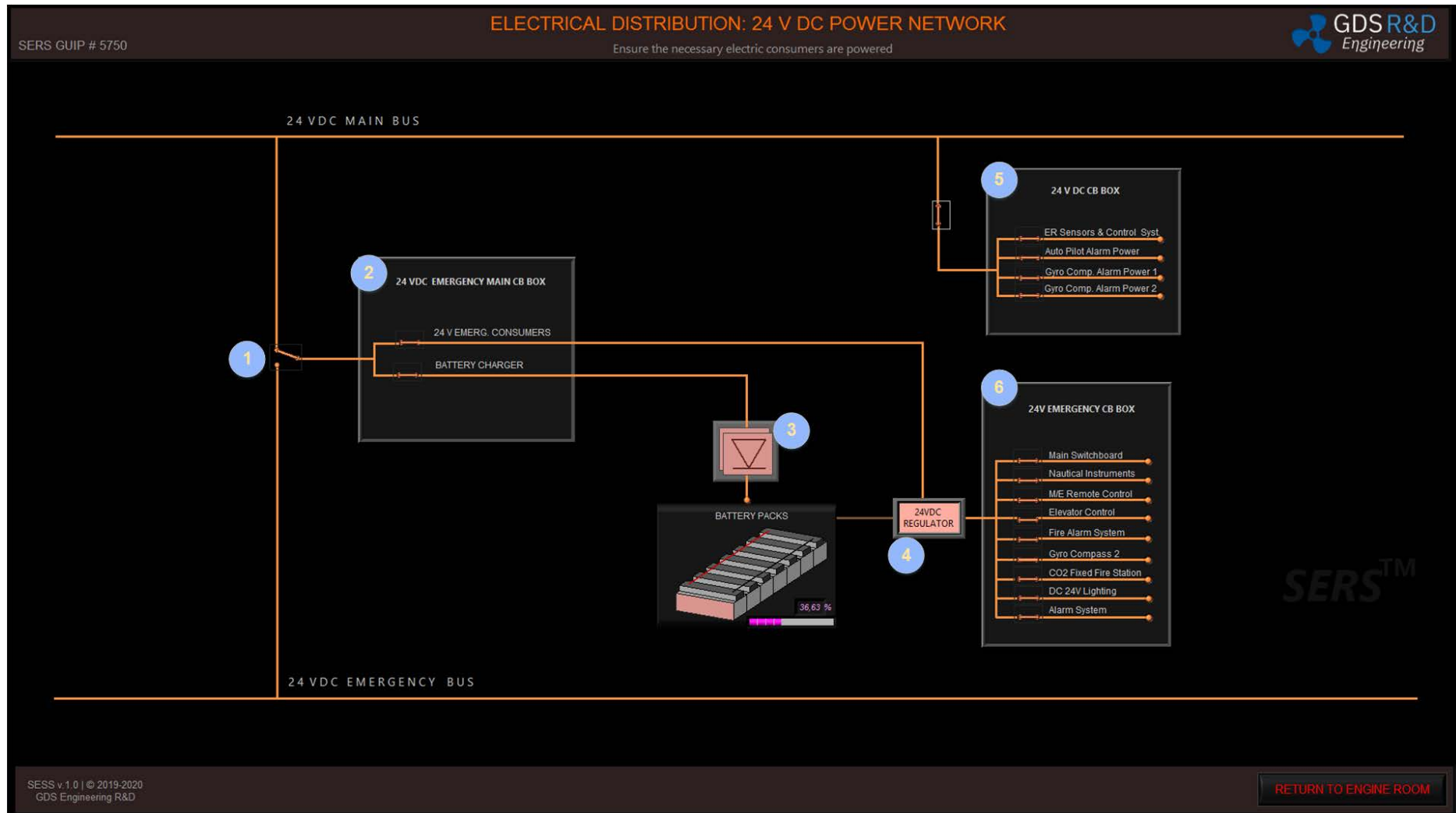
Table of Screen Objects

Number	Description	Number	Description
1	220 V Consumers CB Box 1	4	Emergency Deck Equipment CB Box
2	220 V Consumers CB Box 2	5	Emergency Navigation Equipment CB Box
3	220 V Consumers CB Box 3	6	Emergency Light Panel CB Box

1. 220 V Consumers CB Box 1 fed with 220 V bus bar. Circuit Breaker Box shows electrical diagram of 220 V consumers. 220 V Consumers Circuit Breaker Box 1 includes:
 - a. Light Panel- Bridge
 - b. Light Panel- Engine Room
 - c. Light Panel- Deck
 - d. Light Panel- Accommodation
 - e. Washer Extractors
 - f. Refrigerator
 - g. Water Boiler
 - h. Universal Mixing Machine
 - i. Waste Dispose
 - j. Drying Tumbler
 - k. Galley Appliances
2. 220 V Consumers Circuit Breaker Box 2 includes:
 - a. Control Console- Engine Control Room
 - b. Control Console- Boiler
 - c. Miscellaneous Control Panel
 - d. Minor Panels
 - e. Computer Equipment
 - f. Electric Clock System
 - g. Computer Equipment
3. 220 V Consumers Circuit Breaker Box 3 includes:
 - a. DGPS Navigator 1
 - b. DGPS Navigator 2
 - c. ECDIS 1
 - d. ECDIS 2
 - e. Gyro Compass 1

- f. Gyro Compass 2
 - g. GMDSS
 - h. Window Wipers
4. Emergency Deck Equipment CB Box fed with both 220 V and 220 V Emergency bus bar. Circuit Breaker Box shows electrical diagram of emergency deck equipment. Emergency Deck Equipment Circuit Breaker Box includes:
- a. Lifeboat Battery Charger
 - b. Engine Room Deadman Alarm
 - c. Auto Telephone Exchanger
5. Emergency Navigation Equipment Circuit Breaker Box includes:
- a. Nautical Distribution Panel
 - b. Radar System Panel
 - c. Radio Equipment Panel
6. Emergency Light Panel Circuit Breaker Box includes:
- a. Light Panel- Bridge
 - b. Light Panel- Engine Room
 - c. Light Panel- Deck
 - d. Light Panel- Accommodation
 - e. Signal Lights Column

4.25 ELECTRICAL DISTRIBUTION: 24 V DC POWER NETWORK (GUI PANEL # 5750)

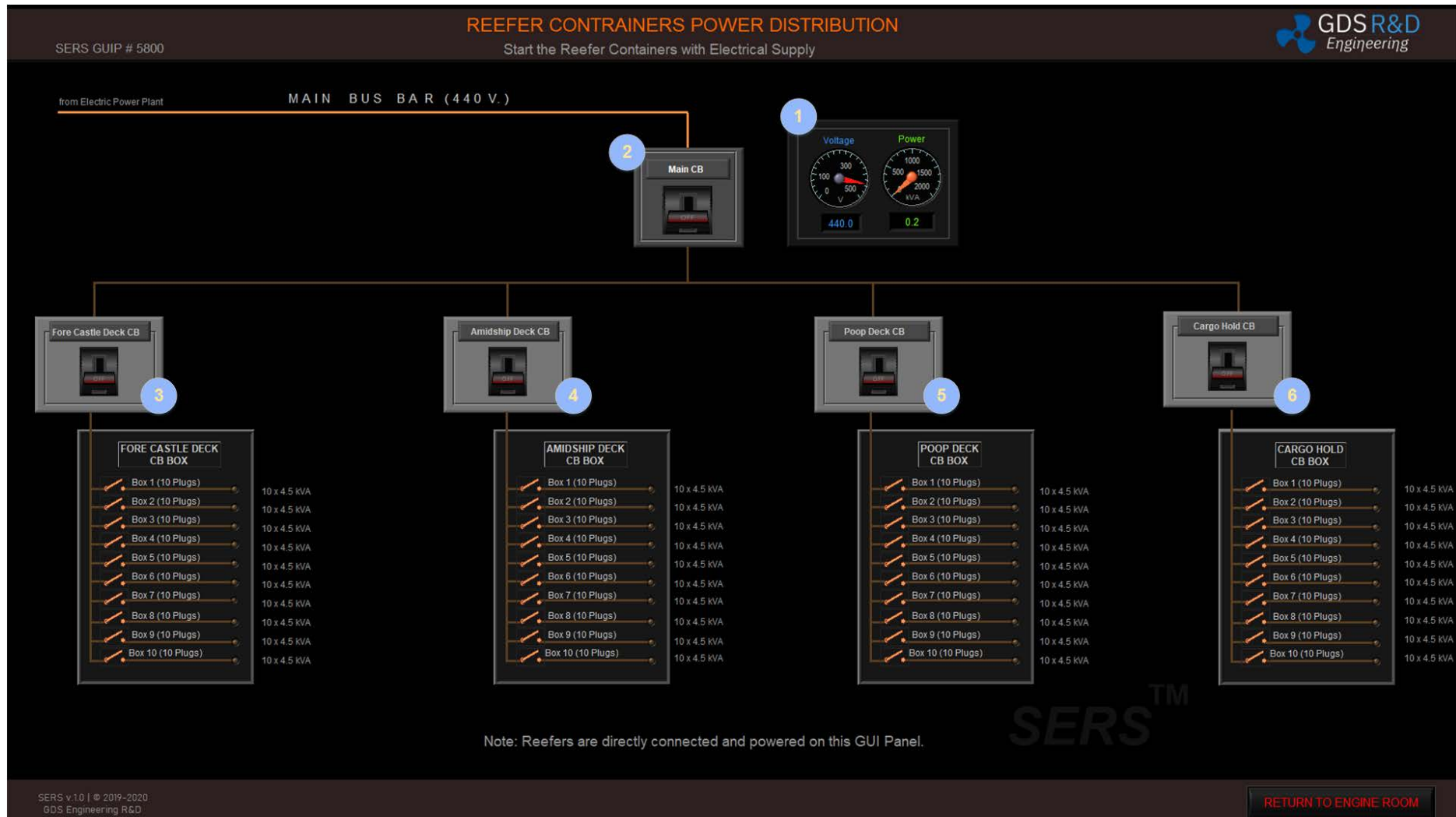


4.25.1 Table of Screen Objects

Number	Description	Number	Description
1	24 V DC Main/Emergency Breaker	4	24 V DC Regulator
2	24 V DC Emergency Main CB Box	5	24 V DC CB Box
3	Battery Charger	6	24 V DC Emergency CB Box

- 24 V DC Emergency Main CB Box and 24 V DC Emergency CB Box can be supplied with 24 V DC Main and Emergency Bus. Emergency generator, if it is working and is at auto position, will supply the emergency bus bar and breaker position will be changed automatically in case of a black out situation.
- 24 V DC Emergency Main CB Box fed with both 24 V DC and 24 V DC Emergency bus bar. Circuit Breaker Box shows electrical diagram of 24 V emergency consumers and battery charger. 24 V DC Emergency Main Circuit Breaker Box includes:
 - 24 V DC Emergency Consumers
 - Battery Charger
- Battery Charger charges the battery packs. Battery chargers is fed with 24 V DC Main or Emergency Bus Bar.
- 24 V DC Regulator regulates the voltage which comes from battery packs.
- 24 V DC Consumers Circuit Breaker Box includes:
 - Engine Room Sensors & Control Systems
 - Auto-Pilot Alarm Panel
 - Gyro Compass Alarm Power 1
 - Gyro Compass Alarm Power 2
- 24 V DC Emergency Circuit Breaker Box includes:
 - Main Switchboard
 - Nautical Instruments
 - Main Engine Remote Control
 - Elevator Control
 - Fire Alarm System
 - Gyro Compass 2
 - CO₂ Fixed Fire Station
 - DC 24 V Lighting

4.26 REEFERS POWER DISTRIBUTION (GUI PANEL # 5800)



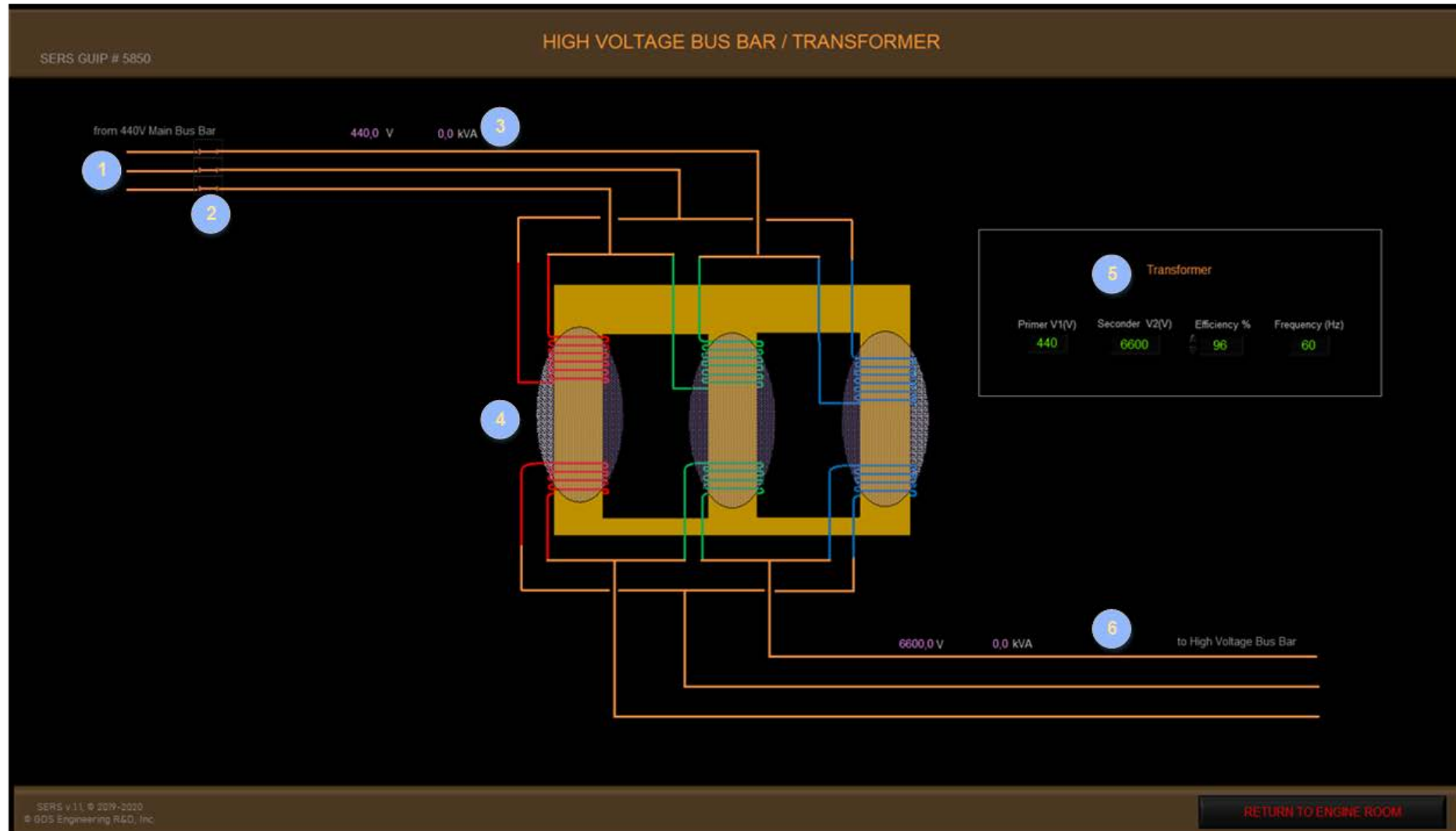
4.26.1 Table of Screen Objects

Number	Description	Number	Description
1	Reefers Voltage & Power Indicators Panel	4	Amidship Deck Reefers CB Box
2	Reefers Main Circuit Breaker	5	Poop Deck Reefers CB Box
3	Fore Castle Deck Reefers CB Box	6	Cargo Hold Deck Reefers CB Box

- Reefers are supplied with the 440 V Main Bus Bar. Reefers Voltage & Power Indicators Panel includes:
 - Voltage Gauge, which indicates the voltage of the 440 V Main Bus Bar.
 - Power Gauge, which indicates the reefer power in units of kVA.
- Reefers Main Circuit Breaker allows Fore Castle, Amidship, Poop Deck, and Cargo Hold Sections Circuit Breakers supplying with electric.
- Fore Castle Deck CB Box Circuit Breaker allows electrical supply to the Fore Castle Deck Reefers. Fore Castle Deck Reefers capacity is a total of hundred plugs and the plugs of reefers was collected ten different boxes. Every box feeds ten reefer plugs and every plug power is rated at 4.5 kVA.
- Amidship Deck CB Box Circuit Breaker allows electrical supply to the Amidship Deck Reefers. Amidship Deck Reefers capacity is a total of hundred plugs and the plugs of reefers was collected ten different boxes. Every box feeds ten plugs and every plug power is 4.5 kVA.
- Poop Deck CB Box Circuit Breaker allows electrical supply to the Poop Deck Reefers. Poop Deck Reefers capacity is a total of hundred plugs and the plugs of reefers was collected ten different boxes. Every box feeds ten plugs and every plug power is 4.5 kVA.
- Cargo Hold CB Box Circuit Breaker allows electrical supply to the Cargo Hold Reefers. Cargo Hold capacity is a total of hundred plugs and the plugs of reefers was collected ten different boxes. Every box feeds ten plugs and every plug power is 4.5 kVA.

(Important Note: Reefers are directly connected and powered on the Reefers Containers Power Distribution GUI Panel. So, the user must check Diesel Generators and Shaft Generator status before supplying of the Reefers with electric for safe operation.)

4.27 HIGH VOLTAGE BUS BAR / TRANSFORMER (GUI PANEL # 5850)



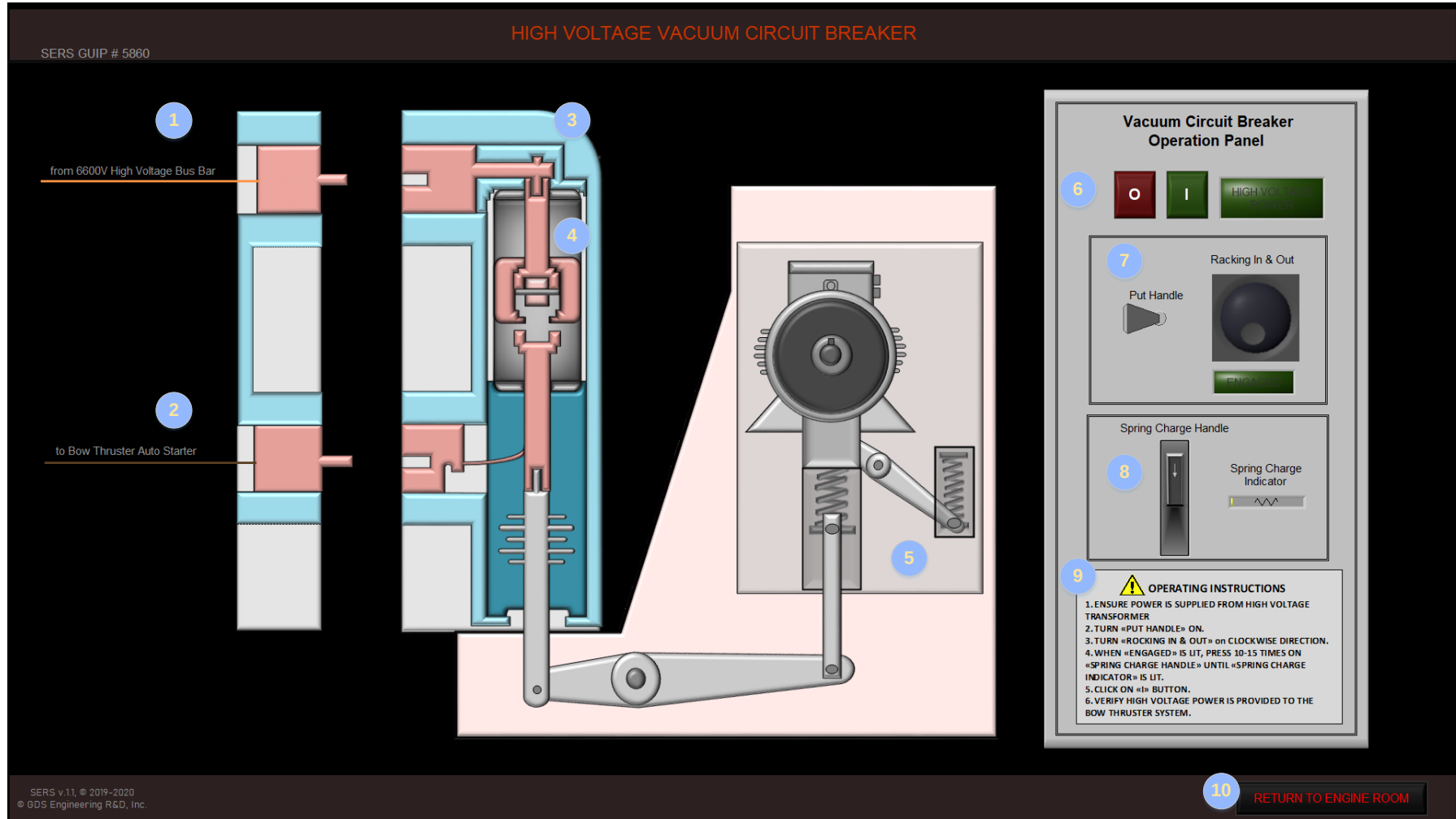
4.27.1 Table of Screen Objects

Number	Description	Number	Description
1	Power lines from 440V Main Bus Bar	4	3 Phase High Voltage Transformer
2	High Voltage Main Circuit Breaker Status Indicator	5	Transformer Parameters display area
3	Power lines to Transformer	6	Power lines to High Voltage Bus Bar / VCB

1. Power lines from 440V Main Bus Bar are lit when power is available from 440V Main Bus Bar
2. High Voltage Main Circuit Breaker is closed when CB is closed from Circuit Breakers GUI Panel (#5500).
3. Voltage (Volts) to transformer and Power (kVA) drawn by High Voltage System is displayed.
4. Transformer. See Section 3.9.10 for characteristics of the transformer.
5. Transformer parameters are displayed in operation.
6. Power lines that are lit when power is provided to Vacuum Circuit Breaker through the High Voltage Bus Bar.

4.28 VACUUM CIRCUIT BREAKER (VCB) PANEL (GUI PANEL # 5860)

High Voltage Power provided through the transformer is connected to the High Voltage Bus Bar via a 3 phase Vacuum Circuit Breaker. Refer to SERS Manual Volume 2 for Operating Instructions of the Vacuum Circuit Breaker.



4.28.1 Table of Screen Objects

Number	Description	Number	Description
1	Power lines from transformer	6	Vacuum Circuit Breaker Operation Panel: Power Buttons
2	Power lines to Bow Thruster power line	7	Racking In & Out Control Panel
3	Rack In & Out Mechanism	8	Spring Charge Handle and Spring Load Indicator
4	Vacuum Circuit Breaker (VCB)	9	Operating Instructions
5	Load Spring Mechanism	10	RETURN TO ENGINE ROOM button

1. Power lines are lit when High Voltage Power is provided through transformer (GUI Panel # 5850).
2. Power lines are lit when High Voltage Power is provided to the Bow Thruster (GUI Panel #7100).
3. Racking In & Out Mechanism containing the Vacuum Circuit Breaker (VCB).
4. VCB Component.
5. Spring Mechanism to load and allow for quickly closing the VCB contacts.
6. Power buttons allow for discharging the spring load and closing the circuit breaker when spring load is available and rack mechanism is in.
7. Racking In & Out control panel allow for moving the rack for engaging the high-power input and output contacts with the VCB contacts.
8. Moving spring charge handle 10-15 times allow for loading the spring mechanism.
9. Operating Instructions list the proper operation of the VCB.
10. Click RETURN TO ENGINE ROOM to display the SERS Main GUI Panel (GUIP #1000).

4.29 MANAGE ELECTRICAL CONSUMERS (GUI PANEL # 5900)

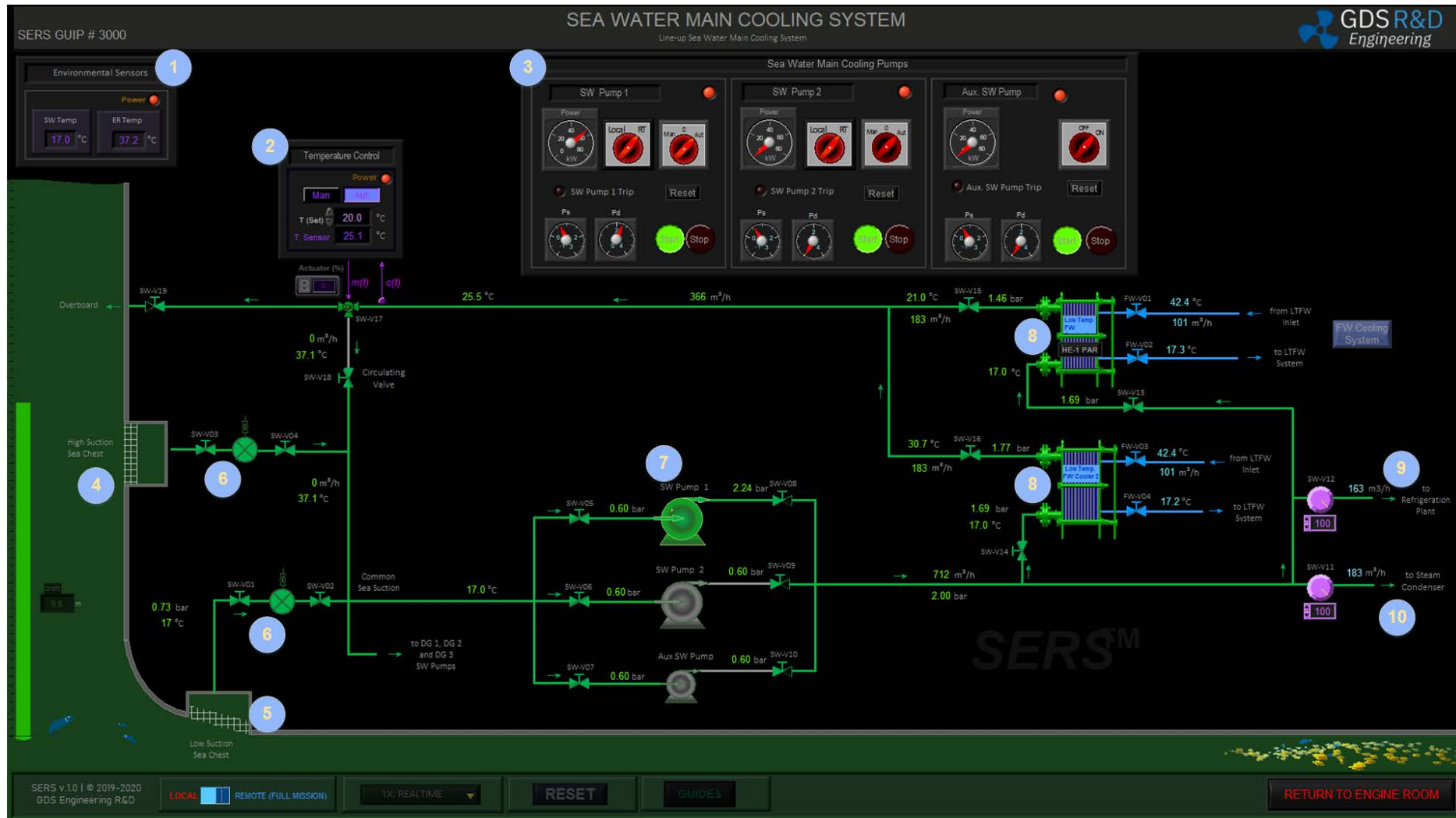


4.29.1 Table of Screen Objects

Number	Description
1	Bus Bar Indicators
2	Components Parameters
3	Electrical Consumers Tab

1. Bus Bar Indicators includes:
 - a. Voltmeter
 - b. Current Indicator
 - c. Power (kW) Indicator
 - d. Power (kVA) Indicator (Only 440 V Bus Bars)
2. Components parameters includes:
 - a. ON/OFF Status
 - b. Power Rating, kW
 - c. Mechanical/Heat Efficiency, %
 - d. RPM
 - e. Load, %
 - f. Other Losses, %
 - g. Electrical Efficiency, %
 - h. Power consumption, kW
 - i. Power Factor
 - j. Apparent Power, kVA
 - k. Electrical Current, A
3. Electrical Consumers Tab includes:
 - a. 440 V Main Engine Systems
 - b. 440 V Auxiliary Systems
 - c. Miscellaneous Consumers
 - d. 220 V Main and Emergency Consumers
 - e. 24 V DC Main and Emergency Consumers
 - f. Emergency Consumers (440 V)

4.30 SEA WATER MAIN COOLING SYSTEM (GUI PANEL # 3000)



4.30.1 Table of Screen Objects

Number	Description	Number	Description
1	Environmental Sensors Panel	6	Sea Chest Filter
2	Temperature Control Panel	7	SW Main Cooling Pumps
3	SW Main Cooling Pumps Control Panel	8	LTFW Coolers
4	High Suction Sea Chest	9	Refrigeration Plant SW Line
5	Low Suction Sea Chest	10	Steam Condenser SW Line

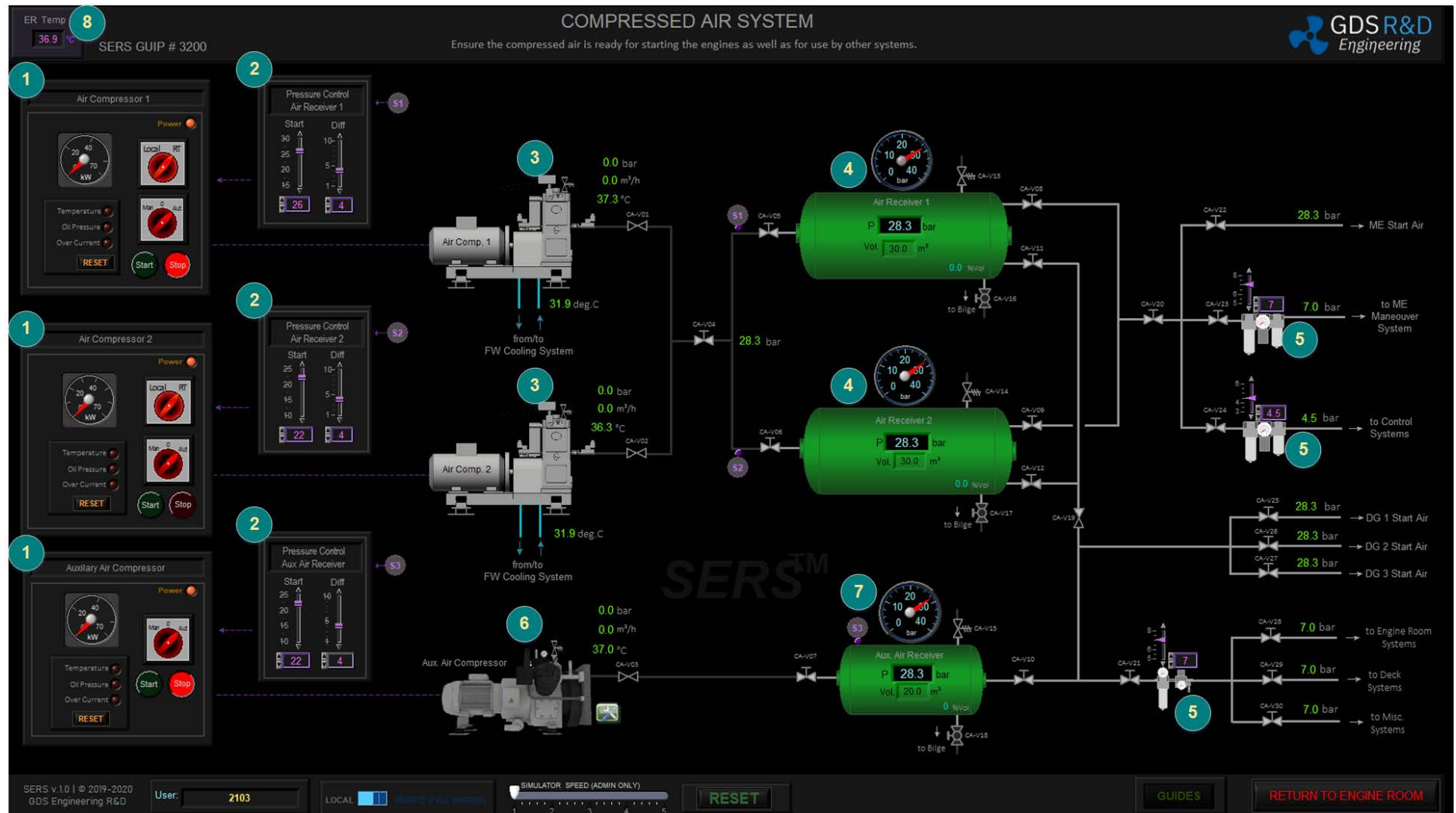
11. Environmental Sensors Panel, includes Seawater and Engine Room Temperature indicator. These values can be changes from the Ship Parameters GUI Panel (GUIP #1600).
12. The sea water temperature controlled by a temperature control valve. Temperature control valve, which is a three-way valve, adjusts the sea water flows through recirculation and overboard according to the set value of temperature control panel. When the sea water temperature increases, temperature control valve allows more sea water flow through overboard. When the sea water temperature decreases, temperature control valve allows more sea water flow through recirculation. In this way temperature of sea water main cooling system, become more stable.
13. Sea water Main Cooling Pumps can be operated from the control panel. Power light, indicates whether electrical supply reached the panel. If switch position is at “0” position, pump will not operate. If switch position is at “MANUAL” pump can be operated when the user clicks start button. If switch position is at “AUTO” pump operates according to the system pressure in-line. If pressure decrease, pump will operate automatically. If switch position is at “REMOTE(RT)” pump can be operated from the pumps and compressors remote panel. (GUI PANEL #5450) If switch position is at “LOCAL” pump can be operated from the local control panel.
14. Sea water main cooling system consists of two sea chest. One is high and the other is low sea chest. High suctions are intended for shallow water to reduce the intake of sediment. High Suction Sea Chest Filter is a single type filter.
15. Low suctions are used at sea, to reduce the risk of drawing in air and losing suction when ship at rough sea. Low Suction Sea Chest Filter is a single type filter.
16. After the respective isolation valves, the sea water line has, a filter called as “sea chest filter” to filter out fishes, weed plankton etc. When these organisms enter into the sea water main cooling system, they cause fluctuation in the sea water pressure and erosion of the impeller of the sea water pumps. They also chock the central coolers, causing heat imbalance, making the parameters of the engine to exceed its limit.
17. Sea water cools fresh water, which cools auxiliary systems. Main sea water pumps discharge the sea water through Low Temperature Fresh Water Main Coolers. Auxiliary sea water pump can be supplied with both main and emergency bus bar.

18. Low Temperature Fresh Water is cooled by sea water at LTFW Coolers. Low Temperature Fresh Water Cooler consists:
 - a. Sea water Inlet and Outlet Lines and Valves
 - b. LTFW Inlet and Outlet Lines and Valves (LTFW Coolers Inlet and Outlet Valves (FW-V01, FW-V02 and FW-V03, FW-V04 can opened or closed from the Fresh Water Cooling GUI Panel #3100)
19. Refrigeration Plant (GUIP #6700) Condenser & Receiver can be fed with Main SW Cooling System. Refrigeration Plant SW Inlet Valve (SW-V12) is an adjustable valve. So that, Refrigeration Plant seawater flow rate can be controlled.
20. Combined Boiler (GUIP #3300) Steam Condenser can be fed with Main SW Cooling System. Steam Condenser SW Inlet Valve (SW-V11) is an adjustable valve. So that, Steam Condenser seawater flow rate can be controlled.

4.30.2 Valve Numbering

Number	Description	Number	Description
SW-V01	Low Suction Sea Chest Filter Inlet Valve	SW-V13	LTFW Cooler 1 SW Inlet Valve
SW-V02	Low Suction Sea Chest Filter Outlet Valve	SW-V14	LTFW Cooler 2 SW Inlet Valve
SW-V03	High Suction Sea Chest Filter Inlet Valve	SW-V15	LTFW Cooler 1 SW Outlet Valve
SW-V04	High Suction Sea Chest Filter Outlet Valve	SW-V16	LTFW Cooler 2 SW Outlet Valve
SW-V05	SW Pump 1 Suction Valve	FW-V01	LTFW Cooler 1 FW Inlet Valve
SW-V06	SW Pump 2 Suction Valve	FW-V02	LTFW Cooler 1 FW Outlet Valve
SW-V07	Aux. SW Pump Suction Valve	FW-V03	LTFW Cooler 2 FW Inlet Valve
SW-V08	SW Pump 1 Discharge Valve	FW-V04	LTFW Cooler 2 FW Outlet Valve
SW-V09	SW Pump 2 Discharge Valve	SW-V17	SW Temperature Control Valve
SW-V10	Aux. SW Pump Discharge Valve	SW-V18	Circulating Valve
SW-V11	Steam Condenser SW Inlet Valve	SW-V19	Overboard Valve
SW-V12	Refrigeration Plant SW Inlet Valve		

4.31 COMPRESSED AIR SYSTEM (GUI PANEL # 3200)



4.31.1 Table of Screen Objects

Number	Description	Number	Description
1	Compressors Control Panel	5	Filter Regulator Lubricator (FRL)
2	Air Receivers Pressure Control Panel	6	Auxiliary Air Compressor
3	Main Air Compressors	7	Auxiliary Air Receiver
4	Main Air Receivers	8	Engine Room Temp. Indicator

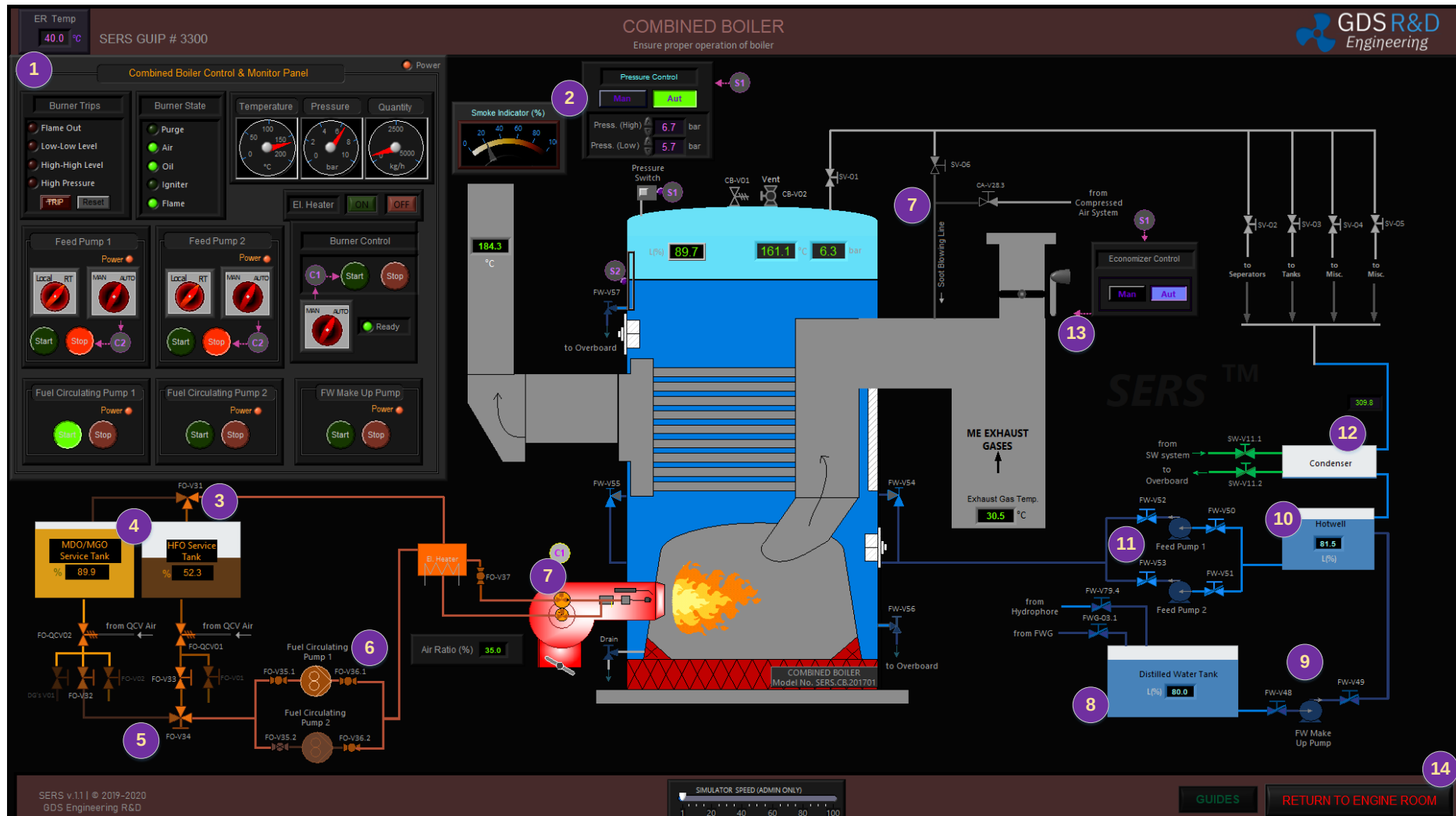
- Air Compressors can be started from the control panel. When in MANUAL mode, compressors work until it stopped by operators. When in AUTO mode, compressors work according to the pressure of air receivers and previously arranged value of pressure switch. Temperature, oil pressure and over current trip can be reset from control panel. If switch position is at "REMOTE(RT)" compressor can be operated from the Pumps and Compressors Remote Panel. (GUI PANEL #5450) If switch position is at "LOCAL" compressor can be operated from the local control panel.
- Air receivers pressure control panel controls the pressure switch of the air compressor. Pressure switch is an electromechanical device that relies on air pressure to control the operation of air compressor. Simultaneously, the motor starts and the air compressor begins to pressurize the air. When the specified system pressure is reached, a diaphragm or piston inside the pressure switch pushes against the mechanism, which forces electrical contacts apart, breaking the circuit and stopping the compressor. At the same time, the pressure relief valve opens and relieves excessive pressure. As air is used and receiver drops to a specified, 'cut-in' and 'cut-out' settings, the contacts close or open for compressor starting/stopping.
- Air compressors, two-stage, two-crank machine used aboard ship to supply compressed air. The air compressed in the first stage, cooled and compressed to higher pressure in the next stage. Compressors must always be started at the unloaded condition since otherwise pressures build up rapidly producing very high starting torques.
- Main air receivers are reservoir to store compressed air supplied by the main air compressor of the ship at high pressure. Main air receivers supply:
 - Main Engine Start Air
 - Main Engine Maneuvering System
 - Control Systems
 - Diesel Generator 1 Start Air
 - Diesel Generator 2 Start Air
 - Diesel Generator 3 Start Air
 - Engine Room Systems
 - Deck Systems
 - Miscellaneous Systems

5. The air that leaves a compressor is hot, dirty and wet-which damage and shorten the life of downstream equipment, such as pneumatic valves and engine cylinders. Before the air can be used, it needs to be filtered, regulated and lubricated. An airline filter cleans the compressed air. It strains the air and traps solid particles (dust, dirt, rust) and separates liquids (water, oil) entrained in the compressed air. Selecting the proper size of filter for any application should be done by determining the maximum allowable pressure drop, which can be caused by the filter. The pressure drop can be determined by referring to flow curves provided by the user.
6. Auxiliary air compressor is used for starting the auxiliary engine at the time of an emergency or when the main air compressor has failed for filling up the main air receiver. Auxiliary air compressor is supplied from emergency generator.
7. Auxiliary air receiver is reservoir to store compressed air supplied by the auxiliary air compressor. Auxiliary air receiver supplies:
 - a. Diesel Generator 1 Start Air
 - b. Diesel Generator 2 Start Air
 - c. Diesel Generator 3 Start Air
 - d. Engine Room Systems
 - e. Deck Systems
 - f. Miscellaneous Systems
8. Engine Room Temperature Indicator shows temperature of Engine Room.

4.31.2 Valve Numbering

Number	Description	Number	Description
CA-V01	Air Compressor 1 Outlet Valve	CA-V16	Air Receiver 1 Drain Valve
CA-V02	Air Compressor 2 Outlet Valve	CA-V17	Air Receiver 2 Drain Valve
CA-V03	Aux. Air Compressor Outlet Valve	CA-V18	Aux. Air Receiver Drain Valve
CA-V04	Air Receivers Main Inlet Valve	CA-V19	Aux. Air Receiver Check-Valve
CA-V05	Air Receiver 1 Inlet Valve	CA-V20	ME Airs Main Inlet Valve
CA-V06	Air Receiver 2 Inlet Valve	CA-V21	Service Airs Main Inlet Valve
CA-V07	Aux. Air Receiver Inlet Valve	CA-V22	ME Start Air Inlet Valve
CA-V08	Air Receiver 1 Outlet Valve for ME Systems	CA-V23	ME Maneuver System Inlet Valve
CA-V09	Air Receiver 2 Outlet Valve for ME Systems	CA-V24	Control Systems Inlet Valve
CA-V10	Aux. Air Receiver Outlet Valve	CA-V25	DG 1 Start Air Inlet Valve
CA-V11	Air Receiver 1 Outlet Valve for DG's and Systems	CA-V26	DG 2 Start Air Inlet Valve
CA-V12	Air Receiver 2 Outlet Valve for DG's and Systems	CA-V27	DG 3 Start Air Inlet Valve
CA-V13	Air Receiver 1 Safety Valve	CA-V28	Engine Room Systems Inlet Valve
CA-V14	Air Receiver 2 Safety Valve	CA-V29	Deck Systems Inlet Valve
CA-V15	Aux. Air Receiver Safety Valve	CA-V30	Misc. Systems Inlet Valve

4.32 COMBINED BOILER (GUI PANEL # 3300)



4.32.1 Table of Screen Objects

Number	Description	Number	Description
1	Boiler Monitoring & Control Panel	8	Distilled Water Tank
2	Smoke Indicator & Pressure Control Panel	9	Fresh Water Make-up Pump
3	Recirculation Valve	10	Hotwell
4	HFO and MDO Service Tank	11	Main Feed Pumps
5	HFO/MDO Mixing Valve and Quick Closing Valves	12	Condenser
6	Fuel Circulating Pumps	13	Economizer Controller and Exhaust Damper
7	Burner and Soot Blowing Line	14	RETURN TO ENGINE ROOM button

1. Combined Boiler Control and Monitor Panel includes:

- a. Steam Properties Indicator
 - i. Steam Temperature Gauge
 - ii. Steam Pressure Gauge
 - iii. Steam Flowmeter
- b. Burner Trips
 - i. Flame Out
 - ii. Low-Low Level
 - iii. High-High Level
 - iv. High Pressure
- c. Burner Status
 - i. Purge
 - ii. Air
 - iii. Oil
 - iv. Igniter
 - v. Flame
- d. Burner Control
 - i. MAN/AUTO Switch
 - ii. Start/Stop Button
- e. Feed Water Pump 1 Control
 - i. LOCAL/REMOTE Switch
 - ii. MAN/AUTO Switch

- iii. Start/Stop Button
 - f. Feed Water Pump 2 Control
 - g. Electrical Heater Control (On/Off Buttons)
 - h. Fuel Circulating Pumps Control
 - i. Fresh Water Make-up Pump Control
- 2. Smoke indicator shows the amount of smoke at exhaust gas of boiler. Steam Pressure can be controlled from the Pressure Control Panel, either manually or automatically. When the pressure control is at Manual Mode, user can control the steam pressure manually via stopping/starting of the burner. When the pressure control is at Auto Mode, burner will be started/stopped according to the High Pressure and Low Pressure set value.
- 3. Fuel returns to MDO or HFO Service Tanks via recirculation valve. Recirculation valve is a three-way valve and allows the fuel flow into MDO or HFO Service Tank.
- 4. HFO and MDO Service Tank contains only the required quality of fuel ready for immediate use. Service Tank used on board, necessary for propulsion, boiler and generator systems.
- 5. HFO/MDO changeover valve allows changing over of HFO and MDO. Quick closing valve is fitted outline of the HFO and MDO Service Tanks which is remotely closed from the Emergency Response Panel. (GUI PANEL #7400) When the valve is closed, the user must click to RESET button for re-opening.
- 6. Fuel Circulating Pumps supply the fuel through the burner.
- 7. Sootblowing: Combined Boiler is operated by either with Oil Fired Burner or the heat from the exhaust gases supplied from the ME exhaust line. The pipes of the boiler are covered with soot in time and this decrease the boiler's efficiency. For this reason, Sootblowing is performed to clear the soot on the pipes and near surfaces inside the boiler. This operation helps increase the heat transfer and therefore the efficiency of the boiler. Sootblowing can be performed using either compressed air or steam.
- 8. Distilled water tank preparing feed water for steam boilers, collecting condensate, adding chemicals, and preheating of feed water. Distilled Water Tank can be filled up from Fresh Water Generator GUI Panel (GUIP #4800) and FW System & Hydrophore GUI Panel (GUIP #4900).
- 9. Fresh Water Make-up Pump supplies the feed water into hotwell.
- 10. Hotwell recollects the steam after the work is done and it is condensed. Boiler water tank is known as the hotwell because boiler feed pump takes suction from the hotwell and gives it to the boiler through feed valves. If any traces of oil are found in the system, it indicates that there is a crack in the steam heating line inside the fuel oil tanks. If oil is present in the system then it forms coating tubes of the boiler, which may lead to lesser heat transfer to the water in the boiler.
- 11. Main Feed Pumps are used to pump feed water into the boiler. The water may be freshly supplied or condensate produced as a result of the condensation of the steam produced by the boiler. The Boiler Water Level is controlled via water supply from Main Feed Pump 1 and 2. When the Main Feed Pumps are set AUTO, they start or stop depending on the Boiler Water Level, adjusting the Boiler Water Level automatically. In this system, there is no recirculation of feed water supply is required.
- 12. The condenser is a heat exchanger, which removes the latent heat from exhaust steam so that it condenses and can be pumped back into the boiler. This condensing should be achieved with the minimum of undercooling, i.e. reduction of condensate temperature below the steam temperature. A condenser is also arranged so that gases and vapors from the condensing steam are removed.
- 13. Economizer Control System, when in AUTO position, adjust the Exhaust Damper based on the temperature of the exhaust gases. Additionally, it has a alarm detection system for fires in the economizer and controls the damper status accordingly.
- 14. RETURN TO ENGINE ROOM button allows for quitting from this panel and displays the SERS Main GUI Panel (#1000).

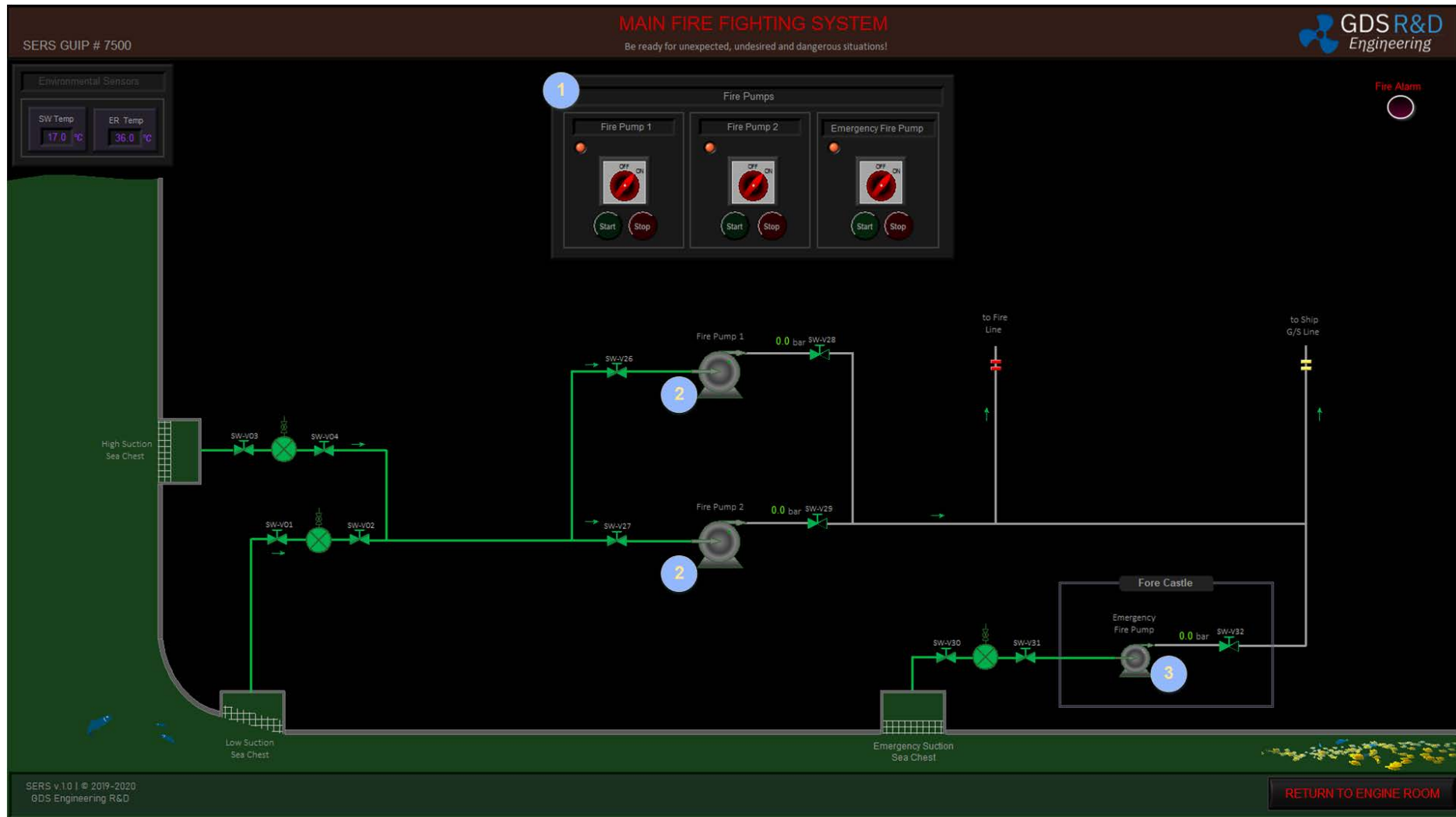
NOTE:**FIRE IN ECONOMIZER**

When there is fire in economizer, an audible fire alarm is activated along with the activation of the fire alarm indicator on Main GUI Panel (#1000). Additionally, a fire image on economizer appears. Fire in Economizer malfunction is activated by the instructor from the Instructor Panel or by the Trainee for using the Malfunctions GUI Panel (#8200) for exercising. Refer to SERS User Manual Volume II for description of the malfunctions with several examples shown.

4.32.2 Valve Numbering

Number	Description	Number	Description
FO-QCV01	HFO Service Tank Quick Closing Valve	FW-V54	Combined Boiler Feed Valve 1
FO-QCV02	MDO Service Tank Quick Closing Valve	FW-V55	Combined Boiler Feed Valve 2
FO-V31	Fuel Recirculation Valve	FW-V56	Blow Down Valve
FO-V32	MDO Service Tank Boiler Outlet Valve	FW-V57	Scum Valve
FO-V33	HFO Service Tank Boiler Outlet Valve	SW-V11.1	Condenser SW Inlet Valve
FO-V34	Fuel Changeover Valve	SW-V11.2	Condenser SW Outlet Valve
FO-V35.1	Fuel Circulating Pump 1 Suction Valve	FW-V79.4	Distilled Water Tank Fill Up Valve (from Hydrophore)
FO-V36.1	Fuel Circulating Pump 1 Discharge Valve	FWG-03.1	Distilled Water Tank Fill Up Valve (from FWG)
FO-V35.2	Fuel Circulating Pump 2 Suction Valve	CA-V28.3	Soot Blowing Compressed Air Inlet Valve
FO-V36.2	Fuel Circulating Pump 2 Discharge Valve	CB-V01	Combined Boiler Safety Valve
FO-V37	Burner Fuel Inlet Valve	CB-V02	Combined Boiler Vent Valve
FW-V48	FW Make Up Pump Suction Valve	SV-01	Main Stop Valve
FW-V49	FW Make Up Pump Discharge Valve	SV-02	Separators Steam Inlet Valve
FW-V50	Feed Pump 1 Suction Valve	SV-03	Tanks Steam Inlet Valve
FW-V51	Feed Pump 2 Suction Valve	SV-04	Misc. Steam Inlet Valve
FW-V52	Feed Pump 1 Discharge Valve	SV-05	Misc. Steam Inlet Valve
FW-V53	Feed Pump 2 Discharge Valve	SV-06	Soot Blowing Steam Inlet Valve

4.33 MAIN FIRE FIGHTING SYSTEM (GUI PANEL # 7500)



4.33.1 Table of Screen Objects

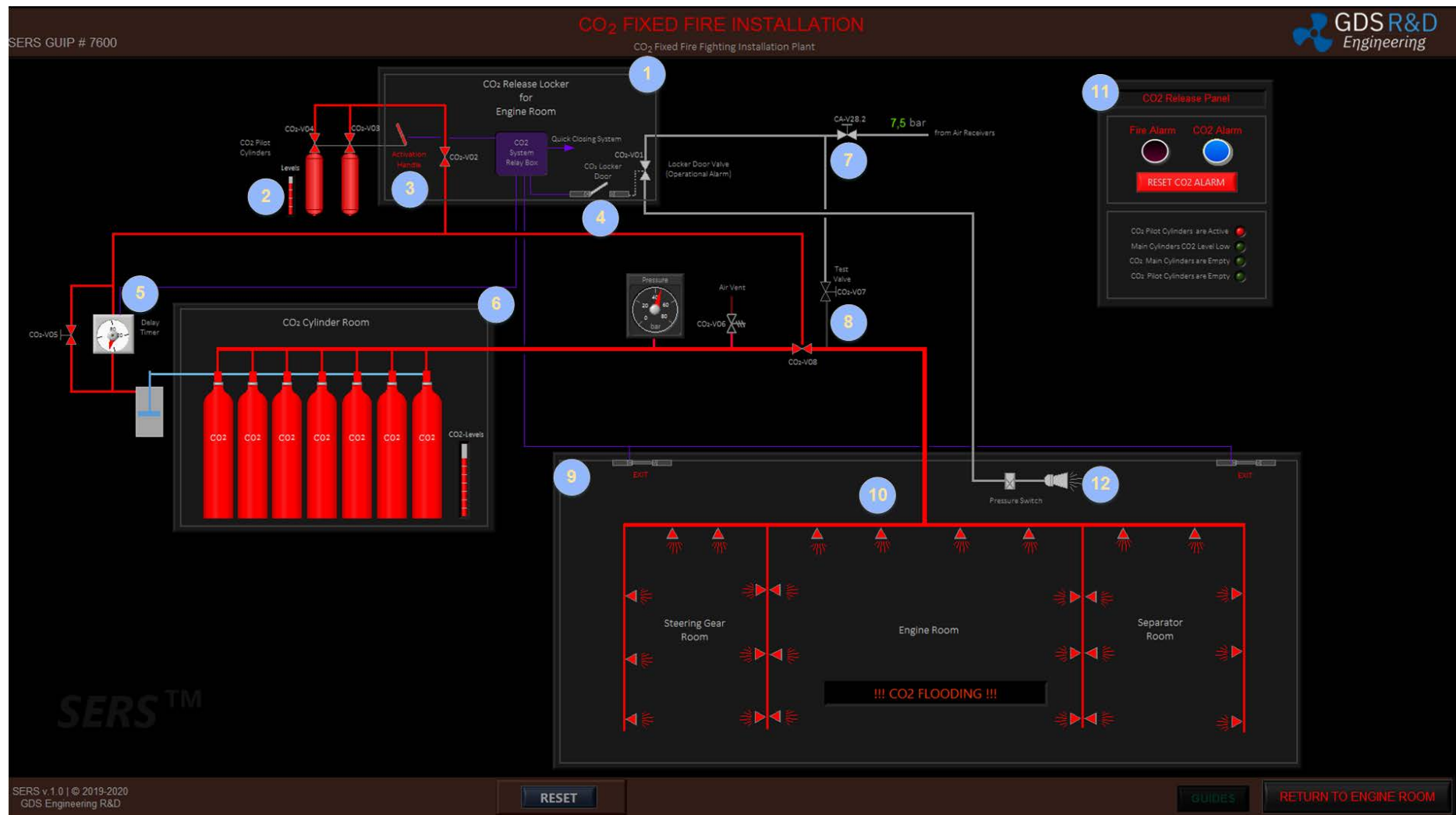
Number	Description
1	Fire Pumps Control Panel
2	Fire Pumps
3	Emergency Fire Pump

1. Fire Pumps Control Panel includes:
 - a. Fire Pump 1 Control Panel, Fire Pump 1 can be operated from the control panel. Power light, indicates whether electrical supply reaches at the panel. If switch is at ON position, pump can be operated when the user clicks start button.
 - b. Fire Pump 2 Fire Pump 2 can be operated from the control panel. Power light, indicates whether electrical supply reaches at the panel. If switch is at ON position, pump can be operated when the user clicks start button.
 - c. Emergency Fire Pump Control Panel, Emergency Fire Pump can be operated from the control panel. Power light, indicates whether electrical supply reaches at the panel. If switch is at ON position, pump can be operated when the user clicks start button.
2. Fire Pumps are the centrifugal pumps with flat curves. Such pumps are capable of supplying maximum flow rates without creating excessive and dangerous pressures, yet are also capable of providing large flow rates while maintaining the required pressures.
3. Emergency Fire Pump which supply the fire line and general service line when the main fire and general service pumps are not available. Emergency Fire Pump fitted at forecastle. Emergency Fire Pump is also supplied from the 440 V Emergency Bus Bar.

4.33.2 Valve Numbering

Number	Description	Number	Description
SW-V01	Low Suction Sea Chest Filter Inlet Valve	SW-V28	Fire Pump 1 Discharge Valve
SW-V02	Low Suction Sea Chest Filter Outlet Valve	SW-V29	Fire Pump 2 Discharge Valve
SW-V03	High Suction Sea Chest Filter Inlet Valve	SW-V30	Emergency Suction Sea Chest Filter Inlet Valve
SW-V04	High Suction Sea Chest Filter Outlet Valve	SW-V31	Emergency Suction Sea Chest Filter Outlet Valve
SW-V26	Fire Pump 1 Suction Valve	SW-V32	Emergency Fire Pump Discharge Valve
SW-V27	Fire Pump 2 Suction Valve		

4.34 CO₂ FIRE EXTINGUISHING INSTALLATION (GUI PANEL # 7600)



4.34.1 Table of Screen Objects

Number	Description	Number	Description
1	CO ₂ Release Locker	7	Air Supply
2	CO ₂ Pilot Cylinders	8	Test Valve
3	Activation Handle	9	CO ₂ Flooding Area
4	CO ₂ Locker Door	10	Main Common CO ₂ Line
5	Delay Timer	11	CO ₂ Release Panel
6	CO ₂ Cylinder Room	12	Buzzer

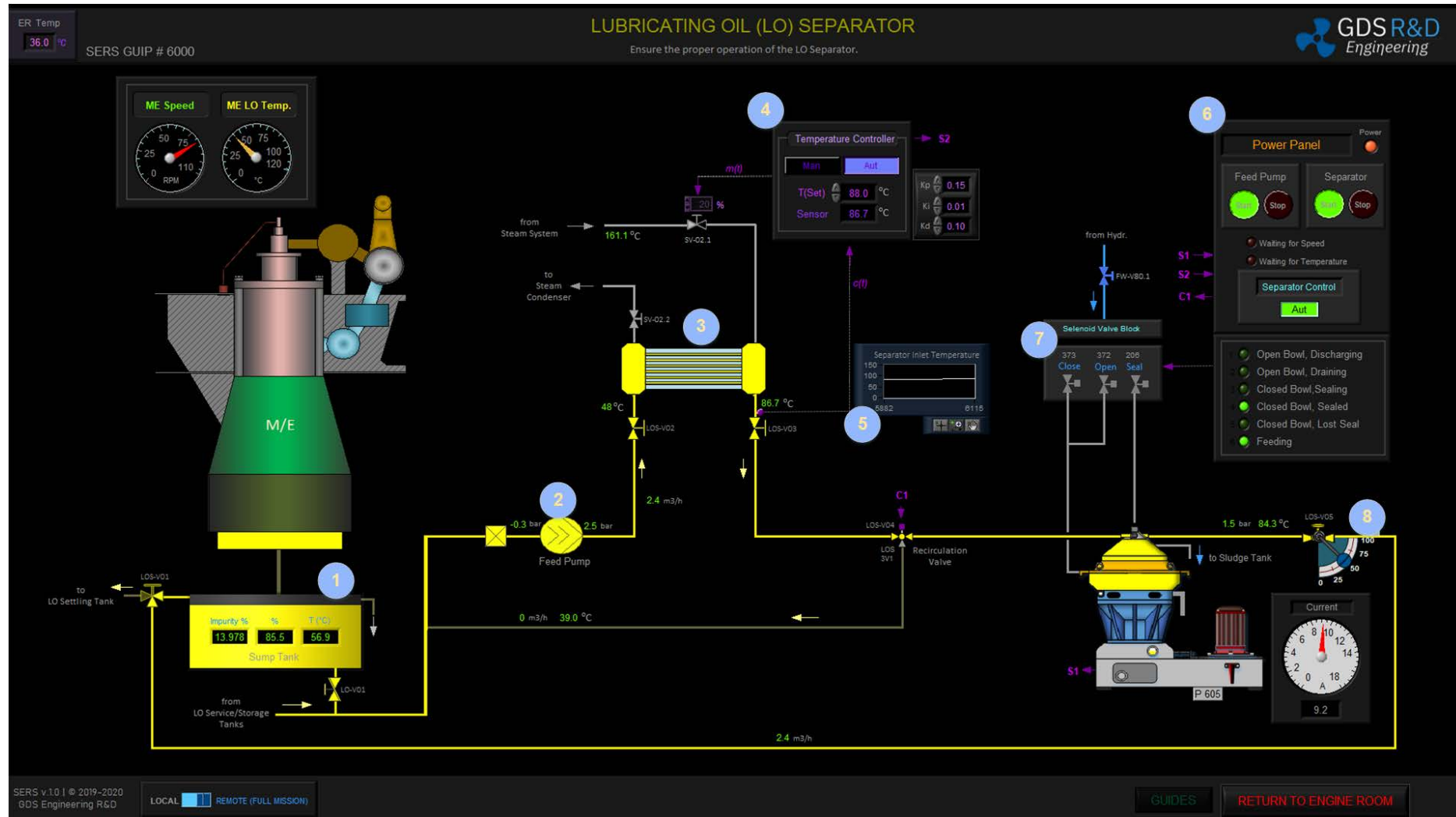
- As soon as the CO₂ release locker door is opened, a micro switch is activated. The micro switch will ensure the activation of CO₂ warning alarms and ventilation shut off. CO₂ release locker consists of two pilot CO₂ cylinders containing CO₂ gas inside.
- CO₂ pilot cylinders activate the master valve. When master valve has been activated, timer delay will start the countdown.
- Activation handle, activates the CO₂ pilot cylinders.
- CO₂ locker door activates CO₂ System Relay Box. CO₂ locker door consists locker door valve, which is supplied with compressed air.
- CO₂ from the pilot cylinders in release cabinet reaches main CO₂ cylinders head assembly through a time delay unit. Function of time delay unit is to delay the supply of CO₂ to the head assembly for 60-90 seconds. When valve release the cabinet is opened, CO₂ reaches only 60 to 90 seconds to the head assembly. Reasons for providing such as delay in CO₂ Fire Extinguishing Installation is:
 - As soon as CO₂ release cabinet opens, alarm is sounded in the protected space. A time delay of 60 to 90 seconds gives sufficient time for any personnel in the protected space to escape, even after the operation of both valves in the release cabinet.
 - If CO₂ is released from main cylinders to common manifold before opening master valve, there may be difficulty in opening master valve because of the bulk CO₂ pressure acting on it. Because of time delay, positive opening of the master valve is ensured before releasing CO₂.
- CO₂ cylinder room stores the CO₂ cylinders ready to use in case of fire situations.
- CO₂ Fire Extinguishing Installation valves operated pneumatically. Pneumatic valves are supplied with air receiver. Also, CO₂ horn actuates by compressed air.
- Test valve provides testing of CO₂ Fire Extinguishing Installation operating condition
- CO₂ Fire Extinguish Installation consists three flooding area:
 - Pump Room
 - Engine Room
 - Separator Room
- CO₂ flows through CO₂ flooding area by main common CO₂ line.

11. CO₂ release panel includes fire alarm and CO₂ alarm indicators, reset alarm button and CO₂ Fire Extinguishing Installation status such as:
 - a. CO₂ Pilot Cylinders Are Active
 - b. Main Cylinders CO₂ Level Low
 - c. CO₂ Main Cylinders Are Empty
 - d. CO₂ Pilot Cylinders Are Empty
12. Buzzer gives audible warning for evacuation of the Engine Room.

4.34.2 Valve Numbering

Number	Description	Number	Description
CA-V28.2	Compressed Air Inlet Valve	CO ₂ -V05	Delay Timer By-Pass Valve
CO ₂ -V01	Locker Door Valve	CO ₂ -V06	Safety Valve
CO ₂ -V02	CO ₂ Outlet Valve	CO ₂ -V07	Test Valve
CO ₂ -V03	CO ₂ Pilot Cylinder 1 Head Assembly Valve	CO ₂ -V08	CO ₂ Engine Room Inlet Valve
CO ₂ -V04	CO ₂ Pilot Cylinder 2 Head Assembly Valve		

4.35 LUBRICATING OIL SEPARATOR (GUI PANEL # 6000)



4.35.1 Table of Screen Objects

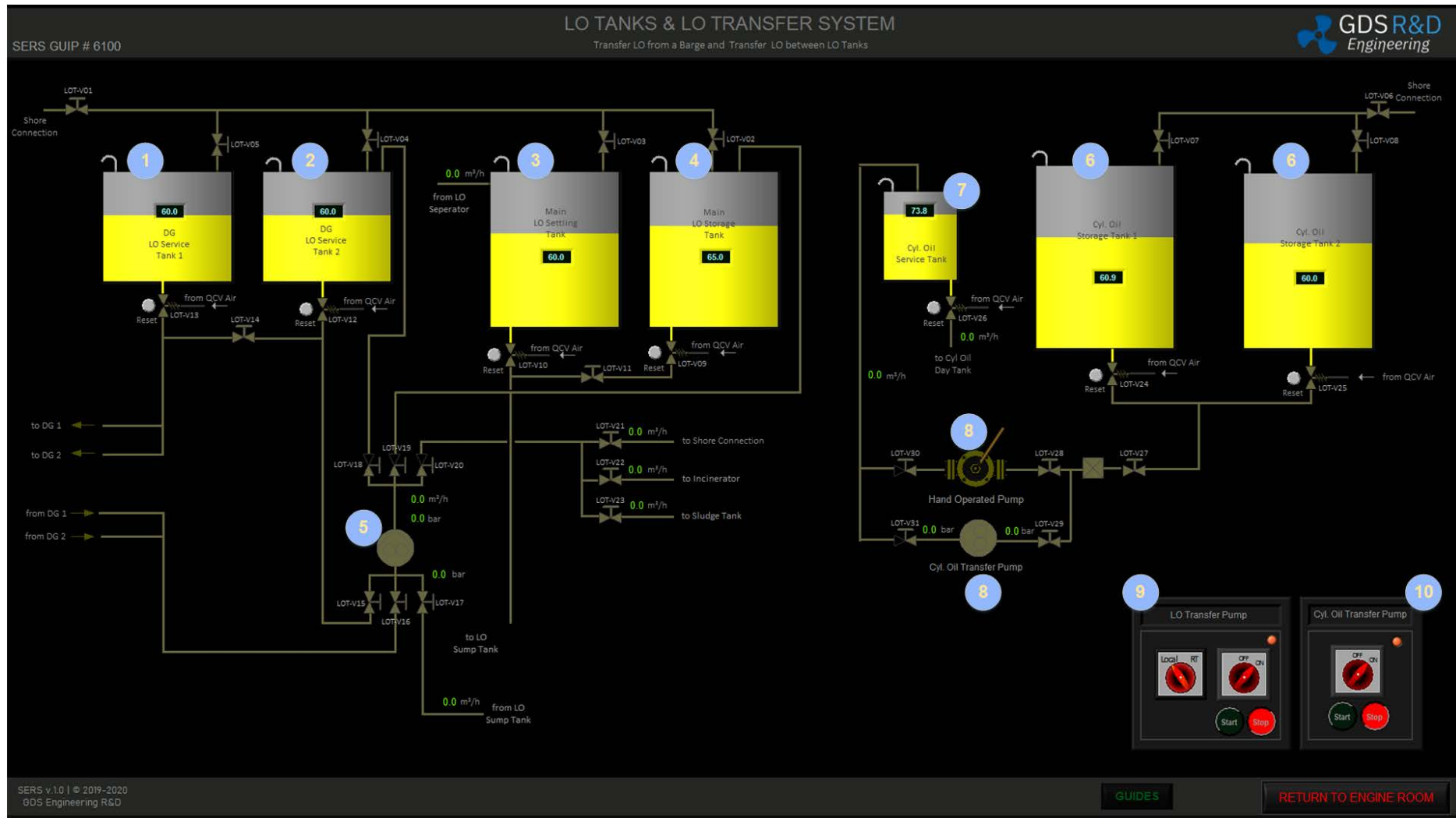
Number	Description	Number	Description
1	Sump Tank	5	Separator Inlet Temperature Diagram Panel
2	Feed Pump	6	Power Panel
3	Heater	7	Solenoid Operated Valve Block
4	Temperature Controller Panel	8	Pressure Regulating Valve

1. Sump Tank located under the main engine in the double bottom and is surrounded by cofferdams. Sump tank consists of a digital level gauge, impurity indicator, temperature indicator, and oil spill pipe.
2. The Feed pump supplies the lubricating oil through the heater. Feed pump provides constant flow in the lubricating oil separator system.
3. The function of the heater is to reduce the lubricating oil viscosity to optimize the flow. The temperature is kept constant with heater.
4. The Temperature controller actuates steam control valve. In this way, the temperature of lubricating oil will kept constant. The Steam control valve adjusts steam flow according to temperature control set value. If the temperature of lubricating oil decreases, steam control valve will allow more steam through the heater. Thus, lubricating oil temperature will be increased. If the temperature of lubricating oil increases, steam control valve will reduce the steam output to the heater. Thus, lubricating oil temperature will be decreased.
5. Separator Inlet Temperature Diagram Panel shows lubricating oil temperature based on time.
6. Power panel consists:
 - a. Feed Pump Control Panel, which is used for starting/stopping feed pump.
 - b. Separator Control Panel, which is used for starting/stopping separator.
 - c. Waiting for Speed, if the separator has not achieved full RPM, then the centrifugal force will not be sufficient to aid the separation.
 - d. Waiting for Temperature, before entering the separator, the dirty oil passes through the heater. This increases the temperature, thus reducing the viscosity of the oil to be purified. The lower viscosity, the better will be separator.
 - e. Separator Control Panel, separator can be operated automatically.
7. Solenoid Operated Valve Block actuates the bowl inside of the separator. Solenoid operated valves supplied with hydrophone system. Solenoid operated valve block consists of three different valve:
 - a. Close Valve, allows the water, which closes the bowl.
 - b. Open Valve, allows the water, which opens the bowl
 - c. Water Seal Valve, allows the water, which seals the bowl
8. Pressure regulating valve regulates the backpressure. The backpressure should be adjusted after separator is started. The back pressure varies as the temperature, density, viscosity of lubricating oil inlet varies. The back pressure ensure that the oil paring disc is immersed in the clean oil on the way of pumping to the sump tank or LO Settling Tank.

4.35.2 Valve Numbering

Number	Description	Number	Description
LO-V01	Sump Tank Separator Outlet Valve	SV-02.2	Heater Steam Outlet Valve
LOS-V01	Sump Tank/LO Settling Tank Changeover Valve	LOS-V04	LO Recirculation Valve
LOS-V02	Heater LO Inlet Valve	FW-V80.1	Operating FW Inlet Valve
LOS-V03	Heater LO Outlet Valve	LOS-V05	LO Separator Outlet Back Pressure Adjusting Valve
SV-02.1	Heater Steam Inlet Valve		

4.36 LUBRICATING OIL TANKS & TRANSFER SYSTEM (GUI PANEL # 6100)



4.36.1 Table of Screen Objects

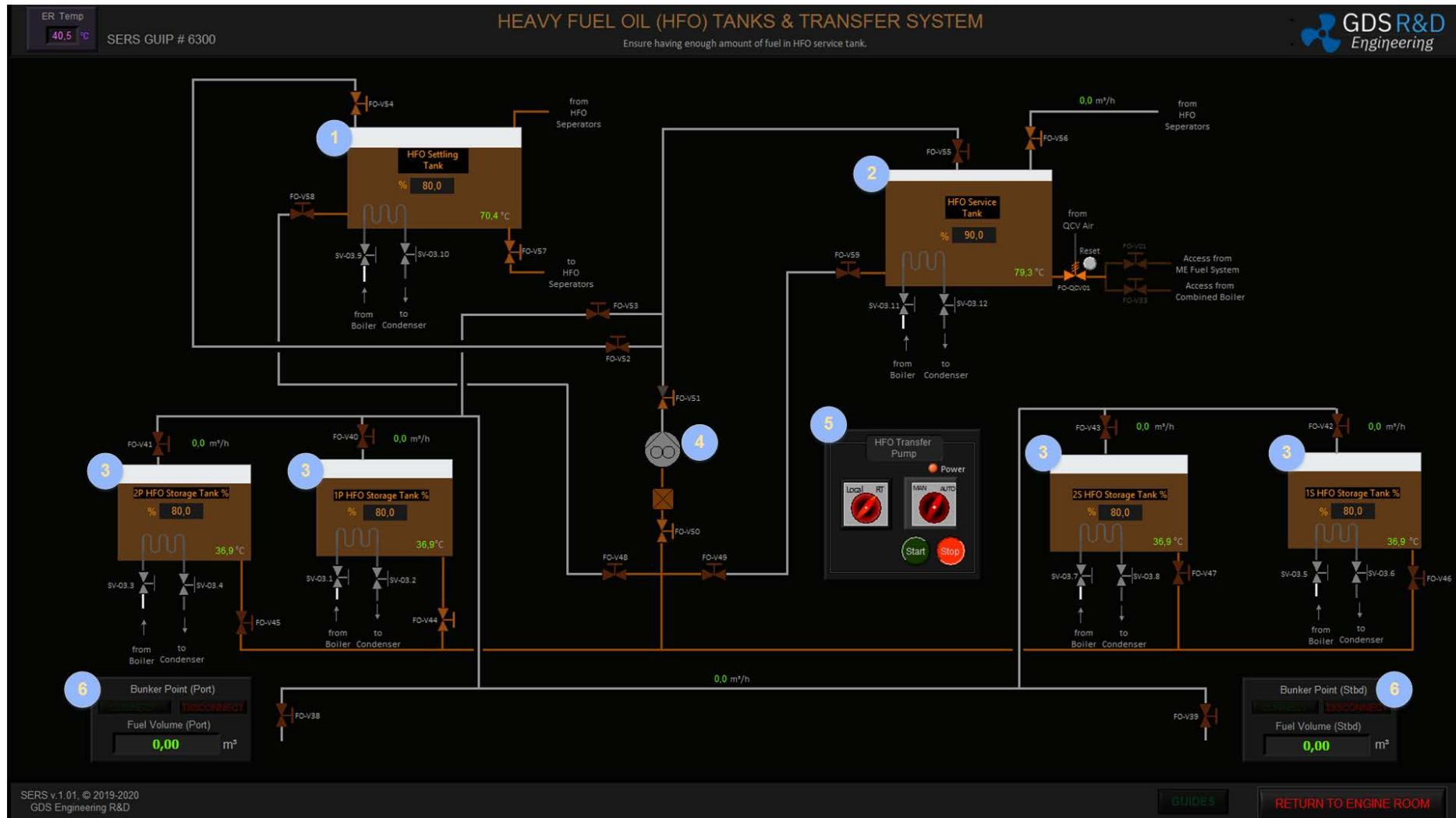
Number	Description	Number	Description
1	Diesel Generator LO Service Tank 1	6	Cylinder Oil Storage Tank
2	Diesel Generator LO Service Tank 2	7	Cylinder Oil Service Tank
3	Main LO Settling Tank	8	Cylinder Oil & Hand Pump
4	Main LO Storage Tank	9	LO Transfer Pump Control Panel
5	LO Transfer Pump	10	Cylinder Oil Transfer Pump Control Panel

1. DG LO Service Tank 1 contains the lubricating oil ready for using at diesel generators. DG Service Tank 1 contains of a digital level gauge, air vent, oil spill pipe, and quick closing valve. Quick closing valve is fitted outline of the LO Tanks which is remotely closed from the Emergency Response Panel. (GUI PANEL #7400) When the valve is closed, the user must click to RESET button for re-opening.
2. DG LO Service Tank 2 contains the required quality of lubricating oil ready for using at diesel generators. DG Service Tank 2 contains of a digital level gauge, air vent, oil spill pipe, and quick closing valve.
3. Main Lubricating Oil Settling Tank used for pre-cleaning of the Main Lubricating Oil by gravity or LO Separator. Main Lubricating Oil Settling Tank contains of a digital level gauge, air vent, oil spill pipe, and quick closing valve.
4. Main Lubricating Oil Storage Tank contains lubricating oil after bunkering. Main lubricating oil storage tank contains of a digital level gauge, air vent, oil spill pipe, and quick closing valve.
5. LO Transfer Pump can transfer diesel generator lubricating oil or main lubricating oil to service tanks, shore connection, incinerator or sludge tank.
6. Cylinder Oil Storage Tanks contain cylinder oil after bunkering. Cylinder Oil Storage Tank contains of a digital level gauge, air vent, oil spill pipe, and quick closing valve.
7. Cylinder Oil Service tank contains cylinder oil ready for using at main engine cylinders. Cylinder Oil Service Tank contains of a digital level gauge, air vent, oil spill pipe, and quick closing valve.
8. Cylinder Oil can be pumped from Cylinder Oil Storage Tank to the Cylinder Oil Day Tank via Cylinder Oil Pump. If cylinder oil pump cannot be operated, hand pump can be used to pump cylinder oil storage tank to the cylinder oil day tank.
9. LO Transfer Pump can be operated from the control panel. Power light indicates whether electrical supply reaches at the panel. If switch is at ON position pumps can be operated when user clicks the start button. If the LO Transfer Pump at Local Mode, the pump can be operated from the local control panel. If the LO Transfer Pump at Remote Mode (RT), the pump can be operated from the ECR Panels: Pumps & Compressors GUI Panel (GUIP #5450).
10. Cylinder Oil Transfer Pump can be operated from the control panel. Power light indicates whether electrical supply reaches at the panel. If switch is at ON position, pumps can be operated when user clicks the start button. If the Cyl. Oil Transfer Pump at Local Mode, the pump can be operated from the local control panel. If the Cyl. Oil Transfer Pump at Remote (RT) Mode, the pump can be operated from the ECR Panels: Pumps & Compressor GUI Panel (GUIP #5450).

4.36.2 Valve Numbering

Number	Description	Number	Description
LOT-V01	LO Shore Connection Main Valve	LOT-V17	LO Transfer Pump Sump Tank Suction Valve
LOT-V02	Main LO Storage Tank Inlet Valve	LOT-V18	LO Transfer Pump DG LO Service Tank Discharge Valve
LOT-V03	Main LO Settling Tank Inlet Valve	LOT-V19	LO Transfer Pump Main LO Storage Tank Discharge Valve
LOT-V04	DG LO Service Tank 2 Inlet Valve	LOT-V20	LO Transfer Pump Shore Connection, Incinerator and Sludge Tank Discharge Valve
LOT-V05	DG Oil Service Tank 1 Inlet Valve	LOT-V21	Shore Connection LO Outlet Valve
LOT-V06	Cyl. Oil Shore Connection Main Valve	LOT-V22	Incinerator LO Inlet Valve
LOT-V07	Cyl. Oil Storage Tank 1 Inlet Valve	LOT-V23	Sludge Tank LO Inlet Valve
LOT-V08	Cyl. Oil Storage Tank 1 Inlet Valve	LOT-V24	Cyl. Oil Storage Tank 1 Outlet Valve
LOT-V09	Main LO Storage Tank Outlet Valve	LOT-V25	Cyl. Oil Storage Tank 2 Outlet Valve
LOT-V10	Main LO Settling Tank Outlet Valve	LOT-V26	Cyl. Oil Day Tank Outlet Valve
LOT-V11	Main LO Tanks Interconnection Valve	LOT-V27	Cyl. Oil Filter Inlet Valve
LOT-V12	DG LO Service Tank 2 Outlet Valve	LOT-V28	Hand Operated Pump Suction Valve
LOT-V13	DG LO Service Tank 1 Outlet Valve	LOT-V29	Cyl. Oil Transfer Pump Suction Valve
LOT-V14	DG LO Tanks Interconnection Valve	LOT-V30	Hand Operated Pump Discharge Valve
LOT-V15	LO Transfer Pump DG LO Tanks Suction Valve	LOT-V31	Cyl. Oil Transfer Pump Discharge Valve
LOT-V16	LO Transfer Pump DG's Suction Valve		

4.37 HFO TANKS & TRANSFER SYSTEM (GUI PANEL #6300)



4.37.1 Table of Screen Objects

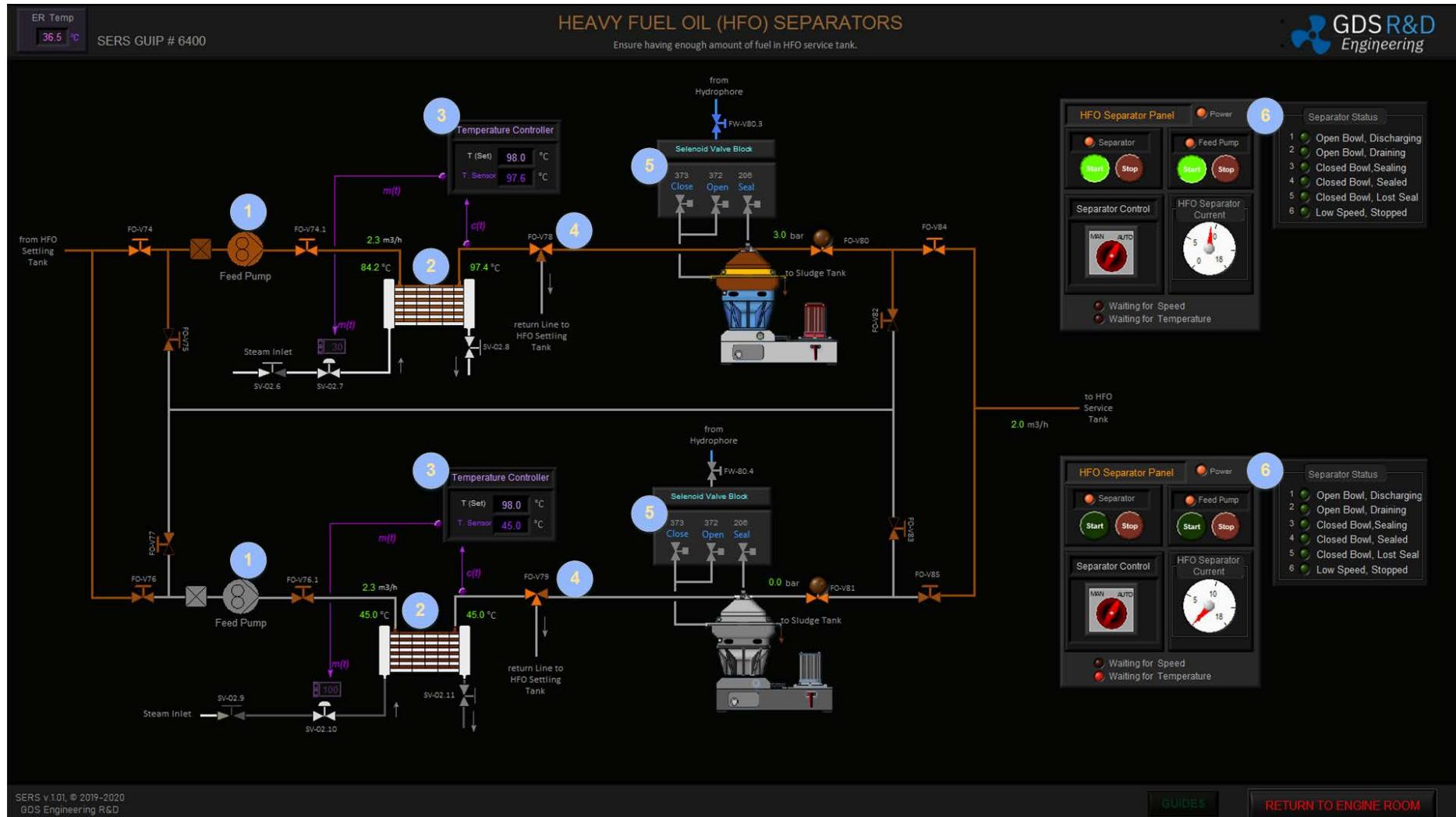
Number	Description	Number	Description
1	HFO Settling Tank	4	HFO Transfer Pump
2	HFO Service Tank	5	HFO Transfer Pump Control Panel
3	HFO Storage Tanks	6	Shore Connection Panel

1. Settling tank used for pre-cleaning of heavy fuel oils by gravity; a liquid mixture in the settling clears slowly as a heavier liquid and solids sink to the bottom under influence of gravity. Settling Tank also includes heating coils, which is heats the fuel in HFO Settling Tank with the steam which is comes from boiler and return to the condenser.
2. Heavy fuel oil (HFO) service tank contains Heavy Fuel Oil ready to use in Main Engine. HFO Service Tank used on board, necessary for propulsion, boiler, and generator systems, are to be provided. HFO Service Tank with a capacity of at least 12 hours at maximum continuous rating (MCR) of the propulsion plant and/or generating plant associated with tank.
3. Heavy Fuel Oil Storage Tanks contains heavy fuel oil after bunkering. Heavy Fuel Oil storage tanks contains a digital level gauge, tank temperature indicator, and heating coils.
4. In preparation of HFO for using, HFO transferred to the HFO Settling Tanks via HFO Transfer Pump, which is equipped with a filter. Piping is so arranged that the pump can transfer fuel between storage tanks to settling tank or storage tank to storage tank (internal transfer).
5. HFO Transfer Pump can be operated from the control panel. Power light, indicates whether electrical supply reaches the panel. If switch position is at "MANUAL" pump can be operated when the user clicks start button. If switch position is at "AUTO" pump operates according to the HFO Service Tank level. If the level decrease, pump will operate automatically. HFO Transfer Pump can be operated in LOCAL or REMOTE mode. If switch position is at LOCAL mode, pump can be operated from the HFO Transfer Pump Local Control Panel. If switch position is at REMOTE mode, pump can be operated from the ECR Panels: Pump & Compressors GUI Panel (GUIP #5450).
6. Shore Connection Panel provides bunkering from manifold of the ship. When user clicks the CONNECT button, bunkering can be achieved. After the bunkering operation click, DISCONNECT button. Intake valve allows HFO flow through HFO Storage Tanks inlet valves.

4.37.2 Valve Numbering

Number	Description	Number	Description
FO-V38	Port Shore Connection Inlet Valve	FO-V49	HFO Transfer Pump HFO Service Tank Suction Valve
FO-V39	Starboard Shore Connection Inlet Valve	FO-V50	HFO Transfer Pump Suction Valve
FO-V40	1P HFO Storage Tank Inlet Valve	FO-V51	HFO Transfer Pump Discharge Valve
FO-V41	2P HFO Storage Tank Inlet Valve	FO-V52	HFO Settling Tank Fill up Valve
FO-V42	1S HFO Storage Tank Inlet Valve	FO-V53	Internal Transfer Valve
FO-V43	2S HFO Storage Tank Inlet Valve	FO-V54	HFO Settling Tank Inlet Valve
FO-V44	1P HFO Storage Tank Outlet Valve	FO-V55	HFO Service Tank Inlet Valve
FO-V45	2P HFO Storage Tank Outlet Valve	FO-V56	HFO Service Tank Inlet Valve (from HFO Separators)
FO-V46	1S HFO Storage Tank Outlet Valve	FO-V57	HFO Settling Tank Separators Outlet Valve
FO-V47	2P HFO Storage Tank Outlet Valve	FO-V58	HFO Settling Tank Outlet Valve
SV-03.1	1P HFO Storage Tank Steam Inlet Valve	FO-V59	HFO Service Tank Outlet Valve
SV-03.2	1P HFO Storage Tank Steam Outlet Valve	SV-03.9	HFO Settling Tank Steam Inlet Valve
SV-03.3	2P HFO Storage Tank Steam Inlet Valve	SV-03.10	HFO Settling Tank Steam Outlet Valve
SV-03.4	2P HFO Storage Tank Steam Outlet Valve	SV-03.11	HFO Service Tank Steam Inlet Valve
SV-03.5	1S HFO Storage Tank Steam Inlet Valve	SV-03.12	HFO Service Tank Steam Outlet Valve
SV-03.6	1S HFO Storage Tank Steam Outlet Valve	FO-QCV01	HFO Service Tank Quick Closing Valve
SV-03.7	2S HFO Storage Tank Steam Inlet Valve	FO-V01	HFO Service Tank Outlet Valve
SV-03.8	2S HFO Storage Tank Steam Outlet Valve	FO-V33	HFO Service Tank Boiler Outlet Valve
FO-V48	HFO Transfer Pump HFO Settling Tank Suction Valve		

4.38 HFO SEPARATORS (GUI PANEL #6400)



4.38.1 Table of Screen Objects

Number	Description	Number	Description
1	Feed Pump	4	Recirculating Valve
2	Heater	5	Solenoid Operated Valve Block
3	Temperature Controller Panel	6	HFO Separator Control and Status Panels

1. The Feed pump supplies the heavy fuel oil through the heater. Feed pump provides constant flow in the heavy fuel oil separator system.
2. The function of the heater is to reduce the heavy fuel oil viscosity. The temperature is kept in constant with heater.
3. Temperature controller actuates steam control valve. In this way, temperature of heavy fuel oil is kept in constant. Steam control valve adjusts steam flow according to temperature control set value. If temperature of heavy fuel oil decrease, steam control valve will more steam through the heater. Thus, heavy fuel oil temperature will be increased. If temperature of heavy fuel oil increase, steam control valve reduces the steam amount through the heater. Thus, heavy fuel oil temperature will be decreased.
4. Recirculation valve allows heavy fuel oil through recirculation line or separator line. If separator waiting for speed or waiting for temperature, fuel oil flows through recirculation line. If separator speed and fuel oil temperature reach sufficient values, recirculation valve position will be changed and fuel oil flows through separator.
5. Solenoid operated valve block actuates the bowl inside of the separator. Solenoid operated valve is supplied with hydrophone system. Solenoid operated valve block consists of three different valve:
 - a. Close Valve, allows the water, which closes the bowl.
 - b. Open Valve, allows the water, which opens the bowl.
 - c. Water Seal Valve, allows the water, which seals the bowl
6. HFO Separator Control Panel consists:
 - a. Feed Pump Control Panel, which is used for starting/stopping operation of the feed pump.
 - b. Separator Control Panel, which is used for starting/stopping operation of the separator.
 - c. Waiting for Speed, if the separator has not achieved full rpm, then the centrifugal force will not be sufficient to aid the separation.
 - d. Separator Control Switch, separator can be operated automatically.
 - e. Separator current indicator indicates current of separator electric motor

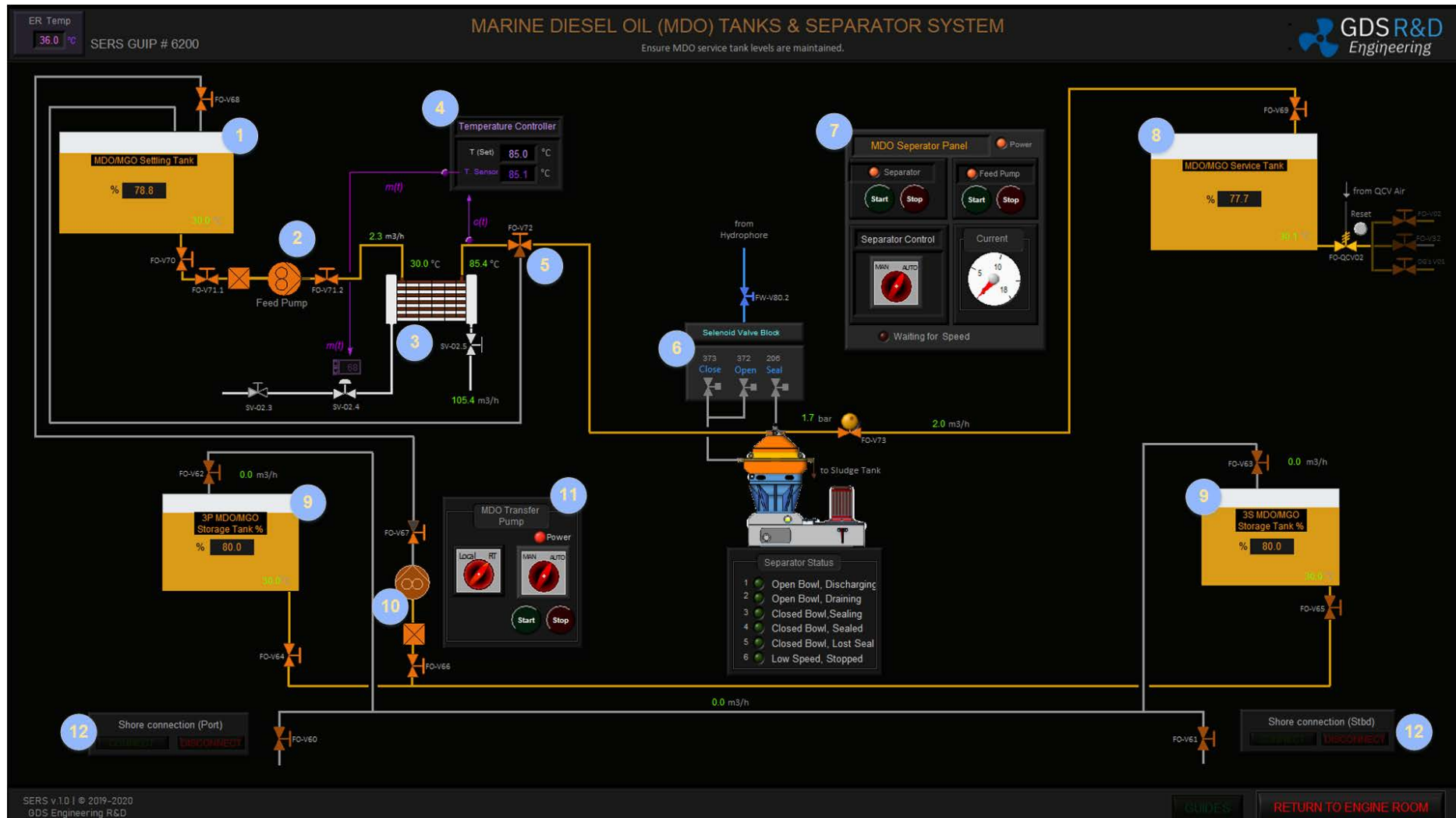
Separator Status Panel consists:

- a. Open Bowl, Discharging
- b. Open Bowl, Draining
- c. Closed Bowl, Sealing
- d. Closed Bowl, Sealed
- e. Closed Bowl Lost Seal
- f. Low Speed, Stopped

4.38.2 Valve Numbering

Number	Description	Number	Description
FO-V74	HFO Separator 1 Feed Pump Suction Valve	SV-02.11	HFO Separator 2 Heater Steam Outlet Valve
FO-V74.1	HFO Separator 1 Feed Pump Discharge Valve	FO-V78	HFO Separator 1 Recirculation Valve
FO-V75	Recirculation Line Inlet Valve 1	FO-V79	HFO Separator 2 Recirculation Valve
FO-V76	HFO Separator 2 Feed Pump Suction Valve	FO-V80	HFO Separator 1 Back Pressure Adjusting Valve
FO-V76.1	HFO Separator 2 Feed Pump Discharge Valve	FO-V81	HFO Separator 2 Back Pressure Adjusting Valve
FO-V77	Recirculation Line Inlet Valve 2	FO-V82	Recirculation Line Outlet Valve 1
SV-02.6	HFO Separator 1 Heater Steam Inlet Valve	FO-V83	Recirculation Line Outlet Valve 2
SV-02.7	HFO Separator 1 Heater Steam Adjustment Valve	FO-V84	HFO Separator 1 Outlet Valve
SV-02.8	HFO Separator 1 Heater Steam Outlet Valve	FO-V85	HFO Separator 2 Outlet Valve
SV-02.9	HFO Separator 2 Heater Steam Inlet Valve	FW-V80.3	HFO Separator 1 Operating Water Inlet Valve
SV-02.10	HFO Separator 2 Heater Steam Adjustment Valve	FW-V80.4	HFO Separator 2 Operating Water Inlet Valve

4.39 MARINE DIESEL OIL TANKS, SEPARATOR & TRANSFER SYSTEM (GUI PANEL #6200)



4.39.1 Table of Screen Objects

Number	Description	Number	Description
1	MDO/MGO Settling Tank	7	MDO Separator Panel
2	Feed Pump	8	MDO/MGO Service Tank
3	Heater	9	MDO/MGO Storage Tanks
4	Temperature Controller Panel	10	MDO Transfer Pump
5	Recirculation Valve	11	MDO Transfer Pump Control Panel
6	Solenoid Operated Valve Block	12	Shore Connection Panel

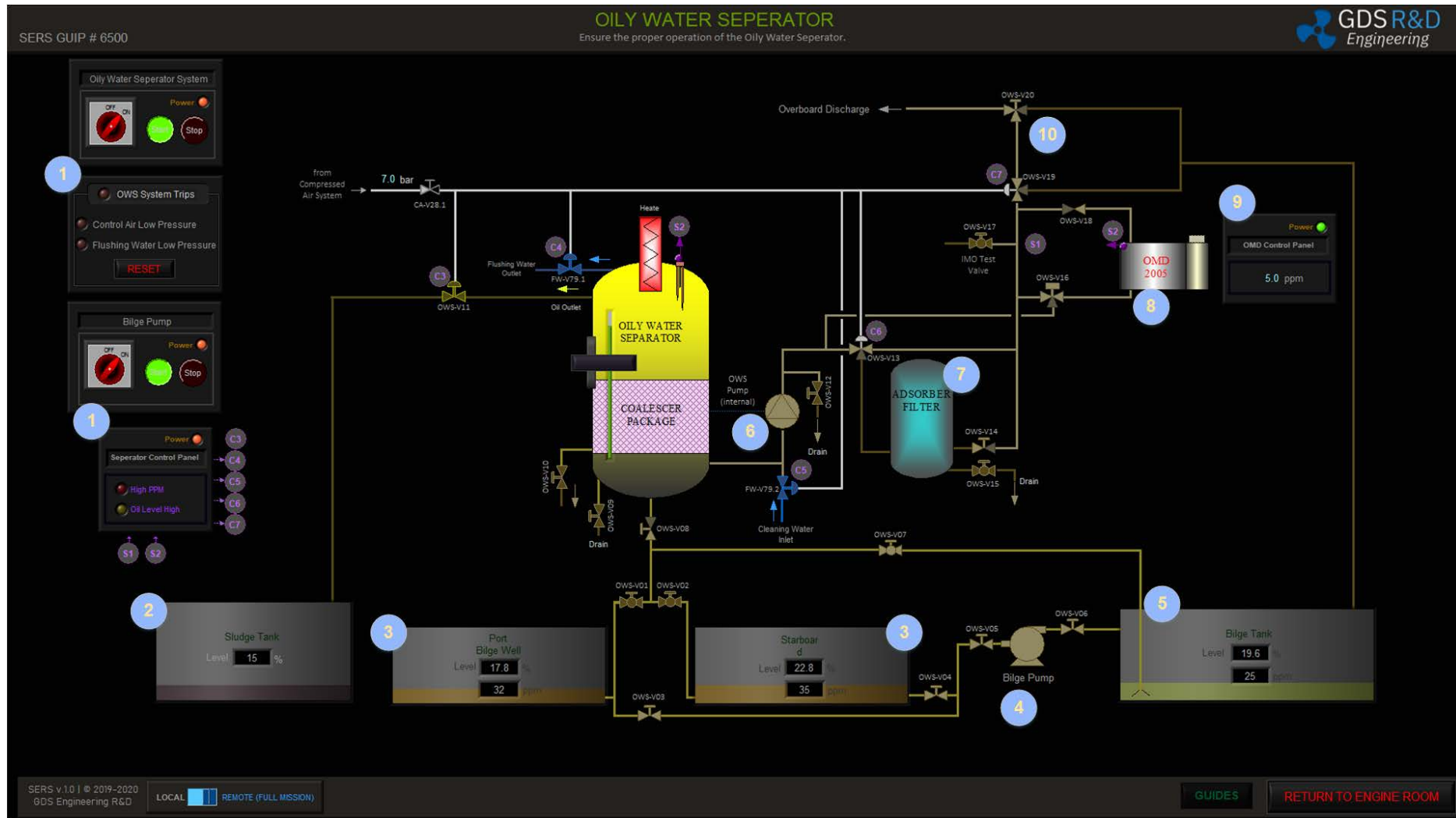
- Settling tank used for pre-cleaning of marine diesel oils by gravity; a liquid mixture in the settling clears slowly as a heavier liquid and solids sink to the bottom under influence of gravity.
- The feed pump supplies the marine diesel oil through the heater. Feed pump provides constant flow to the marine diesel oil separator system.
- The function of the heater is to reduce (via steam) the marine diesel oil viscosity. The temperature is kept in constant with heater.
- Temperature controller actuates steam control valve. In this way, temperature of marine diesel oil is kept constant. Steam control valve adjusts steam flow according to temperature control set value. If temperature of marine diesel oil decrease, steam control valve will more steam through the heater. Thus, marine diesel oil temperature will be increased. If temperature of marine diesel oil increase, steam control valve reduces the steam amount through the heater. Thus, marine diesel oil temperature will be decreased.
- Recirculation valve allows marine diesel oil through recirculation line or separator line. If separator waiting for speed or waiting for temperature, marine diesel oil flows through recirculation line. If separator speed and fuel oil temperature reach sufficient values, recirculation valve position will be changed and fuel oil flows through separator.
- Solenoid valve block actuates the bowl inside of the separator. Solenoid operated valve is supplied with hydrophone. Solenoid valve block consists of three different valve:
 - Close Valve
 - Open Valve
 - Water Seal Valve
- MDO Separator Control Panel consists:
 - Feed Pump Control Panel
 - Separator Control Panel
 - Waiting for Speed
 - Separator Control Switch (Manual/Auto)
 - Separator Current Indicator

8. Marine Diesel Oil (MDO)/Marine Gas Oil (MGO) Service Tank contains fuel ready to use in Main Engine. MDO/MGO Service Tank used on board, necessary for propulsion, boiler and generator systems, are to be provided. MDO Service Tank with a capacity of at least 12 hours at maximum continuous rating (MCR) of the propulsion plant and/or generating plant associated.
9. MDO/MGO Storage Tanks contain marine diesel oil after bunkering. MDO/MGO Tanks contain of a digital level gauge, tank temperature indicator.
10. In preparation of MDO/MGO for using, MDO/MGO transferred to the MDO/MGO Settling Tanks via MDO Transfer Pump, which is equipped with a filter. Piping is arranged that the pump can transfer fuel between storage tanks to settling tank.
11. MDO Transfer Pump can be operated from the control panel. Power light, indicates whether electrical supply reaches the panel. If switch position is at "MANUAL" pump can be operated when the user clicks start button. If switch position is at "AUTO" pump operates according to the MDO/MGO Settling Tank Level. If the level decreases, pump will operate automatically. MDO Transfer Pump can be operated in LOCAL or REMOTE mode. If switch position is at LOCAL mode, pump can be operated from the MDO Transfer Pump Local Control Panel. If switch position is at REMOTE mode, pump can be operated from the ECR Panels: Pump & Compressors GUI Panel (GUIP #5450).
12. Shore Connection Panel provides bunkering from manifold of the ship. When user clicks the CONNECT button, bunkering can be achieved. After the bunkering operation, click the DISCONNECT button. Intake valve allows MDO flow through MDO Storage Tank inlet valve.

4.39.2 Valve Numbering

Number	Description	Number	Description
FO-V60	Port Shore Connection Inlet Valve	SV-02.3	Heater Steam Inlet Valve
FO-V61	Starboard Shore Connection Inlet Valve	SV-02.4	Heater Steam Adjustment Valve
FO-V62	3P MDO Storage Tank Inlet Valve	SV-02.5	Heater Steam Outlet Valve
FO-V63	3S MDO Storage Tank Inlet Valve	FO-V71	Feed Pump Suction Valve
FO-V64	3P MDO Storage Tank Outlet Valve	FO-V72	Recirculation Valve
FO-V65	3S MDO Storage Tank Outlet Valve	FW-80.2	MDO Separator Operating Water Inlet Valve
FO-V66	MDO Transfer Pump Suction Valve	FO-V73	MDO Separator Back Pressure Adjusting Valve
FO-V67	MDO Transfer Pump Discharge Valve	FO-QCV02	MDO Service Tank Quick Closing Valve
FO-V68	MDO Settling Tank Inlet Valve	FO-V02	MDO Service Tank Main Engine Outlet Valve
FO-V69	MDO Service Tank Inlet Valve	FO-V32	MDO Service Tank Boiler Outlet Valve
FO-V70	MDO Settling Tank Outlet Valve	DG's V01	MDO Service Tank Diesel Generators Outlet Valve

4.40 OILY WATER SEPARATOR (GUI PANEL #6500)



4.40.1 Table of Screen Objects

Number	Description	Number	Description
1	Separator, Pumps Control, and OWS System Trips Panel	6	Oily Water Separator (Internal) Pump
2	Sludge Tank	7	Absorber Filter
3	Port Side and Starboard Aft Well	8	Oil Monitoring Device (OMD)
4	Bilge Pump	9	Oil Monitoring Device Control Panel
5	Bilge Tank	10	Outlet Valve

- Oily Water Separator (OWS) pump and bilge pump can be started from the separator control panel. Power light, indicates whether electrical supply reaches at the panel. If switch is at ON position pumps can be operated when the user clicks the start button. Separator control panel includes:
 - High ppm, if the parts of per million (ppm) is higher than 15 in the oily water, high ppm alarm light will be lit.
 - Oil High, if the oil is high, oil high alarm limit will be lit.

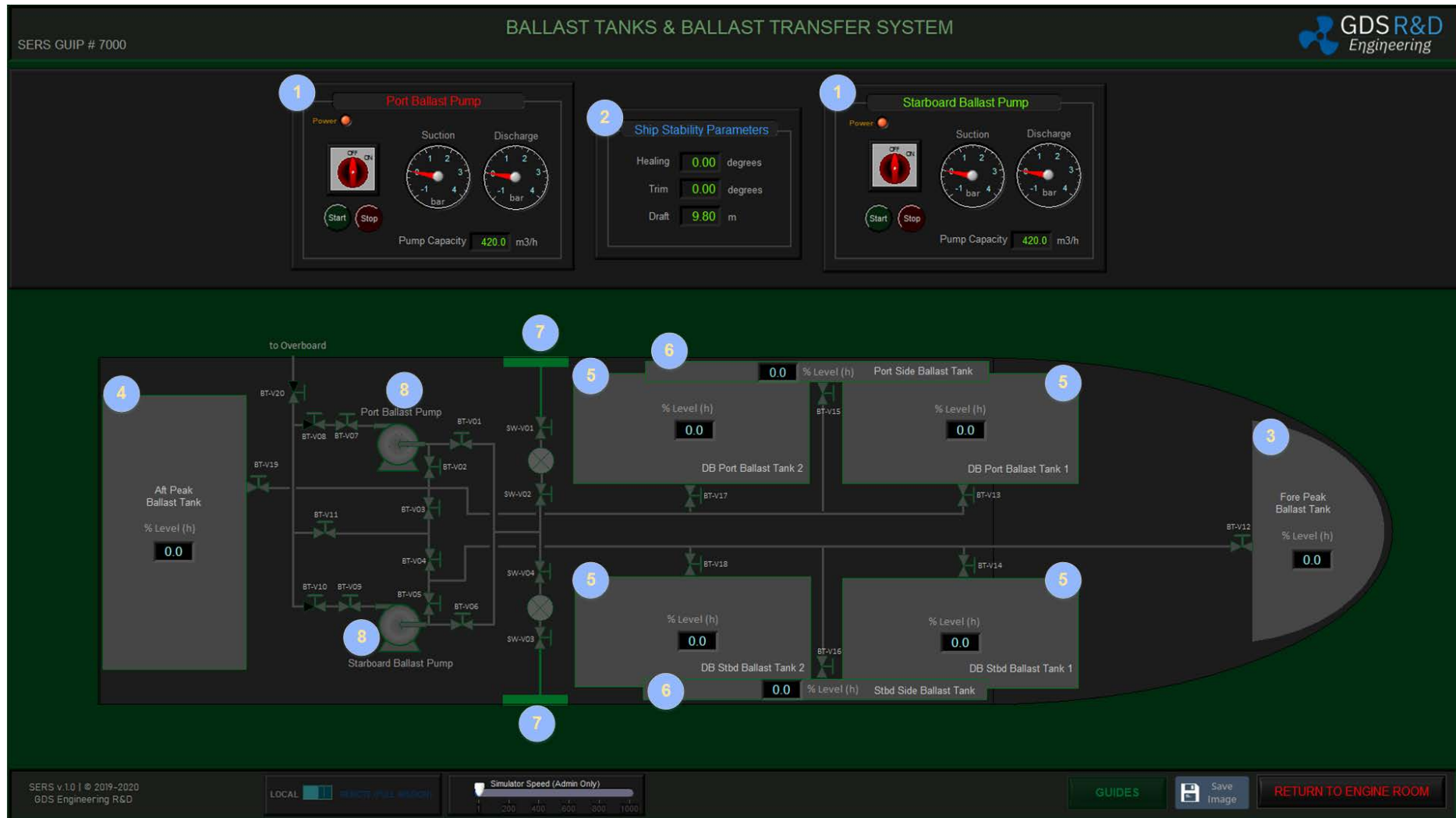
OWS System Trips Panel includes:

- Control Air Low Pressure
 - Flushing Water Low Pressure
- Sludge tank is provided to receive oily residues coming from the oily water filtering or separating equipment and from the purification of fuel and lubricating oils.
 - Bilge well is a space in the bottom of the ship to drain the bilge water and to pump the bilge water overboard.
 - Bilge pump, pumps the bilge water through bilge tank.
 - Bilge tank is the lower part of holds and machinery spaces where bilge water may accumulate.
 - Oily water separator pump (internal pump) pumps the oily water through absorber filter.
 - In case of chemical emulsion in oily water in the bilge, the component used to break this emulsion is called an absorber filter.
 - Operations in oily water separator is controlled by Oil Monitoring Device (OMD). If the oil content of the oily water after the Coalescer package is equal or higher than 14 ppm, the oily water sent to the absorber filter. If the oil content is less than 15 ppm, oily water is discharged to sea.
 - Oil Monitoring Device Control Panel, indicates the ppm of the oily water. Power light, indicates whether electrical supply reaches at the panel.
 - If ppm of the oily water is less than 15 ppm, outlet three way valve will change position and oily water will be discharged.

4.40.2 Valve Numbering

Number	Description	Number	Description
OWS-V01	Port Aft Well OWS Outlet Valve	FW-V79.1	OWS Backflush Discharge Valve
OWS-V02	Starboard Aft Well OWS Outlet Valve	FW-V79.2	OWS FW Inlet Valve
OWS-V03	Port Aft Well Bilge Tank Outlet Valve	OWS-V12	OWS Pump Drain Valve
OWS-V04	Starboard Aft Well Bilge Tank Outlet Valve	OWS-V13	Adsorber Filter By-Pass Valve
OWS-V05	Bilge Pump Suction Valve	OWS-V14	Adsorber Filter Outlet Valve
OWS-V06	Bilge Pump Discharge Valve	OWS-V15	Adsorber Filter Drain Valve
OWS-V07	Bilge Tank Outlet Valve	FW-V79.3	OMD FW Inlet Valve
OWS-V08	OWS Inlet Valve	OWS-V16	OMD Sampling Valve
OWS-V09	OWS Drain Valve	OWS-V17	IMO Test Valve
OWS-V10	OWS Safety Valve	OWS-V18	OMD Check Valve
CA-V28.1	Compressed Air Inlet Valve	OWS-V19	Bilge Tank/Overboard Interconnection Valve 1
OWS-V11	OWS Oil Discharge Valve	OWS-V20	Bilge Tank/Overboard Interconnection Valve 2

4.41 BALLAST TANKS & TRANSFER SYSTEM (GUI PANEL #7000)



4.41.1 Table of Screen Object

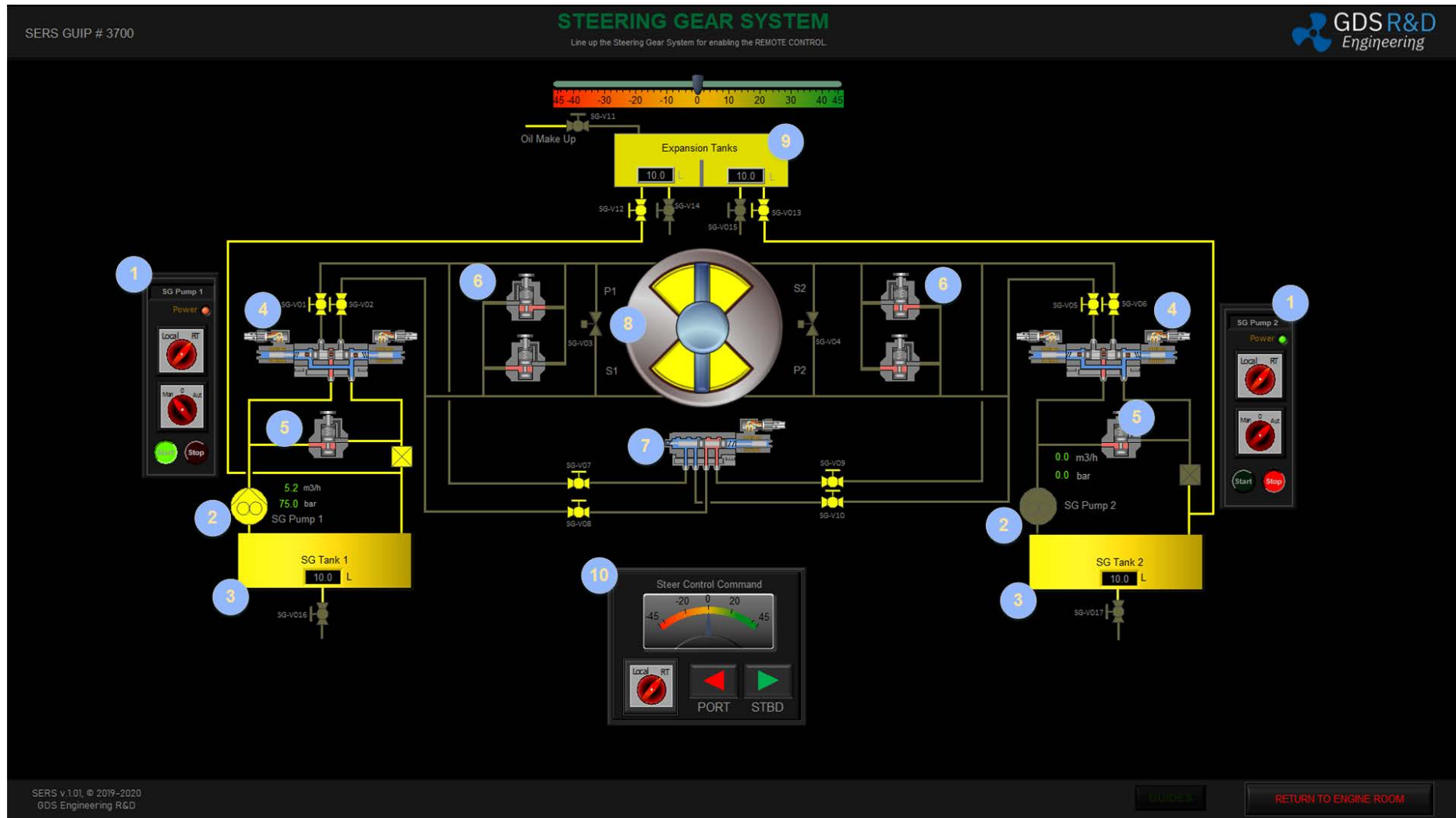
Number	Description	Number	Description
1	Ballast Pumps Control Panels	5	Double Bottom (DB)Ballast Tanks
2	Ship Stability Parameters	6	Side Ballast Tanks
3	Fore Peak Ballast Tank	7	Sea Chests
4	Aft Peak Ballast Tank	8	Ballast Pumps

1. Ballast Pumps can be operated from the control panel. Power light, indicates whether electrical supply reaches at the panel. If switch is at ON position, pump can be operated when user clicks the start button. Control Panels also includes:
 - a. Ballast Pump Suction Pressure Gauge
 - b. Ballast Pump Discharge Pressure Gauge
 - c. Ballast Pump Capacity
2. Ship Stability Parameters Panel includes:
 - a. Healing, a steady angle of heel created by an external force, such as wind or waves.
 - b. Trim, the difference of the drafts between forward and aft.
 - c. Draft, the vertical distance from the moulded base line amidships to the actual waterline.
3. Fore peak ballast tank, the watertight compartment situated forward of collision bulkhead.
4. Aft peak ballast tank, the compartment in the narrow part of stern aft of the aft peak bulkhead.
5. Double bottom ballast tank, watertight compartment for holding water ballast.
6. Side ballast tanks used for ballast and stability when carrying cargo.
7. The sea chest provides an intake reservoir from which piping systems draw raw water. Sea chest are protected by removable grating, and contain baffle plates to dampen the effect of vessel speed or sea state.
8. Ballast pump is used for transferring or discharging water ballast. Together with the tank, pipe, valves, it is composited of the ballast system.

4.41.2 Valve Numbering

Number	Description	Number	Description
SW-V01	Low Suction Sea Chest Filter Inlet Valve	BT-V09	Starboard Ballast Pump Discharge Valve
SW-V02	Low Suction Sea Chest Filter Outlet Valve	BT-V10	Starboard Ballast Pump Discharge Check Valve
SW-V03	High Suction Sea Chest Filter Inlet Valve	BT-V11	Main Interconnection Valve
SW-V04	High Suction Sea Chest Filter Outlet Valve	BT-V12	Fore Peak Ballast Tank Valve
BT-V01	Port Ballast Pump SW Suction Valve	BT-V13	DB Port Ballast Tank 1 Valve
BT-V02	Port Ballast Pump Tank Suction Valve	BT-V14	DB Starboard Ballast Tank 1 Valve
BT-V03	Port Interconnection Valve	BT-V15	Port Side Ballast Tank Valve
BT-V04	Starboard Interconnection Valve	BT-V16	Starboard Side Ballast Tank Valve
BT-V05	Starboard Ballast Pump Tank Suction Valve	BT-V17	DB Port Ballast Tank 2 Valve
BT-V06	Starboard Ballast Pump SW Suction Valve	BT-V18	DB Starboard Ballast Tank Valve
BT-V07	Port Ballast Pump Discharge Valve	BT-V19	Aft Peak Ballast Tank Valve
BT-V08	Port Ballast Pump Discharge Check Valve	BT-V20	Overboard Valve

4.42 STEERING GEAR SYSTEM (GUI PANEL #3700)



4.42.1 Table of Screen Objects

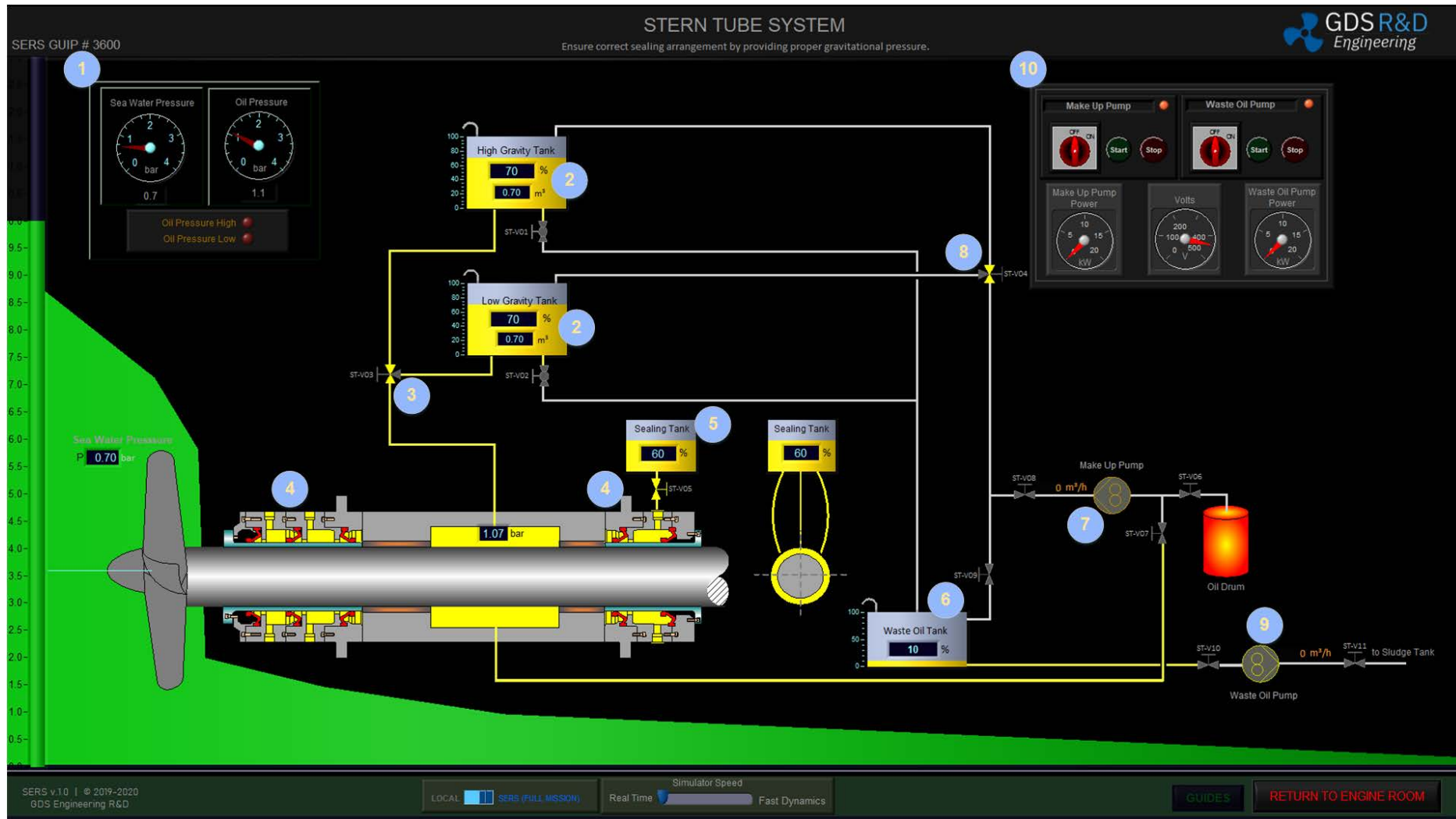
Number	Description	Number	Description
1	Steering Gear Pump Control Panel	6	Safety Relief Valve
2	Steering Gear Pump	7	Isolation Valve
3	Steering Gear Pump Sump Tank	8	Rotary Vane Type Steering Gear
4	4/3 Directional Control Valve	9	Expansion Tank
5	Pressure Limiting Valve	10	Steering Gear Control Panel

- Steering gear pump can be operated from the control panel. Power light, indicates whether electrical supply reaches the panel. If switch position is at “0” position, pump will not operate. If switch position is at “MANUAL” pump can be operated when the user clicks start button. If switch position is at “AUTO” pump operates according to the system pressure in-line. If pressure decrease, pump will operate automatically. If switch position is at “REMOTE(RT)” pump can be operated from the pumps and compressors remote panel. (GUI PANEL #5450) If switch position is at “LOCAL” pump can be operated from the local control panel.
- Hydraulic pumps used in the steering gear system provides the hydraulic pressure required to move rotary vanes. The pumps receive oil from the sump tanks and discharge to rotary vanes.
- Steering gear pump receives the oil to be sent to the rotary vanes from the sump tank and after moving the rotary vanes, it returns to the same tank.
- Directional control valves are the hydraulic valves that provide pressurized oil to be sent to the desired rotary vane. It is one of most important elements in the rudder system as it provides the port or starboard movement of the ship.
- The two circuits of the steering gear system are controlled by pressure limiting valves. Pressure limiting valve provide the system to operate at operating pressure.
- Safety relief valves protect excessive pressure of the system.
- As long as the isolation valve in the port and starboard systems constituting the rudder equipment is kept in open position, one or two pumps are in operation and pressurized oil can be sent to both rotary vanes.
- The rotary vane system works by introducing pressure into compartments formed between a stator fixes to the ship’s structure and a rotor attached to the rudderstock. When steering effort is required, the pressure is increased in the appropriate compartments. The pressure reacts against the fixed vanes and pushes the rotor (and the rudderstock) in the required direction.
- If the oil levels in the sump tanks are reduced, oil can be supplied from the expansion tank.
- Steering gear control panel consists:
 - Rudder Position Indicator
 - LOCAL/REMTOE Switch
 - Non Follow Up Buttons

4.42.2 Valve Numbering

Number	Description	Number	Description
SG-V01	SG Pump 1 Discharge Valve	SG-V10	Outlet Valve of the Isolation Valve 2
SG-V02	Oil Recirculation Valve	SG-V11	Expansion Tank Fill Up Valve
SG-V03	Safety Valve 1	SG-V12	Expansion Tanks SG Tank 1 Outlet Valve
SG-V04	Safety Valve 2	SG-V13	Expansion Tanks SG Tank 2 Outlet Valve
SG-V05	SG Pump 2 Discharge Valve	SG-V14	Expansion Tanks Drain Valve
SG-V06	Oil Recirculation Valve	SG-V15	Expansion Tanks Drain Valve
SG-V07	Inlet Valve of the Isolation Valve 1	SG-V16	SG Tank 1 Drain Valve
SG-V08	Outlet Valve of the Isolation Valve 1	SG-V17	SG Tank 2 Drain Valve
SG-V09	Inlet Valve of the Isolation Valve 2		

4.43 STERN TUBE SYSTEM (GUI PANEL #3600)



4.43.1 Table of Screen Objects

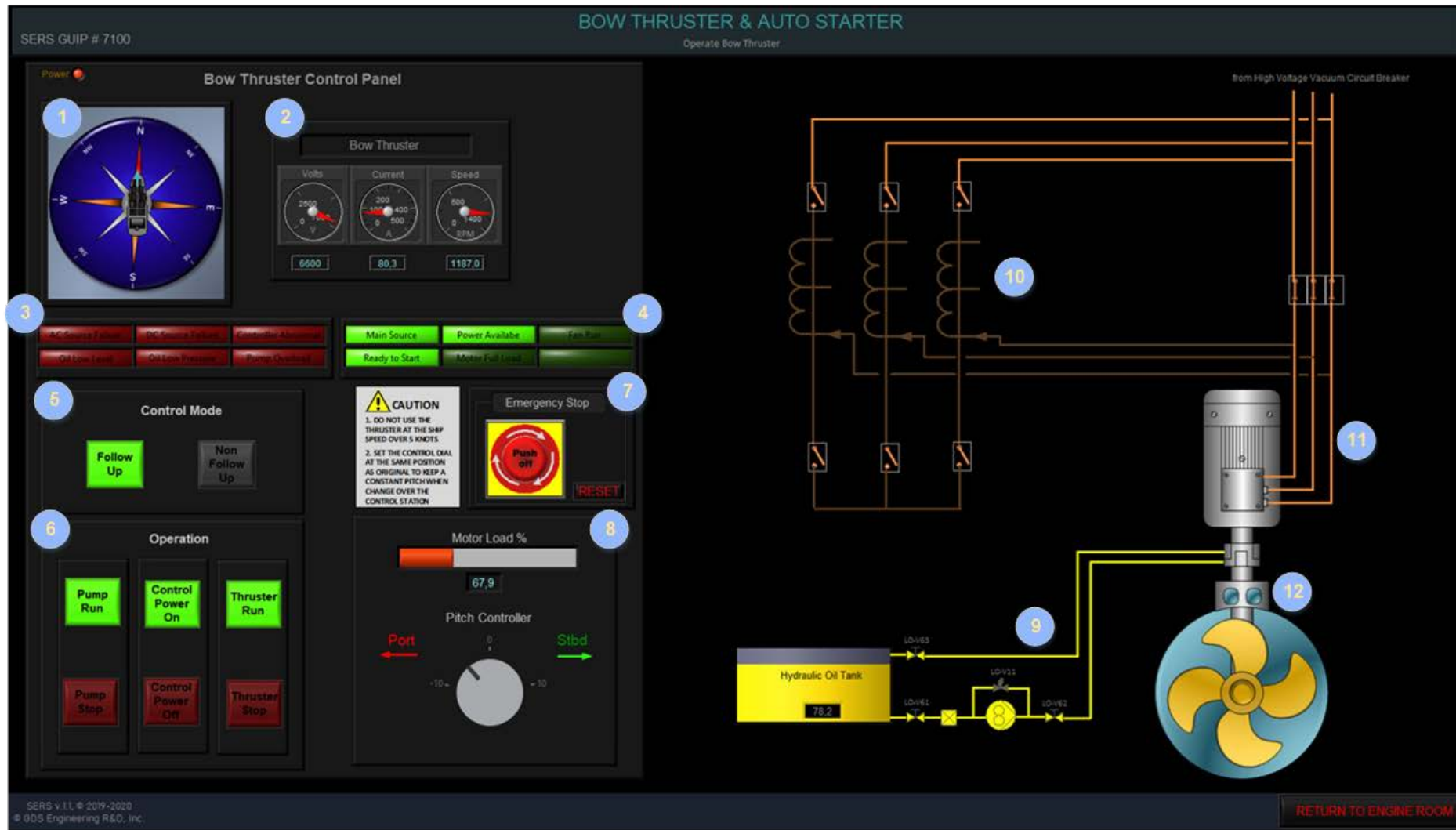
Number	Description	Number	Description
1	Indicator Panel	6	Waste Oil Tank
2	High & Low Gravity Tanks	7	Make-up Pump
3	Gravity Tanks Outlet Valve	8	Gravity Tanks Inlet Valve
4	Aft and Low Stern Tube Seals	9	Waste Oil Pump
5	Sealing Tank	10	Make-up & Waste Oil Pump Control Panel

- Indicator Panel includes:
 - Sea Water Pressure Gauge
 - Oil Pressure Gauge
 - Alarm Indicator
- In order to prevent sea water entering to the engine room from where the propeller shaft passes through stern tube, oil is supplied from the high and low gravity tank with gravity force. The user must decide which tank will be supplied (high and low gravity tank) the system according to the draft by means that static pressure of sea water.
- Gravity tanks outlet valve allows oil flow through the stern tube from high gravity tank or low gravity tank.
- Aft and low stern tube seals prevent entering sea water to engine room and oil to sea.
- Sealing tank provides the seals of forward seal unit.
- Waste oil tank collect waste oil from the system. The waste oil can be transferred to sludge tank with waste oil pump.
- Oil is added into the stern tube system by make-up pump.
- Gravity tanks inlet valve allows oil flow through high gravity tank or low gravity tank.
- Waste oil pump transfer the waste oil to waste oil tank to sludge tank.
- Make-up and Waste Oil Pumps can be operated from the control panel. Power light, indicates whether electrical supply reaches at the panel. If switch is at ON position, pumps can be operated when user clicks the start button. Control panel also includes:
 - Make-up Pump Power Gauge
 - Voltmeter
 - Waste Oil Pump Power Gauge

4.43.2 Valve Numbering

Number	Description	Number	Description
ST-V01	High Gravity Tank Outlet Valve	ST-V07	Make-Up Pump Stern Tube Suction Valve
ST-V02	Low Gravity Tank Outlet Valve	ST-V08	Make-Up Pump Discharge Valve
ST-V03	High/Low Gravity Tank Changeover Valve	ST-V09	Waste Oil Tank Inlet Valve
ST-V04	Recirculation Valve	ST-V10	Waste Oil Pump Suction Valve
ST-V05	Sealing Tank Outlet Valve	ST-V11	Waste Oil Pump Discharge Valve
ST-V06	Make-Up Pump Oil Drum Suction Valve		

4.44 BOW THRUSTER SYSTEM (GUI PANEL #7100)



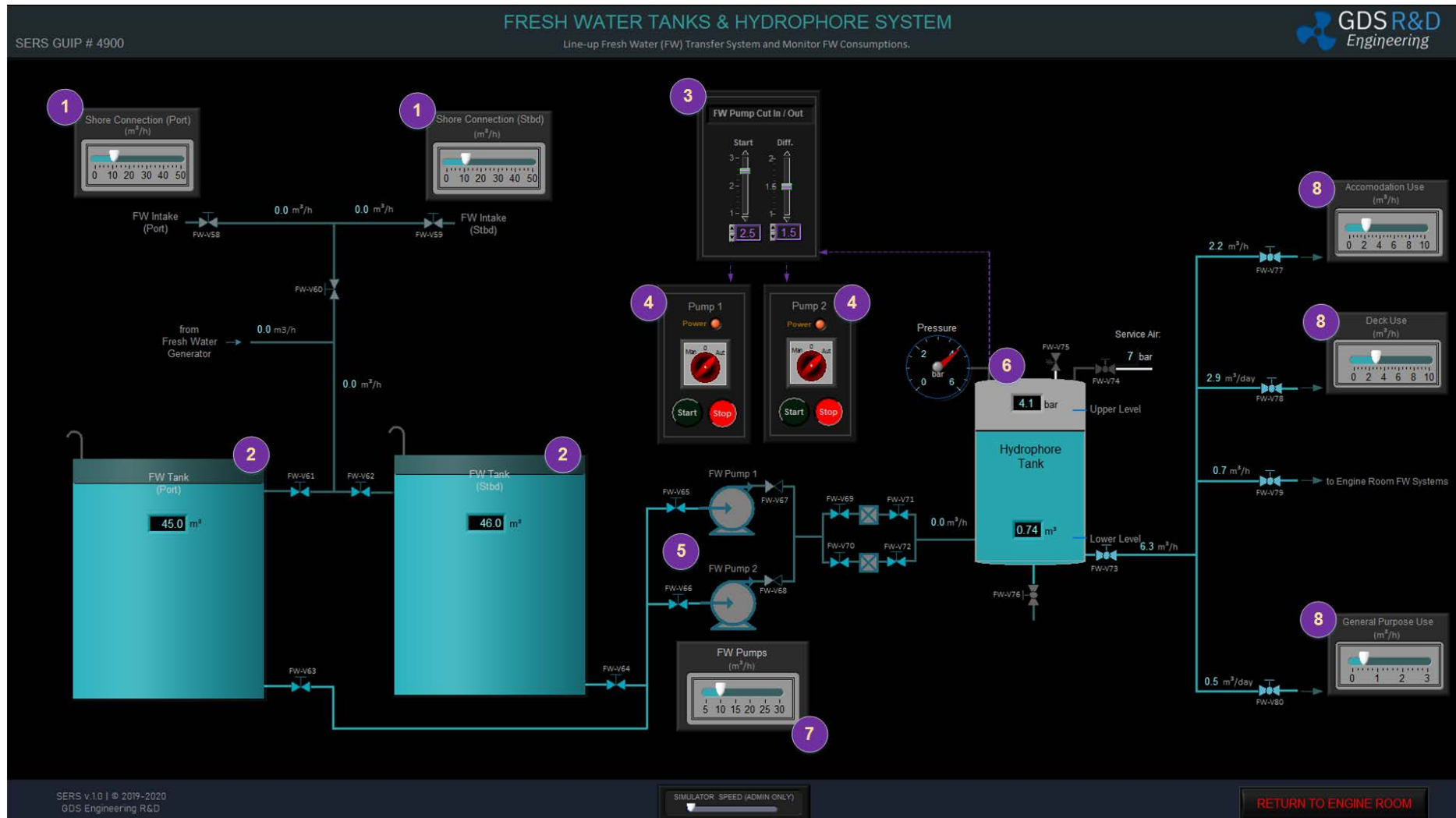
4.44.1 Table of Screen Objects

Number	Description	Number	Description
1	Compass	7	Bow Thruster Emergency Stop
2	Bow Thruster Electrical Indicator Panel	8	Bow Thruster Pitch Controller
3	Bow Thruster Failure Indicator Panel	9	Bow Thruster CPP Hydraulic Oil Layout
4	Bow Thruster Operation Indicator Panel	10	Auto Starter Layout
5	Bow Thruster Control Mode Panel	11	High Voltage Line
6	Bow Thruster Operation Panel	12	Bow Thruster View

1. An instrument using either a magnet or a gyroscope for steering or taking navigational bearings.
2. Bow thruster electrical indicator panel consists:
 - a. Voltmeter, which indicates the control panel supply electrical voltage.
 - b. Current Indicator, which indicates how much current is drawn by the pump.
 - c. RPM Indicator, which indicates the rpm of the bow thruster speed.
3. Bow thruster failure indicator panel consists:
 - a. AC Source Failure
 - b. DC Source Failure
 - c. Controller Abnormal
 - d. Oil Low Level
 - e. Oil Low Pressure
 - f. Pump Overload
4. Bow thruster operation indicator panel consists:
 - a. Main Source
 - b. Power Available
 - c. Fan Run
 - d. Ready to Start
 - e. Motor Full Load
5. Bow thruster control mode panel consists:
 - a. Follow Up
 - b. Non-Follow Up
6. Bow thruster operation panel provides operating of bow thruster. Bow thruster operation panel includes:
 - a. Pump Start and Stop Buttons

- b. Control Power On and Off Buttons
 - c. Thruster Start and Stop Buttons
- 7. Stops the bow thruster at emergency situations. Reset button provides bow thruster re-starting via thruster run button.
- 8. Bow thruster speed can be controlled from bow thruster pitch controller panel. Bow thruster pitch controller panel also includes motor load indicator which indicates load of the bow thruster.
- 9. Bow thruster speed is changing via changing of pitch angle. Bow thruster controllable pitch propeller hydraulic oil layout consists:
 - a. Hydraulic Oil Tank
 - b. Hydraulic Oil Pump
 - c. Filter and valves
- 10. Auto starter system protect the bow thruster motor from high voltage and high inrush current. Automatic starter system consists of 3 different resistance levels. The resistance levels changing automatically for protecting the bow thruster motor from high inrush current. When the current reaches normal level, high voltage line connected to the bow thruster motor automatically.
- 11. Electrical power which is transformed 440 V to 6600 V from High Voltage Bus Bar / Transformer GUI Panel (GUIP #5850), is supplied to high voltage line via Vacuum Circuit Breaker (GUIP #5860).
- 12. The bow thruster gains maneuvering ability of the ship by rotating with electrical motor. The bow thruster is supplied with 6660 V which means high voltage operation.

4.45 FRESH WATER HYDROPHORE SYSTEM (GUI PANEL #4900)



4.45.1 Table of Screen Objects

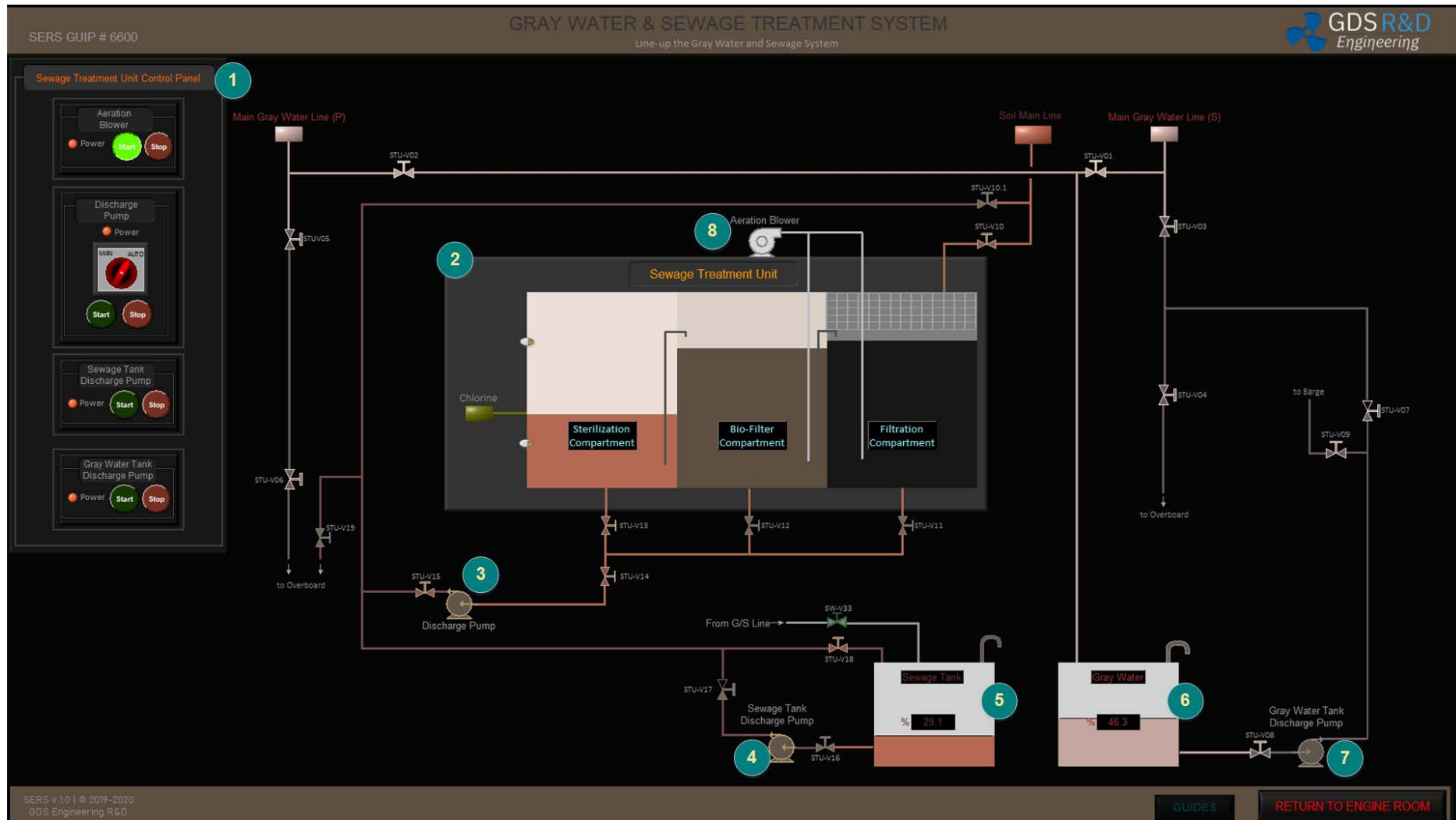
Number	Description	Number	Description
1	Shore Connection Control Panel	5	Fresh Water Pumps
2	Port Side & Starboard Fresh Water Tank	6	Hydrophore Tank
3	Fresh Water Pump Cut In/Out Panel	7	FW Pumps Flow Control Panel
4	Fresh Water Pumps Control Panel	8	Consumers Flow Control Panel

1. Shore Connection Flow Control Panel provides fresh water flows from shore into the fresh water tanks.
2. Fresh water tank used to store fresh water for accommodation, engine room and deck use.
3. Fresh water Pump Cut In/Out Panel controls the pressure switch of the Fresh Water Pump 1 and Fresh Water Pump 2. When the specified system pressure is reached, a diaphragm or piston inside the pressure switch pushes against the mechanism, which forces electrical contacts apart, breaking the circuit and stopping the fresh water pumps. As air is used and Hydrophore Tank drops to a specified, 'cut-in' and 'cut-out' settings, the contacts close or open for fresh water pumps starting/stopping.
4. Fresh water pump can be operated from the control panel. If switch position is at "0" position, pump will not operate. If switch position is at "MANUAL" pump can be operated when click start button. If switch position is at "AUTO" pump operates according to the system pressure in-line. If pressure decrease, pump will operate automatically.
5. Fresh water pump pumps the fresh water through Hydrophore Tank.
6. When water is used by opening a faucet from accommodation, cabin or galley, the compressed air located in the upper part of the Hydrophore Tank expands, and the water with pressure and provides the water to go to the desired place. When the pressure is decreased due to the air expands and water level decreases, the pump automatically switches on and runs to the set pressure and fill the Hydrophore Tank. The increased water level in the Hydrophore Tank, recompresses the compressed air and increases air pressure inside of the Hydrophore Tank.
7. FW Pumps Flow Control Panel is used for changing FW Pumps Capacity.
8. Consumers flow Control Panel provides fresh water flows from Hydrophore Tank through using at the systems.

4.45.2 Valve Numbering

Number	Description	Number	Description
FW-V58	Port Shore Connection FW Valve	FW-V70	FW Filter 2 Inlet Valve
FW-V59	Starboard Shore Connection FW Valve	FW-V71	FW Filter 1 Outlet Valve
FW-V60	FW Tanks Main Inlet Valve	FW-V72	FW Filter 2 Outlet Valve
FW-V61	Port FW Tank Inlet Valve	FW-V73	Hydrophore Tank Outlet Valve
FW-V62	Starboard FW Tank Inlet Valve	FW-V74	Service Air Inlet Valve
FW-V63	Port FW Tank Outlet Valve	FW-V75	Hydrophore Tank Safety Valve
FW-V64	Starboard FW Tank Outlet Valve	FW-V76	Hydrophore Tank Drain Valve
FW-V65	FW Pump 1 Suction Valve	FW-V77	Accommodation Use FW Inlet Valve
FW-V66	FW Pump 2 Suction Valve	FW-V78	Deck Use FW Inlet Valve
FW-V67	FW Pump 1 Discharge Valve	FW-V79	ER Systems FW Inlet Valve
FW-V68	FW Pump 2 Discharge Valve	FW-V80	Separators FW Inlet Valve
FW-V69	FW Filter 1 Inlet Valve		

4.46 GRAY WATER & SEWAGE TREATMENT (GUI PANEL #6600)



4.46.1 Table of Screen Objects

Number	Description	Number	Description
1	Sewage Treatment Unit Control Panel	5	Sewage Tank
2	Sewage Treatment Unit	6	Gray Water Tank
3	Discharge Pump	7	Gray Water Tank Discharge Pump
4	Sewage Tank Discharge Pump	8	Aeration Blower

1. Sewage Treatment Unit Control Panel includes:

a. Aeration Blower Control

Aeration Blower can be operated from this panel via Start/Stop buttons. Power light indicates whether electrical supply reaches at the panel.

b. Discharge Pump Control

Discharge Pump can be operated from this panel. Power light indicates whether electrical supply reaches at the panel. If switch position is at “MANUAL” pump can be operated when the start button is pressed. If switch position is at “AUTO” pump operates according to the Sterilization Compartment level. If level increase, pump will operate automatically.

c. Sewage Tank Discharge Pump Control

Sewage Tank Discharge Pump can be operated from this panel via Start/Stop buttons. Power light indicates whether electrical supply reaches at the panel.

d. Gray Water Tank Discharge Pump Control

Gray Water Tank Discharge Pump can be operated from this panel via Start/Stop buttons. Power light indicates whether electrical supply reaches at the panel.

2. Sewage Treatment Unit consists of three compartment:

a. Filtration Compartment

It is also known as physical purification at the same time. In the physical treatment process, the coarse material in the waste water are decomposed by mechanical methods (in the form of precipitation and flotation). Grid filters are used for this purpose.

b. Bio-filter Compartment

The removal of organic and partially inorganic pollutants from sewage by using bacteria as energy and nutrient sources is called biological treatment. Aerobic biological treatment method; the organic substances in the aerated waste water are used by the microorganisms as nutrients and decomposed into carbon dioxide and water products to form new microorganisms. Since the aerobic biological treatment method is carried out in an aerated environment, air must be supplied to bio-filter compartment.

c. Sterilization Compartment

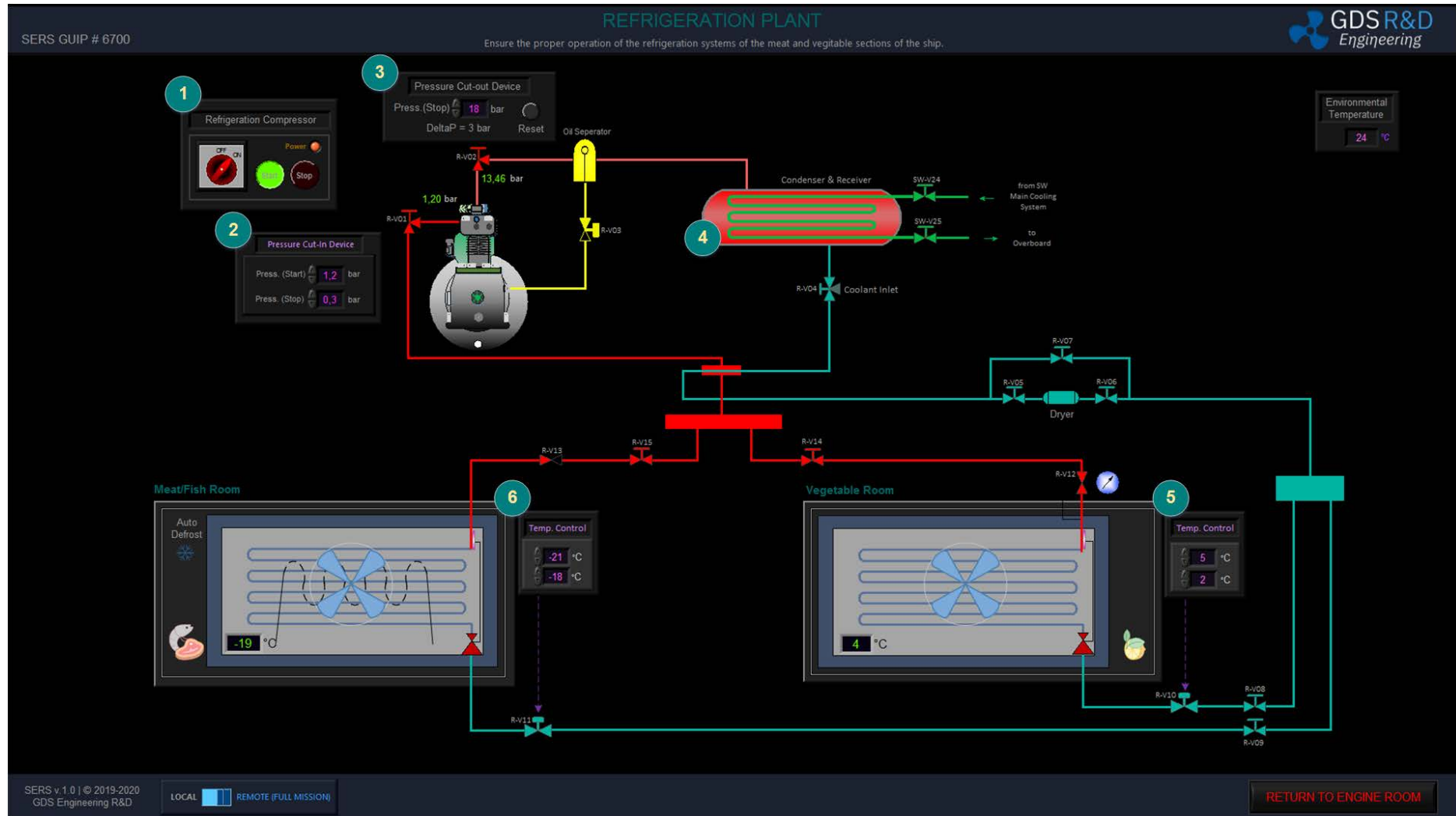
Chemical treatment is a process for the destruction of pathogenic microorganisms. Because chlorine is a good oxidizer, it destroys bacteria. At last stage, there is no harm in discharging the chlorinated water overboard.

3. The discharge pump is mounted on the sterilization compartment of the sewage treatment unit. The pump is running at AUTO mode controlled by the level switches installed in the sterilization compartment. The pump is usually runs at MANUAL mode when taking out the sludge from the compartments after the cleaning of the tank insides.
4. Sewage Tank Discharge Pump pumps the sewage through overboard.
5. Sewage Tanks is used for collection and storage of sewage.
6. Gray Water Tank is used for collection and storage of gray water.
7. Gray Water Tank Discharge Pump pumps the gray water through overboard.
8. Aeration Blower provides air for the microorganisms.

4.46.2 Valve Numbering

Number	Description	Number	Description
STU-V01	Starboard Gray Water Line Tank Inlet Valve	STU-V11	Filtration Compartment Outlet Valve
STU-V02	Port Gray Water Line Tank Inlet Valve	STU-V12	Bio-Filter Compartment Outlet Valve
STU-V03	Starboard Gray Water Line Outlet Valve	STU-V13	Sterilization Compartment Outlet Valve
STU-V04	Starboard Gray Water Line Overboard Valve	STU-V14	STU Discharge Pump Suction Valve
STU-V05	Port Gray Water Line Outlet Valve	STU-V15	STU Discharge Pump Discharge Valve
STU-V06	Port Gray Water Line Overboard Valve	STU-V16	Sewage Tank Discharge Pump Suction Valve
STU-V07	Gray Water Tank Discharge Pump Overboard Discharge Valve	STU-V17	Sewage Tank Discharge Pump Discharge Valve
STU-V08	Gray Water Tank Discharge Pump Suction Valve	STU-V18	Sewage Tank Inlet Valve
STU-V09	Gray Water Tank Discharge Pump Barge Discharge Valve	STU-V19	STU Overboard Valve
STU-V10	Sewage Treatment System Inlet Valve	SW-V33	SW Inlet Valve
STU-V10.1	Soil Main Line Sewage Tank Inlet Valve		

4.47 REFRIGERATION PLANT (GUI PANEL #6700)



4.47.1 Table of Screen Objects

Number	Description	Number	Description
1	Refrigeration Compressor Control Panel	4	Condenser & Receiver
2	Pressure Cut-In Device	5	Vegetable Room & Temperature Control Panel
3	Pressure Cut-Out Device	6	Meat/Fish Room & Temperature Control Panel

1. Refrigeration Compressor can be operated from the control panel. Power light indicates whether electrical supply reaches at the panel. If switch is at ON position, refrigeration compressor can be operated when user clicks the start button.
2. Pressure Cut-In Device protects the system against the low pressure that occurs in the absence of or insufficient amount of refrigerant on the suction side of the compressor and provides automation.
3. Pressure Cut-Out Device installed in the refrigerant compressor output line is to protect the system from high pressure. The compressor stops when the value pressure at the compressor output reaches to the set value shown on the cut-out device.
4. The heat exchanger provides condensation for the gaseous refrigerant.
5. Milk, eggs, cheese, fruits, vegetables etc. are stored in the Vegetable Room. Temperature control panel provides that the vegetable room is kept at the desired temperature, usually between 2 – 5 °C
6. Meat and fish are stored in Meat/Fish Room. Temperature control panel provides that the meat/fish room is kept at the desired temperature, usually between (-18) – (-21) °C. Meat/Fish Room includes Auto Defrost System. Defrosting is a method of removal of frost, built-up on evaporator coils. When Auto Defrosting is started, refrigerator compressor will be stopped, and heater will be operated to melt the ice/snow on the evaporator. Then Meat/Fish Room fan will start to dispose of the melted ice/snow. Defrosting provides more stable heat transfer properties on the evaporator.

4.47.2 Valve Numbering

Number	Description	Number	Description
R-V01	Refrigeration Compressor Suction Valve	R-V08	Vegetable Room Refrigerant Inlet Valve
R-V02	Refrigeration Compressor Discharge Valve	R-V09	Meat/Fish Room Refrigerant Inlet Valve
R-V03	Oil Separator Outlet Valve	R-V10	Vegetable Room Temperature Control Valve
SW-V24	Condenser SW Inlet Valve	R-V11	Meat/Fish Room Temperature Control Valve
SW-V25	Condenser SW Outlet Valve	R-V12	Vegetable Room Back Pressure Check Valve
R-V04	Coolant Inlet Valve	R-V13	Meat/Fish Room Check Valve
R-V05	Dryer Inlet Valve	R-V14	Vegetable Room Refrigerant Outlet Valve
R-V06	Dryer Outlet Valve	R-V15	Meat/Fish Room Refrigerant Outlet Valve
R-V07	Dryer By-Pass Valve		

4.48 EMERGENCY RESPONSE PANEL (GUI PANEL #7400)



Table of Screen Objects

Number	Description	Number	Description
1	Fire Pumps Control Panel	3	Pumps Emergency Stop Panel
2	Fans & Dampers Emergency Stop Panel	4	Quick Closing Valves

1. Fire Pumps Control Panel includes:
 - a. Fire Pump 1 Control Panel, Fire Pump 1 can be operated remotely from the control panel. Power light, indicates whether electrical supply reaches at the panel. If switch is at ON position, pump can be operated when the user clicks start button.
 - b. Fire Pump 2 Fire Pump 2 can be operated remotely from the control panel. Power light, indicates whether electrical supply reaches at the panel. If switch is at ON position, pump can be operated when the user clicks start button.
 - c. Emergency Fire Pump Control Panel, Emergency Fire Pump can be operated remotely from the control panel. Power light, indicates whether electrical supply reaches at the panel. If switch is at ON position, pump can be operated when the user clicks start button.
2. Fans and dampers can be stopped remotely from this panel. Enable button provides pushing of the emergency stop buttons. Fans and dampers emergency stop panel includes remote control for:
 - a. ER Supply Fans
 - b. ER Exhaust Fans
 - c. Emergency Supply Fans
 - d. Emergency Exhaust Fans
 - e. Auxiliary Blowers
 - f. Boiler Fan
3. Pumps which are pumping dangerous fluids (fuel, sludge, oil etc.) in the engine room, can be stopped remotely from this panel. Enable button provides the activation of the emergency stop button and then the Emergency Stop can be accessed for stopping the fuel and LO pumps in the engine room.
4. Pneumatic quick closing valves are controlled from this panel. The control cabinet consists of a control panel with air receiver and quick closing control valves. Quick closing valves includes:
 - a. HFO Tanks
 - b. MDO Tanks
 - c. LO Tanks
 - d. Air Dampers

4.49 SHIP PARAMETERS (GUI PANEL #1600)

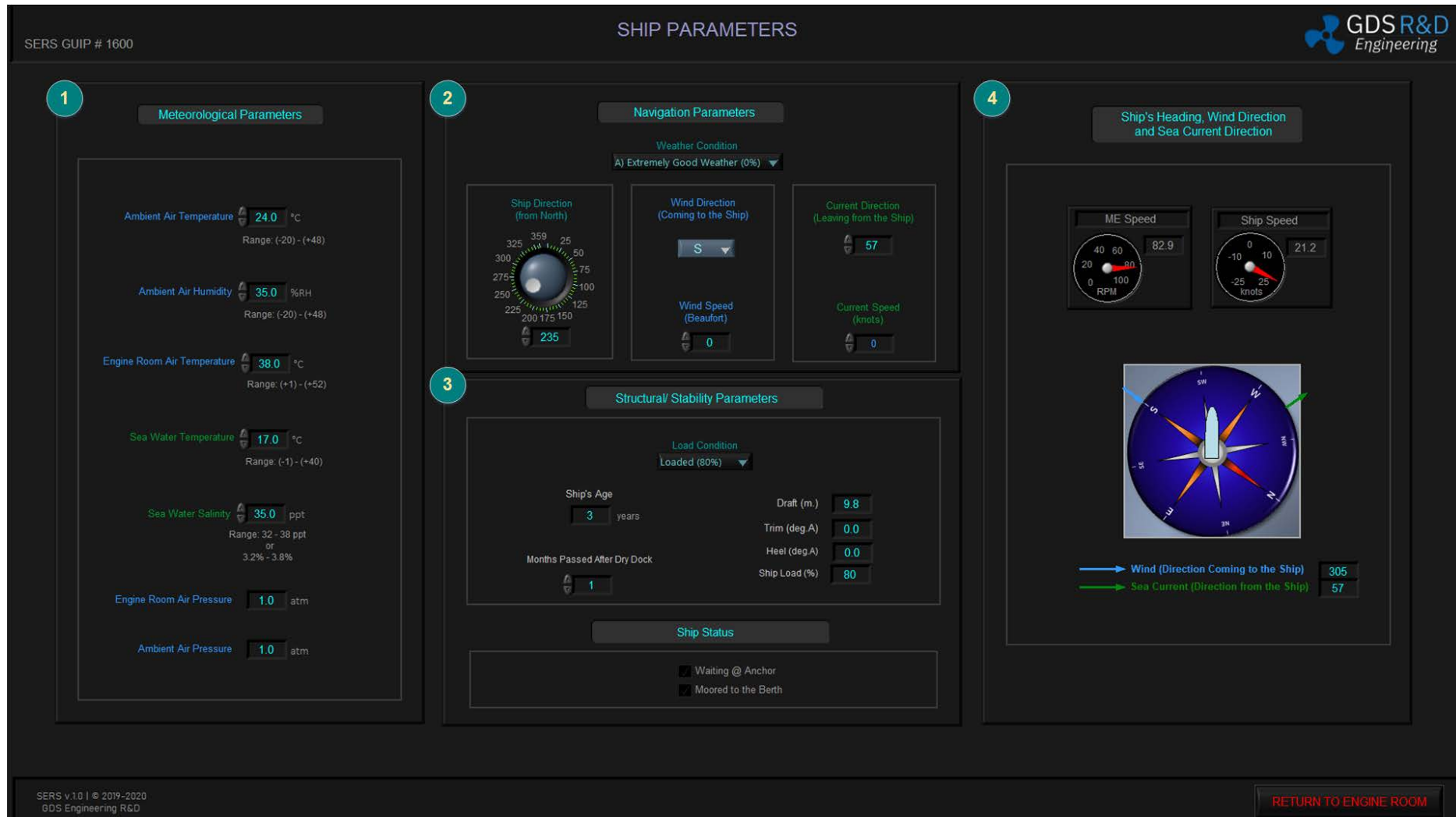


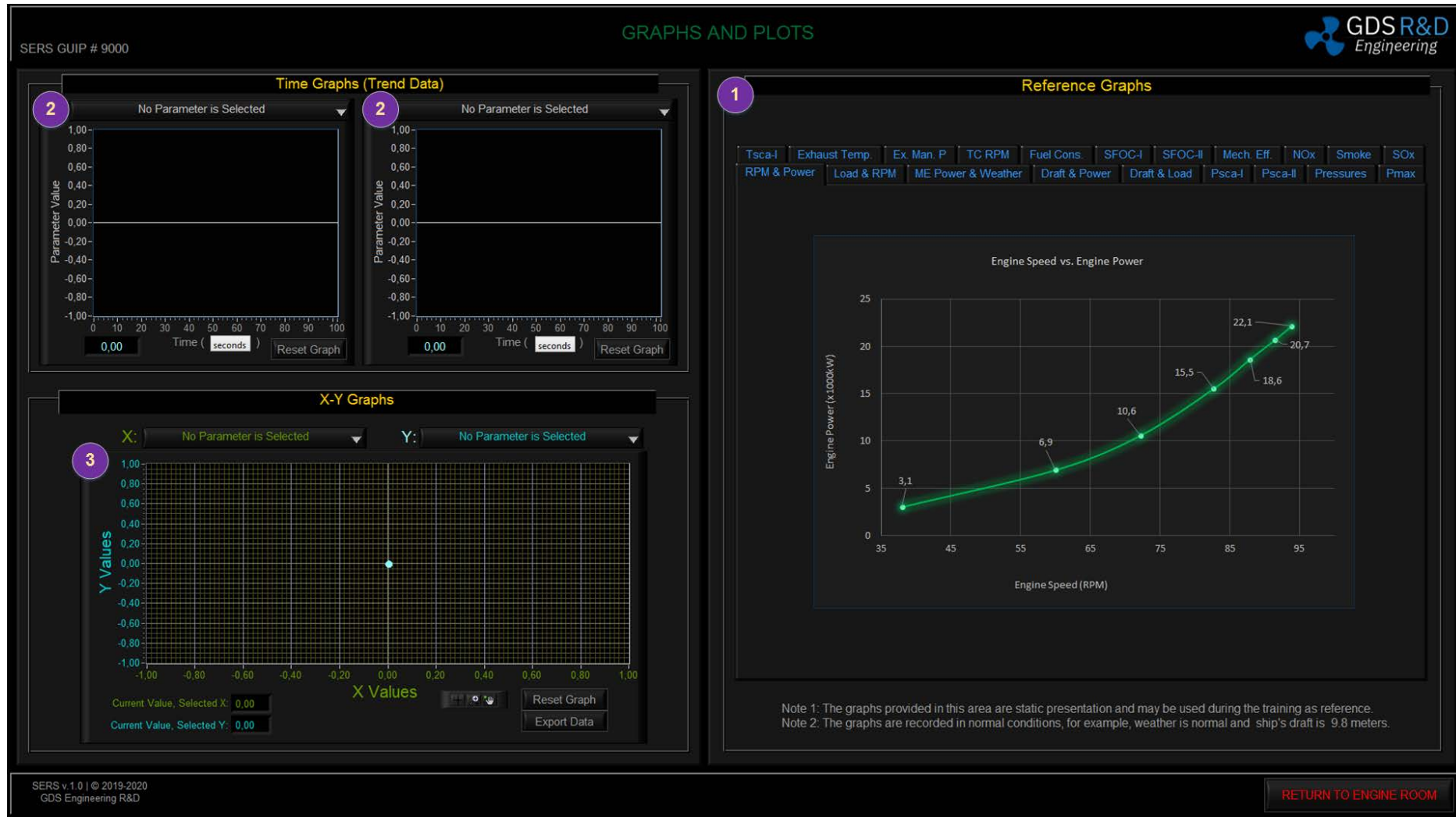
Table of Screen Objects

Number	Description	Number	Description
1	Meteorological Parameters	3	Structure & Stability Parameters
2	Navigation Parameters	4	Ship's Heading, Wind Direction & Sea Current Direction

- Meteorological parameters can be changed from this panel. The changes affect the related engine room systems parameters. Meteorological parameters include:
 - Ambient Air Temperature
 - Ambient Air Humidity
 - Ambient Air Pressure
 - Engine Room Air Temperature
 - Engine Room Air Pressure
 - Sea Water Temperature
 - Sea Water Salinity
- Navigation parameters can be changed from this panel. The changes affect the related engine room systems parameters. Navigation parameters include:
 - Weather Condition: Weather condition maybe selected as follows:
 - A: Extremely Good Weather
 - B: Light Weather
 - C: Heavy Weather
 Refer to User Manual Vol II, Section 7.2.14, which shows the effect of the weather on the engine parameters.
 - Ship Direction
 - Wind Direction and Speed
 - Current Direction and Speed
- Structure and stability parameters can be changed from this panel. The changes affect the engine room systems parameters. Structure and stability parameters include:
 - Ship's Age
 - Month Passed After Dry Dock
 - Draft, Trim, Heel and Ship Load
 - Ship Status

4. Also this panel includes the following navigational parameters:
- a. Ship's Heading
 - b. Wind Direction and Speed
 - c. Sea Current Direction and Speed
 - d. ME RPM Indicator
 - e. Ship Speed Indicator
 - f. Compass

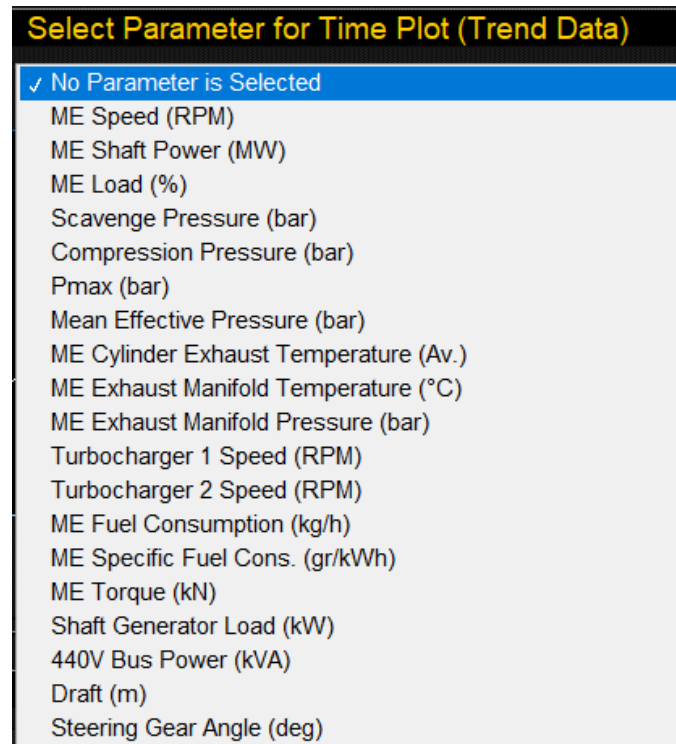
4.50 GRAPHS & PLOTS (GUI PANEL #9000)



4.50.1 Table of Screen Objects

Number	Description
1	Reference Graphs Section
2	Time Graphs Section (Two Identical Time Plot Areas)
3	X-Y Graphs Section

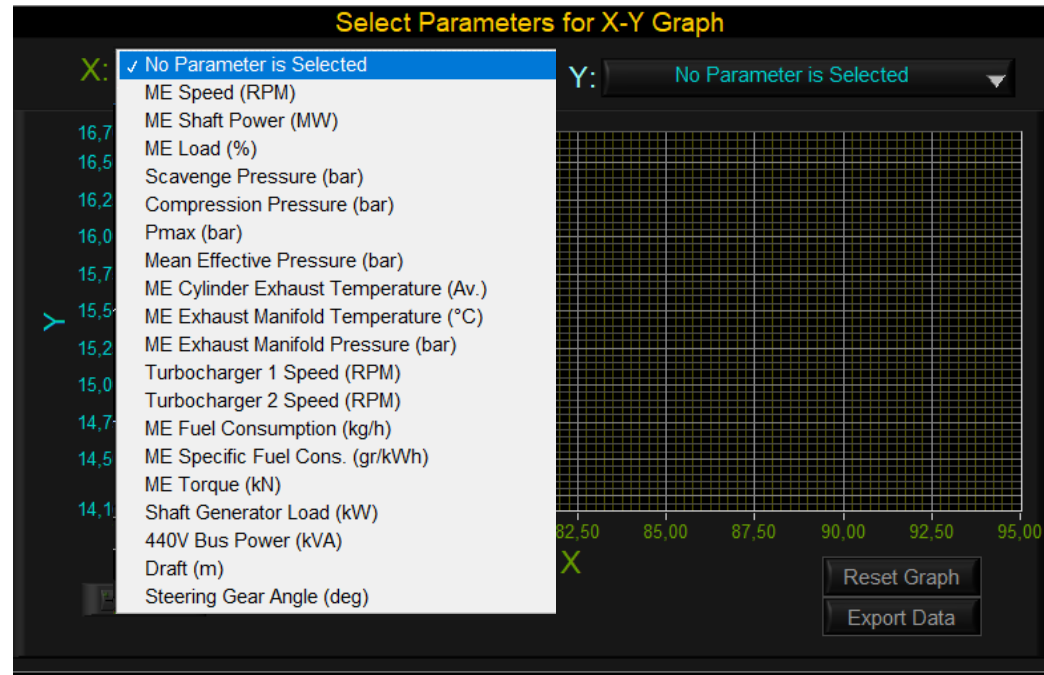
1. Reference Graphs Section includes the following graphs, presented as reference for comparison during training:
 - a. ME Speed (RPM) vs. Engine Shaft Power (MW)
 - b. ME Index and ME Speed (RPM) vs. Engine Load (%)
 - c. Engine Speed vs. Engine Power in Different Weather Conditions
 - d. ME Power Draft Changes
 - e. ME Load Draft Changes
 - f. P_{comp} vs. P_{sca}
 - g. Scavenge Pressure vs. Turbine Speed
 - h. Pressures: ME Speed (RPM) vs. P_{comp} (bar), P_{max} (bar), P_{mean} (bar) (eff., ind.) Values (Average)
 - i. P_{max} (bar) vs. ME Load (%)
 - j. Charge Air Temperature, T_{sca} (before Air Cooler) vs. TC Speed (RPM)
 - k. ME Exhaust Temperatures: Cylinder Outlets (Average), Exhaust Manifold @ TC Inlet, Exhaust Outlet (to Economizer)
 - l. Exhaust Manifold Pressure (bar) vs. Load (%)
 - m. Turbocharger Speed (RPM) vs. Exhaust Manifold Temperature
 - n. Fuel Consumption (kg/h) vs. Load (%)
 - o. Specific Fuel Oil Consumption (SFOC) vs. ME Shaft Power (MW)
 - p. Specific Fuel Oil Consumption (SFOC) vs. ME Speed (RPM)
 - q. Mechanical Efficiency (%) vs. Engine Load (%)
 - r. NO_x (g/kWh) vs. ME Power (MW)
 - s. Smoke (%) vs. ME Power (MW)
 - t. SO_x (g/kWh) vs. ME Power (MW)
2. Time Graphs Section provides two time graph areas that can display parameters simultaneously.
 - a. Parameters Selection: Click on “Select Parameter for Time Plot (Trend Data)” menu ring button, located on top of this section. SERS provides with a selection of the following parameters, plotted on a time graph:



- b. Select one of the parameters to display the time plot on the graph section. Opening and closing this GUI does not stop the recording; therefore, the other training operations can continue while the software is recording the selected trend data.
- c. Export Data: Right click on the graph area provides the following options for exporting the data:
 - i. Export Data to Clipboard
 - ii. Export Data to Excel
 - iii. Export Simplified Image

3. Parameter X-Y Graph Section

- a. Parameters Selection: Click on “X” menu ring button, located on top of this section. Select a desired parameter from the displayed list to associate with the X-axis. Do the same for “Y” pull-down button. The following list of parameters can be selected for association with the X- and Y- axes, respectively:



- b. Resetting Graph: Click on “Reset Graph” button to clear the data after the selection of X and Y parameters are complete. This allow for clearing existing data displayed on the graph area.
- c. Opening and closing this GUI does not stop the recording; therefore, the other training operations can continue while the software is recording the selected X-Y data.

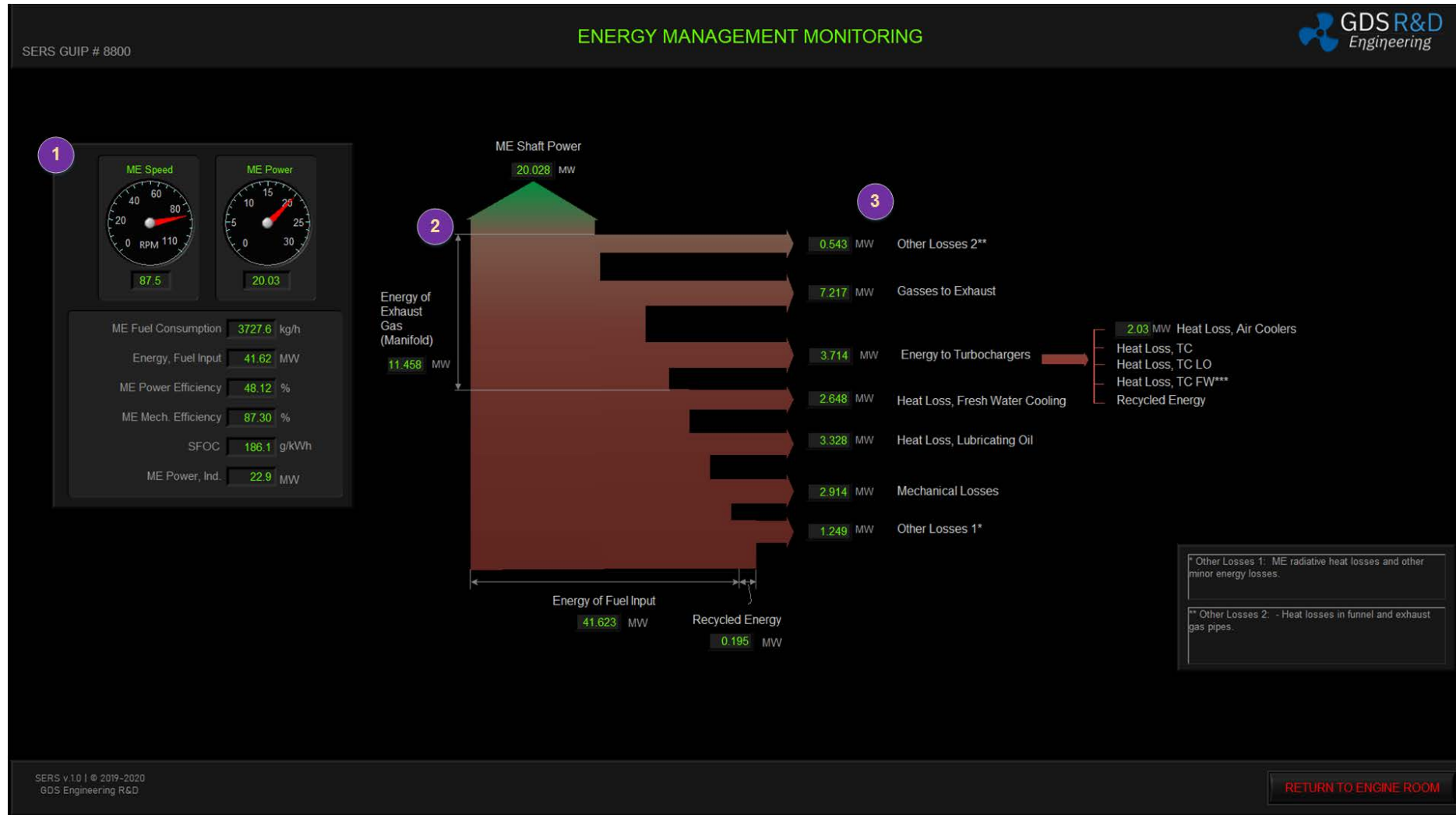
- d. Exporting the Data: Click “Export Data” to save the file on disc. The file saved with this method is a standard CVS file with columns divided by a tab space. The data then can be opened using any spreadsheet software.

Alternatively, right click on the graph area provides the following options for exporting the data:

- i. Export Data to Clipboard
- ii. Export Data to Excel
- iii. Export Simplified Image

4.51 ENERGY MANAGEMENT MONITORING (GUI PANEL #8800)

Use this panel in your training for Heat Balance studies. IMO Model Course 2.07 (2017 Edition) Exercise 16 may be used for specific instructions, implementation, and debriefing objectives of this training.



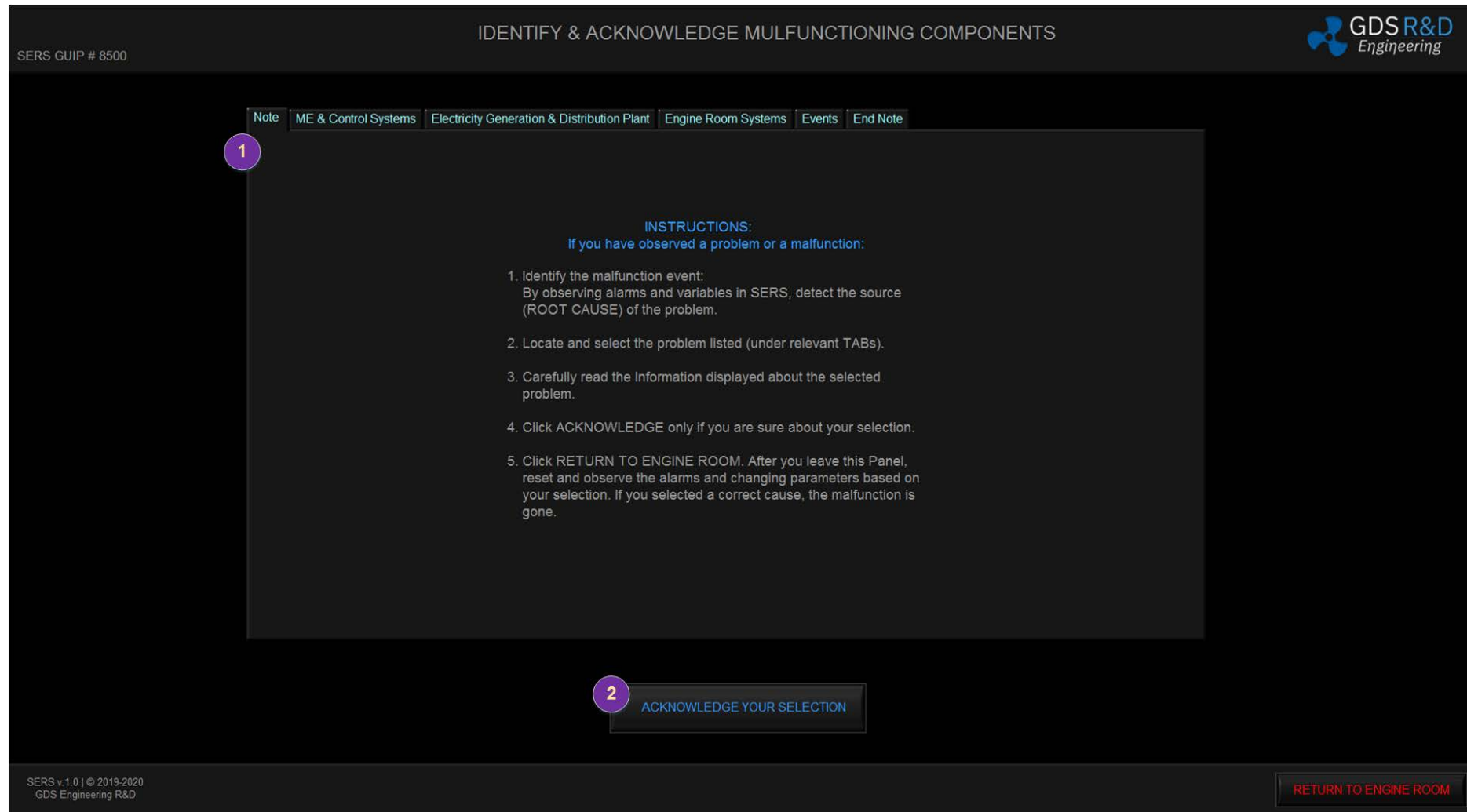
4.51.1 Table of Screen Objects

Number	Description
1	Main Engine Parameters Panel
2	ME Heat Balance Sankey Diagram
3	ME Heat Balance Losses

1. Main Engine Parameters Panel includes:
 - a. ME Speed Gauge
 - b. ME Power Gauge
 - c. ME Fuel Consumption indicator
 - d. Energy of Fuel Input indicator
 - e. ME Power Efficiency indicator
 - f. ME Mechanical Efficiency
 - g. SFOC indicator
 - h. ME Indicated Power indicator
2. Main Engine Heat Balance Sankey Diagram shows parametric power losses, power provided to the Economizer, and Turbochargers Consumed Power in MW, according to the energy of fuel Main Engine Input.
3. ME Heat Balance Losses includes:
 - a. Other Losses (Exhaust gas heat (radiative) and kinetic energy losses at Exhaust Manifold & TC Inlet and Outlets, other minor losses to urea when SCR is active.)
 - b. Gases to Exhaust
 - c. Energy to Turbocharges
 - i. Heat Loss at Air Coolers
 - ii. Heat Loss at TC
 - iii. Heat Loss at TC LO
 - iv. Heat Loss at TC FW (TC FW Cooling is provided by the HTFW cooling system, which is internal in the ME Cooling System.)

- v. Recycled Energy
- d. Heat Loss at Fresh Water Cooling
- e. Heat Loss at Lubricating Oil
- f. Mechanical Losses
- g. Heat Dissipation and Other Losses (Exhaust gas heat (radiative) and kinetic energy losses (ME Outlet), and other minor energy losses.)

4.52 IDENTIFY & ACKNOWLEDGE MALFUNCTIONING COMPONENTS (GUI PANEL #8500)



IDENTIFY & ACKNOWLEDGE MALFUNCTIONING COMPONENTS

SERS GUIP # 8500

Note ME & Control Systems Electricity Generation & Distribution Plant Engine Room Systems Events End Note

1

INSTRUCTIONS:
If you have observed a problem or a malfunction:

1. Identify the malfunction event:
By observing alarms and variables in SERS, detect the source (ROOT CAUSE) of the problem.
2. Locate and select the problem listed (under relevant TABs).
3. Carefully read the Information displayed about the selected problem.
4. Click ACKNOWLEDGE only if you are sure about your selection.
5. Click RETURN TO ENGINE ROOM. After you leave this Panel, reset and observe the alarms and changing parameters based on your selection. If you selected a correct cause, the malfunction is gone.

2 ACKNOWLEDGE YOUR SELECTION

RETURN TO ENGINE ROOM

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GDS Engineering R&D

4.52.1 Table of Screen Objects

Number	Description
1	Malfunctioning Components Panel
2	Acknowledge Selection Button

1. Malfunctioning Component Panel includes:

a. Note Page

INSTRUCTIONS: If you have observed a problem or a malfunction

- Identify the malfunction event: By observing alarms and variables in SERS, detect the source (ROOT CAUSE) of the problem.
- Locate and select the problem listed (under relevant TABs).
- Carefully read the information displayed about the selected problem.
- Click ACKNOWLEDGE only if you are sure about your selection.
- Click RETURN TO ENGINE ROOM. After you leave this panel, reset and observe the alarms and changing parameters based on your selection. If you selected a correct cause, the malfunction is gone.

b. ME & Control Systems Malfunctioning Components Page

- ME Air Start Valve Stuck
- ME Fuel Pump No.1, ME Inlet, Stuck Closed
- ME Fuel Pump No.2, ME Inlet, Stuck Closed
- ME Fuel Pump No.3, ME Inlet, Stuck Closed
- ME Fuel Pump No.4, ME Inlet, Stuck Closed
- ME Fuel Pump No.5, ME Inlet, Stuck Closed
- ME Fuel Pump No.6, ME Inlet, Stuck Closed
- ME Fuel Pump No.7, ME Inlet, Stuck Closed
- ME Cyl No.1, Injection Time Late
- ME Cyl No.2, Injection Time Late
- ME Cyl No.3, Injection Time Late

- xii. ME Cyl No.4, Injection Time Late
- xiii. ME Cyl No.5, Injection Time Late
- xiv. ME Cyl No.6, Injection Time Late
- xv. ME Cyl No.7, Injection Time Late
- xvi. ME Cyl No.1, Injection Nozzle Wear
- xvii. ME Cyl No.2, Injection Nozzle Wear
- xviii. ME Cyl No.3, Injection Nozzle Wear
- xix. ME Cyl No.4, Injection Nozzle Wear
- xx. ME Cyl No.5, Injection Nozzle Wear
- xxi. ME Cyl No.6, Injection Nozzle Wear
- xxii. ME Cyl No.7, Injection Nozzle Wear
- xxiii. ME Cyl. No.1, Injection Nozzle Clogged
- xxiv. ME Cyl. No.2, Injection Nozzle Clogged
- xxv. ME Cyl. No.3, Injection Nozzle Clogged
- xxvi. ME Cyl. No.4, Injection Nozzle Clogged
- xxvii. ME Cyl. No.5, Injection Nozzle Clogged
- xxviii. ME Cyl. No.6, Injection Nozzle Clogged
- xxix. ME Cyl. No.7, Injection Nozzle Clogged
- xxx. ME Cyl. No.1, Piston Ring Wear
- xxxi. ME Cyl. No.2, Piston Ring Wear
- xxxii. ME Cyl. No.3, Piston Ring Wear
- xxxiii. ME Cyl. No.4, Piston Ring Wear
- xxxiv. ME Cyl. No.5, Piston Ring Wear
- xxxv. ME Cyl. No.6, Piston Ring Wear
- xxxvi. ME Cyl. No.7, Piston Ring Wear
- xxxvii. ME Cyl. No.1, Exhaust Valve Closes Late
- xxxviii. ME Cyl. No.2, Exhaust Valve Closes Late
- xxxix. ME Cyl. No.3, Exhaust Valve Closes Late
- xl. ME Cyl. No.4, Exhaust Valve Closes Late

- xli. ME Cyl. No.5, Exhaust Valve Closes Late
- xlvi. ME Cyl. No.6, Exhaust Valve Closes Late
- xlvi. ME Cyl. No.7, Exhaust Valve Closes Late
- xli. ME Cyl. No.1, Exhaust Valve Leakage
- xli. ME Cyl. No.2, Exhaust Valve Leakage
- xli. ME Cyl. No.3, Exhaust Valve Leakage
- xli. ME Cyl. No.4, Exhaust Valve Leakage
- xli. ME Cyl. No.5, Exhaust Valve Leakage
- xli. ME Cyl. No.6, Exhaust Valve Leakage
- l. ME Cyl. No.7, Exhaust Valve Leakage
- li. ME Cyl. No.1, Liner Crack
- lii. ME Cyl. No.2, Liner Crack
- liii. ME Cyl. No.3, Liner Crack
- liv. ME Cyl. No.4, Liner Crack
- lv. ME Cyl. No.5, Liner Crack
- lvi. ME Cyl. No.6, Liner Crack
- lvii. ME Cyl. No.7, Liner Crack
- lviii. ME Cyl. No.1, Score in ME Bearing
- lix. ME Cyl. No.2, Score in ME Bearing
- lx. ME Cyl. No.3, Score in ME Bearing
- lxi. ME Cyl. No.4, Score in ME Bearing
- lxii. ME Cyl. No.5, Score in ME Bearing
- lxiii. ME Cyl. No.6, Score in ME Bearing
- lxiv. ME Cyl. No.7, Score in ME Bearing
- lxv. ME Cyl. No.1, Oil Mist Detector, Sensor Failure
- lxvi. ME Cyl. No.2, Oil Mist Detector, Sensor Failure
- lxvii. ME Cyl. No.3, Oil Mist Detector, Sensor Failure
- lxviii. ME Cyl. No.4, Oil Mist Detector, Sensor Failure
- lxix. ME Cyl. No.5, Oil Mist Detector, Sensor Failure

- lxx. ME Cyl. No.6, Oil Mist Detector, Sensor Failure
- lxxi. ME Cyl. No.7, Oil Mist Detector, Sensor Failure
- lxxii. ME Crosshead Bearing No.7, Temperature is High
- c. Electricity Generation & Distribution Plant Malfunctioning Components Page
 - i. Diesel Generator 1 Lub. Oil Filter Dirty
 - ii. Diesel Generator 1 Lub. Oil Filter Clogged
 - iii. Diesel Generator 2 Lub. Oil Filter Dirty
 - iv. Diesel Generator 2 Lub. Oil Filter Clogged
 - v. Diesel Generator 3 Lub. Oil Filter Dirty
 - vi. Diesel Generator 3 Lub. Oil Filter Clogged
 - vii. ECR Control Systems Panel, Circuit Breaker Failure
 - viii. Seawater Pump No.1 Overload
 - ix. Seawater Pump No.2 Overload
 - x. ME Systems Main CB Overload
 - xi. Aux. Seawater Pump Overload
 - xii. LTFW Pump No.1 Overload
 - xiii. LTFW Pump No.2 Overload
 - xiv. HTFW Pump No.1 Overload
 - xv. HTFW Pump No.2 Overload
 - xvi. FO Supply Pump No.1 Overload
 - xvii. FO Supply Pump No.2 Overload
 - xviii. FO Circulation Pump No.1 Overload
 - xix. FO Circulation Pump No.2 Overload
 - xx. LO Pump No.1 Overload
 - xxi. LO Pump No.2 Overload
 - xxii. Air Compressor 1 Overload
 - xxiii. Air Compressor 2 Overload
 - xxiv. ME Turning Gear Overload
 - xxv. Auxiliary I Circuit Breaker Overload

- xxvi. Steering Gear Pump No.1 Overload
- xxvii. Steering Gear Pump No.2 Overload
- xxviii. Engine Room Supply Fans Trip
- xxix. Seawater Pump No.1 Current Leakage
- xxx. 220 V Main Bus Low Insulation Failure (Due to Galley)
- d. Engine Room Systems Malfunctioning Components Page
 - i. Seawater Leakage on Delivery Line
 - ii. Seawater Pump No.1 Wear
 - iii. Seawater Pump No.2 Wear
 - iv. Aux. Seawater Pump Wear
 - v. Starting Air to DG 2 Valve Stuck
 - vi. Air Tube 1 Drain Valve Leakage
 - vii. Air Tube 2 Drain Valve Leakage
 - viii. Aux. Air Tube Drain Valve Leakage
 - ix. Boiler Deep Blow Down Valve Leakage
 - x. Boiler Feed Pump 1 Switch Failure
 - xi. Fire in Economizer
 - xii. LO Cooler 1 Dirty
 - xiii. LO Cooler 2 Dirty
 - xiv. FO Heater 1 Dirty
 - xv. FO Heater 2 Dirty
 - xvi. FO Circulation Pump No.1 Wear
 - xvii. FO Circulation Pump No.2 Wear
 - xviii. FWG By-Pass Valve Stuck

- e. Events
- f. End Note
 - i. If you ACKNOWLEDGED your selection, SERS software have already recorded.
 - ii. Click RETURN TO ENGINE ROOM.
 - iii. After you leave this panel:
 - 1. Reset the alarms in the ALARM Panel (GUIP #8000).
 - 2. Observe the alarms and changing parameters based on your selection.
 - 3. If you are selected correct problem, the parameters should be restored.
 - 4. If nothing changed, probably you have made wrong selection. The you may be want to change your selection?

4.53 CREATE & INJECT MALFUNCTIONS (GUI PANEL #8200)

GDS R&D
Engineering

SERS GUIP # 8200

CREATE & INJECT MALFUNCTIONS

Session Runtime:
D HH MM SS

INSTRUCTIONS:

1. Select a Category for the Malfunction Event:
2. Select the malfunction from the list.
3. Set "Occurance Time", the duration after the malfunction is injected.
4. Click ACTIVATE.
5. Return to the MAIN GUI PANEL for observing and finding the root-cause.

1) Select Category of Malfunction

ME Malfunctions

2) Select Malfunction

M4303: ME Croshead Bearing No 4, Temp is high.

3) Set Occurance Time

0 50 100 150 200 250 300 360

10 seconds

Remaining Time for Injection

8,0

ACTIVATE

Malfunction Status Log

M3801 is injected to system by the time 3.4.2020 14:27:50
Malf01 is injected to SERS01 Training station.

RETURN TO ENGINE ROOM

4.53.1 Table of Screen Objects

Number	Description	Number	Description
1	Malfunction Selection Section	3	Malfunction Activation Button
2	Occurrence Time Setting Section	4	Malfunction Status Log

1. Malfunction can be selected from this section. Malfunction Selection Section includes
 - a. Selection Category of the Malfunction
 - b. Selection of the Malfunction according to the selected category
2. Malfunction occurrence time can be set from this section.
3. Malfunction can be activated via ACTIVATE Button. When the user clicks the ACTIVATE Button, selected malfunction will be injected according to the setting time.
4. Malfunction Status Log shows, actions about malfunction creation and identifying

4.54 ALARMS LOG & MONITORING PANEL (SERS GUIP # 8000)

4.54.1 Locations (GUI Panels) for all Alarm Controls and Indicator Used in SERS

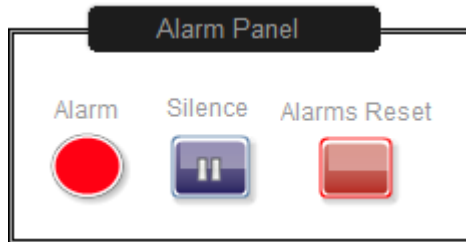
SERS GUI Panel/Location		SERS Alarms: Controls and Indicator Functions		
		Indicator	Silence	Activation
Main GUI (Panel #1000)				
	General Alarm	✓	✓	✗
	Fire Alarm	✓	✗	✗
Alarms Display (Panel #8000)				
	General Alarm	✓	✓	✓
	Fire Alarm	✗	✗	✗
Alarm Panel (Distributed)				
	General Alarm	✓	✓	✓
	Fire Alarm	✗	✗	✗
ECR GUI (Panel #2200)				
	General Alarm	✓	✗	✗
	Fire Alarm	✓	✗	✗
Emerg. Response GUI (Panel #7400)				
	General Alarm	✗	✗	✗
	Fire Alarm	✓	✓(Acknowledge)	✓
Main Fire Fighting (Panel #7500)				
	General Alarm	✗	✗	✗
	Fire Alarm	✓	✗	✗
CO2 Fire Fighting GUI (Panel #7600)				
	General Alarm	✗	✗	✗
	Fire Alarm	✓	✓(Acknowledge)	✓

4.54.2 Alarms Page Screen Objects (GUI Panel #8000)

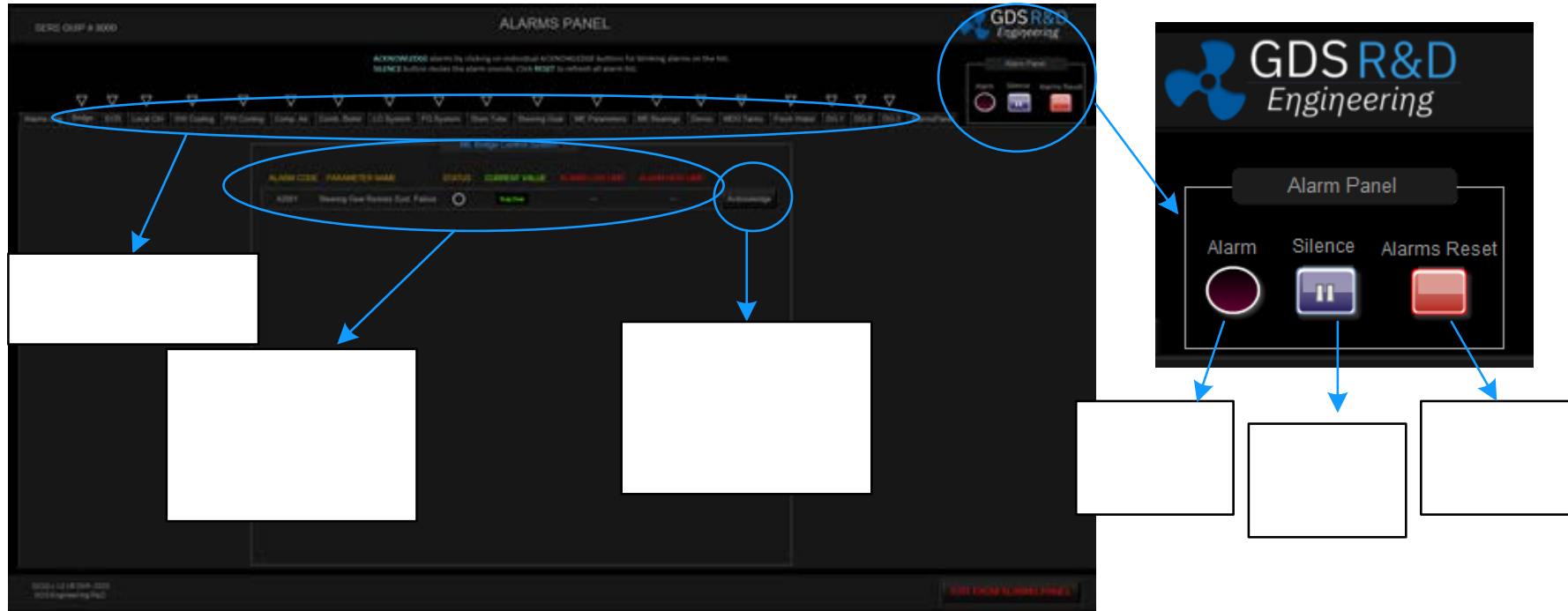
The first tab of the Alarm Page is the Alarms Log Panel. Alarms Log panel displays all alarms with time stamp. Alarms as well as malfunctions are also recorded on SERS Training Log file.

While performing the training operations described in Sections 3 and 4, trainee must monitor the alarms and take the measures for the removal of alarms.

Alarm Control Panel is located on the right above corner of the ALARMS PANEL (GUIP #8000), which allows for the following control:



VISIBLE and AUDIBLE ALARM INDICATOR SILENCE: When an alarm is activated, audible alarm is emitted with a visual indicator on the Alarm Panel. Alarm Pages (see Sections 5.1 thru) displays the alarms, grouped and displayed on the same page. ACKNOWLEDGE button beside each row allows for Acknowledging the specific alarm. ALARMS RESET function resets all alarms and only active the ones that remain displaying the status being TRUE.



ALARM visually indicates an existing alarm continuing.

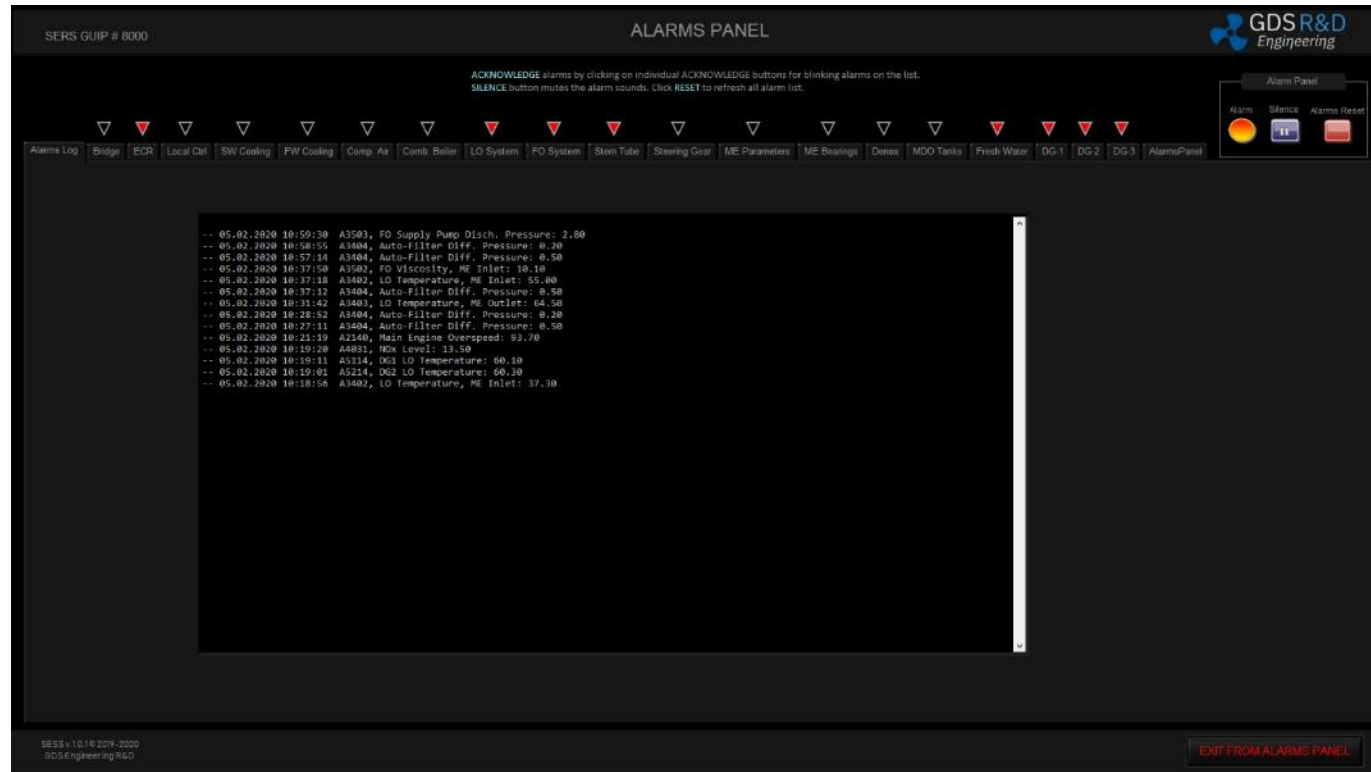
An Audible ALARM (being sound) sounds unless SILENCE is pressed.

ALARMS RESET function resets all alarms. When pressed, only the active alarms are indicated.

All alarms displayed on ALARMS PANEL is shown in the following pages.

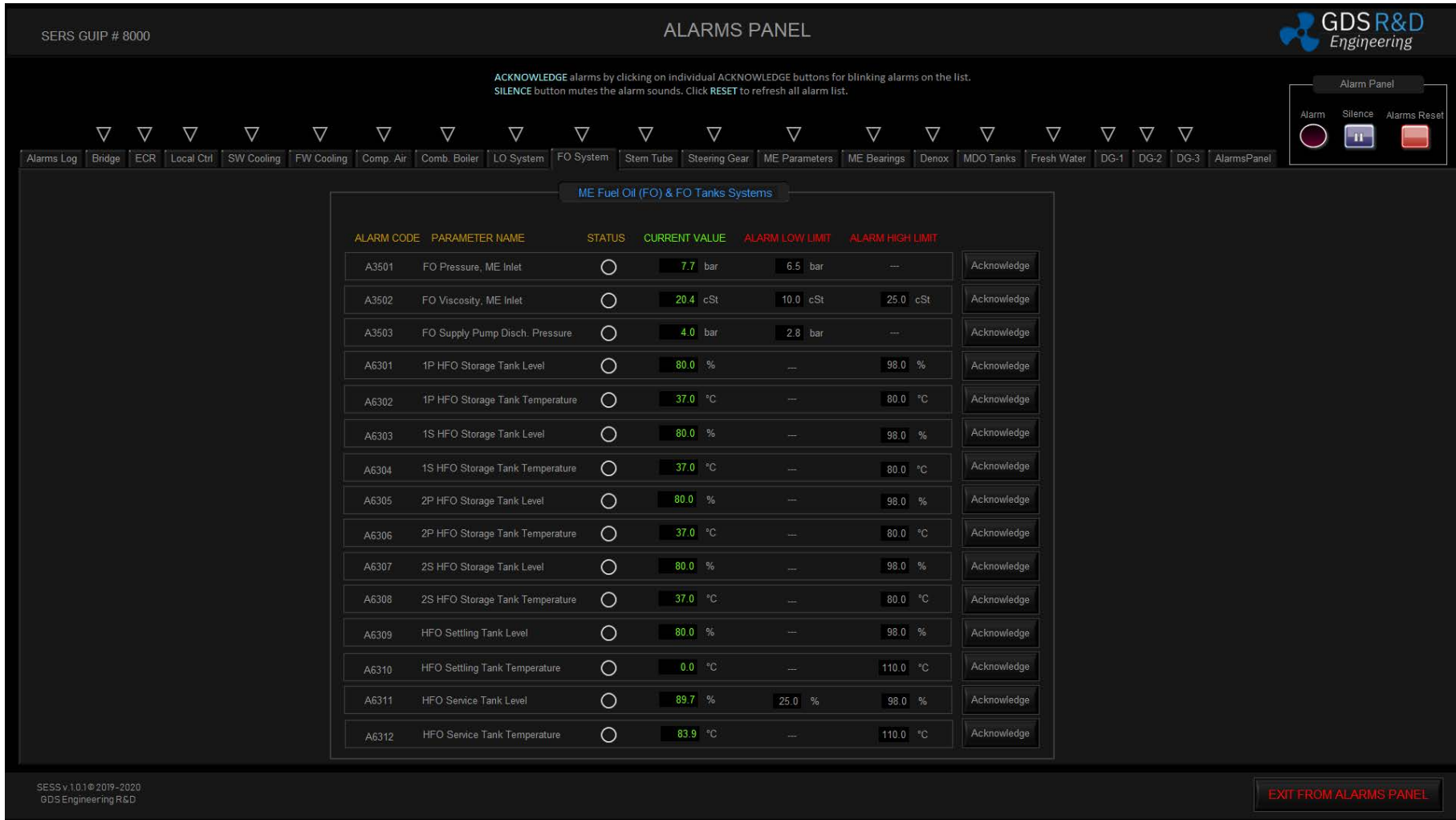
4.54.3 Alarms Log Page

The first tab of the Alarm Page is the Alarms Log Panel. Alarms Log panel displays all alarms with time stamp. Alarms as well as malfunctions are recorded on SERS Training Log file. The Log file is shown on the first Page (tab) of the ALARMS GUI Panel.



4.54.4 Alarm Pages /or Tabs

Alarms are classified according to the systems and shown on Alarm Tabs in groups. When a malfunction occurred, alarm will be triggered related to the malfunction. An example of an ALARM Page is shown in Figure below.



ALARMS PANEL

ACKNOWLEDGE alarms by clicking on individual ACKNOWLEDGE buttons for blinking alarms on the list.
SILENCE button mutes the alarm sounds. Click RESET to refresh all alarm list.

Alarm Panel: Alarm, Silence, Alarms Reset

Alarms Log | Bridge | ECR | Local Ctrl | SW Cooling | FW Cooling | Comp. Air | Comb. Boiler | LO System | **FO System** | Stem Tube | Steering Gear | ME Parameters | ME Bearings | Denox | MDO Tanks | Fresh Water | DG-1 | DG-2 | DG-3 | AlarmsPanel

ME Fuel Oil (FO) & FO Tanks Systems

ALARM CODE	PARAMETER NAME	STATUS	CURRENT VALUE	ALARM LOW LIMIT	ALARM HIGH LIMIT	
A3501	FO Pressure, ME Inlet	○	7.7 bar	6.5 bar	---	Acknowledge
A3502	FO Viscosity, ME Inlet	○	20.4 cSt	10.0 cSt	25.0 cSt	Acknowledge
A3503	FO Supply Pump Disch. Pressure	○	4.0 bar	2.8 bar	---	Acknowledge
A6301	1P HFO Storage Tank Level	○	80.0 %	---	98.0 %	Acknowledge
A6302	1P HFO Storage Tank Temperature	○	37.0 °C	---	80.0 °C	Acknowledge
A6303	1S HFO Storage Tank Level	○	80.0 %	---	98.0 %	Acknowledge
A6304	1S HFO Storage Tank Temperature	○	37.0 °C	---	80.0 °C	Acknowledge
A6305	2P HFO Storage Tank Level	○	80.0 %	---	98.0 %	Acknowledge
A6306	2P HFO Storage Tank Temperature	○	37.0 °C	---	80.0 °C	Acknowledge
A6307	2S HFO Storage Tank Level	○	80.0 %	---	98.0 %	Acknowledge
A6308	2S HFO Storage Tank Temperature	○	37.0 °C	---	80.0 °C	Acknowledge
A6309	HFO Settling Tank Level	○	80.0 %	---	98.0 %	Acknowledge
A6310	HFO Settling Tank Temperature	○	0.0 °C	---	110.0 °C	Acknowledge
A6311	HFO Service Tank Level	○	89.7 %	25.0 %	98.0 %	Acknowledge
A6312	HFO Service Tank Temperature	○	83.9 °C	---	110.0 °C	Acknowledge

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EXIT FROM ALARMS PANEL

4.54.5 Alarms Lists

Following tables provide the list of alarms exist in the SERS.

Alarm Page Name	SERS		Normal Val.	Unit	Alarm		Slow Down		Shut Down	
	A Codes	Alarm Name			Low	High	Low	High	Low	High
Bridge	A2011	Steering Gear Remote System Failure	INACTIVE	-	-	-	-	-	-	-
ME Control	A2103	Overspeed	0-91	rpm	-	98,5	-	-	-	-
	A2108	ECR Control Panel, Power Out	INACTIVE	-	-	-	-	-	-	-
	A2109	ME Shut Down Pre-warning	INACTIVE	-	-	-	-	-	-	-
	A2110	ME Shut Down	INACTIVE	-	-	-	-	-	-	-
	A2111	ME Slow Down Pre-warning	INACTIVE	-	-	-	-	-	-	-
	A2112	ME Slow Down	INACTIVE	-	-	-	-	-	-	-
	A2113	ME Wrong Way	INACTIVE	-	-	-	-	-	-	-
	A2201	Air Pressure, ME Air Start System	>15	bar	15	-	-	-	-	-
SW Main Cooling System	A3001	Sea Water No.1 Pump Trip	INACTIVE	-	-	-	-	-	-	-
	A3002	Sea Water No.2 Pump Trip	INACTIVE	-	-	-	-	-	-	-
	A3003	Aux Sea Water Pump Trip	INACTIVE	-	-	-	-	-	-	-
	A3004	SW Main Cooling System Line Press.	2,5	bar	-	-	-	-	-	-
	A3005	SW Main Cooling System Outlet Temp.	>20	°C	19	-	-	-	-	-
FW Cooling System	A3101	LTFW Line Pressure	2,5	bar	-	-	-	-	-	-
	A3102	LTFW Temperature, Coolers Inlet	45	°C	-	57	-	-	-	-
	A3103	LTFW Temperature, Pumps Inlet	28-35	°C	-	40	-	-	-	-
	A3111	HTFW Pressure, ME Inlet	3	bar	-	-	-	-	-	-
	A3112	HTFW Temperature, ME Inlet	68	°C	60	78	-	-	-	-
	A3113	HTFW Temperature, ME Outlet	78	°C	-	92	-	95	-	-
	A3131	FW Expansion Tank Level	80	%	30	95	-	-	-	-

Alarm Page Name	SERS		Normal Val.	Unit	Alarm		Slow Down		Shut Down	
	A Codes	Alarm Name			Low	High	Low	High	Low	High
Compressed Air System	A3201	Air Receiver 1, Pressure	15-30	bar	14,5	-	-	-	-	-
	A3202	Air Receiver 2, Pressure	15-30	bar	14,5	-	-	-	-	-
	A3203	Aux Air Receiver, Pressure	12-30	bar	11	-	-	-	-	-
	A3204	ME Maneuvering System Air Pressure	7	bar	5,5	-	-	-	-	-
	A3205	ME Start Air Pressure	>15	bar	15	-	-	-	-	-
	A3206	Start Air Pressure, DG 1 Inlet	>15	bar	15	-	-	-	-	-
	A3207	Start Air Pressure, DG 2 Inlet	>15	bar	15	-	-	-	-	-
	A3211	Air Compressor 1, Temperature	<60	°C	-	65	-	-	-	-
	A3212	Air Compressor 2, Temperature	<60	°C	-	65	-	-	-	-
	A3213	Aux Air Compressor, Temperature	<55	°C	-	60	-	-	-	-
	A3221	Air Compressor 1 Trip	INACTIVE	-	-	-	-	-	-	-
	A3222	Air Compressor 2 Trip	INACTIVE	-	-	-	-	-	-	-
	A3223	Aux Compressor Trip	INACTIVE	-	-	-	-	-	-	-
	A3231	Air Tube 1 Press Sensor Failure	INACTIVE	-	-	-	-	-	-	-
	A3232	Air Tube 2 Press Sensor Failure	INACTIVE	-	-	-	-	-	-	-
	A3233	Aux Air Tube Press Sensor Failure	INACTIVE	-						
Combined Boiler	A3301	Boiler Level	100	%	80	120	-	-	-	-
	A3302	Boiler Low Low Level	70	%	70	-	-	-	-	-
	A3303	Boiler High High Level	130	%		130				
	A3310	Boiler Pressure	6.5	bar	4.0	7.5	-	-	-	-
	A3311	Smoke Density	25	%	-	35	-	-	-	-
	A3321	Boiler Flame Out	INACTIVE	-	-	-	-	-	-	-
	A3330	Burner Trip	INACTIVE	-	-	-	-	-	-	-

Alarm Page Name	SERS		Normal Val.	Unit	Alarm		Slow Down		Shut Down	
	A Codes	Alarm Name			Low	High	Low	High	Low	High
ME LO System	A3401	LO Pressure, ME Inlet	2,0 - 2,9	bar	1,9	-	1,7	-	1,3	-
	A3402	LO Temperature, ME Inlet	40-52	°C	35	55	-	60	-	-
	A3403	LO Temperature, ME Outlet	48-60	°C	-	64,5	-	-	-	-
	A3404	Aut. Backflushing Filter Diff. Press.	0,2	bar	-	0,5	-	-	-	-
	A3405	ME LO Sump Tank Level	>50	%	20	-				
	A3406	ME Cyl. Oil Day Tank Level	>50	%	20	-				
ME FO System	A3501	FO Pressure, ME Inlet	7-8	bar	6,5	-	-	-	-	-
	A3502	FO Viscosity, ME Inlet	13-15	cSt	10	20	-	-	-	-
	A3503	FO Supply Pump Discharge Pressure	4-5	bar	2,8	-	-	-	-	-
Stern Tube	A3601	Stern Tube, Diff. Oil Pressure	0,2-0,4	bar	0,2	0,4	-	-	-	-
Steering Gear	A3701	SG System, Expansion Tank Low Level	50-90	%	50	-	-	-	-	-
	A3711	SG System, Expansion Tank 1 Low Level	50-90	%	30	-	-	-	-	-
	A3712	SG System, Expansion Tank 1 Low Low Level	50-90	%	10					
	A3721	SG System, Expansion Tank 2 Low Level	50-90	%	30	-	-	-	-	-
	A3722	SG System, Expansion Tank 2 Low Low Level	50-90	%	10	-	-	-	-	-
ME Parameters	A4111	Exhaust Temperature, Cyl. No.1	250-350	°C	200	430	-	450	-	-
	A4112	Exhaust Temperature, Cyl. No.2	250-350	°C	200	430	-	450	-	-
	A4113	Exhaust Temperature, Cyl. No.3	250-350	°C	200	430	-	450	-	-
	A4114	Exhaust Temperature, Cyl. No.4	250-350	°C	200	430	-	450	-	-
	A4115	Exhaust Temperature, Cyl. No.5	250-350	°C	200	430	-	450	-	-
	A4116	Exhaust Temperature, Cyl. No.6	250-350	°C	200	430	-	450	-	-
	A4117	Exhaust Temperature, Cyl. No.7	250-350	°C	200	430	-	450	-	-
	A4118	Exhaust Temperature, Average	<380	°C	-	380	-	-	-	-
	A4119	Exhaust Temperature Deviation	±30	°C	- 50	50	- 60	60	-	-

Alarm Page Name	SERS		Normal Val.	Unit	Alarm		Slow Down		Shut Down	
	A Codes	Alarm Name			Low	High	Low	High	Low	High
ME Manifold and TCs	A4651	Scavenge Manifold Air Pressure	0 - 3.1	bar	2	-	-	-	-	-
	A4652	Scavenge Manifold Air Temperature	35-50	°C	-	55	-	-	-	-
	A4653	Exhaust Manifold Air Pressure	2	bar	-	3				
	A4654	Exhaust Manifold Air Temperature	250-350	°C	-	430				
	A4655	Scavenge Air Temp., AC Inlet	200	°C	-	220				
	A4656	Scavenge Air Temp., AC Outlet	40	°C	-	55				
	A4657	Turbocharger 1, RPM	7000-15500	rpm						
	A4658	Turbocharger 2, RPM	7000-15500	rpm						
ME Bearings	A4701	Oil Mist, No.1	1-10	%	-	30	-	60	-	-
	A4702	Oil Mist, No.2	1-10	%	-	30	-	60	-	-
	A4703	Oil Mist, No.3	1-10	%	-	30	-	60	-	-
	A4704	Oil Mist, No.4	1-10	%	-	30	-	60	-	-
	A4705	Oil Mist, No.5	1-10	%	-	30	-	60	-	-
	A4706	Oil Mist, No.6	1-10	%	-	30	-	60	-	-
	A4707	Oil Mist, No.7	1-10	%	-	30	-	60	-	-
	A4708	Main Bearing Temperature, No.1	50-70	°C	-	75	-	80	-	-
	A4709	Main Bearing Temperature, No.2	50-70	°C	-	75	-	80	-	-
	A4710	Main Bearing Temperature, No.3	50-70	°C	-	75	-	80	-	-
	A4711	Main Bearing Temperature, No.4	50-70	°C	-	75	-	80	-	-
	A4712	Main Bearing Temperature, No.5	50-70	°C	-	75	-	80	-	-
	A4713	Main Bearing Temperature, No.6	50-70	°C	-	75	-	80	-	-
	A4714	Main Bearing Temperature, No.7	50-70	°C	-	75	-	80	-	-
	A4715	Thrust Bearing Temperature	55-65	°C	-	70	-	75	-	85
Denox	A4751	Air Pressure	7	bar	6	-	-	-	-	-
	A4752	Urea Pump Failure	INACTIVE	-	-	-	-	-	-	-
FWG	A4801	Salinity	<4,5	ppm	-	4,5				

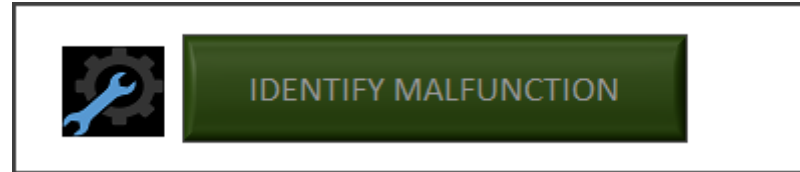
Alarm Page Name	SERS		Normal Val.	Unit	Alarm		Slow Down		Shut Down	
	A Codes	Alarm Name			Low	High	Low	High	Low	High
DG 1	A5111	LO Pressure, DG 1 Inlet	4,5	bar	1	-	-	-	-	-
	A5112	FO Pressure, DG 1 Inlet	8,5	bar	1	-	-	-	-	-
	A5113	FW Temperature, DG 1 Outlet	82	°C	-	88	-	-	-	-
	A5114	LO Temperature, Cooler Inlet	52	°C	-	60	-	-	-	-
	A5115	Exhaust Temperature	335	°C	-	390	-	-	-	-
	A5116	Sump Tank Level	50-90	%	30	-	-	-	-	-
	A5117	Overspeed	720	rpm	-	740	-	-	-	-
	A5118	Diesel Generator 1 Trip	INACTIVE	-	-	-	-	-	-	-
DG 2	A5211	LO Pressure, DG 2 Inlet	4,5	bar	1	-	-	-	-	-
	A5212	FO Pressure, DG 2 Inlet	8,5	bar	1	-	-	-	-	-
	A5213	FW Temperature, DG 2 Outlet	82	°C	-	88	-	-	-	-
	A5214	LO Temperature, DG 2 Cooler Inlet	52	°C	-	60	-	-	-	-
	A5215	DG 2 Exhaust Manifold Temperature	335	°C	-	390	-	-	-	-
	A5216	DG 2 Sump Tank Level	50-90	%	0.3	-	-	-	-	-
	A5217	DG 2 Overspeed	720	rpm	-	740	-	-	-	-
	A5218	DG 2 Trip	INACTIVE	-	-	-	-	-	-	-
DG 3	A5311	LO Pressure, DG 2 Inlet	4,5	bar	1	-	-	-	-	-
	A5312	FO Pressure, DG 2 Inlet	8,5	bar	1	-	-	-	-	-
	A5313	FW Temperature, DG 2 Outlet	82	°C	-	88	-	-	-	-
	A5314	LO Temperature, DG 2 Cooler Inlet	52	°C	-	60	-	-	-	-
	A5315	DG 2 Exhaust Manifold Temperature	335	°C	-	390	-	-	-	-
	A5316	DG 2 Sump Tank Level	50-90	%	0.3	-	-	-	-	-
	A5317	DG 2 Overspeed	720	rpm	-	740	-	-	-	-
	A5318	DG 2 Trip	INACTIVE	-	-	-	-	-	-	-

Alarm Page Name	SERS		Normal Val.	Unit	Alarm		Slow Down		Shut Down	
	A Codes	Alarm Name			Low	High	Low	High	Low	High
Electrical Systems	A5032	Battery Level	80	%	30	-	-	-	-	-
	A5032	Emergency Gen., Tank Level	80	%	30	-	-	-	-	-
	A5401	ME Systems Main CB Trip Failure	INACTIVE	-	-	-	-	-	-	-
	A5402	SW Pump 1 CB Trip Failure	INACTIVE	-	-	-	-	-	-	-
	A5403	SW Pump 2 CB Trip Failure	INACTIVE	-	-	-	-	-	-	-
	A5404	Aux. SW Pump CB Trip Failure	INACTIVE	-	-	-	-	-	-	-
	A5405	LTFW Pump 1 CB Trip Failure	INACTIVE	-	-	-	-	-	-	-
	A5406	HTFW Pump 1 CB Trip Failure	INACTIVE	-	-	-	-	-	-	-
	A5407	FO Supply Pump 1 CB Trip Failure	INACTIVE	-	-	-	-	-	-	-
	A5408	FO Circulation Pump 1 CB Trip Failure	INACTIVE	-	-	-	-	-	-	-
	A5409	LO Pump 1 CB Trip Failure	INACTIVE	-	-	-	-	-	-	-
	A5410	Air Compressor 1 CB Trip Failure	INACTIVE	-	-	-	-	-	-	-
	A5411	Air Compressor 2 CB Trip Failure	INACTIVE	-	-	-	-	-	-	-
	A5412	ME Turning Gear CB Trip Failure	INACTIVE	-	-	-	-	-	-	-
	A5413	Auxiliary I CB Trip Failure	INACTIVE	-	-	-	-	-	-	-
	A5414	Steering Gear Pump 1 CB Trip Failure	INACTIVE	-	-	-	-	-	-	-

Alarm Page Name	SERS		Normal Val.	Unit	Alarm		Slow Down		Shut Down	
	A Codes	Alarm Name			Low	High	Low	High	Low	High
LO Separator	A6001	LO Temperature, Heater Outlet	88	°C	80	98	-	-	-	-
	A6002	Separator Outlet Pressure		bar	0,8	2,5	-	-	-	-
	A6003	FW Pressure		bar	1	-	-	-	-	-
MDO Separator and Tanks	A6201	3P MDO Storage Tank Level	>90	%	-	90	-	-	-	-
	A6202	3P MDO Storage Tank Temperature	Ambient	°C	-		-	-	-	-
	A6203	3S MDO Storage Tank Level	>90	%	-	90	-	-	-	-
	A6204	3S MDO Storage Tank Temperature	Ambient	°C	-		-	-	-	-
	A6205	MDO Settling Tank Level	>95	%	-	95	-	-	-	-
	A6206	MDO Settling Tank Temperature	Ambient	°C	-		-	-	-	-
	A6207	MDO Service Tank Level	>98	%	25	98	-	-	-	-
	A6208	MDO Service Tank Temperature	Ambient	°C	-		-	-	-	-
HFO Separator and Tanks	A6301	1P HFO Storage Tank Level	>90	%	-	90	-	-	-	-
	A6302	1P HFO Storage Tank Temperature	35-45	°C	-	80	-	-	-	-
	A6303	1S HFO Storage Tank Level	>90	%	-	90	-	-	-	-
	A6304	1S HFO Storage Tank Temperature	35-45	°C	-	80	-	-	-	-
	A6305	2P HFO Storage Tank Level	>90	%	-	90	-	-	-	-
	A6306	2P HFO Storage Tank Temperature	35-45	°C	-	80	-	-	-	-
	A6307	2S HFO Storage Tank Level	>90	%	-	90	-	-	-	-
	A6308	2S HFO Storage Tank Temperature	35-45	°C	-	80	-	-	-	-
	A6309	HFO Settling Tank Level	>95	%	-	95	-	-	-	-
	A6310	HFO Settling Tank Temperature	65-80	°C	-	110	-	-	-	-
	A6311	HFO Service Tank Level	>98	%	25	98	-	-	-	-
	A6312	HFO Service Tank Temperature	80-90	°C	-	110	-	-	-	-
FW and Hydrophore System	A6501	FW Tank Level, Portside	<30	%	30	-	-	-	-	-
	A6502	FW Tank Level, Starboard	<30	%	30	-	-	-	-	-
	A6503	Hydrophore Tank Level	<30	%	30	-	-	-	-	-

4.55 MALFUNCTION IDENTIFICATION PANEL

4.55.1 Access to the Identify Malfunctions Panel

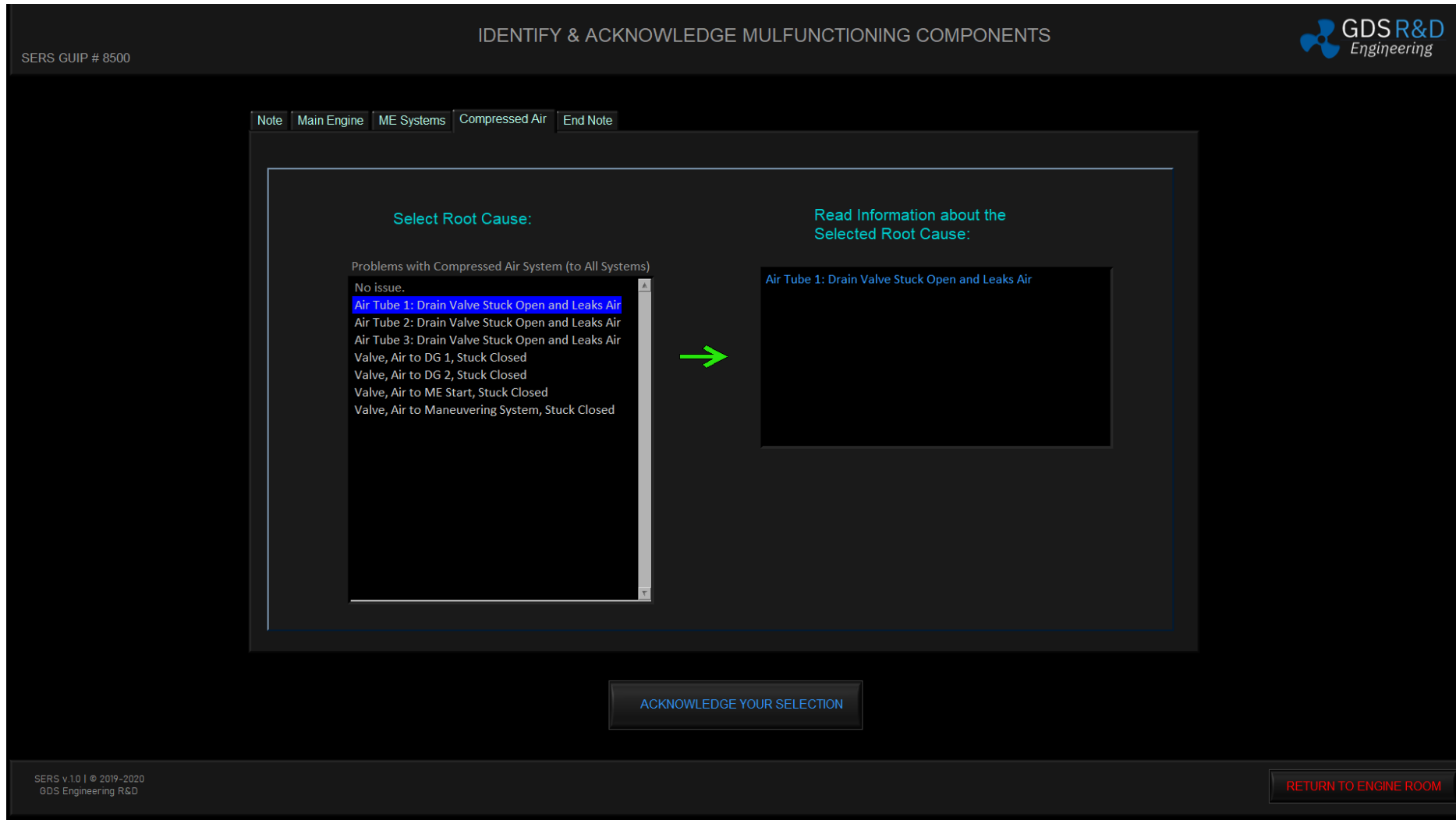


Clicking on IDENTIFY MALFUNCTION on SERS MAIN panel display the IDENTIFY AND ACKNOWLEDGE MALFUNCTIONS panel.

When malfunctions are created and injected from Instructor Panel, by understanding the root cause of the problem from alarms and changing parameters, the Trainee must open this panel and ensure to select the root cause of the malfunction/problem. Otherwise, the malfunction will continue resulting in more damage on the systems and components. Notice that the reaction times are recorded at the Instructor Station with the malfunction and SERS Workstation ID as well as User ID for the Trainee logged in to the SERS Workstation.

Figure on next page is displayed when IDENTIFY MALFUNCTION is clicked on SERS MAIN panel.

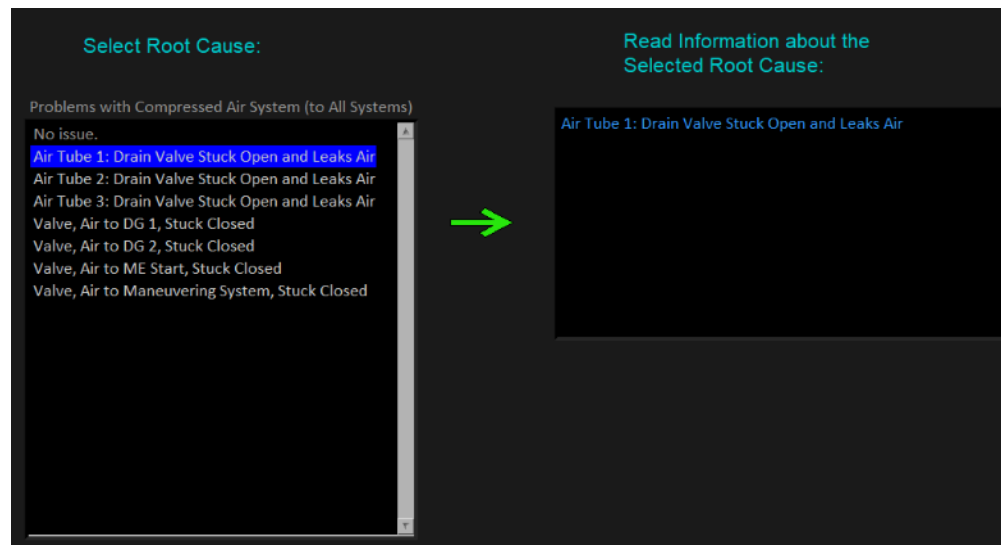
4.55.2 GUI Panel View (Panel #8500)



4.55.3 Operating Instructions

- Identify the malfunction event (What is the ROOT-CAUSE of the problem?)
 - By observing alarms and variables in the simulator, understand the source of the malfunction causing parameters change.
- Read the displayed maintenance actions associated with the selected issue. Read carefully!
- Locate and select the event in the list.
- If you agree with the displayed issue and maintenance actions, click ACKNOWLEDGE MAINTENANCE ACTION.
 - Note 1: If the correct method is selected for corresponding malfunction event, the software will assume the appropriate maintenance actions are approved and the issue will be resolved.
 - Note 2: If the correct cause is not selected, the problem will not be fixed. Note that the problem may grow and other alarms may be displayed if the problem persist.
- Click RETURN TO ENGINE ROOM to show the Main Display Frame.

4.55.4 Identify Root-Cause



After identifying the root cause, user now can select correct root cause from this screen. Issues are separated related to systems. Student/Trainee can select the proper root-cause according to alarms and changes of parameters.

4.55.5 Associated Maintenance Actions

- Displayed maintenance actions will be performed by the student/trainee. Read carefully, acknowledge maintenance operation and actions as described, and select ACKNOWLEDGE.

4.56SERS SYMBOLS I: PIPING & ILLUSTRATION DIAGRAM SYMBOLS & OBJECTS (GUI PANEL #9100)

SERS GUIP # 9100

SERS Symbols, Units, Acronyms, and Illustration Objects

GDS R&D Engineering

P&ID Diagrams

Electrical Systems Diagrams

Units, Acronyms, and Abbreviations

Engineering Systems Piping & Illustration Objects

 Compressed Air Diesel Oil Heavy Fuel Oil Fuel Oil Low Temperature Fresh Water High Temperature Fresh Water Sea Water Steam Lubrication Oil Control System	 Main Centrifugal Pump  Auxiliary Centrifugal Pump  General Pump  Gear Pump  Attachment Pump  Hand Pump  Strainer  Back Flush Auto Filter	 Unspecified Valve  Check Valve  Manual Operated Butterfly Valve  Manual Operated Check Valve  3 Way Solenoid Valve  Ball Valve  Solenoid Valve  Relief Valve / Quick Closing Valve  Spring Loaded Valve  Outlet Valve (HFO & MDO Tanks)  Pressure Regulating Valve 2  Manual Operated 3 Way Valve  Mixing Valve  Pressure Regulating Valve  4/3 Direction Control Valve  4/2 Direction Control Valve
 Flow Direction  Preheater  Heaters (Steam)  Sea Water System Main Coolers  Low Temperature Fresh Water (LTFW) System Main Coolers  LTFW Coolers		

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RETURN TO ENGINE ROOM

4.57 SERS SYMBOLS II: ELECTRIC SYSTEMS DIAGRAM SYMBOLS & ILLUSTRATION OBJECTS (GUI PANEL #9100)

SERS GUIP # 9100

SERS Symbols, Units, Acronyms, and Illustration Objects

Electrical System Panels and Diagrams

P&ID Diagrams | **Electrical Systems Diagrams** | **Units, Acronyms, and Abbreviations**

Connect Diesel Generator Connect Button
Disconnect Diesel Generator Disconnect Button
RAISE Diesel Generator Speed Raise Button
LOWER Diesel Generator Speed Lower Button
MDO DGFuel Changeover Button, MDO
HFO DGFuel Changeover Button, HFO
RESET Trip/Alarm Reset Button
TRIP DG Engine Trip Indicator
Running Engine Running Indicator
Tripped Engine Tripped Indicator
Electric Switch, ON / OFF
Electric Switch, OFF / ON
Electric Line Selector Switch
Electric Power Line
Circuit Braker, ON/OFF
CLUTCH Shift Generator Clutch, IN/OUT

Control Switch, OFF/AUTO
Control Switch, OFF/ON
Control Switch, LOCAL/REMOTE
Control Switch, MAN/AUTO
Frequency Control Switch, LOWER-0-RAISE
Diesel Generator Governor Position
Engine Start Button, OFF / ON
Engine Stop Button, OFF / ON
Alternator CONNECT Button, OFF / ON
Alternator DISCONNECT Button, OFF / ON
Diesel Generator "Ready to Start" Indicaor (OFF / ON)
Diesel Generator "Run Status" Indicaor (OFF / ON)
Diesel Generator "Electric Power Status" Indicaor (OFF / ON)

Power Gauge Power, KVA
Voltage Gauge Voltage
Current Gauge Current, A
Frequency Gauge Frequency
Power Factor (PF) Gauge Power Factor
Earth Resistance Gauge Earth Resistance
Pressure Gauge Pressure
Generator Selection Switch
Earth Check Control Switch
Syncroscope
Diesel Generators Synchronization Indicator

Generator Priority Selector
Generator Load Control Mode Selector
220 Volts AC Bus Transformer
24 Volts DC Bus Transformer
24 Volts DC Regulator
24 Volts Battery Packs

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RETURN TO ENGINE ROOM

4.58 SERS UNITS, ACRONYMS AND ABBREVIATIONS (GUI PANEL #9100)

SERS Units, Acronyms, and Abbreviations


Engineering Units

E	: Apparent Power , kVA (Kilo Volt)	SFOC	: Specific Fuel Consumption, g/kWh (gram/kilowatt/hour)
kW	: Power, Kilowatt		
kVA	: Power, KiloVoltAmper	RPM, rev/min.	: Engine speed in revolution per minute
kVAr	: Power, Reactive (kVAr)		
I	: Current , A (Amper)	rho	: density, kilograms per cubic meters
V	: Voltage, V (Volt)	cSt	: Centistokes, Kinematic
V	: Speed, V	knots	: Nautical Miles
F	: Frequency, Hz (Hertz)	PF, cos ϕ	: Power Factor
m	: Length in meters	Kp	: Proportional Gain Constant
L	: Level	Ki	: Integrative Gain Constant
deg.C, °C	: Temperature, (Degrees Celsius)	Kd	: Derivative Gain Constant
deg.A	: Degrees of Angle	m ³ /h, m3/h	: Flow rate, Q Cubic meters per hour
bar	: Pressure, (bar)	ton/h	: Flow rate, Q (tons per hour)
kg	: kilograms	kg/h	: Flow rate, Q (Kilogram/hour)
h, HH	: time in hours	Torr	: Vacuum
min., MM	: time in minutes		
s, SS	: time in seconds		

Acronyms and Abbreviations

©	: Copyright	HCU	: Hydraulic Control Unit
AC	: Alternating Current	HL	: High Level
AE	: Auxilliary Engine	HT	: High Temperature
Alt	: Alternator	HTFW	: High Temperature Fresh Water
AST	: Auto Starter Transformer	LO	: Lubrication Oil
Aut.	: Auto	LL	: Low Level
CA	: Compressed Air	LT	: Low Temperature
CB	: Circuit Breaker	LTFW	: Low Temperature Fresh Water
Ctrl	: Control	Man.	: Manual
Cyl	: Cylinder	ME	: Main Engine
CPP	: Controllable Pitch Propeller	OWS	: Oily Water Separator
DC	: Direct Current	Press	: Pressure
DENOX	: Denoxification	Stbd.	: Starboard
DG	: Diesel Generator	Syst	: System
DO	: Diesel Oil	SW	: Sea Water
ECR	: Engine Control Room	TC	: Turbocharger
ECU	: Electrical Control Unit	Temp	: Temperature
ER	: Engine Room	TG	: Turbogenerator
FO	: Fuel Oil	TM	: Trademark
FPP	: Fixed Pitch Propeller	VCB	: Vacuum Circuit Breaker
FW	: Fresh Water		
Gen	: Generator		

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