SHIP ENGINE ROOM SIMULATOR (SERS)

Version 1.1

USER MANUAL

VOLUME II: ENGINE ROOM OPERATIONS

GDS Engineering R&D, Inc.

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

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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 to the SERS Team.

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.

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1. INTRODUCTION

1.1 Scope

This document describe the technical steps to operate each systems in the engine room using the Ship Engine Room Simulator (SERS). Instructions provided in this document may be used by the Instructors as "Training Checklists / Course Material" in their Maritime Education & Training (MET) trainings, prepared according to the STCW 2010 (with Manila Amendments). Do not hesitate to contact with the SERS Development Team on how to arrange the Training Curricula for the inclusion of the SERS to meet the IMO requirements.

1.2 Overview of the SERS User Manuals

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

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

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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1.3 Symbols and Engineering Units used in SERS and in this Document

©	: Copyright
cSt	: Centistokes, Kinematic Viscosity
deg.C, °C	: Temperature, (Degrees Celsius)
deg.A	: Degrees of Angle
E	: Apparent Power, kVA (Kilo Volt Ampere)
F	: Frequency, Hz (Hertz)
h, HH	: time in hours
I	: Electrical Current, A. (Ampere)
Kp	: Proportional Gain Constant
Ki	: Integrative Gain Constant
Kd	: Derivative Gain Constant
kg	: kilograms weight
kg/h	: Flow rate, Q (Kilogram/hour)
knots	: Nautical Miles
kW	: Power, Kilowatt
kVA	: Power, Kilo x Volts x Ampere
kVAr	: Power, Reactive Power in Kilo x Volts x Ampere (Reactive)
L	: Level
m	: Length in meters
min, MM	: time in minutes
m^3/h, m3/h	: Flow rate, Q, cubic meters per hour, cubic meters per hour
P, bar	: Pressure, (bar)
PF, cos Ø	: Power Factor
RPM, rev/min.	: Engine speed, revolution per minute
ppt	: Salinity, parts per thousands
ppm	: Pollution, parts per million
rho	: density, kilograms per cubic meters
SERS	: Ship Engine Room Simulator
SFOC	: Specific Fuel Consumption, g/kWh (gram/kilowatt/hour)
s, SS	: time in seconds

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ton/h	: Flow rate, Q (tons per hour)
V	: Voltage, V (Volts)
V	: Speed (usually in metes per seconds)

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1.4 Acronyms used in SERS and in this Document

AC	: Alternating Current
AE	: Auxiliary Engine or Engines
Alt.	: Alternator
Aut.	: Auto
CA	: Compressed Air
CB	: Circuit Breaker
Cyl.	: Cylinder
Ctrl .	: Control
DC	: Direct Current
DENOX	: Denoxification
DG	: Diesel Generator
DO	: Diesel Oil
ECR	: Engine Control Room
EMG or Emg.	: Emergency
ER	: Engine Room
FO	: Fuel Oil
FW	: Fresh Water
GDS	: Global Dynamic Systems
Gen.	: Generator
GUI	: Graphical User Interface
GUIP	: GUI Panel
HL	: High Level
HT	: High Temperature
HTFW	: High Temperature Fresh Water
LL	: Low Level
LO	: Lubrication Oil
LT	: Low Temperature
LTFW	: Low Temperature Fresh Water
Man.	: Manual
ME	: Main Engine

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OWS	: Oily Water Separator
Press.	: Pressure
SERS	: Ship Engine Room Simulator
Stbd.	: Starboard
Syst.	: System
SW	: Sea Water
TC	: Turbocharger
Temp.	: Temperature
TM	: Trademark
QCV	: Quick Closing Valve

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2. STARTING THE SERS

2.1 Starting the SERS with the Ship Initial Conditions (ICs)

The SERS software is started with several SHIP Initial Conditions (ICs) selected by the Trainee based on the assigned training objective (Figure 3.1). Refer to the SERS User Manual Volume I Section 1.3, for reading the instructions on how to start the SERS, login, select the initial condition and the display the SERS Main GUI Panel.

This selection of the Ship IC is made after a successful login, on the Ship Initial Condition Selection GUI Panel (Figure 3.1). Refer to Section 3 for descriptions of each of the initial condition selections and associated trainee exercises.

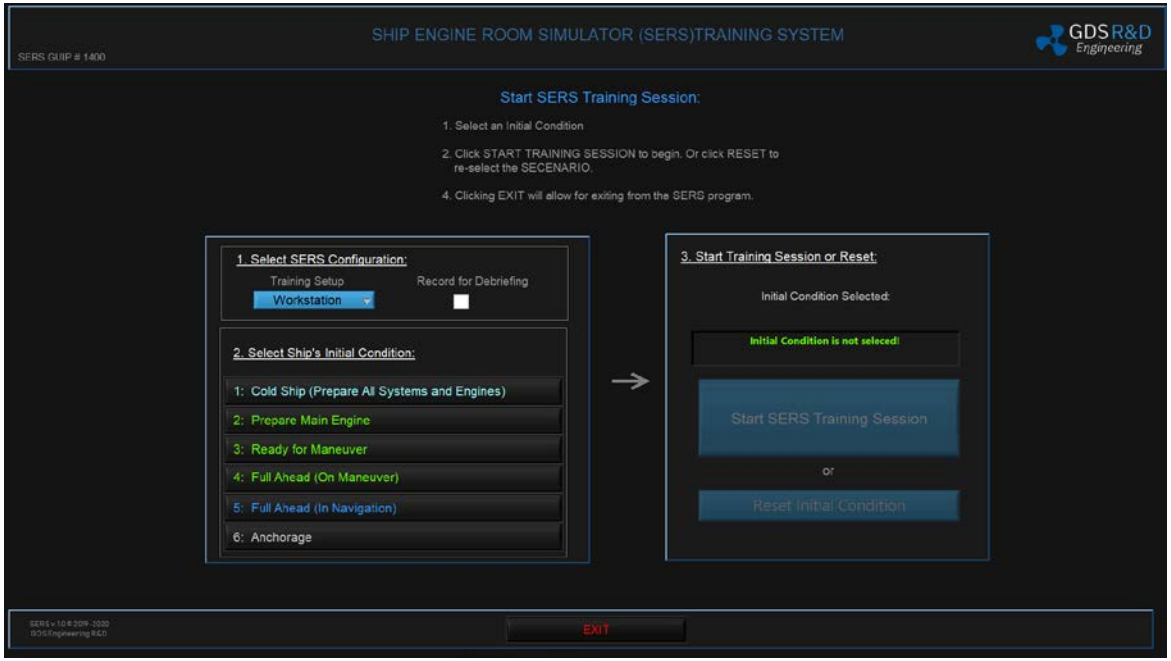

Figure 3.1 Ship Initial Conditions Selection GUI Panel (SERS User Manual Volume I Section 1.3)

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2.2 SERS Main GUI Panel (GUI Panel #1000)

After Ship IC is selected and the SERS is started, the SERS Main GUI Panel is displayed. Refer to the SERS User Manual Volume I Section 4.1 for the detail description of the Main Panel. SERS Main GUI Panel is shown in Figure 3.2 and the list of GUI panels that can be accessed is shown in Section 3.3.

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2.3 SERS Graphical User Interface (GUI) Panels List

Each of the SERS GUI Panels 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: CO_2 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

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3. SHIP IC AND GENERAL INSTRUCTIONS

3.1 Ship Initial Condition (Ship IC) and Systems Status List

Systems (SERS GUIP #)	Cold Ship	Prepare Main Engine	Ready for Maneuvering	Full Ahead (On Maneuver)	Full Ahead (In Navigation)	Anchorage
Sea Water Main Cooling (SERS GUIP #3000)	Not Ready	SW main cooling provided with the Aux. SW Pump.	SW main cooling provided with the SW Pump 1/2 in AUTO mode.	SW main cooling provided with the SW Pump 1/2 in AUTO mode.	SW main cooling provided with the SW Pump 1/2 in AUTO mode.	SW main cooling provided with the Aux. SW Pump.
Fresh Water Cooling (SERS GUIP #3100)	Not Ready	FW cooling provided with the Aux. LTFW and Preheating Pumps.	FW cooling provided with the LTFW and HTFW Pump 1/2 in AUTO mode.	FW cooling provided with the LTFW and HTFW Pump 1/2 in Auto mode.	FW cooling provided with the LTFW and HTFW Pump 1/2 in Auto mode.	FW cooling provided with the Aux. LTFW Pump.
Compressed Air (SERS GUIP #3200)	Not Ready	Compressed Air provided with the Aux. Air Compressor.	Compressed Air provided with the Air Compressor 1/2 in AUTO mode.	Compressed Air provided with the Air Compressor 1/2 in AUTO mode.	Compressed Air provided with the Air Compressor 1/2 in AUTO mode.	Compressed Air provided with the Aux. Air Compressor
Combined Boiler (SERS GUIP #3300)	Not Ready	Not Ready	Steam is provided by the Combined Boiler.	Steam is provided by the Combined Boiler	Steam is provided by the Combined Boiler	Steam is provided by the Combined Boiler
ME Lubrication Oil (SERS GUIP #3400)	Not Ready	Not Ready	ME LO provided with the LO Pump 1/2 in AUTO mode.	ME LO provided with the LO Pump 1/2 in AUTO mode.	ME LO provided with the LO Pump 1/2 in AUTO mode.	ME LO System is ready but not provided.
ME Fuel (SERS GUIP #3500)	Not Ready	Not Ready	ME FO provided with Supply and Circulation Pump 1/2 AUTO mode.	ME FO provided with Supply and Circulation Pump 1/2 AUTO Mode.	ME FO provided with Supply and Circulation Pump 1/2 AUTO Mode.	ME FO System is ready but not provided.

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Systems (SERS GUIP #)	Cold Ship	Prepare Main Engine	Ready for Maneuvering	Full Ahead (On Maneuver)	Full Ahead (In Navigation)	Anchorage
Stern Tube (SERS GUIP #3600)	Not Ready	Not Ready	High/Low Gravity Tank provided LO.	High/Low Gravity Tank provided LO.	High/Low Gravity Tank provided LO.	High/Low Gravity Tank provided LO.
Steering Gear (SERS GUIP #3700)	Not Ready	Not Ready	SG LO provided with SG Pump 1/2 AUTO mode.	SG LO provided with SG Pump 1/2 AUTO mode.	SG LO provided with SG Pump 1/2 AUTO mode.	SG LO provided with SG Pump 1/2 AUTO mode.
Ship Propulsion & Shaft Generator (SERS GUIP #4600)	Not Ready	Not Ready	Not Ready	Not Ready	Shaft Generator provided the power.	Not Ready
Exhaust Gas Denoxification (SERS GUIP #4750)	Not Ready	Not Ready	Not Ready	Not Ready	Lined up and SCR is ON.	Not Ready
FW System & Hydrophore (SERS GUIP #4900)	Not Ready	FW provided the corresponding system.	FW provided the corresponding system.	FW provided the corresponding system.	FW provided the corresponding system.	FW provided the corresponding system.
Electrical Power (SERS GUIP #5100, #5200, #5300, #4600)	Not Ready	DG 1 is providing power. Emg. CBs are ON. Main CBs must be activated.	DG 1,2, and 3 are providing power with equal load sharing all CBs.	DG 1,2, and 3 are providing power with equal load sharing all CBs.	DG 1,2 and Shaft Generator are providing power with equal load sharing. DG 3 is stand by.	DG 2 is providing power. DG 1 is stand by. DG 3 is OFF for maintenance.
LO Separator (SERS GUIP #6000)	Not Ready	Lined up system and LO Separator is operating.	Lined up system and LO Separator is operating.	Lined up system and LO Separator is operating.	Lined up system and LO Separator is operating.	Lined up system and LO Separator is operating.
MDO Tanks & Transfer (SERS GUIP #6200)	Not Ready	Not Ready	Lined up system and MDO Separator is operating.	Lined up system and MDO Separator is operating.	Lined up system but MDO Separator is not operating.	Lined up system but MDO Separator is not operating.
HFO Separators (SERS GUIP #6400)	Not Ready	Not Ready	Not Ready	Lined up system but HFO Separators are not operating.	Lined up system and HFO Separator 1 is operating. HFO Separator 2 is standby.	Lined up system and HFO Separator 1 is operating.

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Systems (SERS GUIP #)	Cold Ship	Prepare Main Engine	Ready for Maneuvering	Full Ahead (On Maneuver)	Full Ahead (In Navigation)	Anchorage
Oily Water Separator (OWS) (SERS GUIP #6500)	Not Ready	Not Ready	Lined up system and OWS is operating.	Lined up system and OWS is operating.	Lined up system and OWS is operating.	Lined up system and OWS is operating.
Gray Water & Sewage Treatment (SERS GUIP #6600)	Not Ready	Lined up system and STU is operating.	Lined up system and STU is operating.	Lined up system and STU is operating.	Lined up system but STU is not operating. Overboard valve opened.	Lined up system and STU is operating.
Refrigeration Plant (SERS GUIP #6700)	Not Ready	Not Ready	Lined up system and refrigeration compressor is operating.	Lined up system and refrigeration compressor is operating.	Lined up system and refrigeration compressor is operating.	Lined up system and refrigeration compressor is operating.
Bow Thruster (SERS GUIP #7100)	Not Ready	Not Ready	Bow Thruster is ready for maneuvering.	Bow Thruster is ready for maneuvering.	Not Ready	Not Ready
Main Fire Fighting (SERS GUIP #7500)	Not Ready	Not Ready	Main Fire Fighting System is ready for using in case of fire.	Main Fire Fighting System is ready for using in case of fire.	Main Fire Fighting System is ready for using in case of fire.	Main Fire Fighting System is ready for using in case of fire.
CO_2 Fixed Fire Installation (SERS GUIP #7600)	Not Ready	Not Ready	CO_2 Fixed Fire Installation is ready for using in case of fire.	CO_2 Fixed Fire Installation is ready for using in case of fire.	CO_2 Fixed Fire Installation is ready for using in case of fire.	CO_2 Fixed Fire Installation is ready for using in case of fire.

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3.2 Essential Items Starting with the Cold Ship IC - General Task List for the Preparation of the ER Systems

The following essential items must be prepared to be ready for use by each of the systems in the engine room such that all pertaining machinery and equipment can be operated:

- Electrical Supply
- Fresh Water
- Cooling Water
- Compressed Air
- Steam
- Lubrication Oil
- Fuel Oil

The instructions shown in this manual show how to prepare each of the systems using GUI Panels based on the Ship IC is selected. Following sections describe the general task list for achieving the goals after a specific Ship IC is selected.

Section 4 describe how each of the systems are prepared regardless of the selected Ship IC.

All operational tasks provided in tables under Sections 3.1 thru 3.9 can be performed using configuration of the SERS as both a workstation for individual study and Distributed System with Hardware and Environment except that the task provided in Section 3.8.2, may only be performed with a Team of Trainees.

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3.3 Starting with the Cold Ship IC - General Task List for the Preparation of the ER Systems

General tasks for preparation of all of the Engine Room machinery and systems are shown in table below and the sections of this document is arranged in this order. No systems are ready in Cold Ship IC. The purpose is that the ME must be prepared to be ready for maneuvering.

Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
1	Starting the Emergency Generator (EG)	Provide power to the Emergency Bus line. Note: If the ship is at port, student may exercise receiving the electrical power from Port electricity.	4.1	5000
2	Turning on the switches for the Emergency Circuit Breakers (E-CBs)	Provide power to the emergency bus lines using the emergency power.	4.2	5500 5650
3	Lining up the Compressed Air System with the Auxiliary Air Compressor	Provide compressed air to the auxiliary pumps and systems; starting a Diesel Generator being the first priority.	4.3	3200
4	Lining Up Seawater (SW) System with the Auxiliary SW Pump.	Ensure the Diesel Generators can receive SW from Common SW Suction. Ensure the Low Temperature Fresh Water (LTFW) Coolers (Heat Exchangers) are ready for lowering the LTFW system temperature. Ensure that the SW Aux. Pump can supply SW to the Steam Condenser and Condenser in the Refrigeration Plant.	4.4	3000
5	Lining up the systems for the Diesel Generator 1 (DG 1) and starting DG 1 (DG 1 is used as an example)	Provide power to the consumers from an onboard power generator.	4.5	5100
6	Connecting the DG 1 to the 440V Main Bus Bar)	Provide power to the 440VAC Bus Line.	4.6	5000

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Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
7	Lining up the Main Circuit Breakers	Provide power to the 440 VAC Consumes. Turn on the 220VAC and 24VDC transformers. Provide power to the 220 VAC Bus electrical consumers. Provide power to the 24VDC Bus electrical consumers. Verify that the 440V, 220V and 24VDC consumers are ready to receive electrical power.	4.7	5500 5600 5650 5700 5750
8	Lining up the systems for the Diesel Generator (DG) 2 and 3 and Starting the DGs 2 and 3.	Prepare two other DGs to make all 3 generators working in parallel to the DG already providing power. Must meet the electrical power needed by all of the electrical consumers during maneuvering with an additional power generator working in parallel. The generators are started for heating up and may be stopped to restart again at later steps. For that reason, the synchronization tasks are provided at later steps.	4.8	5200 5300
9	Lining up Fresh Water (FW) system, tanks and Hydrophore.	Provide FW to the Low Temperature Fresh Water (LTFW) system for cooling the essential auxiliary engines and systems; Supply FW to the Combined Boiler.	4.9	4900
10	Lining Up Combined Boiler	Provide steam to the steam consuming machinery or devices; Pre-heating the Main Engine (ME) for maneuvering preparations. While the steam is being built in the Combined Boiler, other tasks can be performed before starting to pre-heat the ME.	4.10	3300

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Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
11	Lining up the LO separator	ME Lubricating Oil (LO) in Sump Tank becomes circulated through the LO separator so that is ready for the removal of any contaminated wear particles, combustion products or water.	4.11	6000
12	Lining Up Low Temperature Fresh Water (LTFW) Cooling System	Provide cooled FW to the coolers on the LTFW cooling line using the Auxiliary LTFW Pump.	4.12	3100
13	Lining up the Hot Temperature Fresh Water (HTFW) system.	Starting to preheat the ME using the ME Preheating Pump. Connect the LT and HT systems with the HTFW Temperature Control valve.	4.13	3100
14	Lining up Seawater (SW) System with the Main SW Cooling Pumps	Ensure that the SW Main Cooling System Line provides SW to the Low Temperature Fresh Water (LTFW) Coolers.	4.4	3000
15	Lining Up the Compressed Air system with the Main Air Compressors (Air Compressors 1 or 2)	Ensure the Main Air Receivers are filled with enough air (Air pressure is maximum of 30 bars in each receivers) and the ME Air Start System is ready for starting the ME with pressurized air. Note: Other systems may be prepared while the air receivers are being filled by the air compressors.	4.14	3200
16	Lining up the Marine Diesel Oil (MDO) tanks & Diesel Oil (DO) separator	Ensure that the DGs and the ME can continuously be operated using the Marine Diesel Oil (MDO) as the engine Fuel. Ensure the service tank levels are filled minimum of 60%. Ensure that the MDO transferred to the service tanks are purified using the DO Separator.	4.15	6200

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Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
17	Lining up the ME Fuel Oil system	Ensure that the ME can start with the MDO (ME running with the HFO usually preferred after the maneuvering). Ensure the steam is provided to the FO Heaters. Activate the Fuel Viscosity Control System is activated with proper settings, for example with 15cSt.	4.16	3500
18	Lining up the Stern Tube system	Ensure the correct gravity tank is causing pressure on the stern tube bearings meeting approximately the same pressure caused by the seawater due to the ship's draft.	4.17	3600
19	Lining up the Steering Gear system	Ensure that the steering gear is lined up. Perform a test for that the steering can be managed locally. Be able to transfer the control of the steering to the Bridge Panel. Ensure that the Ship Steering can be managed remotely from the Bridge.	4.18	3700 2000
20	Lining up the Main Lubricating Oil (LO) system for the ME	Ensure that the LO is circulated from sump tank to the ME. LO Coolers bypass line should be lined up for temperature control is programmed with the correct variables. Ensure that the LO temperature is pressure inlet to the ME is within the alarm limits.	4.19	3400

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Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
21	Parallel Operation of the DGs at **Local Mode**	Learn how to: • Line up the two other DGs and start each one of them. • Synchronize each of them (one-by-one) to the 440V Main Bus. • Ensure that all 3 generators are equally sharing he power requested on the 440V main Bus Bar. using the synchronization of the generators using the **LOCAL PANEL (Power Plant Panel)**.	4.20	5000
22	Synchronizing of DG 1 and DG 2 (or DG 3) at **Remote Mode**	Learn how to: • Line up the two other DGs and start each one of them. • Synchronize each of them (one-by-one) to the 440V Main Bus. • Ensure that all 3 generators are equally sharing he power requested on the 440V main Bus Bar. using the synchronization of the generators using the **REMOTE PANEL (Generators Remote Panel)**.	4.21	5400
23	Switching pumps and compressors to control them **REMOTELY**.	Pumps and compressors must be ready to control them using the "ECR: REMOTE CONTROLS: PUMPS & COMPRESSORS". Exercise each of the pump and compressor remote control actions.	4.22	5450
24	Line up Bow Thruster	Ensure the Bow Thruster is ready to operate.	4.23	7100

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Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
25	Final Checks for the Main Engine for Starting	Ensure the following conditions are ready to start the Main Engine: • Compressed air: ME Start Air is above he required limit. • ME is pre-heated (ME Inlet Temperature is above 58 °C) • ME LO system is lined up and the LO Inlet o Temperature is below 35 °C o Pressure is above 2.1 bar • ME FO system is ready with the following: o Ready for maneuvering with MDO o ME FO Inlet Pressure is above 6.5 bar o ME FO System is lined up for Viscosity Control of	4.23	2100 2200 4000
26	Test ME with Air and Fuel	Notify the Deck Officer responsible for watchkeeping • Turn the engine with Turning Gear (indicator cocks are open) • Start the ME with air while the indicator cocks are open. • Start the ME with air while the indicator cocks are closed and ensure ME speed (RPM) is reaching up to 10 rpm	4.24	2200
27	"ME is Ready for Maneuvering"	Notify the Chief Engineer for that the "ME is Ready for Maneuvering".	4.24	2100

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3.4 Lining Up the Emergency Response Panels and Systems

Lining up the Emergency response panels must be performed before starting the ME preparations for maneuvering. Trainee is assumed to prepare these systems at all times.

Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
1	Line up Main Fire Fighting System	Line up the Main Fire Fighting System. Exercise the operation of the Fire Pumps locally and remotely.	4.26	7500 5450
2	Lining up the CO2 Fixed Fire Installation	Line up the Main Fire Fighting System. Exercise the operation of the Fixed Fire Installation.	4.27	7600
3	Exercise the Emergency Response Operations	Ensure the compressed air is provided to the Emergency Response Panel. Exercise the operation of the following emergency system components remotely: • Fire pumps • Pumps Emergency stop • Emergency stop of the fans & dampers. • Quick Closing Valves.	4.28	7600

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3.5 Maneuvering Exercise

The maneuvering can be exercised after the ME Preparations are complete OR the software may be started with that the Ship Initial Condition is "ON MANEUVER". Note that the ME is turned with "Turning Gear" and must be tested with air and fuel before the Maneuvering (see Section 3.2 Steps 25, 26, and 27).

Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
1	Starting ME and Maneuvering Exercise	Start ME from the ME Local Control. Transfer Control Responsibility to the Engine Control Room. Give Engine Order from the Bridge Control and respond the Engine Order using the Engine Telegraph. Exercise Engine Order and Control Responsibility functions using Bridge and Engine Control Room (ECR) panels.	4.24 4.25	2200 2100 2000
1	Starting ME and Maneuvering Exercise	Start ME from the ME Local Control. Transfer Control Responsibility to the Engine Control Room. Give Engine Order from the Bridge Control and respond the Engine Order using the Engine Telegraph. Exercise Engine Order and Control Responsibility functions using Bridge and Engine Control Room (ECR) panels.	4.24 4.25	2200 2100 2000
2	Operating Bow Thruster	Operate the Bow Thruster, which is probably the most essential equipment to utilize by the Deck Officers during maneuvering. Ensure that the Power Generators meet the power required by the Bow Thruster.	4.23	7100
3	Change to Navigation Mode	Change the mode to NAVIGATION. Increase RPM between 80% and %100 engine load conditions.	4.25	2000 2100

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Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
4	Observation of the ME Performance	Ensure the ME parameters are stable within the alarm limits.	4.37	2100 4000 4650 4700

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3.6 Starting the Navigation and Energy Saving Operations

Assumption in this exercise is that the student completed the instructions provided in above sections and continues to the exercise with the tasks to perform just after switching to the Navigation Mode. This starts with "NAV Mode Notification" received from the responsible Deck Officer or through the Chief Engineer.

Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
1	Lining up HFO Tanks and Transfer System	Exercise HFO transfer between HFO tanks.	4.29	6300
2	Lining up the HFO Separators	Start HFO separator to provide HFO to the HFO Service Tank.	4.30	6400
3	Changeover to HFO.	Use HFO as the ME Fuel during Navigation with the viscosity within the limits. Observe the ME parameters after the HFO Changeover.	4.37	3500 4000
4	Lining up the Fresh Water Generator	Line up the Fresh Water Generator (FWG) Slowly provide HTFW from ME outlet to the FWG. Ensure the FW is generated.	4.31	3100 4800 4900
5	Starting the Shaft Generator	Start the Shaft Generator. Connect Shaft Generator to the 440V Main Bus line (synchronization).	4.32	5000 5400

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3.7 Lining Up the Systems for the Environmental Protection and Monitoring

Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
1	Lining up the Oily Water Separator (OWS)	Line up and start the OWS. Ensure the polluted waters are discharged with the PPM being within the allowed limits.	4.34	6500
2	Lining up the Gray Water & Sewage Treatment System	Line up and operate the Gray Water & Sewage Treatment System.	4.35	6600
3	Line up and Start the ME Denoxification (ME DENOX) System	Start the ME DENOX system. Observe the ME NOX (g/kWh) parameter change.	4.36	4750

3.8 Lining Up Other Ship Systems

Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
1	Lining up Refrigeration System	Ensure the Meat Room and Vegetable Room sections are cooled to the required temperatures.	4.32	6700

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Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
2	Ballast Transfer Operations	Line up the Ballast Transfer System Operate the ballast pumps Observe the change of the Ship Stability Parameters.	4.39	7000

3.9 Watchkeeping during Sea Navigation in NAVIGATION MODE

3.9.1 For Individual and Team Study

Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
1	Maintain a safe engineering Watch: • duties associated with taking over and handing over the watchkeeping responsibility • routine duties undertaken during a watchkeeping	Take-over the responsibility for engine room watch keeping Monitor engines and systems for safe and continuous operations with a routine frequency (hourly). With a routine frequency (hourly), monitor parameters (Electric Power, Fresh Water, Steam, Compressed Air, Lubricating Oil, Fuel Oil) for all engine room machinery and systems to ensure that the parameters are within the operational limits through visual checks and by inspections. Use Alarms Log for checking the abnormal parameters.	-	All GUI Panels

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Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
2	Record/Maintain machinery space logs and the significance of the readings taken	Record parameters and significant operations into the Engine Room Log Book.	-	All GUI Panels
3	Monitor the proper operation of the control systems	Exercise the change-over of remote/automatic to local control of all systems. Ensure proper operation and change over from Local to Auto and Auto to Local modes.		All GUI Panels

3.9.2 For Team Study Only:

This part of the study may be implemented with the SERS configured to run with distributed touch-screen monitors and associated hardware. Refer to the SERS User Manual Volume III Installation and Configuration for how to setup the SERS to perform the activities described in this section.

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Task #	General Task Name	Purpose	Section Number for the Detail Instructions	Related SERS GUI Panel(s) #
1	Maintain a safe engineering Watch: • duties associated with taking over and handing over the watchkeeping responsibility • routine duties undertaken during a watchkeeping	1. Conduct a Briefing Session: • Assign duties to Trainees. • Brief the end goal and overall activities • Prioritize the tasks • Emphasize the effective communication between the team 2. Start the Training (using Sections 3.1 to 3.7) depending on the scope of the particular training 3. Conduct a Debriefing Session: • Discuss plan versus actual continuation and completion of all events as discussed in the Briefing Session. • Team member(s) share accurate understanding of current and predicted engine-room and associated systems state, and of external environment • Communication records are complete, accurate and comply with statutory requirements • Discuss positive actions and discuss the actions that could have done better • Effective leadership behaviors are identified	-	All GUI Panels with Hardware and Environment

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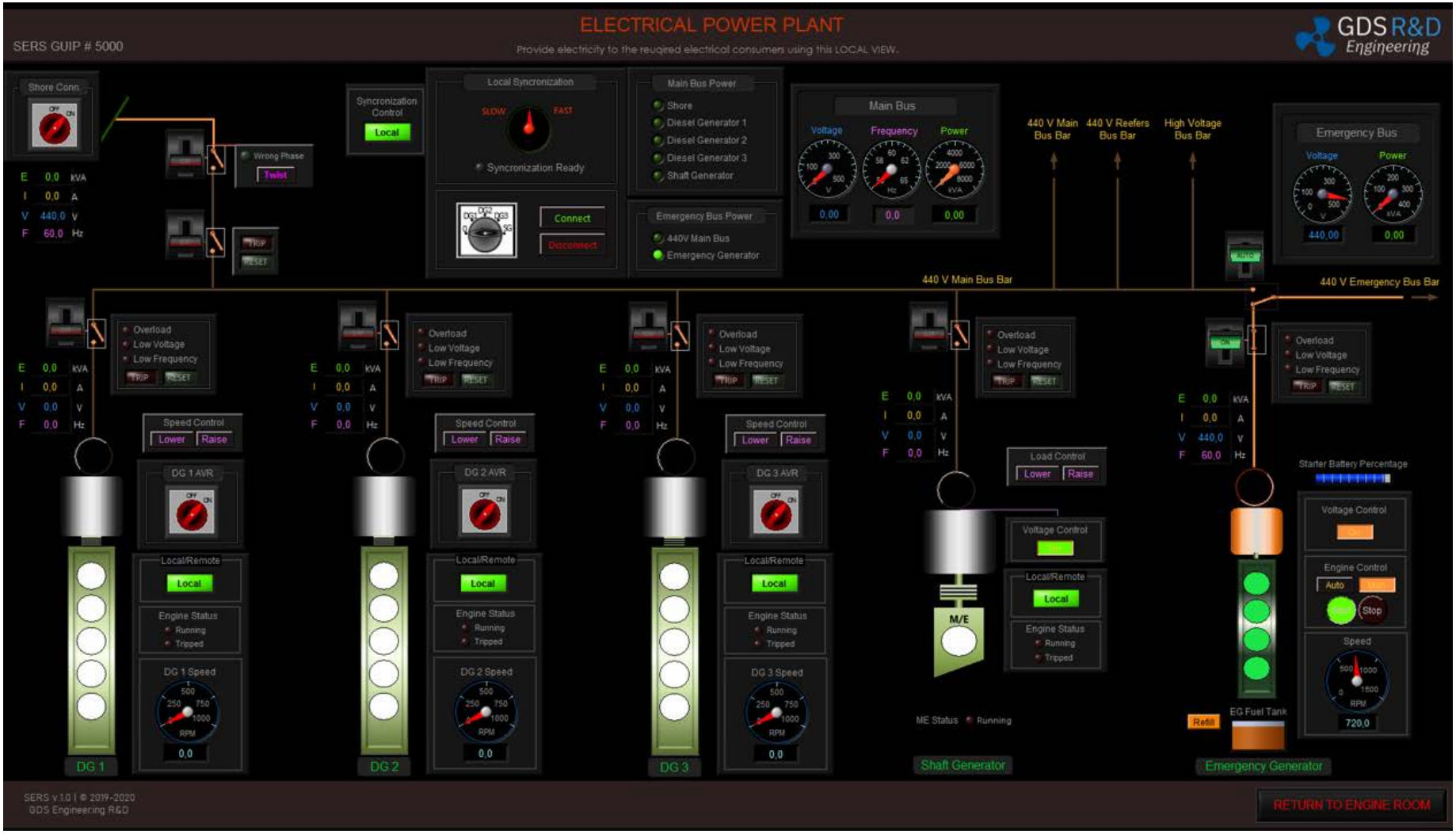
4. LINING UP THE ENGINE ROOM MACHINARY AND SYSTEMS

4.1 Emergency Generator (GUIP #5000)



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4.1.1 Operating Instructions

The emergency generator is a source of electrical power, intended to supply the emergency switchboard in the event of failure the supply from the main source of electrical power. The emergency generator is a source of electrical power to provide essential circuits such as steering, navigation lights and communications when the main power supply fails.

For Operating Emergency Generator:

- Open ELECTRICAL POWER PLANT GUI PANEL (GUIP #5000).
- Click MAN Button from the Emergency Generator Engine Control Panel.
- Click START Button from the Emergency Generator Engine Control Panel.
- Observe the rising of RPM.
- While the RPM is reaching above 650, Emergency Generator Alternator will be magnetizing.
- When the Emergency Generator Alternator is magnetized, set Circuit Breaker ON position for supplying of the 440 V Main Emergency Bus Bar.
- Emergency Bus Gauges Panel indicates actual Voltage and Power values at 440 V Emergency Bus Bar.

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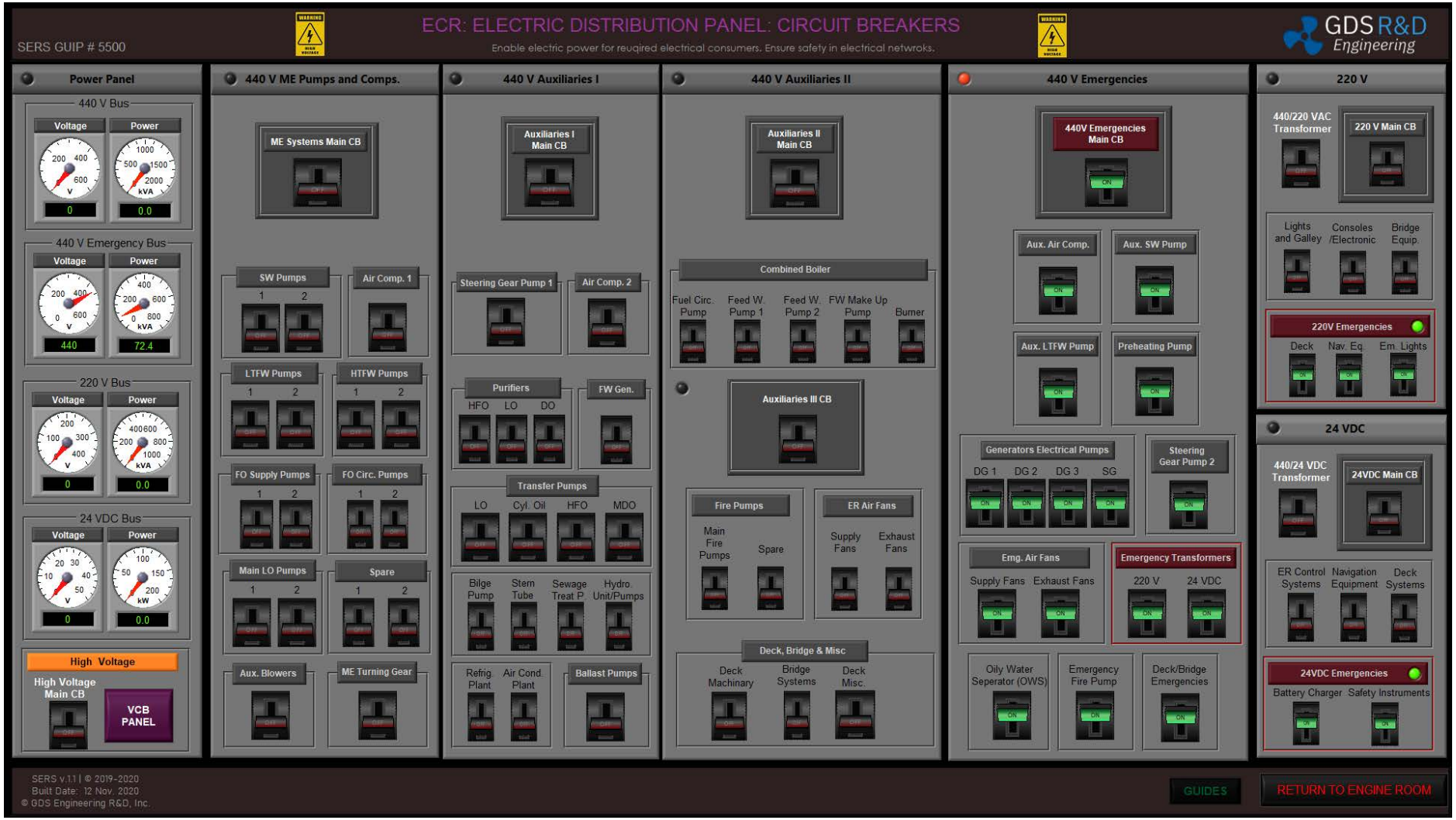
4.2 Emergency Circuit Breakers (GUIP #5500)



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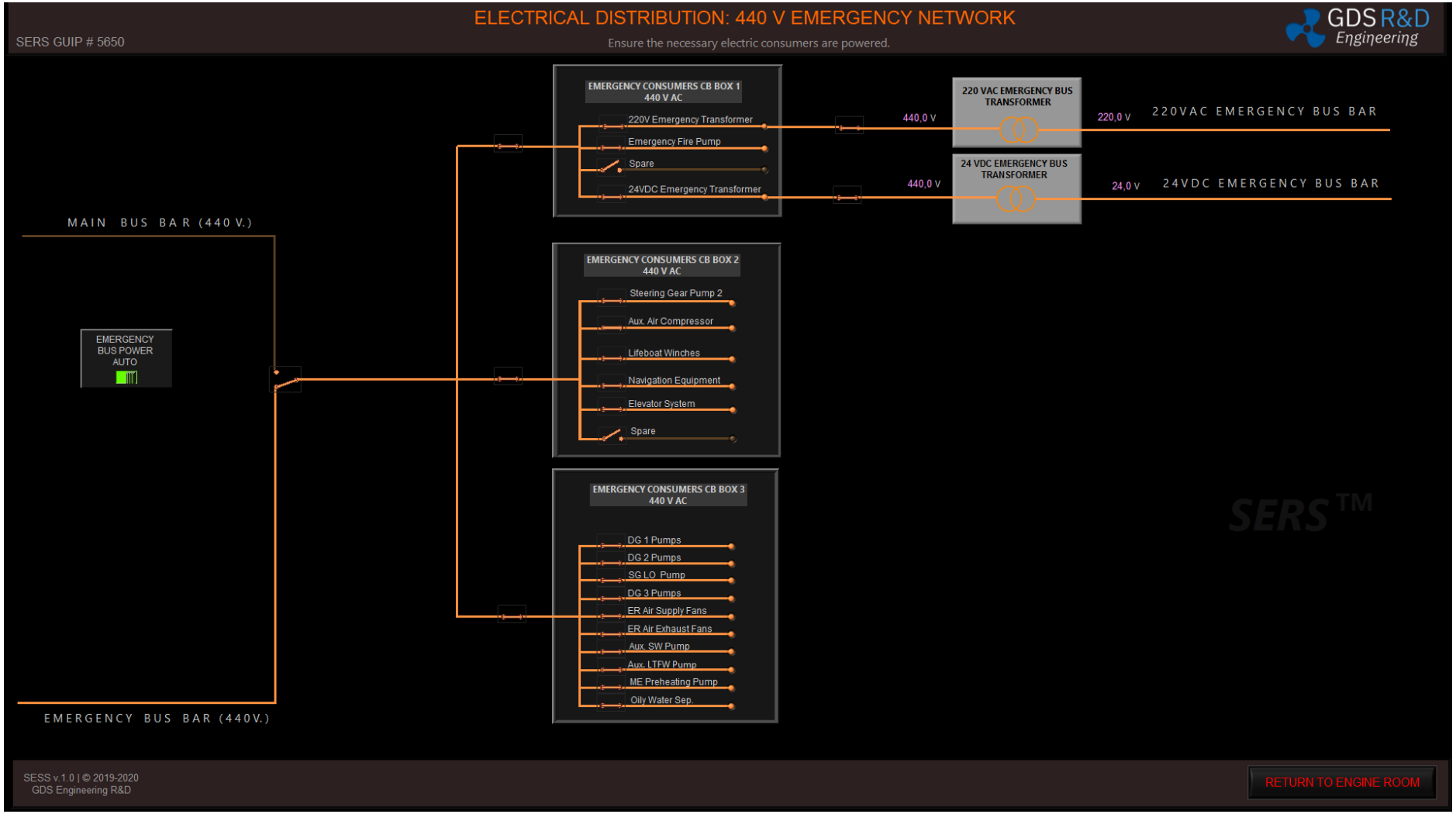
Ensure that the electrical power is supplied to the pertaining emergency electrical consumers and equipment. For 440 V Emergency Consumers:



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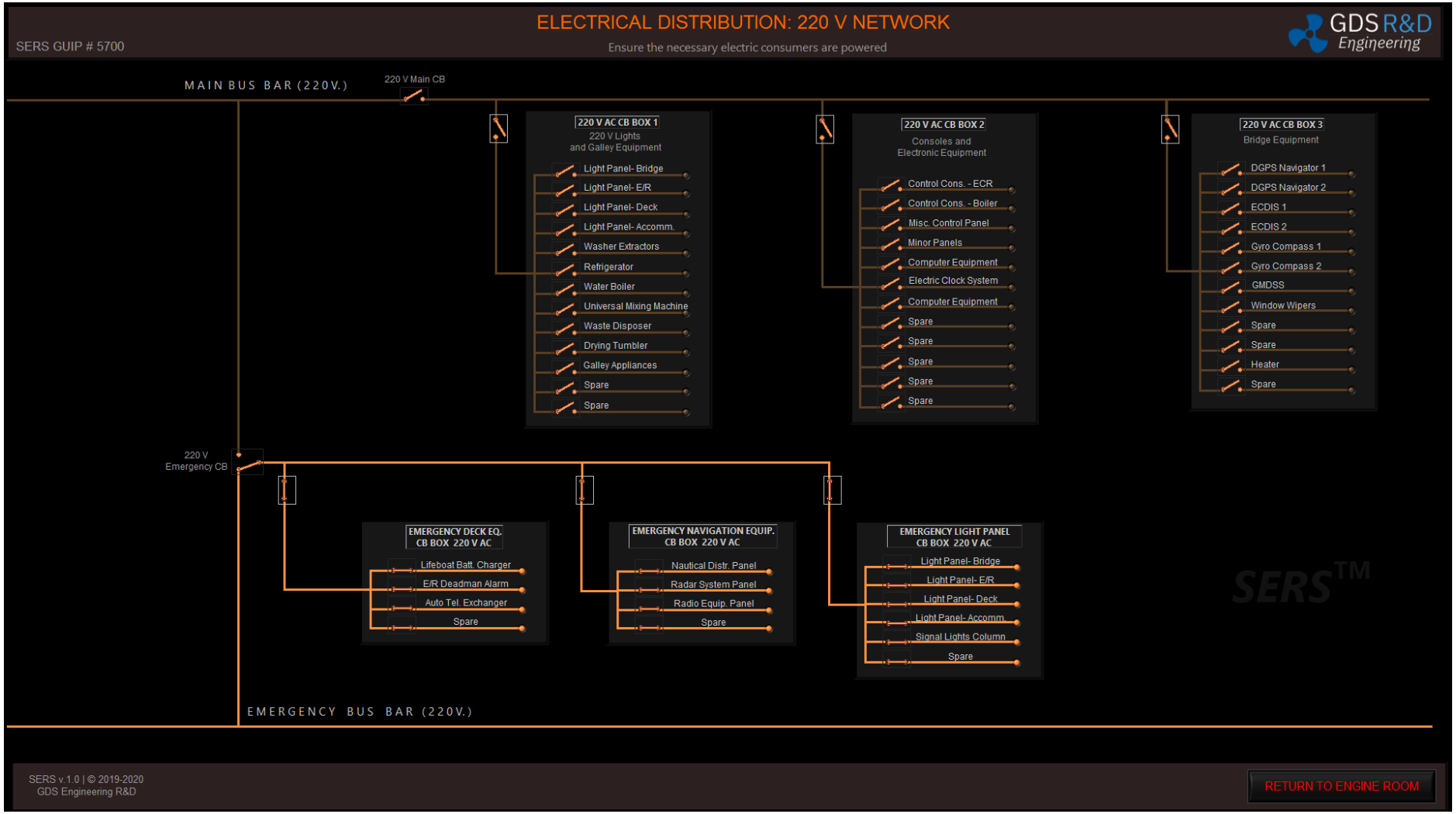
For 220 V Emergency Consumers:



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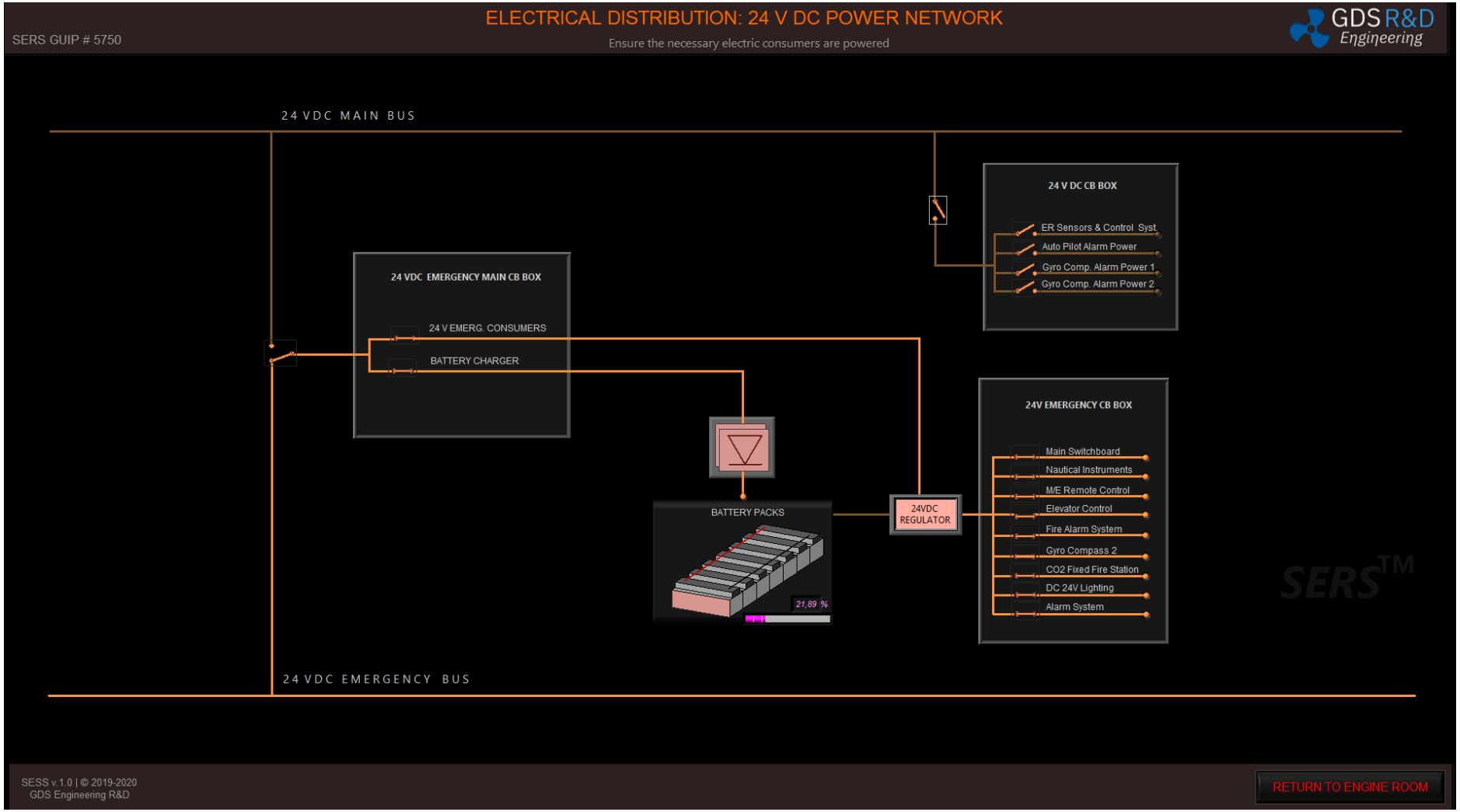
For 24 V DC Emergency Consumers:



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4.2.1 440 V Emergencies

440 V Emergencies Circuit Breakers Panel provides distribution of electrical supply between 440 V Emergency Consumers. The 440 V Emergency Circuit Breaker Panel is essentially a big switch that safely distributes the supply of power to the 440 V Emergency Consumers. The Circuit Breaker Box also includes smaller sub-switches that connect with specific areas of the ship. These small switches are called breakers and their function is to ensure electrical safety.

For distribution of power supply for 440 V Emergency Consumers:

- Open ECR PANELS: CIRCUIT BREAKERS GUI PANEL (GUIP #5500).
- Observe the 440 V Emergency CB Panel has been energized. Power light, indicates whether electrical supply reaches the panel.
- Set 440 V Emergency CB Panel Main Circuit Breaker ON Position.
- Set Auxiliary Air Compressor Circuit Breaker ON Position.
- Set Auxiliary SW Pump Circuit Breaker ON Position.
- Auxiliary LTFW Pump Circuit Breaker ON Position.
- Preheating Pump Circuit Breaker ON Position.
- Set DG 1, DG 2, DG 3, and SG Pumps Circuit Breakers ON Position.
- Set 220 V and 24 V DC Emergency Transformer Circuit Breaker ON Position.
- Set Oily Water Separator (OWS) Circuit Breaker ON Position.
- Set Emergency Fire Pump Circuit Breaker ON Position.
- Set Deck/Bridge Emergencies Circuit Breaker ON Position.

4.2.2 220 V Emergencies

When the 220 V Emergency Transformer CB set ON position, 220 V Emergency Panel will be energized. 220 V Emergency Transformer transforms 440 V to 220 V and provides supplying of 220 V Emergency Consumers.

For distribution of power supply for 220 V Emergency Consumers:

- Observe the 220 V Emergency Panel have been energized.
- Set Deck Circuit Breaker ON Position.
- Set Navigation Equipment Circuit Breaker ON Position.
- Set Emergency Lights Circuit Breaker ON Position.

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4.2.3 24 VDC Emergencies

When the 24 V DC Emergency Transformer CB set ON position, 24 V DC Emergency panel will be energized. 24 V DC Emergency Transformer transforms 440 V to 24 V DC and provides supplying of 24 V DC Emergency Consumers.

For distribution of power supply for 24 V DC Emergency Consumers:

- Observe the 24 V DC Emergency Panel have been energized.
- Set Battery Charger Circuit Breaker ON Position.
- Set Safety Instruments Circuit Breaker ON Position.

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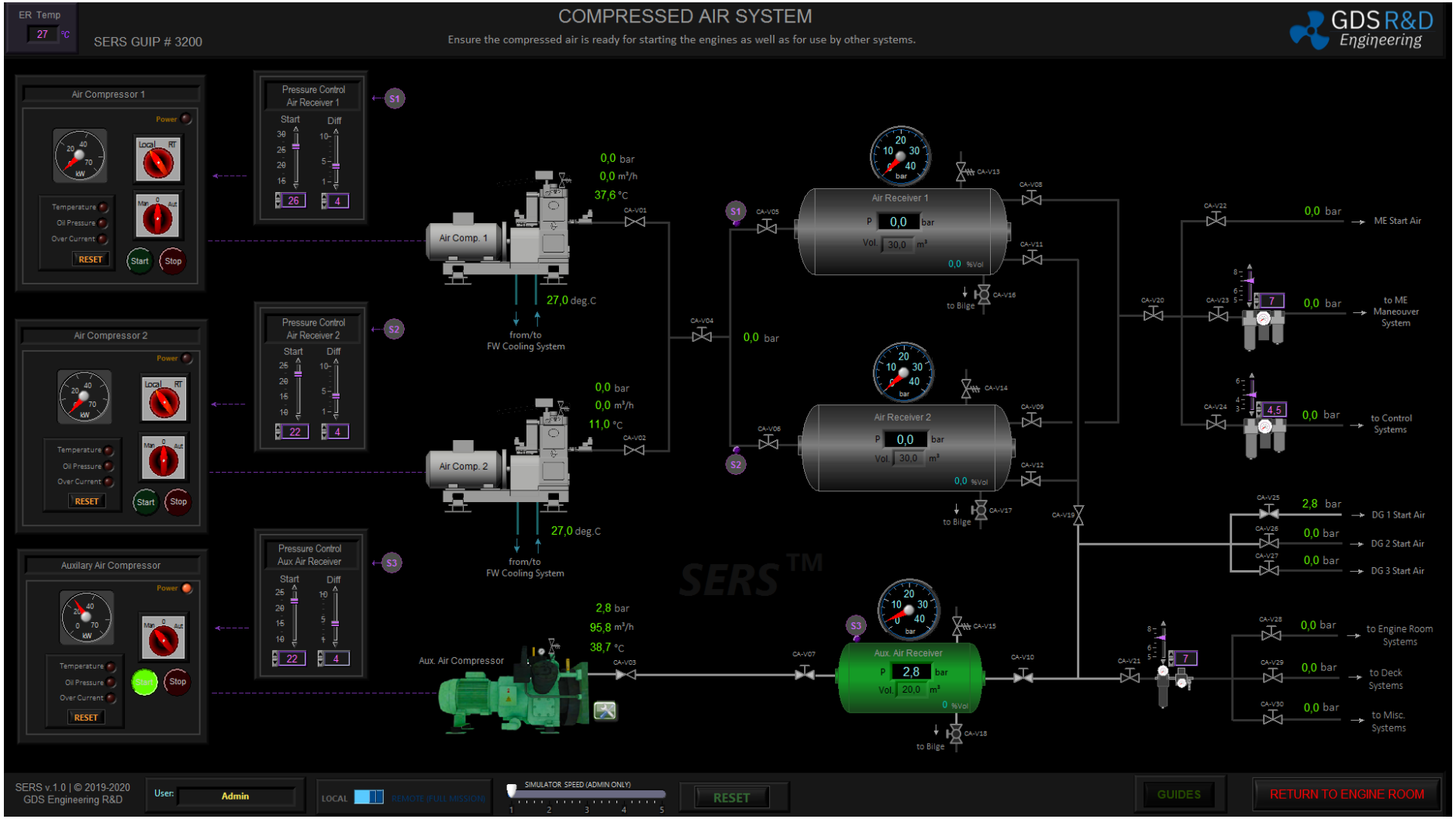
4.3 Compressed Air System with Aux. Air Compressor Started (GUIP #3200)



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4.3.1 Operating Instructions

The air compressors designed in the SERS are two stage and provide 30 bar pressure. The air pressurized by these compressors is storage in the air receivers. Compressed air system includes two main compressors which are supplied from the MAIN 440 V BUS BAR. (GUIP #5600). Compressed air system also includes an auxiliary air compressor which can be supplied from both MAIN 440 V BUS BAR and 440 V EMERGENCY BUS BAR. (GUIP #5650) The compressors fill the air receivers by passing the compressed air through non-return valve. The main compressors are cooled by LTFW System. (GUIP #3100). The auxiliary compressor is air cooled.

For lining-up and operation of the system:

- Open COMPRESSED AIR SYSTEM GUI Panel (GUIP #3200).
- Ensure the Aux. Air Compressor Control Panel energized. (Aux. Air Compressor supplied with both Main 440V and Emergency 440V Bus Bars.)
- If there any alarm on control panel, press RESET button.
- Open the Aux. Air Receiver Inlet Valve (CA-V07).
- Set MANUAL Position and Click START button.
- Observe the pressure of Aux. Air Receiver is rising.
- Drain Aux. Air Receiver if exists any water content (CA-V18).
- Open the Aux. Air Receiver Outlet Valve (CA-V10).
- Open DG 1 (or DG 2, or DG 3) Start Air Inlet Valve (CA-V25, or CA-V26, or CA-V27).

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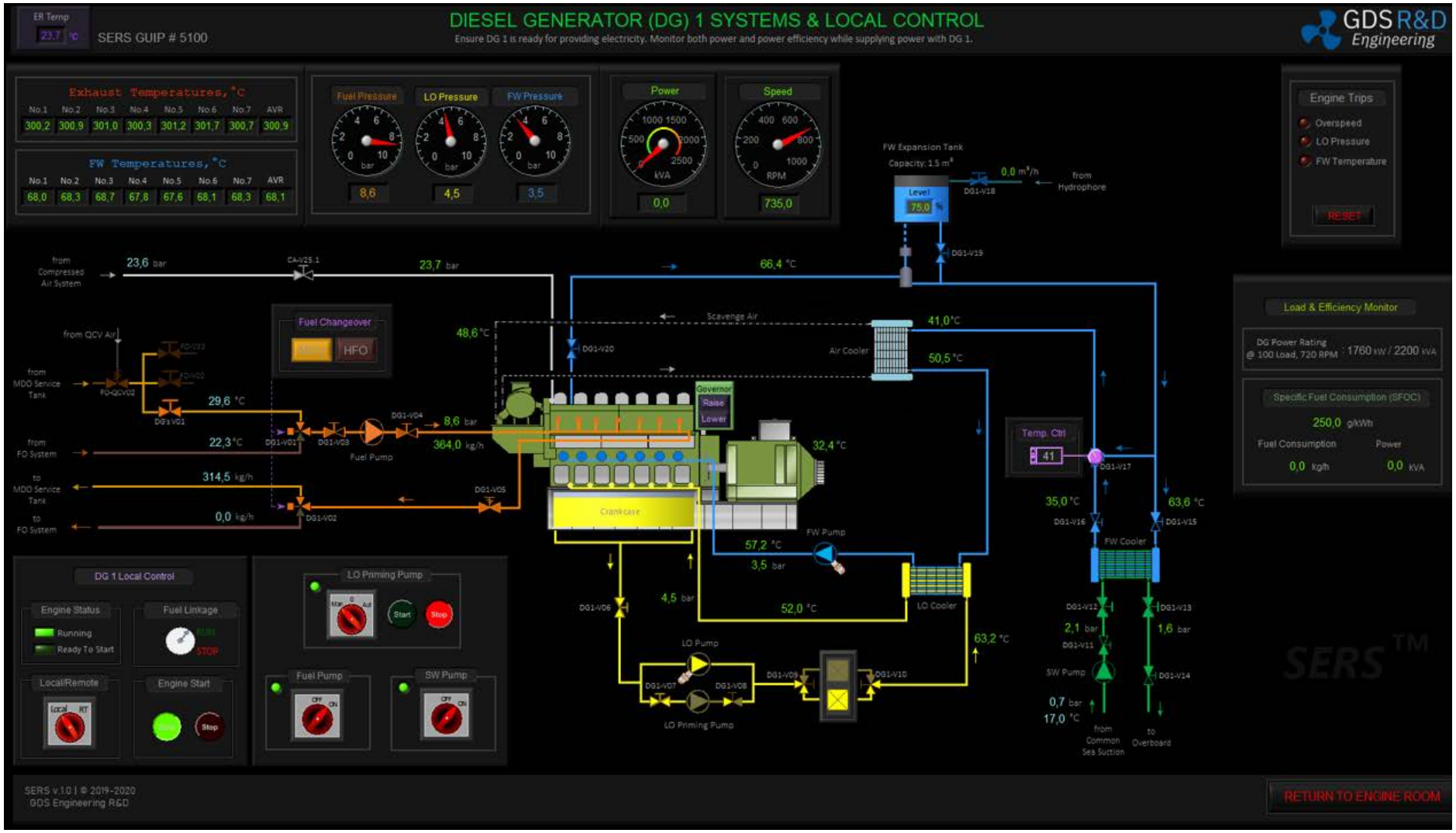
4.4 Starting the Diesel Generator (DG) 1 (or 2, or 3) (GUIP #5100, or GUIP #5200, or GUIP #5300)



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4.4.1 Operating Instructions

Diesel generator is a machine which converts mechanical power into electrical power. Diesel generator is the main energy source on the board. Diesel generator which is simulated at SERS, is three phase AC type. Diesel generator supplies both main and emergency bus bars. For preparing and operating the DG 1 (or DG 2, or DG 3):

4.4.2 Lining Up LO System

- Ensure the LO Priming Pump Control Panel has been energized. (LO Priming Pump supplied with both Main 440 V and Emergency 440 V Bus Bars.)
- Select the lower or up Duplex Filter Inlet and Outlet Valves as necessary (DG1-V08 and DG1-V09, or DG2-V08 and DG2-V09, or DG3-V08 and DG3-V09). (NOTE: Click on three-way valve inlet or outlet allows for making this change.)
- Open LO Priming Pump Suction Valve (DG1-V06, or DG2-V06, or DG3-V06)
- Open LO Priming Pump Discharge Valve (DG1-V07, or DG2-V07, or DG3-V07).
- Set MAN Position and click START button from the LO Priming Pump Control Panel.
- Observe that LO Priming Pump is started and provided the LO flow.
- Observe the LO Inlet Pressure.
- Observe LO Inlet Temperature.

4.4.3 Lining Up SW Cooling System

- Open SEA WATER MAIN COOLING SYSTEM GUI Panel (GUIP #3000).
- Open Inlet and Outlet Valves of Low (or High) Sea Suction Filter (according to draft) (GUIP #3000) (SW-V01 and SW-V02 or SW-V03 and SW-V04).
- Open Overboard Valve (DG1-V13, or DG2-V13, or DG3-V13).
- Open appropriate Diesel Generator GUI Panel (GUIP #5100, #5200, or #5300).
- Observe SW Pump suction line is supplied via Common Sea Suction Line.
- Open Sea Water Pump Discharge Valve (DG1-V10, or DG2-V10, or DG3-V10).
- Open Fresh Water Cooler Sea Water Inlet and Outlet Valves (DG1-V11 and DG1-V12, or DG2-V11 and DG2-V12, or DG3-V11 and DG3-V12).
- Open Fresh Water Cooler Fresh Water Inlet and Outlet Valves (DG1-V14 and DG1-V15, or DG2-V14 and DG2-V15, or DG3-V14 and DG3-V15).
- Ensure the SW Pump Control Panel has been energized. (SW Pump supplied with both Main 440 V and Emergency 440 V Bus Bars.)
- Set ON position SW Pump from Control Panel.
- Observe that SW Pump is started and provided the seawater flow.
- Observe the Sea Water Pressure of Fresh Water Cooler Inlet and Outlet.

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4.4.4 Lining Up FW Cooling System

- SERS simulator assumes there is always FW in the expansion tanks.
- FW Pump is coupled with the DG shaft; therefore, no power is required to energize the DG FW cooling pumps.

4.4.5 Lining Up Starting Air System

- Observe the sufficient air pressure. (min. 7 bars) (If compressed air pressure less than 7 bars, engine will not be started.)
- Open DG 1 (or DG 2, or DG 3) Starting Air Inlet Valve (CA-V25.1, or CA-V26.1, or CA-V27.1).

4.4.6 Lining Up Fuel System

- Open MDO Service Tank Outlet Valve (FO-QCV02).
- Open Diesel Generators Isolation Valve (DG's-V01).
- Open Fuel Pump Suction and Discharge Valves (DG1-V03 and DG1-V04, or DG2-V03 and DG2-V04, or DG3-V03 and DG3-V04).
- Ensure the Fuel Pump Control Panel has been energized. (Fuel Pump supplied with both Main 440 V and Emergency 440 V Bus Bars.)
- Ensure the MDO comes through Diesel Generator Fuel System (DG1-V01 and DG1-V02, or DG2-V01 and DG2-V02, or DG3-V01 and DG3-V02).
- Click MDO Button from Fuel Changeover Panel.
- Set ON position Fuel Pump from Control Panel.
- Observe that Fuel Pump is started and provided the fuel flow.
- Observe the Fuel Inlet Pressure and Flow Rate.

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4.4.7 Operation and Observation

- Set RUN Fuel Linkage Position from Diesel Generator Local Control Panel.
- Ensure Engine Status changed into READY TO START. If the Ready to Start lamp does not light, review previous steps.
- Click Engine Trips Reset Button.
- Set Switch at LOCAL position for starting in local mode.
- Click START Button.
- Observe RUNNING Status Bar is ON, from Engine Status Panel.
- Observe Exhaust Gas Temperature.
- Observe DG rpm is reached at 735 rpm.
- Observe Cooling Water Pressure and Temperature.
- Observe Freshwater Gear Drive Pump is started automatically.
- Observe LO Priming Pump is stopped and LO Gear Drive Pump is started automatically.
- Set LO Priming Pump switch to AUTO Position.
- Observe Freshwater Inlet and Outlet temperature at FW Main Cooler.
- Observe Freshwater inlet and outlet temperature at Air Cooler.
- Observe Lubricating Oil inlet and outlet temperature at LO Cooler.

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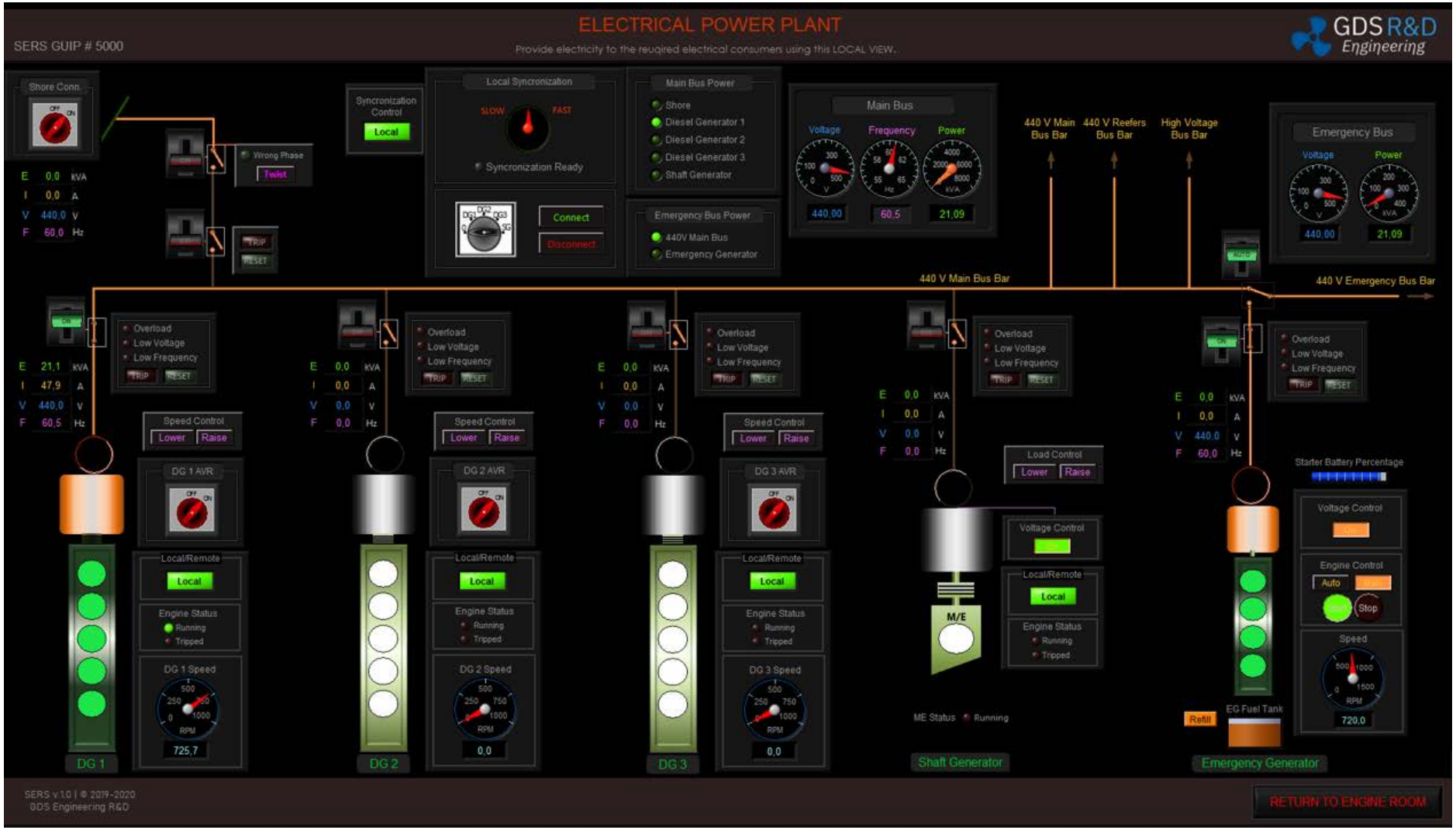
4.5 Connecting DG 1 to the Main Bus Bar (GUIP #5000)



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4.5.1 Operating Instructions

It must be connected to the 440 V Main and Emergency Bus Bars after the operating the Diesel Generator for supplying of the electrical consumers.

- Observe the Diesel Generator is running.
- Observe the rpm of Diesel Generator is 735.
- Observe the Diesel Generator Voltage is 440 V.
- Observe the Diesel Generator Frequency is 61,2 Hz.
- Observe the Diesel Generator at LOCAL Mode.
- Set Breaker ON and supply 440 V Main and Emergency Bus Bars.
- Observe 440 V MAIN BUS BAR and 440 V EMERGENCY BUS BARS are supplied with Diesel Generator from Bus Power Indicator Panel. If Diesel Generator supplies 440 V Main Bus Bar, lights of Diesel Generator will turn green at Main Bus Bar Indicator Panel.
- Observe the load on the Emergency Generator is transferred to the Diesel Generator.
- Observe the current on the Emergency Generator is transferred to the Diesel Generator.
- Set the Emergency Generator AUTO mode from the Engine Control Panel. In this way, Emergency Generator will be started automatically in case of Blackout Situation.
- Observe that the Emergency Generator stops automatically after a while.

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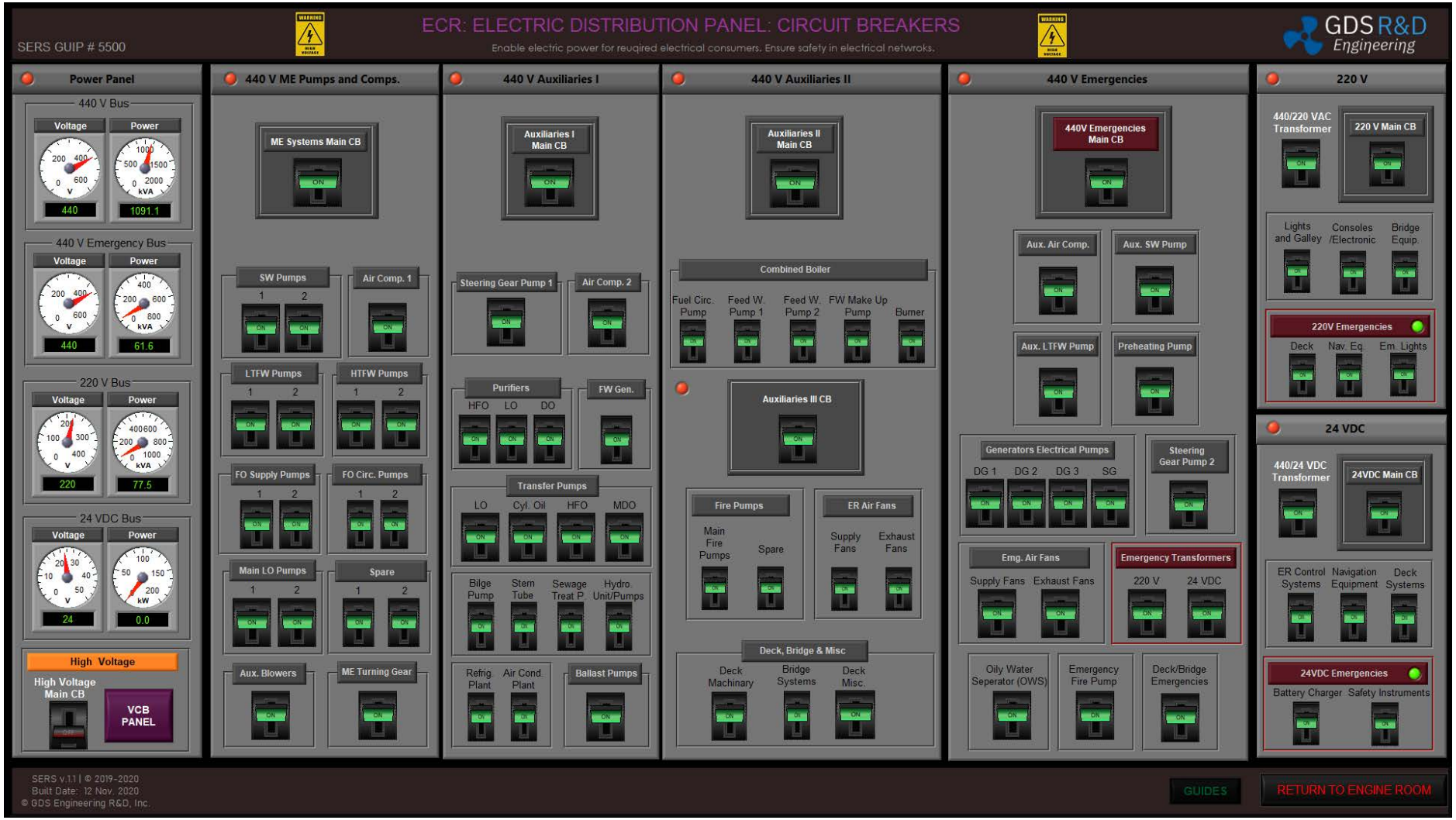
4.6 Main Circuit Breakers (GUIP #5500)



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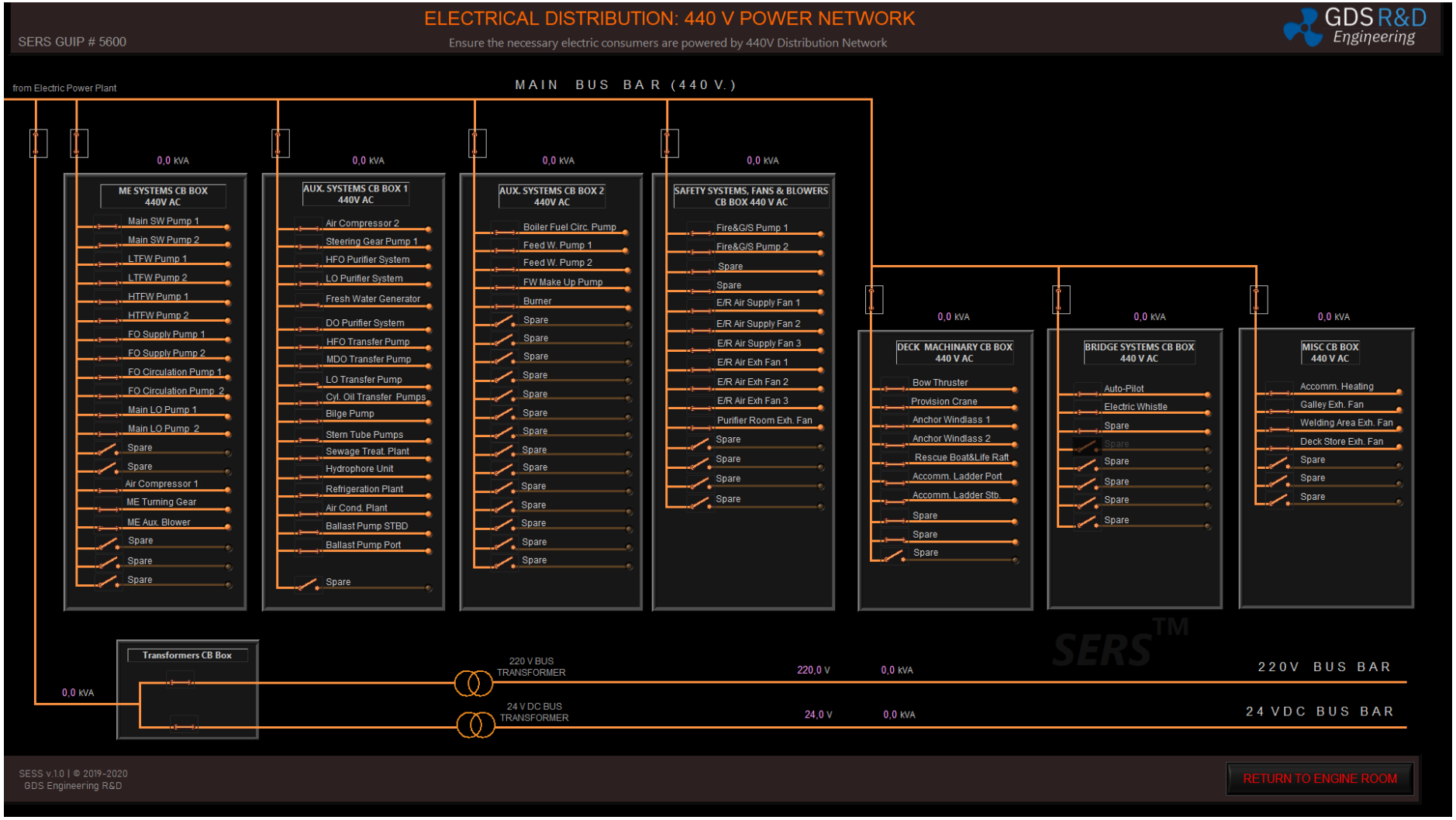
Ensure that the electrical power is supplied to the pertaining all electrical consumers and equipment. For 440 V Main Consumers:



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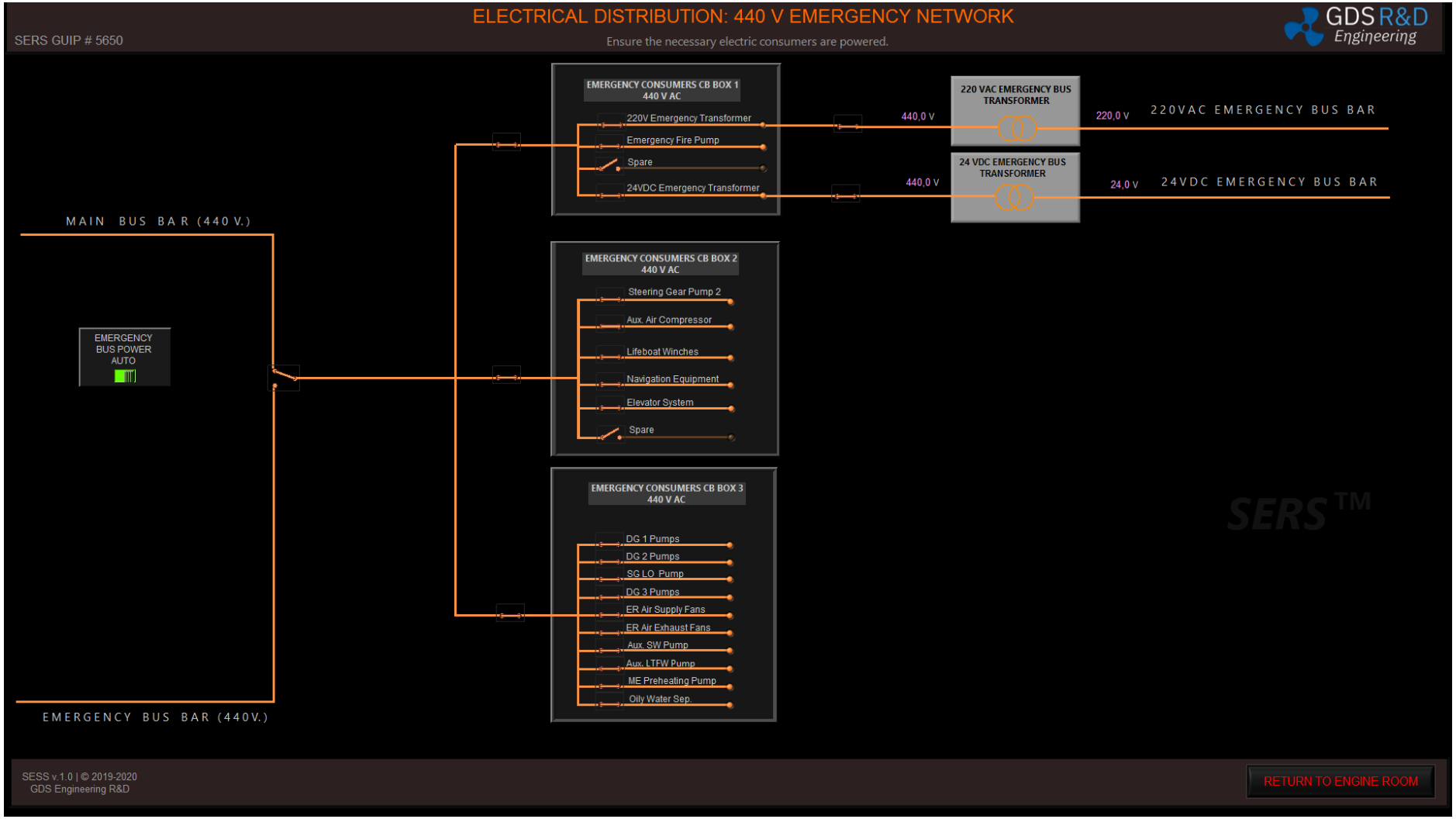
For 440 V Emergency Consumers:



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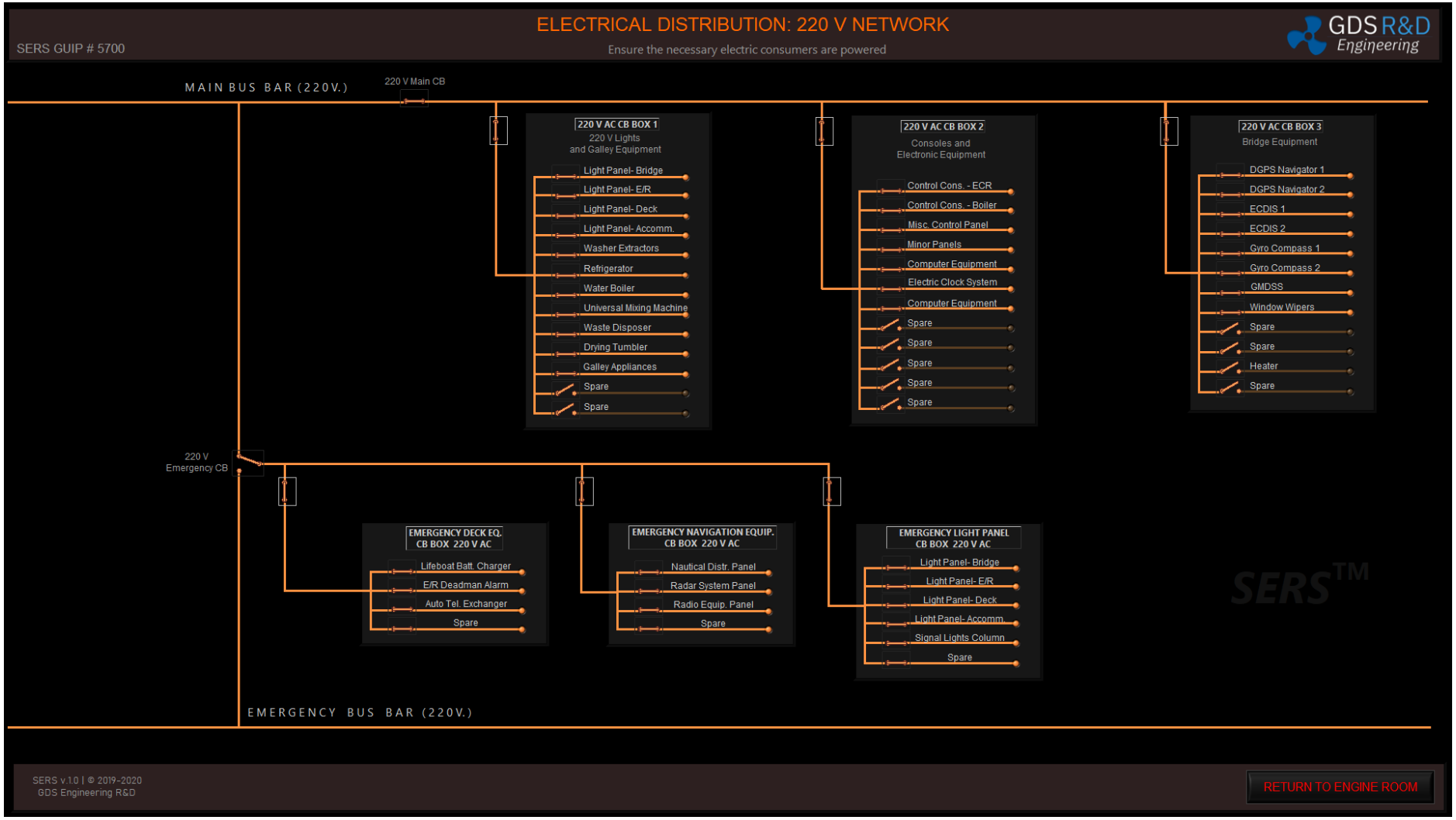
For 220 V Main and Emergency Consumers:



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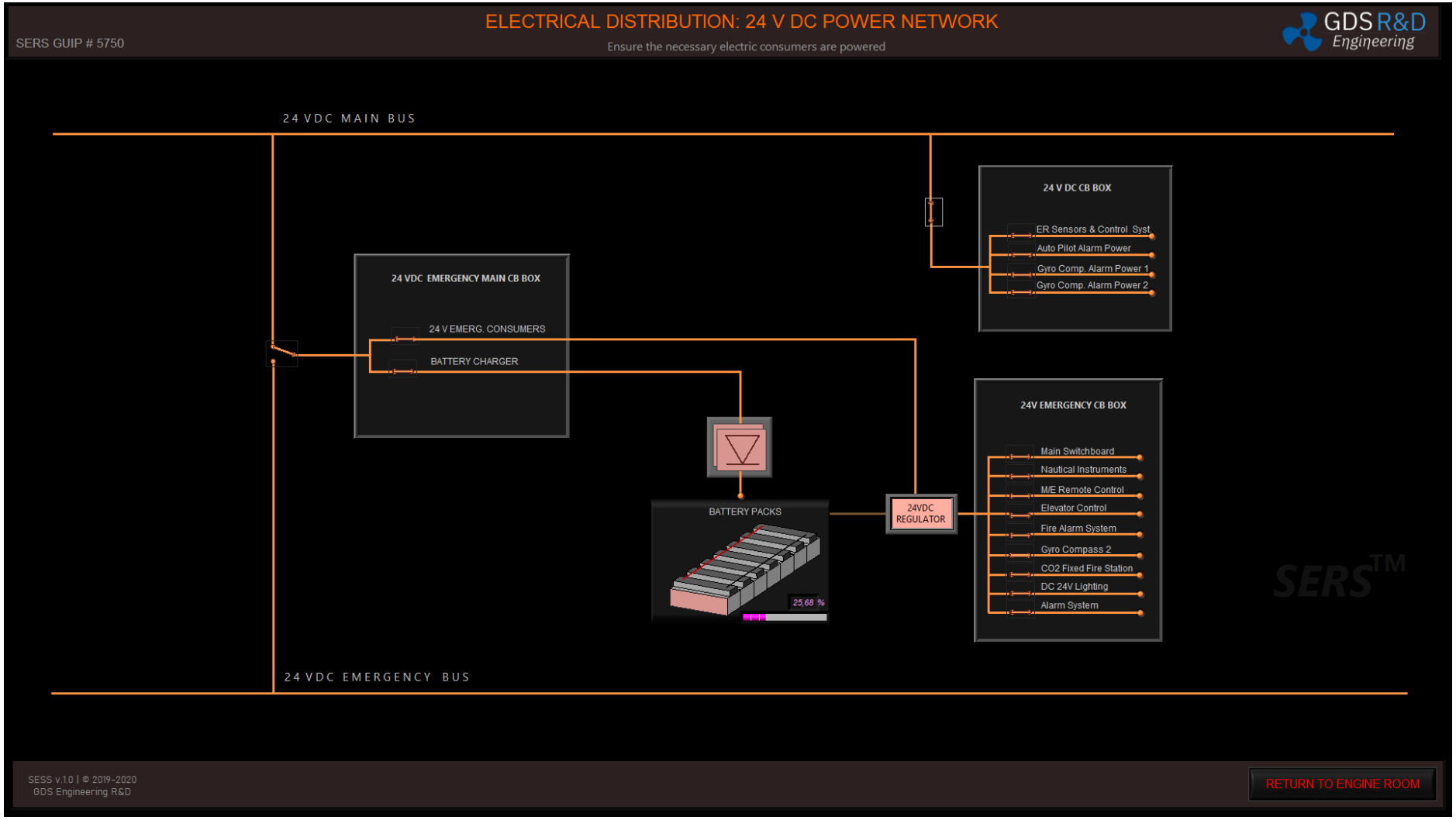
For 24 V DC Main and Emergency Consumers:



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4.6.1 Lining Up Main 440 V Circuit Breakers

Setting ON position of the all Circuit Breakers does not mean that the electrical consumers will draw electricity, only supplies to the control panels of the electrical consumers. So all Circuit Breakers can be opened. Only the electrical consumers tabled below will start drawing electricity when their CB's open:

Electrical Consumers Name	Bus	Continuous Power	Electrical Consumers Name	Bus	Continuous Power
Deck Machinery	440 V	30.7 kVA	Bridge Equipment	220 V	3.2 kVA
Bridge System	440 V	6.2 kVA	Emg. Deck Equipment	Emg. 220 V	4.3 kVA
Deck Miscellaneous	440 V	6.5 kVA	Emg. Navigation Equipment	Emg. 220 V	0.3 kVA
220 V Transformer	440 V	%1 Power Loss	Emg. Lights	Emg. 220 V	3.4 kVA
24 V DC Transformer	440 V	%1 Power Loss	Engine Room Control System	24 V DC	0.2 kVA
220 V Emg. Transformer	Emg. 440 V	%1 Power Loss	Navigation Equipment	24 V DC	0.3 kVA
24 V DC Emg. Transformer	Emg. 440 V	%1 Power Loss	Battery Charger	Emg. 24 V DC	0.1 kVA
Lights and Galley	220V	71.4 kVA	Safety Instruments	Emg. 24 V DC	0.1 kVA
Consoles and Electronic	220 V	3.1 kVA			

440 V Circuit Breakers Panels provide distribution of electrical supply between 440 V Consumers. The 440 V Circuit Breaker Panels are essentially a big switch that safely distributes the supply of power to the 440 V Consumers. The Circuit Breaker Box also includes smaller sub-switches that connect with specific areas of the ship. These small switches are called breakers and their function is to ensure electrical safety.

For distribution of power supply for 440 V Consumers:

- Observe the 440 V CB Panels have been energized. Power light, indicates whether electrical supply reaches the panel.
- Set 440V ME Pumps and Compressors Panel Main Circuit Breaker ON Position.
    - Set SW Pumps Circuit Breaker ON Position.
    - Set Air Compressor 1 Circuit Breaker ON Position.
    - Set LTFW Pumps Circuit Breakers ON Position.
    - Set HTFW Pumps Circuit Breakers ON Position.

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  - Set FO Supply Pumps Circuit Breakers ON Position.
  - Set FO Circulation Pumps Circuit Breakers On Position.
  - Set Main LO Pumps Circuit Breaker ON Position.
  - Set ME Turning Gear Circuit Breaker ON Position.
  - Set Aux. Blowers Circuit Breaker ON Position.
- Set 440V Auxiliaries I Panel Main Circuit Breaker ON Position.
  - Set Steering Gear Pump 1 Circuit Breaker ON Position.
  - Set Air Compressor 2 Circuit Breaker ON Position.
  - Set HFO, LO and MDO Separator Circuit Breakers ON Position.
  - Set Fresh Water Generator (FWG) Circuit Breakers ON Position.
  - Set Transfer Pumps Circuit Breakers ON Position.
  - Set Bilge Pump Circuit Breaker ON Position.
  - Set Stern Tube Pumps Circuit Breaker ON Position.
  - Set Sewage Treatment Plant Circuit Breaker ON Position.
  - Set Hydrophore Unit and Pumps Circuit Breaker ON Position.
  - Set Refrigeration Plant Circuit Breaker ON Position.
  - Set Air Conditioning Plant Circuit Breaker ON Position.
  - Set Ballast Pumps Circuit Breaker ON Position.
- Set 440V Auxiliaries II Panel Main Circuit Breaker ON Position.
  - Set Fuel Circulation Pump Circuit Breaker ON Position.
  - Set Feed Water 1, 2, and Make-Up Circuit Breakers ON Position.
  - Set Burner Circuit Breaker ON Position.
- Set 440V Auxiliary III Panel Main Circuit Breaker ON Position.
  - Set Main Fire Pumps Circuit Breaker ON Position.
  - Set Supply and Exhaust Fans Circuit Breakers ON Position.
  - Set Deck Machinery Circuit Breaker ON Position.
  - Set Bridge System Circuit Breaker ON Position.
  - Set Deck Miscellaneous Circuit Breaker ON Position.
- Set 440/220V Transformer Circuit Breaker ON Position.
- Set 440/24VDC Transformer Circuit Breaker ON Position.

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4.6.2 Lining Up Main 220 V Circuit Breaker

When the 220 V Transformer CB set ON position, 220 V Panel will be energized. 220 V Transformer transforms 440 V to 220 V and provides supplying of 220 V Consumers.

For distribution of power supply for 220 V Consumers:

- Observe the 220 V Panel have been energized.
- Set 220 V Main Circuit Breaker ON Position.
    - Set Lights and Galley Circuit Breaker ON Position.
    - Set Consoles/Electronics Circuit Breaker ON Position.
    - Set Bridge Equipment Circuit Breaker ON Position.

4.6.3 Lining Up Main 24 V DC Circuit Breaker

When the 24 V DC Transformer CB set ON position, 24 V DC panel will be energized. 24 V DC Transformer transforms 440 V to 24 V DC and provides supplying of 24 V DC Consumers.

For distribution of power supply for 24 V DC Consumers:

- Observe the 24 V DC Panel have been energized.
- Set 24 V DC Main Circuit Breaker ON Position.
    - Set Engine Room Systems Circuit Breaker ON Position.
    - Set Navigation Equipment Circuit Breaker ON Position.

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4.7 Starting DG 2 (and DG 3) (GUIP#5200 or #5300)

Because this ship is a Container Type ship, all 3 generators must be started to meet all power requirements for both ER machinery as well as Deck power consumers including the reefers. Two DGs meet all power required by all power consumers; however, one additional DG must be started and connected to the 440 V Bus Line during maneuvering for lowering the outcomes of a risk of one DG is becoming out of line. For practicality purpose, connecting the two other DGs may be started to observe the performance and then stopped to start again as a final step before maneuvering for unnecessary use of electrical energy.

The Diesel Generator (2 and 3) will be started and stand-by for synchronization. Follow the same instructions for lining up both DGs to make both ready to connect to the 440V Main Bus Line.

4.7.1 Lining Up LO System

- Ensure the LO Priming Pump Control Panel has been energized.
- Select the lower or up Duplex Filter Inlet and Outlet Valves as necessary (DG2-V08 and DG2-V09 or DG3-V08 and DG3-V09). (NOTE: Click on three-way valve inlet or outlet allows for making this change.)
- Open LO Priming Pump Suction Valve (DG2-V06 or DG3-V06)
- Open LO Priming Pump Discharge Valve (DG2-V07 or DG3-V07).
- Set MAN Position and click START button from the LO Priming Pump Control Panel.
- Observe that LO Priming Pump is started and provided the LO flow.
- Observe the LO Inlet Pressure.
- Observe LO Inlet Temperature.

4.7.2 Lining Up SW System

- Open Sea Water Pump Discharge Valve (DG2-V13 or DG3-V13).
- Open Fresh Water Cooler Sea Water Inlet and Outlet Valves (DG2-V11 and DG2-V12 or DG3-V11 and DG3-V12).
- Open Fresh Water Cooler Fresh Water Inlet and Outlet Valves (DG2-V14 and DG2-V15 or DG3-V14 and DG3-V15).
- Ensure the SW Pump Control Panel has been energized.
- Set ON position SW Pump from Control Panel.

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- Observe that SW Pump is started and provided the seawater flow.
- Observe the Sea Water Pressure of Fresh Water Cooler Inlet and Outlet.

4.7.3 Lining Up Starting Air System

- Open DG 2 Starting Air Valve (or DG 3 Starting Air Valve) (CA-V26 or CA-V27) from Compressed Air System GUI Panel. (GUIP #3200)
- Observe the sufficient air pressure. (min. 7 bars) (If compressed air pressure less than 7 bars, engine will not be started.)
- Open DG 2 (or DG 3) Starting Air Inlet Valve (CA-V26.1 or CA-V27.1).

4.7.4 Lining Up Fuel System

- Open Fuel Pump Suction and Discharge Valves (DG2-V03 and DG2-V04 or DG3-V03 and DG3-V04).
- Ensure the Fuel Pump Control Panel has been energized.
- Ensure the MDO comes through Diesel Generator Fuel System (DG2-V01 and DG2-V02 or DG3-V01 and DG3-V02).
- Click MDO Button from Fuel Changeover Panel.
- Set ON position Fuel Pump from Control Panel.
- Observe that Fuel Pump is started and provided the fuel flow.
- Observe the Fuel Inlet Pressure and Flow Rate.

4.7.5 Operation and Observation

- Set RUN Fuel Linkage Position from Diesel Generator Local Control Panel.
- Ensure Engine Status changed into READY TO START. If the Ready to Start lamp does not light, review previous steps.
- Click Engine Trips RESET Button.
- Set Switch at LOCAL position for starting in local mode.
- Click START Button.
- Observe RUNNING Status Bar is ON, from Engine Status Panel.
- Observe Exhaust Gas Temperature.
- Observe DG rpm is reached at 735 rpm.
- Observe Cooling Water Pressure and Temperature.
- Observe Freshwater Gear Drive Pump is started automatically.

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- Observe LO Priming Pump is stopped and LO Gear Drive Pump is started automatically.
- Observe Freshwater Inlet and Outlet temperature at FW Main Cooler.
- Observe Freshwater inlet and outlet temperature at Air Cooler.
- Observe Lubricating Oil inlet and outlet temperature at LO Cooler.

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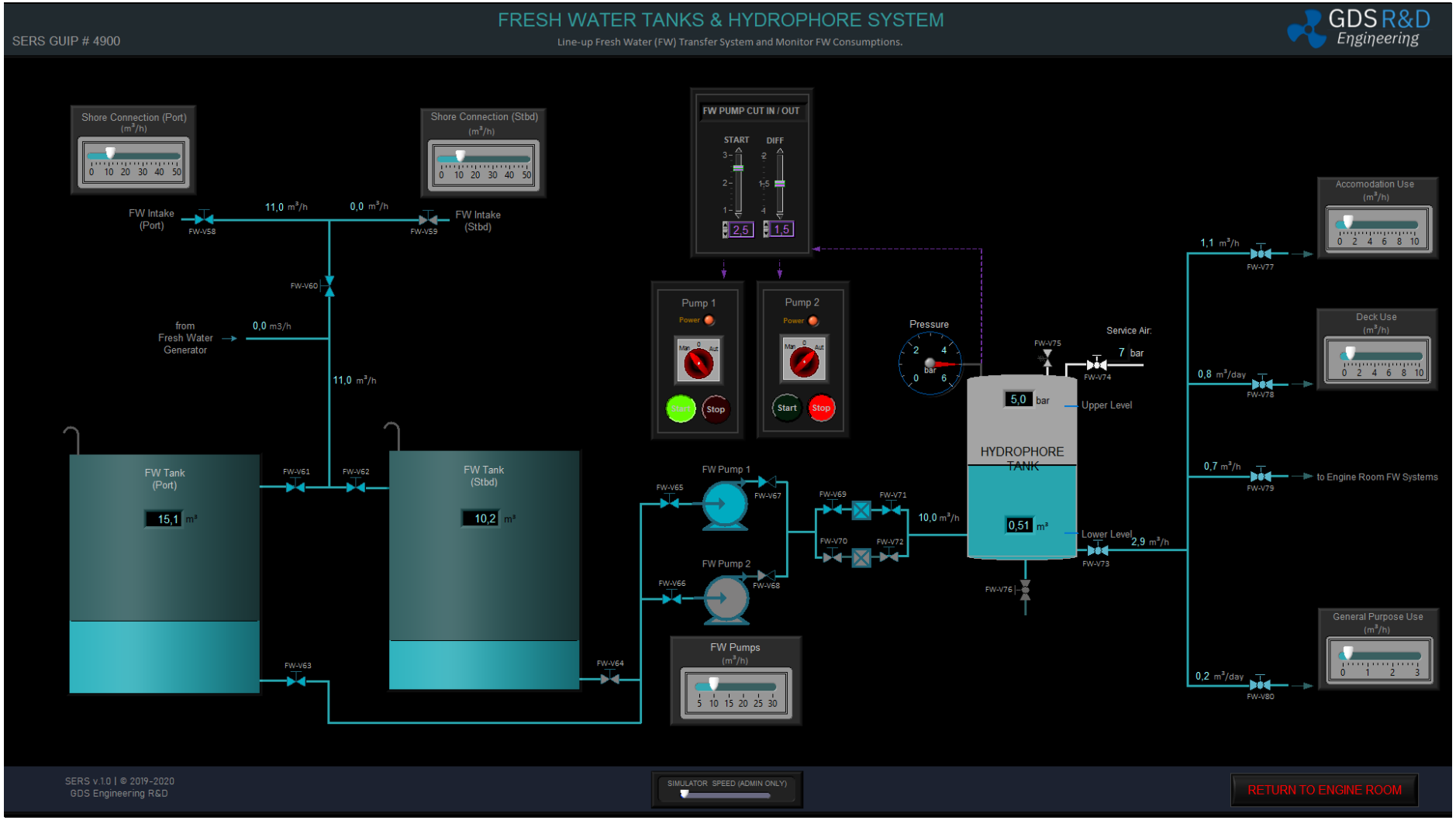
4.8 Fresh Water (FW) Tanks & Hydrophore System (GUIP #4900)



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4.8.1 Operating Instructions

Fresh water pumps suck the fresh water from the fresh water tanks and pump it to the Hydrophore Tank. Approximately, two thirds of the hydrophore tank is filled with water and one third is filled with compressed air. If the fresh water pumps are in auto mode, the pumps automatically start or stop between the values set with the cut in/out device. When water used by consumers, the compressed air on the upper side of the hydrophore tank expands, allowing the water to be used at the desired location. As the pressure in the hydrophore tank decreases as the air expands and the water decreases, the pumps automatically start. The increasing amount of water in the Hydrophore Tank compresses the air thus air pressure is increased.

- Open FRESH WATER TANKS & HYDROPHORE SYSTEM GUI Panel.
- Ensure the FW Pumps Control Panel has been energized. (GUIP #5500).
- The Fresh Water (FW) Tanks will need to be filled with shore connections, as Fresh Water Tanks will be almost empty in the Cold Ship Initial Condition. For filling Fresh Water Tanks via shore connections:
    - Open Port or Starboard Shore Connection FW Intake Valve (FW-V58 or FW-V59)
    - Open Fresh Water Tanks Main Inlet Valve (FW-V60).
    - Open Port or Starboard Fresh Water Tank Inlet Valve (FW-V61 or FW-V62).
- Open Starboard or Port FW Tank Outlet Valve (FW-V63 or FW-V64).
- Open FW Pump 1 or FW Pump 2 Suction Valve (FW-V65 or FW-V66).
- Open FW Filter 1 or FW Filter 2 Inlet and Outlet Valves (FW-V69 and FW-V71 or FW-V70 and FW-V72).
- Set MAN and Click START Button for starting of corresponding FW Pump from Control Panel.
- Observe the Hydrophore Tank Inlet Flow.
- Click STOP Button after upper level of the Hydrophore Tank is filled up.
- Open Service Air Inlet Valve (FW-V74).
- Set corresponding FW Pump AUTO mode.
- Observe the pressure of the tank is rising.
- Observe the Pressure Switch (FW Pump Cut In/Out Device) value, change set value if necessary.
- When the Hydrophore Tank pressure reached at the set value, close Service Air Inlet Valve.
- Open Hydrophore Tank Outlet Valve (FW-V73).
- Open Engine Room (ER) Systems FW Inlet Valve (FW-V79) for filling up Combined Boiler. (GUIP #3300)
- Open Accommodation Use, Deck Use, and General Purpose Use FW Inlet Valves (FW-V77, FW-V78, and FW-V80).

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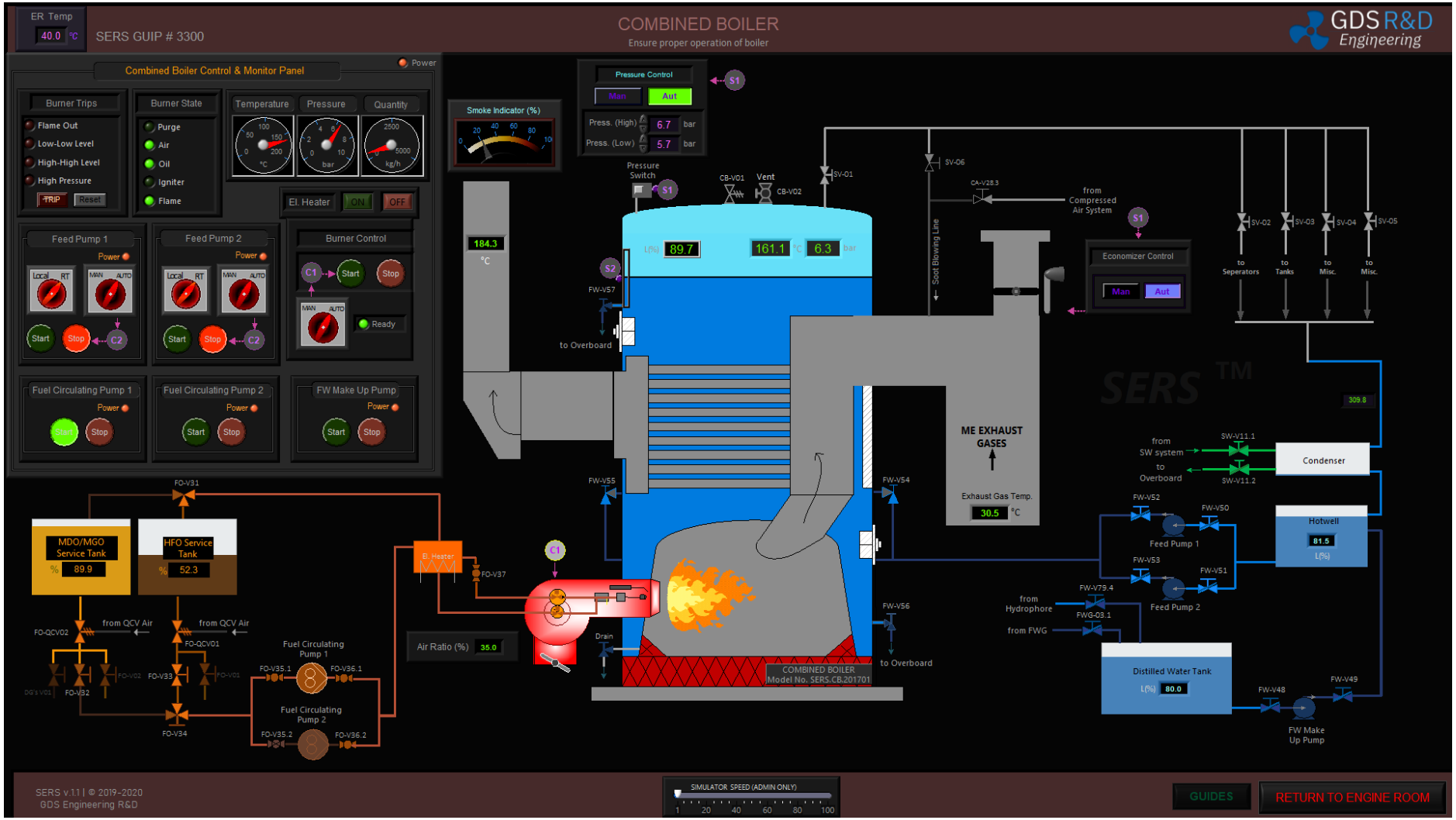
4.9 Combined Boiler (GUIP #3300)



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4.9.1 Operating Instructions

The hot gasses formed as a result of the combustion of the fuel pass through the pipes and makes steam with the water outside of the pipes. The steam requirement of the ship is met by the combined boiler. Distilled Water Tank can be filled up both Hydrophore and Fresh Water Generator. Combined Boiler also includes economizer and soot blowing. If exhaust gas temperature is above 285 °C, economizer can be produced the steam. Soot blowing supplied with compressed air and steam.

- Ensure the sufficient fuel at MDO Service Tank. If not, operate MDO Separator. (GUIP #6200) (See Sec. 4.15)
- Ensure Combined Boiler Control and Monitor Panel and component has been energized. If not, check circuit breaker of the Combined Boiler and component at ON position. (GUIP #5500)
    - Fuel Circulating Pump
    - Feed Water Pump 1 and 2
    - FW Make up Pump
- Click RESET Button if any trips on the Burner Trips Panel.
- Ensure the Distilled Water Tank level is sufficient. If not, fill it from Hydrophore System (GUIP #4900). For filling, open Distilled Water Tank FW fill up valve (FW-79.4).
- Ensure the Hotwell level is sufficient. If not fill it from Distilled Water Tank. For filling:
    - Open Suction and Discharge Valves of the Freshwater Make-up Pump (FW-V48 and FW-V49).
    - Click START Button from Control Panel.
    - After the filling, click STOP Button.
- For Starting Feed Water Pump 1 or 2:
    - Open suction and discharge valves of the Feed Water Pump 1 or 2 (FW-V50 and FW-V52 or FW-V51 and FW-V53).
    - Open Combined Boiler Feed Valve 1 or 2 (FW-V54 or FW-V55).
    - Set AUTO from Main Feed Water Pump 1 or Main Feed Water Pump 2 Control Panel. (Manual Mode can be used in rough sea.)
- Open Air Vent Valve (CB-V02).
- For Lining-up MDO Line to Boiler:
    - Open MDO Service Tank Boiler Valve. (FO-V32)
    - Set the Mixing Valve for MDO (FO-V34).
    - Recirculation Valve (FO-V31) position will be changed automatically according to the Mixing Valve (FO-V34).
    - Open the suction and discharge valve of the Fuel Circulating Pump 1 or 2 (FO-V35.1 and FO-V36.1 or FO-V35.2 and FO-V36.2).
    - Open Burner Fuel Inlet Valve (FO-V37).
    - Click ON button from the control panel for starting Electrical Heater.

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  - Click START Button from the Fuel Circulating Pump 1 or 2 Control Panel.
- Observe the water level is sufficient for operation of the Combined Boiler.
- Set Burner Control to MAN Mode and click START button.
- Observe the Burner has been ignited. (Approximately 30 sec. later)
- Operate boiler step by step and heat up gradually.
- When the user sees the steam coming from the air vent valve (CB-V02), close the air vent valve. After the closing of the air vent valve, observe the steam pressure is rising.
- After the steam pressure reaches at 1 bar, set AUTO Position from the Burner Control Panel.
- Set High Pressure and Low Pressure Set Value from the Pressure Control Panel.
- When steam arrived sufficient pressure, open Main Stop Valve (SV-01).
- Open consumers steam inlet valves such as:
  - Separators (SV-02)
  - Tanks (SV-03)
  - Miscellaneous (SV-04 and SV-05)
- Open Condenser Sea Water Inlet and Outlet Valves (SW-V11.1 and SW-V11.2).

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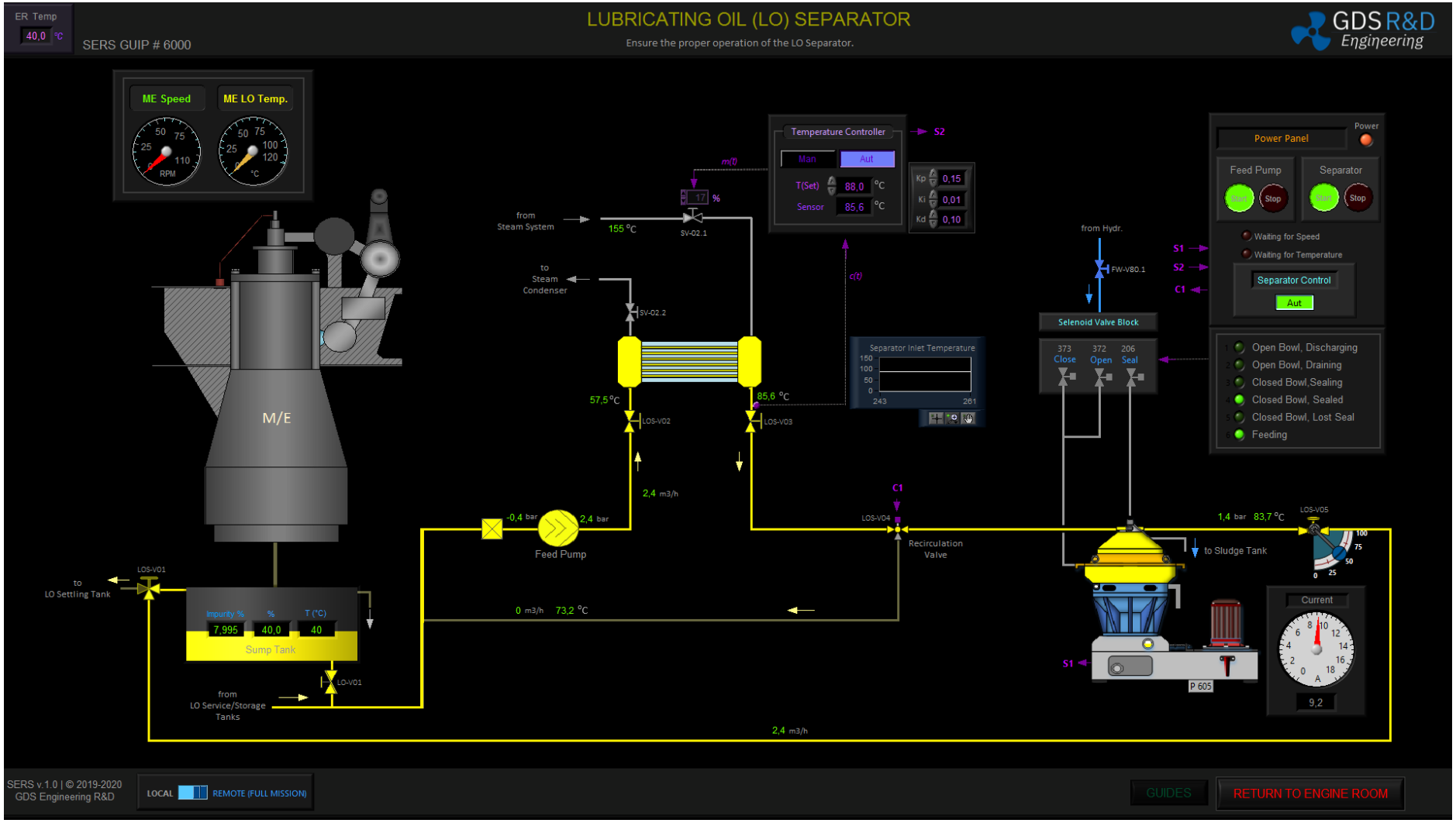
4.10 LO Separator (GUIP #6000)



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Prepare the LO Separator System for operation and start the LO Separator.

4.10.1 Operating Instructions

- Ensure the LO Separator Control Panel has been energized.
- Ensure the steam pressure and temperature are sufficient.
- Ensure that sufficient LO at Sump Tank. If not, fill up from LO Transfer System. For filling Sump Tank:
    - Open LO Tanks & LO Transfer System GUI Panel. (GUIP #6100)
    - Open Main LO Settling Tank Outlet Valve (LOT-V10) or Main LO Storage Tank Outlet and Main LO Tanks Interconnection Valve (LOT-V09 and LOT-V11).
    - Observe the LO Sump Tank Level is increasing. Close the valves when the amount of LO in the Sump Tank has reached a sufficient level.
- Set Sump Tank Separator Inlet Valve Position to Sump Tank (LOS-V01).
- Open LO Heater LO Inlet and Outlet Valve (LOS-V02 and LOS-V03).
- Set LO Temperature from Temperature Controller Panel.
- Click AUTO button.
- Click START button from Feed Pump Control Panel.
- Observe the LO Flow Rate.
- Open LO Heater Steam Inlet and Outlet Valves (SV-02.1 and SV-02.2).
- Observe the steam flow rate.
- Observe the temperature of LO is been rising.
- Ensure LO Separator supplied with Hydrophore Tank. (GUIP #4900)
- Open Operating FW Inlet Valve (FW-V80.1).
- Click START button from the Separator Control Panel.
- The Separator will wait for LO temperature and the separator rpm to reach the appropriate values.
- Meanwhile, LO will recirculate through recirculation line.
- Set Backpressure Valve position (LOS-V05).
- After the values reached appropriate, recirculation valve (LOS-V04) position will be changed automatically and LO flow through the separator.
- Observe LO Separator Process.
- Observe the LO Separator outlet pressure and temperature.

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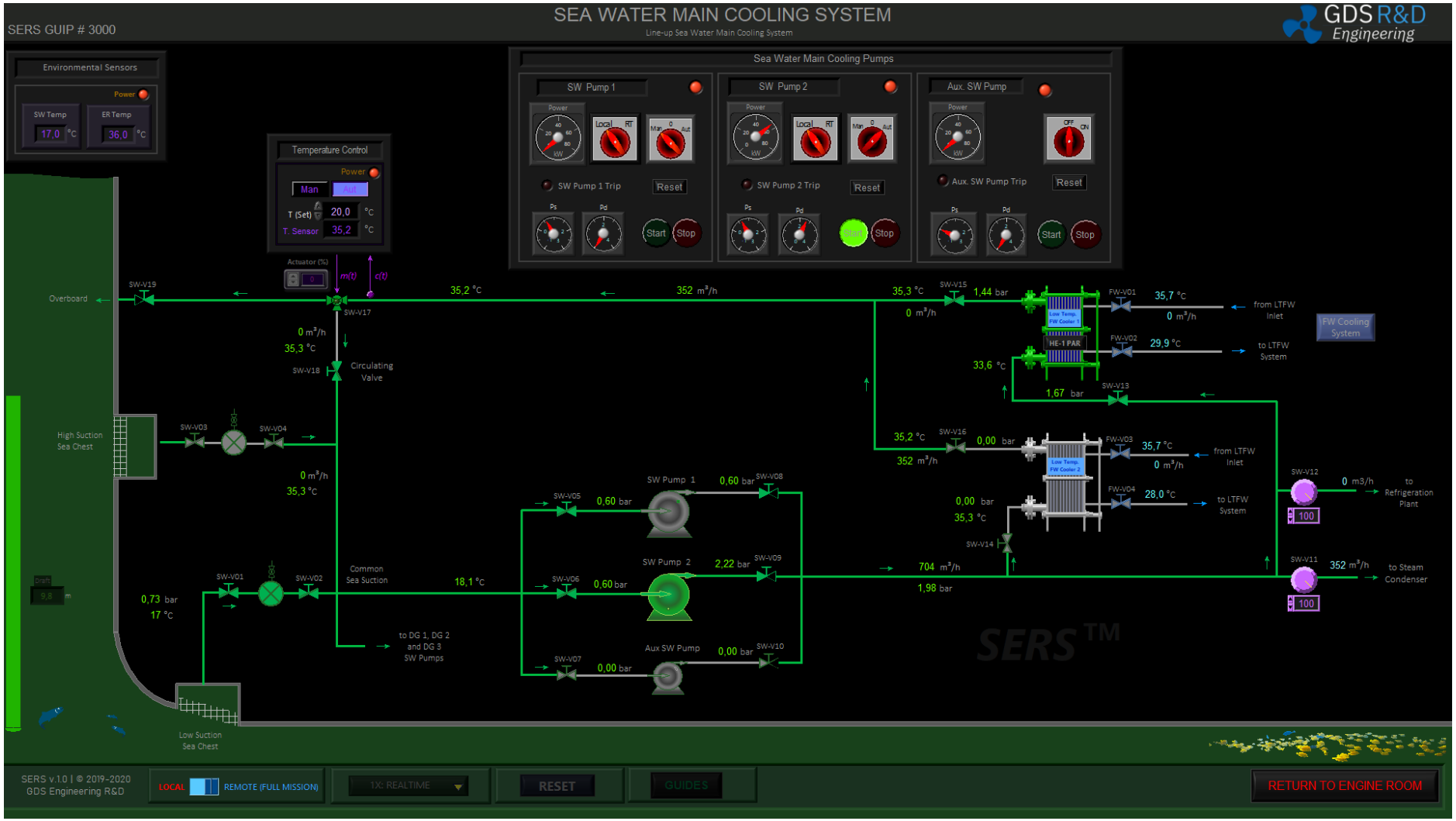
4.11 Seawater (SW) System and Starting the SW Cooling Pump 1 or SW Pump 2 (GUIP #3000)



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4.11.1 Operating Instructions

Central Sea Water Cooling System include two Low Temperature Fresh Water (LTFW) coolers, one of which is backup of the other and cooled by sea water. In addition, two main sea water pumps are used in the system, one of which operates continuously in the navigation and the other kept as a stand-by, and auxiliary sea water pump with low flow rate is used in the port. In order to increase the sea water temperature to be given to the coolers where the sea water temperature is too low, a by-pass circuit and a valve are added between inlet to outlet lines. For lining-up the sea water main cooling system and starting SW Pump 1 (or SW Pump 2).

- Ensure the SW Pump 1 (or SW Pump 2) Control Panel has been energized.
- Ensure Inlet and Outlet Valves of Low (or High) Suction Sea Chest Filter have been opened (SW-V01 and SW-V02 or SW-V03 and SW-V04).
- Open SW Pump 1 (and SW Pump 2) Suction and Discharge Valves (SW-V05 and SW-V08, SW-V06 and SW-V09).
- Open LTFW Cooler 1 (or LTFW Cooler 2) Sea Water Inlet and Outlet Valves (SW-V13 and SW-V15 or SW-V14 and SW-V16).
- Open Overboard Valve (SW-V19).
- Open Circulating Valve (SW-V18).
- For starting the pump locally, Set LOCAL Position from SW Pump 1 (or SW Pump 2) Control Panel.
- Set ON Position and Click START Button from SW Pump 1 (or SW Pump 2) Control Panel.
- Observe the suction and discharge pressure at SW Pump. Ensure that the values are normal.
- Observe the flow and pressure at main seawater line. Ensures that the values are normal.
- Observe the outlet flow and temperature of the LTFW Cooler. Ensure that the values are normal.
- For keeping stand-by of the other SW Pump, Set AUTO Positon from the Control Panel. Thus, the pump will automatically start when the decreasing of the pressure in the Sea Water Main Cooling System.

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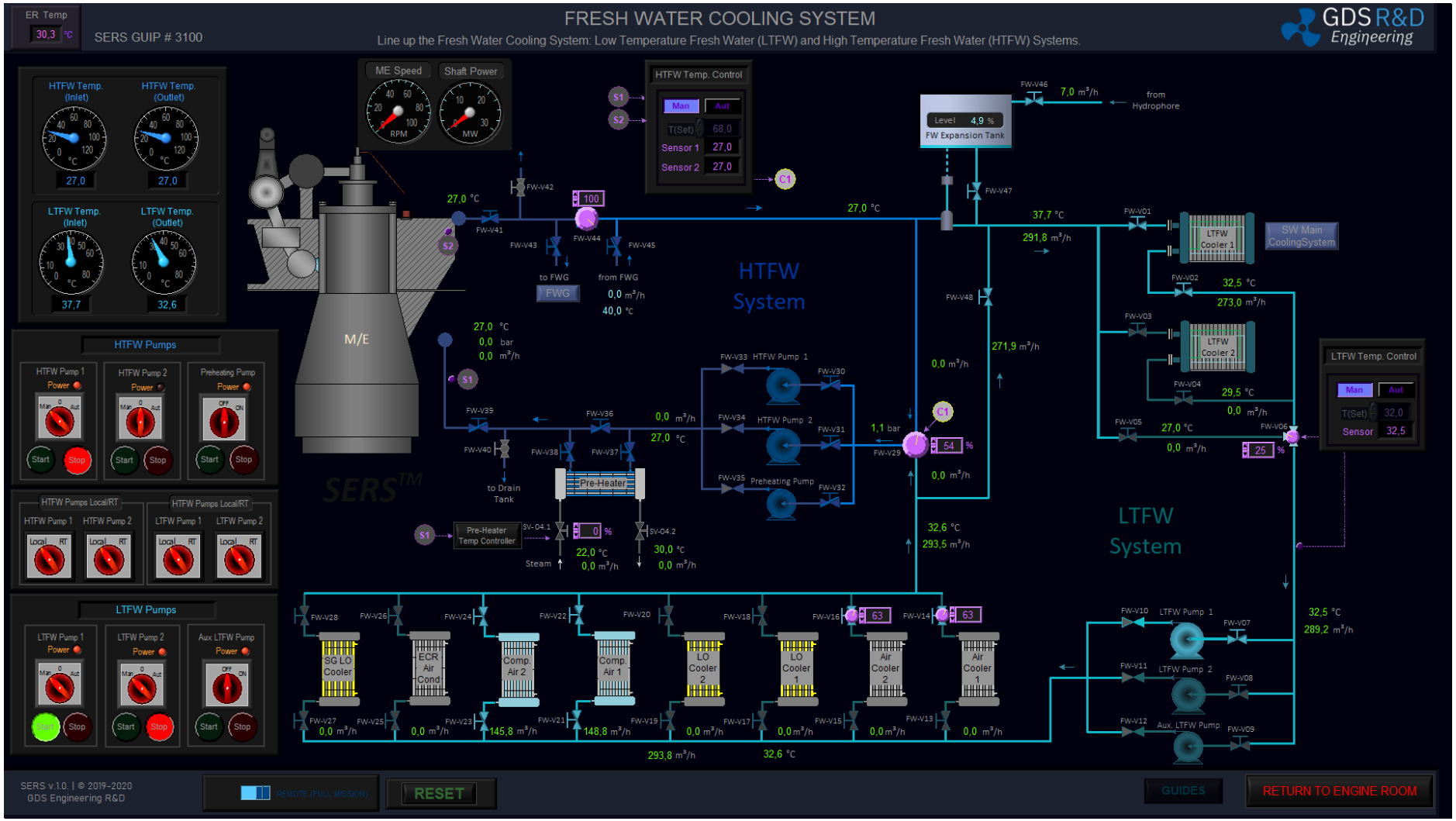
4.12 LTFW Cooling System and Starting LTFW Pump 1 (or LTFW Pump 2) (GUIP #3100)



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4.12.1 Operating Instructions

Two different fresh water pumps (Low Temperature Fresh Water (LTFW) and High Temperature Fresh Water (HTFW)Pumps) are used in the central fresh water cooling system. Both LTFW and HTFW systems have two main and one auxiliary pumps. One of the main pumps is operated continuously while navigation, the other is kept in stand-by. HTFW pumps cool the main engine. There is a pre-heater for heating the jacket water while the main engine is preparing. Heating is done with main pumps as well as with a lower capacity pump to save energy. This pump is therefore called a preheater pump. HTFW is cooled by participating in LTFW via a three way mixing valve. Main engine charge air, main engine lubricating oil, air compressors, ECR air condition, shaft generator (SG) lubricating oil, and HTFW is cooled by LTFW. LTFW is cooled by seawater at LTFW coolers. (GUIP #3000) For lining-up the fresh water cooling system and starting LTFW Pump 1 (or LTFW Pump 2).

- Open ME FRESH WATER COOLING SYSTEM GUI Panel.
- Ensure the LTFW Pump 1 (or LTFW Pump 2) has been energized.
- Check Freshwater Expansion Tank Level. If requires, fill up from Hydrophore System. (GUIP #4900)
- Open LTFW Cooler 1 (and LTFW Cooler 2) Fresh Water Inlet and Outlet Valves (FW-V01 and FW-V02, FW-V03 and FW-V04). (NOTE: User should open the corresponding LTFW Cooler, e.g. user should open the LTFW Cooler 1 if the user has opened the LTFW Cooler 1 in GUIP #3000)
- Open Compressed Air Cooler 1 (or Compressed Air Cooler 2) Inlet and Outlet Valves (FW-V21 and FW-V22 or FW-V23 and FW-V24).
- Open LO Cooler 1 or 2 Fresh Water Inlet and Outlet Valves (FW-V17 and FW-V18 or FW-V19 and FW-V20).
- Open LTFW Pump 1 (or LTFW Pump 2) Suction Valve (FW-V07 or FW-V08).
- Open HTFW Recirculating Valve (FW-V48).
- Open LTFW Coolers By-Pass valve (FW-V05).
- For starting the LTFW Pump locally, Set LOCAL Position from LTFW Pump 1 (or LTFW Pump 2) Control Panel.
- Set MAN. Position and Click START Button from LTFW Pump 1 (or LTFW Pump 2) Control Panel.
- Observe the discharge flow and temperature.
- Observe outlet temperature and flows of the Coolers.

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4.13 HTFW System and Starting the Preheating Pump (SERS 3100)

HTFW System should be lining up and the preheating pump should be starting for the preheating of the main engine.

4.13.1 Operating Instructions

- Ensure the Preheating Pump Control Panel has been energized. If not, check circuit breaker of the Preheating Pump at ON position. (GUIP #5500)
- Ensure sufficient steam arrives to the preheater.
- Open Preheating Pump Suction Valve (FW-V32).
- Close the Preheater By-pass Valve if it is open (FW-V36).
- Open Preheater FW Inlet and Outlet Valves (FW-V37 and FW-V38).
- Open HTFW Main Engine Inlet Valve (FW-V39).
- Open HTFW Main Engine Outlet Valve (FW-V41).
- Set FWG By-Pass Valve 100% value (FW-V44). Thus, HTFW will circulate without going to the Fresh Water Generator.
- Set HTFW Temperature Control Valve (FW-V29) 100% value. Thus, HTFW will not mix with LTFW.
- Set MAN Position and Click START button from the Preheating Pump Control Panel.
- Observe the Flow Rate of the HTFW.
- Open Preheater Steam Inlet and Outlet Valve (SV-04.1 and SV-04.2).
- Observe the flow rate and temperature of the steam.
- Observe the temperature of the HTFW is increasing gradually.

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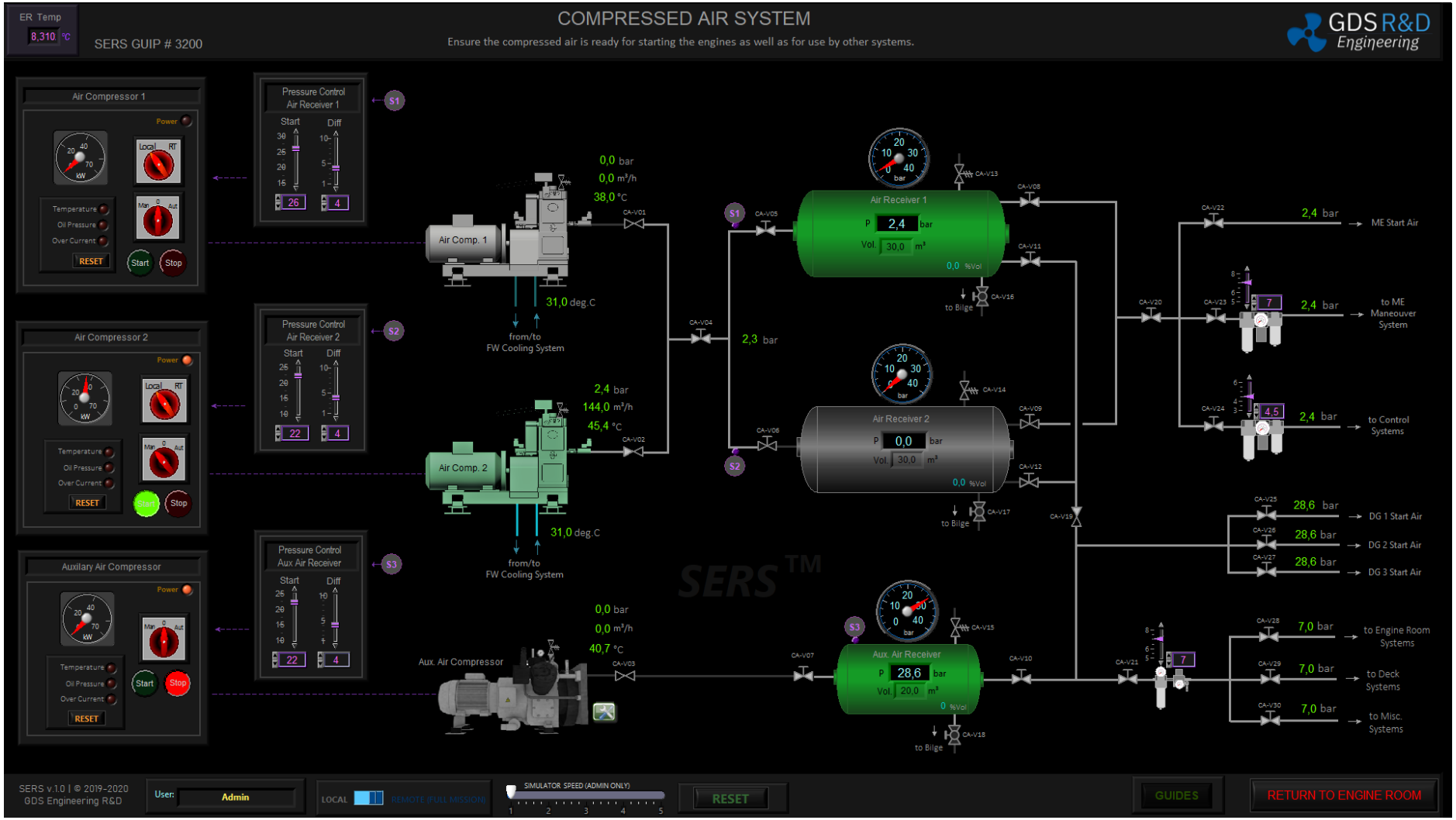
4.14 Compressed Air System with the Start of the Main Air Compressors (GUIP #3200)



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4.14.1 Operating Instructions

- Open COMPRESSED AIR SYSTEM GUI Panel
- Ensure the Main Air Compressor 1 (or Main Air Compressor 2) has been energized.
- Check cooling fresh water is supplied to corresponding Main Air Compressor. (GUIP #3100)
- Open Air Receivers Main Inlet Valve (CA-V04).
- Open Air Receiver 1 (or Air Receiver 2) Inlet Valve (CA-V05 or CA-V06).
- For starting Main Air Compressor locally, Set LOCAL position from Main Air Compressor 1 (or Main Air Compressor 2) from the Control Panel.
- Set MAN position and Click START button from Main Air Compressor 1 (or Main Air Compressor 2) from the Control Panel.
- Observe discharge flow and pressure.
- Open Air Receiver 1 (or Air Receiver 2) drain valve for draining water and other contaminants for short period (CA-V16 or CA-V17).
- Observe corresponding Air Receiver pressure is rising.
- Open Air receiver 1 (or Air Receiver 2) outlet valves (CA-V08 and CA-V11 or CA-V09 and CA-V12).
- Set change value of the Pressure Switch (Pressure Control Air Receiver 1 or 2).
- Set operated compressor at AUTO position. Thus compressor will be start and stop according to set values.

For stopping Auxiliary Air Receiver:

- Click STOP Button and Set 0 position from Auxiliary Air Compressor Control Panel.
- Close Auxiliary Air Receiver Inlet and Outlet Valves (CA-V07 and CA-V10).

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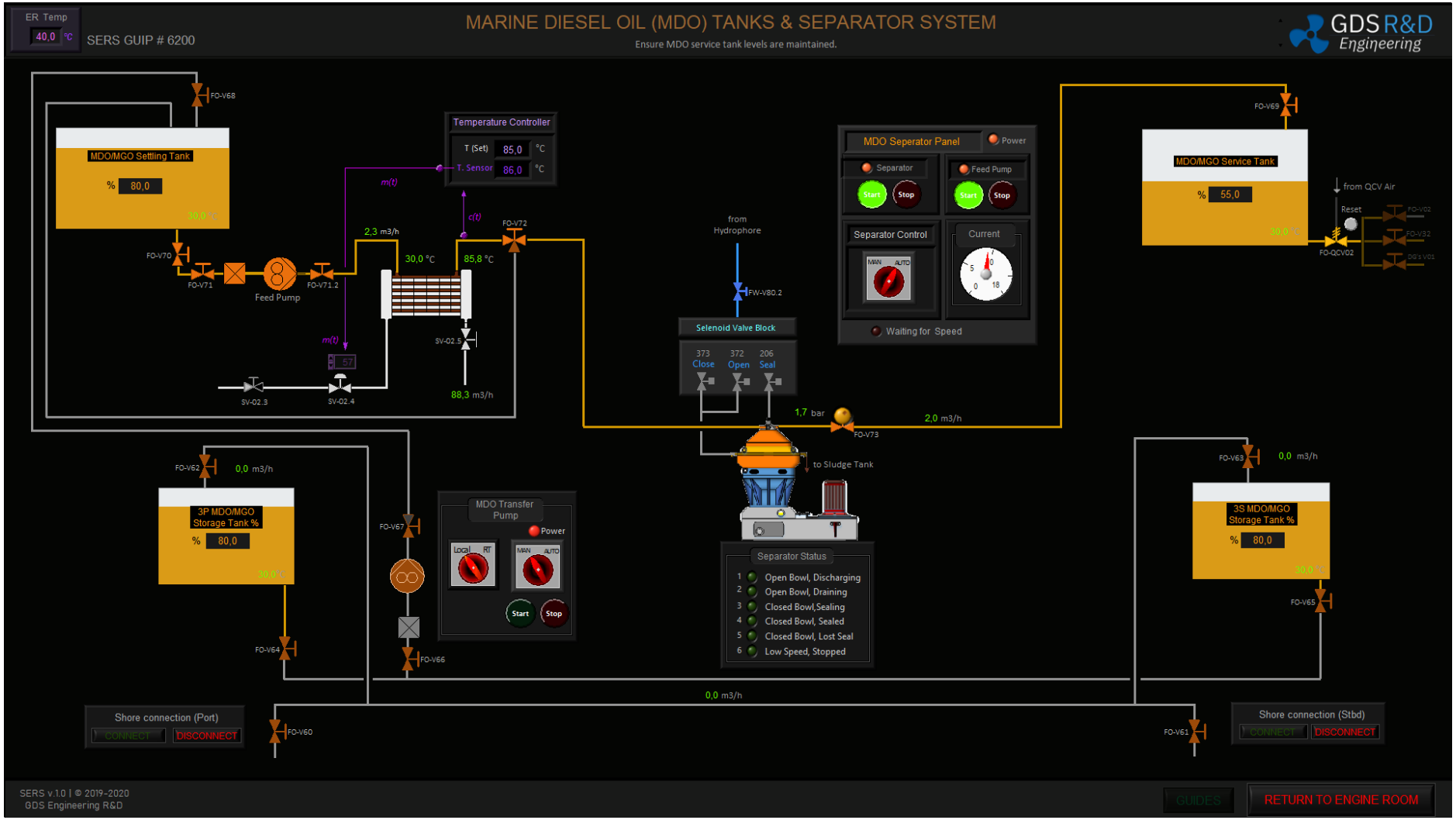
4.15 MDO Tanks & Separator (GUIP #6200)



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4.15.1 Operating Instructions

- Ensure the MDO Transfer Pump Control Panel has been energized. If not, check circuit breaker of the MDO Transfer Pump at ON position. (GUIP #5500)
- Ensure the sufficient MDO at Settling Tank. If not, fill up via MDO Transfer Pump. For filling MDO Service Tank:
    - Open 3P MDO Storage Tank Outlet Valve (FO-V64) or 3S MDO Storage Tank Outlet Valve (FO-V65).
    - Open MDO Transfer Pump Suction and Discharge Valve (FO-V66 and FO-V67).
    - Open MDO Settling Tank Inlet Valve (FO-V68).
    - For starting the pump locally, set LOCAL position from MDO Transfer Pump Control Panel.
    - Set MAN position and Click START button from MDO Transfer Pump Control Panel.
    - Observe the MDO Settling Tank level is increasing.
    - Click STOP button when sufficient level at MDO Settling Tank.
- Ensure the MDO Separator and Feed Pump Control Panel has been energized.
- Ensure the steam is reached at MDO Separator Heater.
- Open MDO Settling Tank Outlet Valve (FO-V70).
- Open Feed Pump Suction and Discharge Valve (FO-V71 and FO-V71.2).
- Click START button from the Feed Pump Control Panel.
- Observe the Feed Pump is operated and MDO Flow Rate.
- Open Heater Steam Inlet (SV-02.3) and Outlet Valve (SV-02.5).
- Observe the MDO temperature is rising.
- Ensure MDO Separator supplied with Hydrophore Tank. (GUIP #4900)
- Open Operating FW Inlet Valve (FW-V80.2).
- Click START button from the Separator Control Panel.
- Switch AUTO Mode after rpm of the Separator is stabilized.
- Set MDO Separator Back Pressure Adjusting Valve (FO-V73).
- Open MDO Service Tank Inlet Valve (FO-V69).
- When the MDO temperature reaches the set value and the rpm of the separator reaches the appropriate values, the recirculation valve (FO-V72) will change position and MDO will start going to the MDO Separator.

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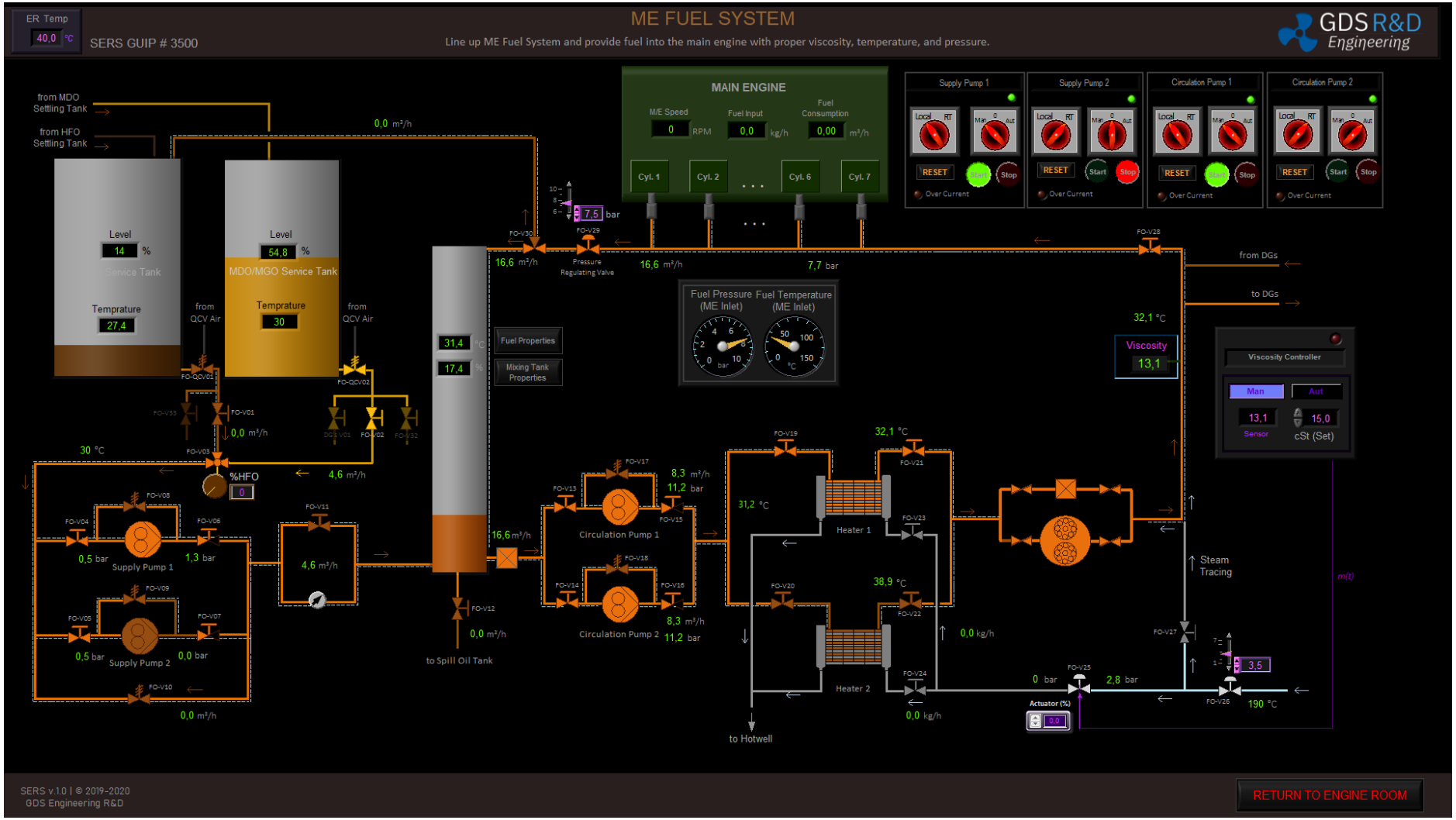
4.16 ME Fuel System (GUIP #3500)



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4.16.1 Operating Instructions

The main engine will be operated primarily with MDO. The ME Fuel System must be prepared accordingly.

- Ensure the Supply and Circulation Pumps Control Panel has been energized. If not, check circuit breakers of the Supply and Circulation Pumps at ON position. (GUIP #5500)
- Open MDO Outlet Valve (FO-V02).
- Set Mixing Valve (FO-V03) at 0% value. Thus, Supply Pump suck only MDO.
- Open Supply Pump 1 or Supply Pump 2 Suction and Discharge Valve (FO-V04 and FO-V06 or FO-V05 and FO-V07).
- For starting Supply Pump 1 or 2 locally, set LOCAL position from the Supply Pump 1 or 2 Control Panel.
- Set MAN mode and Click START button from the corresponding Control Panel.
- Observe the Supply Pump Suction and Discharge Pressure.
- Observe the MDO Flow Rate.
- Observe the Mixing Tank Level is increasing.
- Open Circulation Pump 1 or 2 Suction and Discharge Valves (FO-V13 and FO-V15 or FO-V14 and FO-V16).
- Open Heater 1 or 2 FO Inlet and Outlet Valves (FO-V19 and FO-V21 or FO-V20 and FO-V22).
- Open Main Engine FO Shut off Valve (FO-V28).
- Open Pressure Regulating Valve (FO-V29).
- Set FO Recirculation Valve (FO-V30) to Mixing Tank.
- For starting Circulation Pump 1 or 2 locally, set LOCAL position from the Circulation Pump 1 or 2 Control Panel.
- Set MAN mode and Click START button from the corresponding Control Panel.
- Observe the FO Pressure and Flow Rate.

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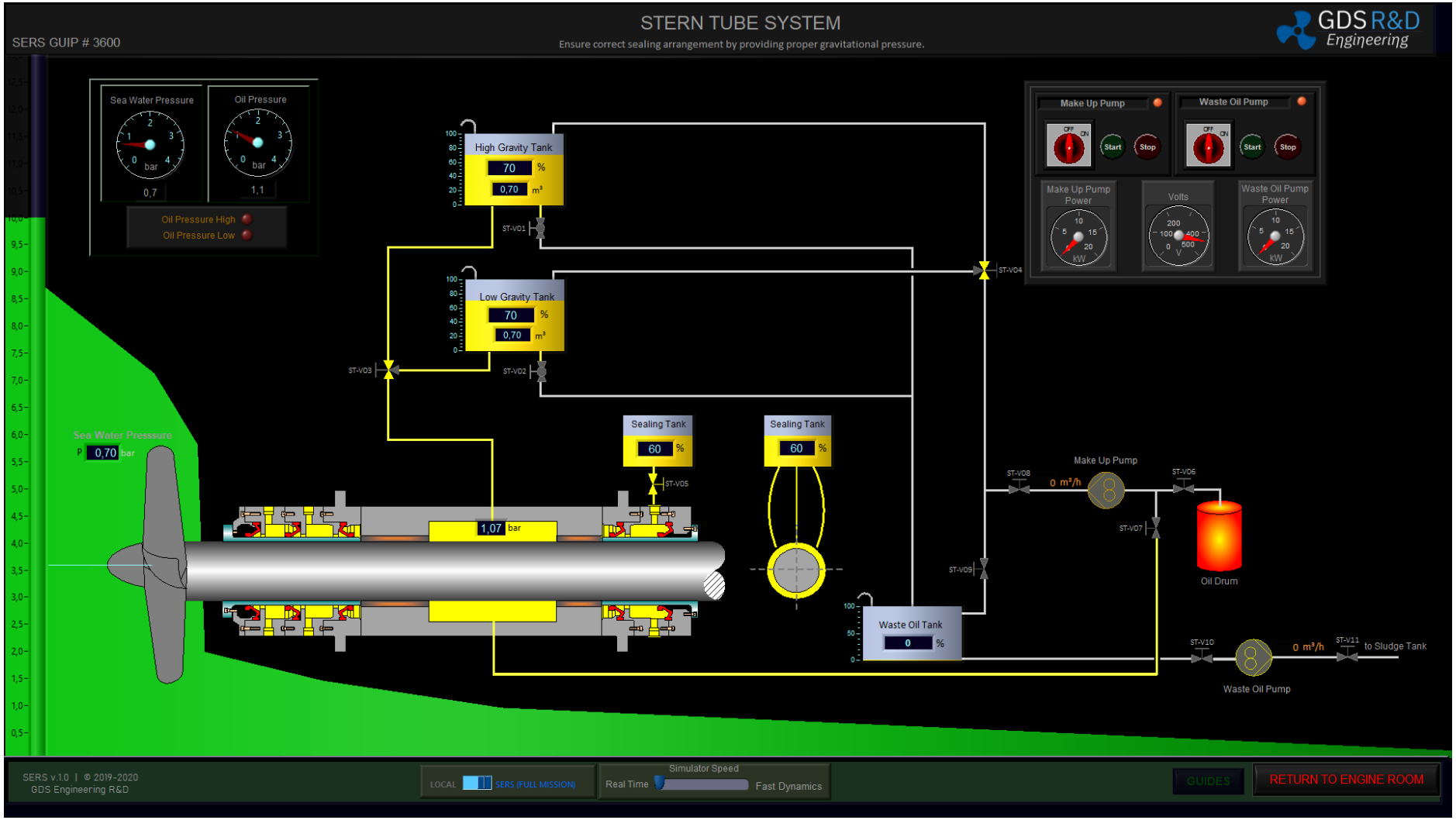
4.17 Stern Tube (GUIP #3600)



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4.17.1 Operating Instructions

- Ensure the Make Up Pump and Waste Oil Pump Control Panels has been energized.
- Ensure the sufficient oil at the High Gravity and Low Gravity Tanks. If not, fill up with Make Up Pump. For filling:
    - Open Make Up Suction and Discharge Valves (ST-V06 and ST-V08).
    - Line Up the Inlet Valve (ST-V04) for appropriate Gravity Tank.
    - Set ON position and Click START button from the Make Up Control Panel.
    - Observe the Oil Flow Rate and the Gravity Tank Level is increasing.
    - Click STOP button when sufficient level at Gravity Tank.
- Line up Outlet Valve (ST-V03) for appropriate Gravity Tank.
- Observe the Oil and Sea Water Pressure.

For draining the High or Low Gravity Tank:

- Open High or Low Gravity Tank Drain Valve (ST-V01 or ST-V02).
- Observe the Gravity Tank Level is decreasing and Waste Oil Tank Level is increasing.
- Transfer the waste oil from Waste Oil Tank to Sludge Tank. For transferring:
    - Open Waste Oil Pump Suction and Discharge Valves (ST-V10 and ST-V11).
    - Set ON position and Click START button from the Waste Oil Pump Control Panel.
    - Observe the Waste Oil Flow Rate and Waste Oil Tank Level is increasing.

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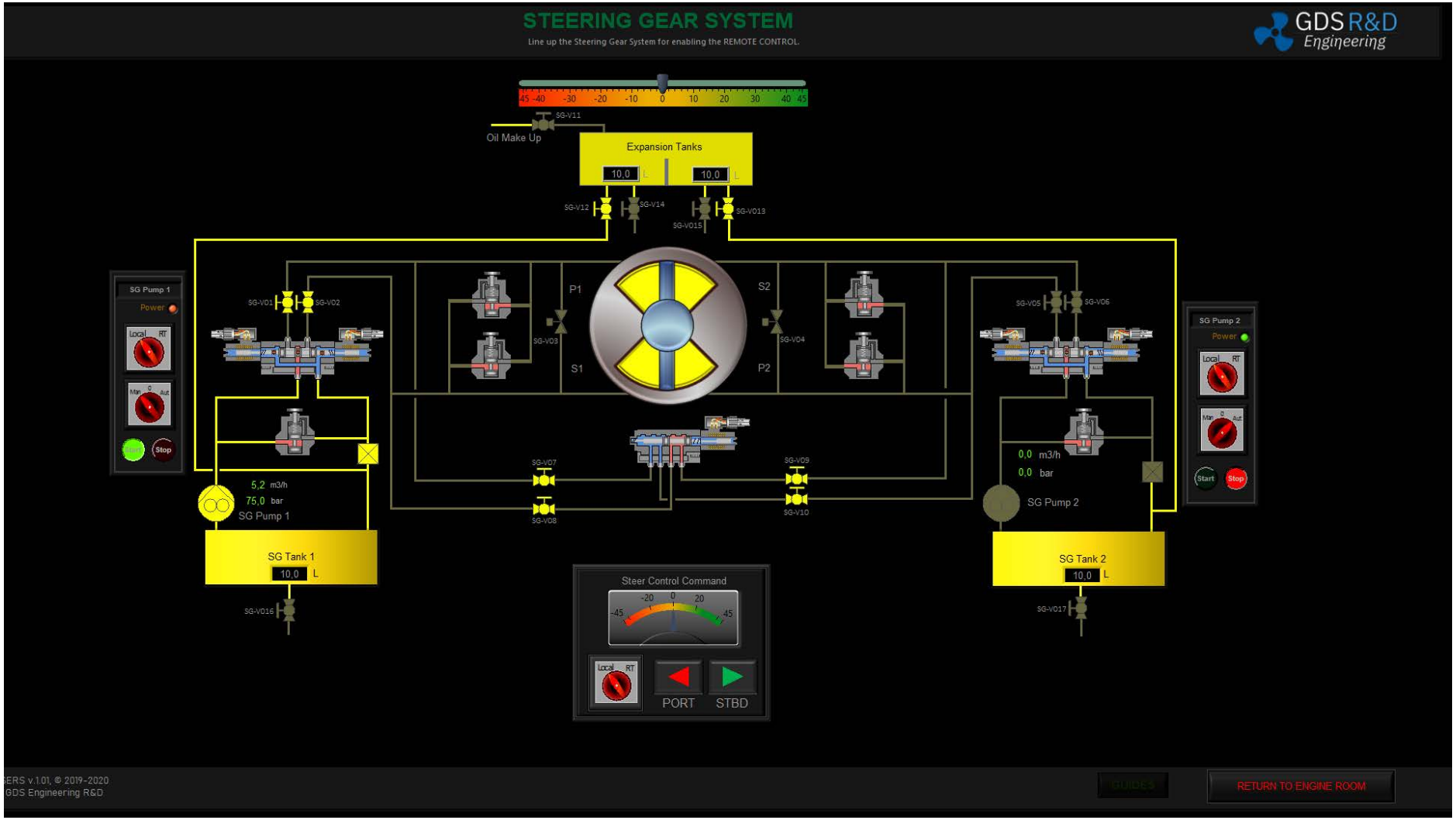
4.18 Steering Gear (GUIP #3700)



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4.18.1 Operating Instructions

- Ensure the Steering Gear Pump 1 and 2 Control Panel has been energized.
- Check Expansion Tank Level, if necessary fill up. For filling:
    - Open Expansion Tank Fill Up Valve (SG-V11).
    - After filling, close the valve.
- Check SG Tank 1 or 2 Level, if necessary fill up via Expansion Tank. For filling:
    - Open Expansion Tank SG Tank 1 or 2 Outlet Valve (SG-V12 or SG-V13).
    - Observe the corresponding SG Tank Level is rising.
    - After filling, close the valve.
- Open corresponding SG Pump Discharge and Oil Recirculation Valves (SG-V01 and SG-V02 or SG-V05 and SG-V06).
- For starting corresponding SG Pump locally, set switch LOCAL position from the Control Panel.
- Set MAN mode and Click START button from the Control Panel.
- Observe the Oil Flow Rate and Pressure.
- For operating of Steering Gear locally:
    - Set switch LOCAL mode from the Steering Gear Control Panel.
    - Click PORT or STARBOARD buttons.
    - Observe the Steer Control Command Indicator is changing.
    - Observe the Rotary Vane Angle is changing.
    - Observe the Oil Pressure is changing.

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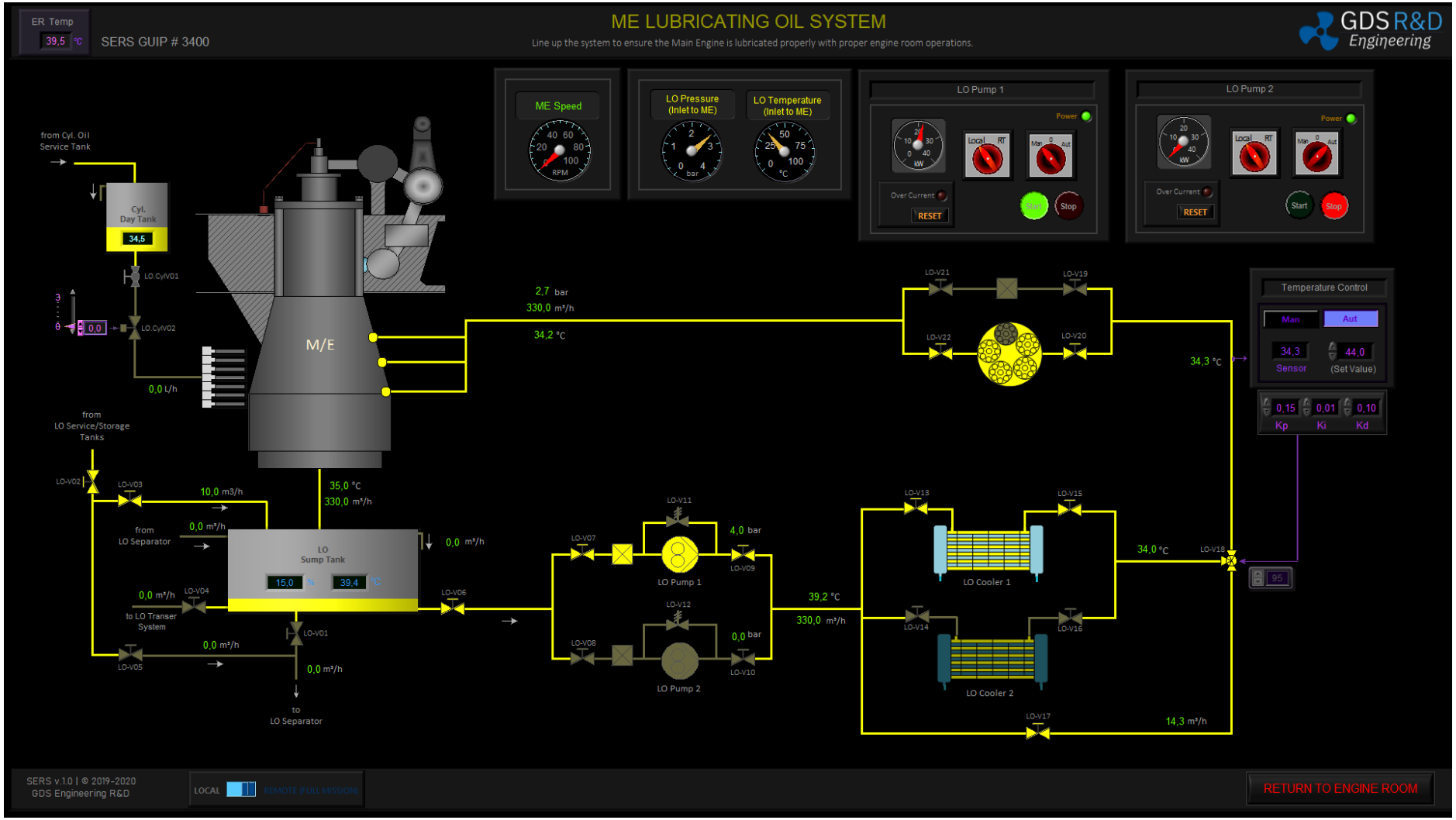
4.19 Main LO System and Starting LO Pump 1 (or LO Pump 2) (GUIP #3400)



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4.19.1 Operating Instructions

Although the Main Engine Lubricating Oil System is the first system to be prepared, the system was lined up in order to enable the oil separator to separate the oil. Line up the system to ensure the Main Engine is lubricated properly with engine room operations.

- Ensure the LO Pumps Panel has been energized.
- Open LO Pump 1 and 2 Suction and Discharge Valves (LO-V07, LO-V09 and LO-V08, LO-V10).
- Open LO Cooler 1 or 2 LO Inlet and Outlet Valves (LO-V13 and LO-V15 or LO-V14 and LO-V16).
- Open corresponding LO Cooler FW Inlet and Outlet Valves (FW-V17 and LO-V18 or FW-V19 and FW-V20) from the Fresh Water Cooling System. (GUIP #3100)
- Open LO Coolers By-pass Valve (LO-V17).
- Open Auto Backflushing Inlet and Outlet Valves (LO-V20 and LO-V22).
- Set Temperature Control at AUTO mode.
- For starting LO Pump 1 or 2 locally, Set LOCAL Position from the LO Pump 1 or 2 Control Panel.
- Set MAN position and Click START Button LO Pump 1 (or LO Pump 2) from the Control Panel.
- Observe the LO flow rate, pressure and temperature.
- For keeping stand-by of the other LO Pump, Set AUTO Positon from the Control Panel. Thus, the pump will automatically start when the decreasing of the pressure in the Main Engine Lubricating Oil System.

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4.20 Local Synchronization of the DG 1 and DG 2 or DG 3 (GUIP #5000)

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4.20.1 Operating Instructions

The other diesel generator, which was operated, was warmed up and became ready for synchronization until the systems were lined up. Synchronization can be done in two different modes, local and remote. Demonstrate synchronizing of Diesel Generator 1 and Diesel Generator 2 or 3 locally.

- Observe the Diesel Generator 1 supplies the 440 V Main and Emergency Bus Bars, and corresponding Diesel Generator is running but not connected to the bus bars.
- Ensure DG 1 and corresponding DG at LOCAL mode.
- Ensure the Synchronization Control at LOCAL mode. (Synchronization Control mode can be changed from the ECR Panels: Power Generators GUI Panel #5400.)
- Observe Volts and Frequency of the Diesel Generator 1 and corresponding Diesel Generator is the same.
- If the frequencies are not same, adjust that via SPEED CONTROL PANEL.
    - When Click RAISE, frequency will be increased.
    - When Click LOWER, frequency will be decreased.
- Select corresponding DG for synchronizing at Local Synchronization Panel.
- Observe the Auto Synchronization Ready Lamp changed to GREEN.
- Click CONNECT Button from the Local Synchronization Panel.
- Observe corresponding DG Circuit Breaker ON position automatically.
- After the synchronization of the diesel generators, adjust the load and current sharing manually via Lower/Raise buttons.
    - When Click RAISE, the load and current of the corresponding diesel generator will be increased.
    - When Click LOWER, the load and current of the corresponding diesel generator will be decreased.

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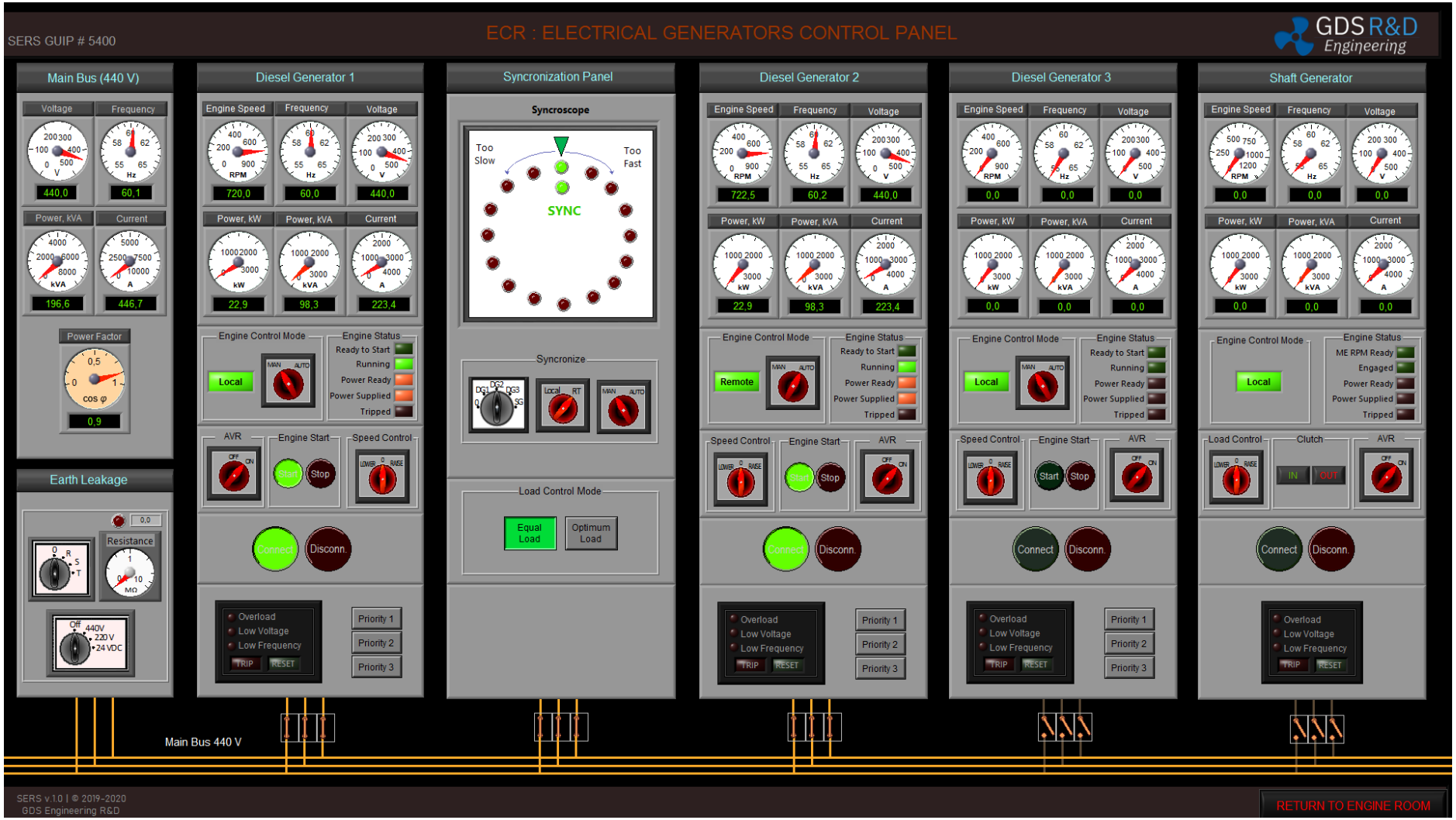
4.21 Remote Synchronization of the DG 1 and DG 2 or DG 3 (GUIP #5400)



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4.21.1 Operating Instructions

Demonstrate synchronizing of Diesel Generator 1 and corresponding Diesel Generator remotely.

- Set Diesel Generator 1 REMOTE mode from DG 1 Local Control Panel (GUIP #5100).
- Set corresponding Diesel Generator REMOTE mode from DG 2 or DG 3 Local Control Panel (GUIP #5200 or GUIP #5300).
- Open ECR: ELECTRICAL GENERATORS REMOTE CONTROL GUI Panel. (GUIP #5400)
- Observe the Diesel Generator 1 connected at Main Bus Bar and corresponding Diesel Generator is running but not connected to the Main Bus Bar.
- Select EQUAL Load Control Mode from the Synchronization Panel.
- Observe Volts and Frequency of the Diesel Generator 1 and corresponding Diesel Generator is the same.
- If the frequencies are not same, adjust the frequency via SPEED CONTROL SWITCH.
    - When Click LOWER, frequency will be decreased.
    - When Click RAISE, frequency will be increased.
- Select the corresponding Diesel Generator for synchronizing from the Synchroscope Panel.
- Set REMOTE position from the Synchroscope Panel.
- If the RED lamps rotate through TOO FAST direction, click LOWER Switch from the corresponding Diesel Generator Panel.
- If the RED lamps rotate through TOO SLOW direction, click RAISE Switch from the corresponding Diesel Generator Panel.
- When Synchroscope Lamp turned to GREEN, Click CONNECT button from the corresponding Diesel Generator Panel.
- Observe the equal load sharing is started.
- Observe the POWER SUPPLIED led of the corresponding DG is lit. This means Diesel Generator supplies the Bus Bars.
- Observe the power and frequency are the same.

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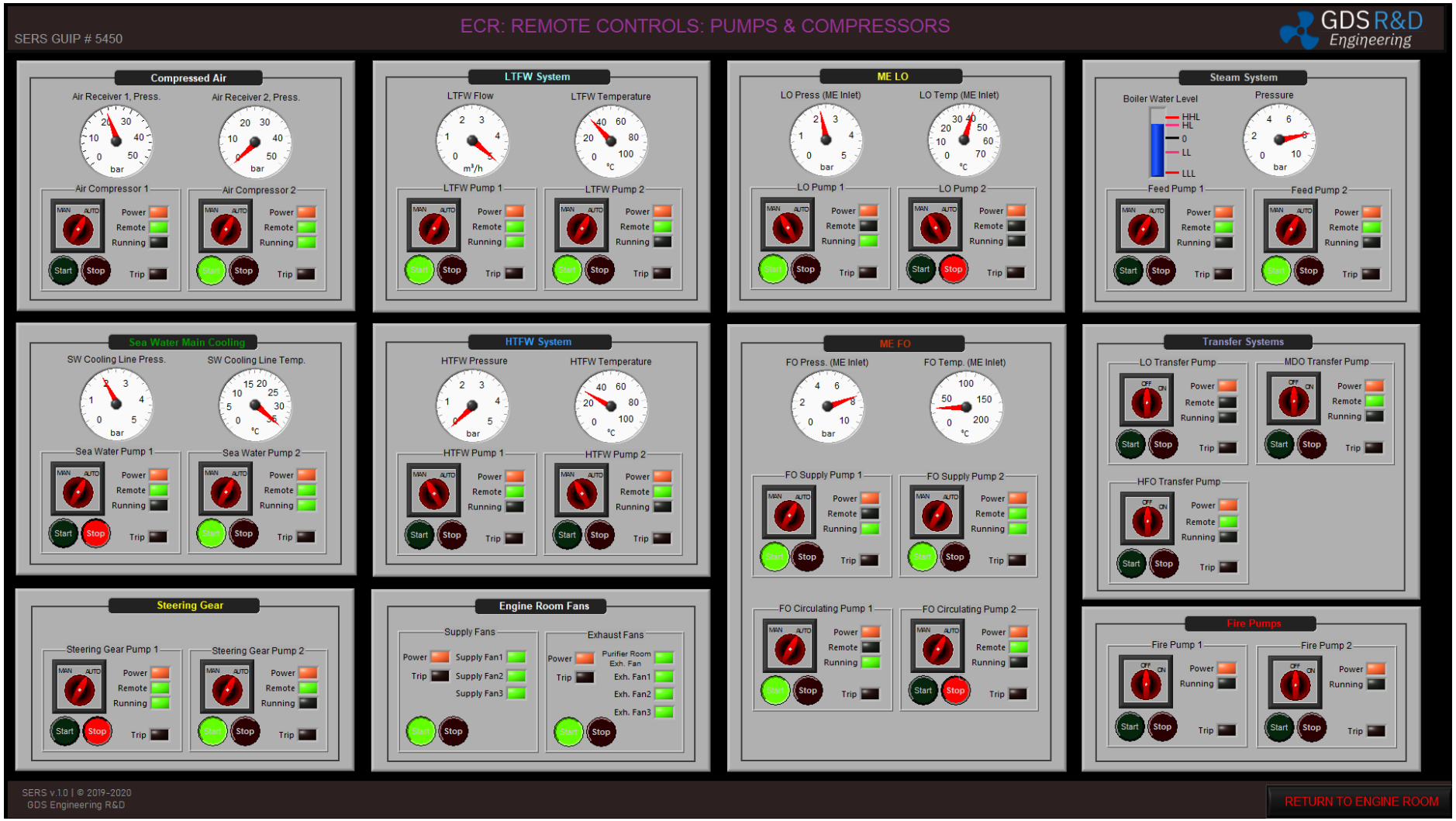
4.22 Remote Operation of Pumps and Compressors (GUIP #5450)



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Pumps and compressor must be placed in REMOTE mode to be controlled from the Engine Control Room. The following system components can be controlled from the Engine Control Room:

- Air Compressor 1 and 2
- Sea Water Pump 1 and 2
- LTFW Pump 1 and 2
- HTFW Pump 1 and 2
- LO Pump 1 and 2
- Main Engine FO Supply Pump 1 and 2
- Main Engine FO Circulation Pump 1 and 2
- Steering Gear Pump 1 and 2
- Boiler Feed Pump 1 and 2
- LO, MDO and HFO Transfer Pumps
- Fire Pump 1 and 2
- Supply and Exhaust Fans

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4.22.1 Operating Instructions

- Open Compressed Air GUI Panel. (GUIP #3200)
- Set switch REMOTE (RT) mode from the Air Compressor 1 and 2 Control Panel.
- Open Sea Water Main Cooling GUI Panel. (GUIP #3000)
- Set switch REMOTE (RT) mode from the Sea Water Pump 1 and 2 Control Panel.
- Open Fresh Water Cooling GUI Panel. (GUIP #3100)
- Set switch REMOTE (RT) mode from the LTFW Pump 1 and 2 Control Panel.
- Set switch REMOTE (RT) mode from the HTFW Pump 1 and 2 Control Panel.
- Open ME Lubrication Oil GUI Panel. (GUIP #3400)
- Set switch REMOTE (RT) mode from the LO Pump 1 and 2 Control Panel.
- Open ME Fuel GUI Panel. (GUIP #3500)
- Set switch REMOTE (RT) mode from the FO Supply Pump 1 and 2 Control Panel.
- Set switch REMOTE (RT) mode from the FO Circulation Pump 1 and 2 Control Panel.
- Open Steering Gear GUI Panel. (GUIP #3700)
- Set switch REMOTE (RT) mode from the SG Pump 1 and 2 Control Panel.
- Open Combined Boiler GUI Panel. (GUIP #3300)
- Set switch REMOTE (RT) mode from the Feed Pump 1 and 2 Control Panel.
- Open LO Tanks & Transfer GUI Panel. (GUIP #6100)
- Set switch REMOTE (RT) mode from the LO Transfer Pump Control Panel.
- Open MDO Tanks & Transfer GUI Panel. (GUIP #6200)
- Set switch REMOTE (RT) mode from the MDO Transfer Pump Control Panel.
- Open HFO Tanks & Transfer GUI Panel. (GUIP #6300)
- Set switch REMOTE (RT) mode from the HFO Transfer Pump Control Panel.

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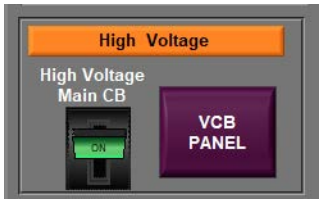
4.23 Providing High Voltage to High Voltage Consumers (GUI Panels #5500, #5850, and #5860)

4.23.1 Turning on High Power Transformer

Caution: 440V must be ready on Main Bus Bar and ensure that the DGs can meet the power when requested by the High Voltage Bus Bar consumers.

- If needed, have an additional Diesel Generator or Diesel Generators power the bus bar to ensure meeting the power when requested by the Bow Thruster.
- Open Circuit Breakers Panel (GUIP #5500) (**See Figure 4.23.1**).
- Verify the power on the 440V Main Bus Bar.
- Turn on High Voltage Main CB.



- Open High Voltage Bus Bar Panel (GUIP # 580).
- Verify the 3 phase CBs are closed and 6600 Volts is available at the Transformer outlet.

4.23.2 Turning on Vacuum Circuit Breaker (VCB)

- Open High Voltage Vacuum Circuit Breaker Panel (GUIP #5860).
- Ensure High Voltage Power is supplied to the VCB (**See Figure 4.23.2**).
- Turn “Put Handle” on.

- Press, hold, and turn “Rocking In & Out” on clockwise direction until “Engaged” indicator is lit.

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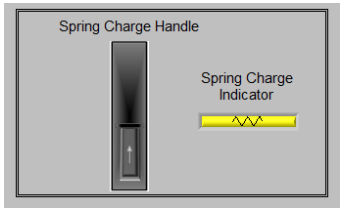
- Also, verify the position of the Rack moved to latch to the Bus Bar lines (**See Figure 4.23.3**).
- Press 10-15 times on “Spring Charge Handle” until Spring Charge Indicator is lit.



- Activate Vacuum Circuit Breaker by pressing on “I” button.

- Verify that “HIGH VOLTAGE POWER” indicator is lit.
- Also verify that VCB is latched and power is provided to the Bow Thruster power lines (**See Figure 4.23.4**).

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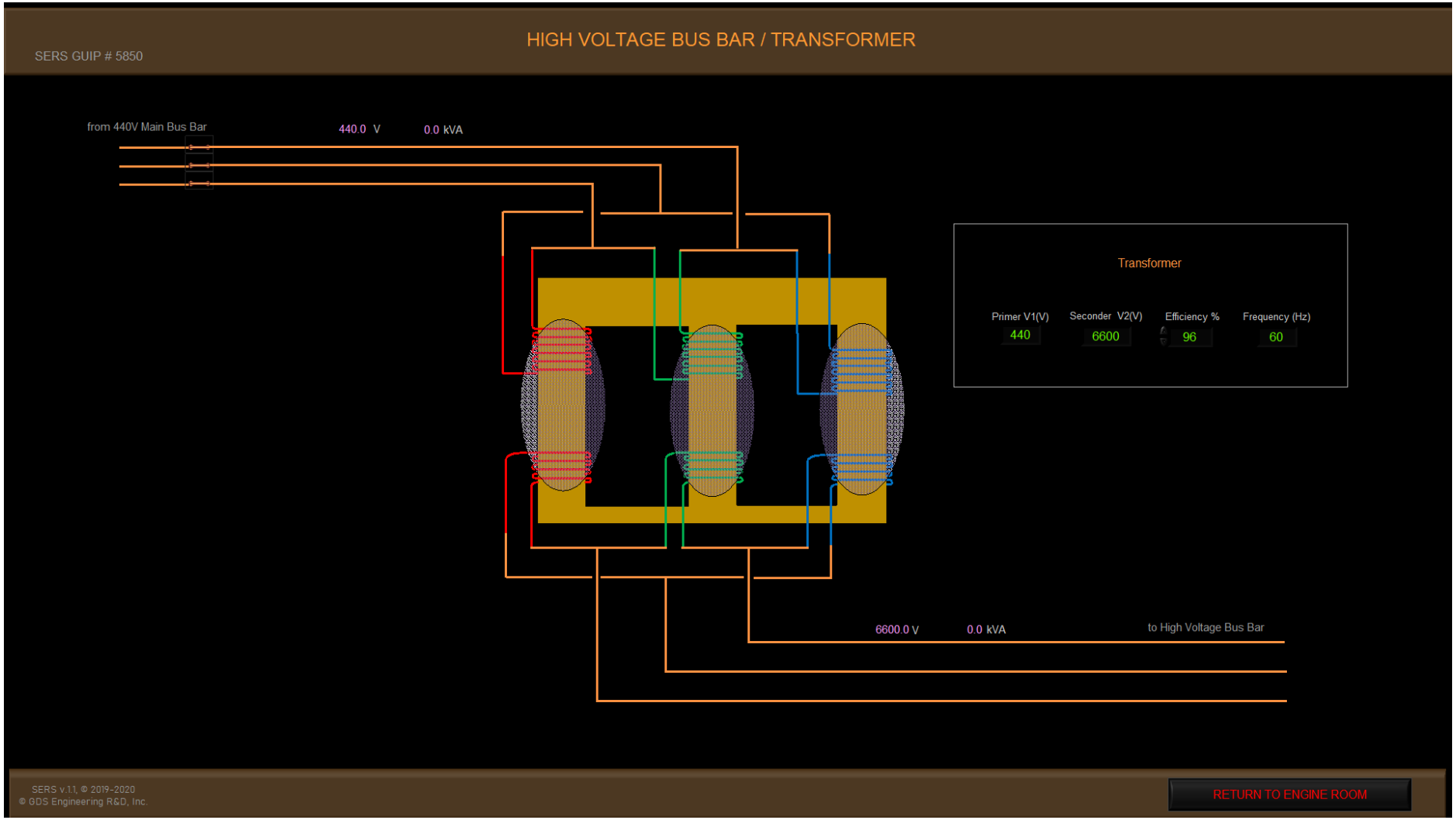

Figure 4.23.1 High Voltage Bus Bar / Transformer (GUI Panel #5850).

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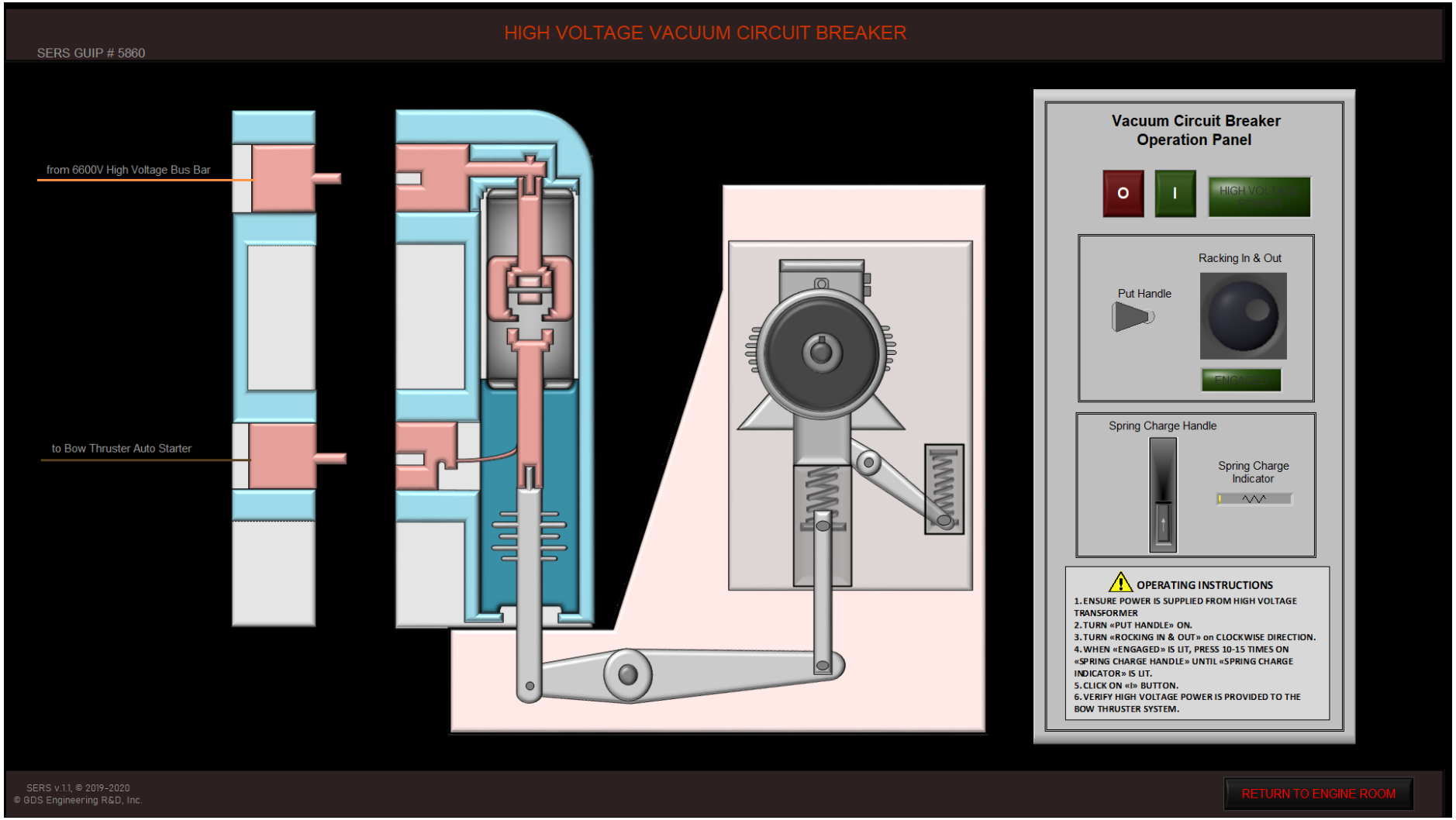

Figure 4.23.2 GUI Panel #5860: VCB is not Turned ON

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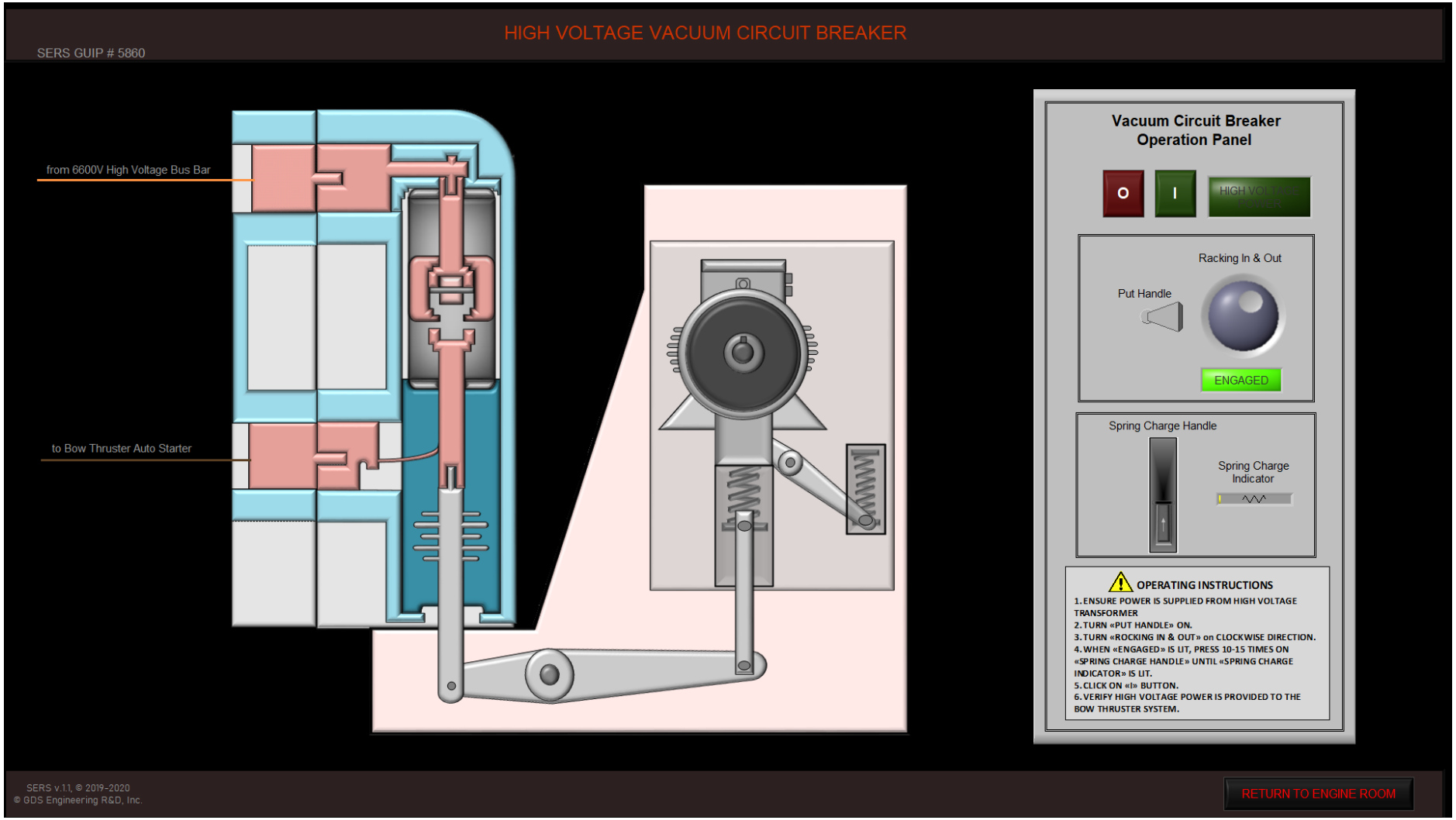

Figure 4.23.3 GUI Panel #5860: Rack is Engaged, VCB is not Latched.

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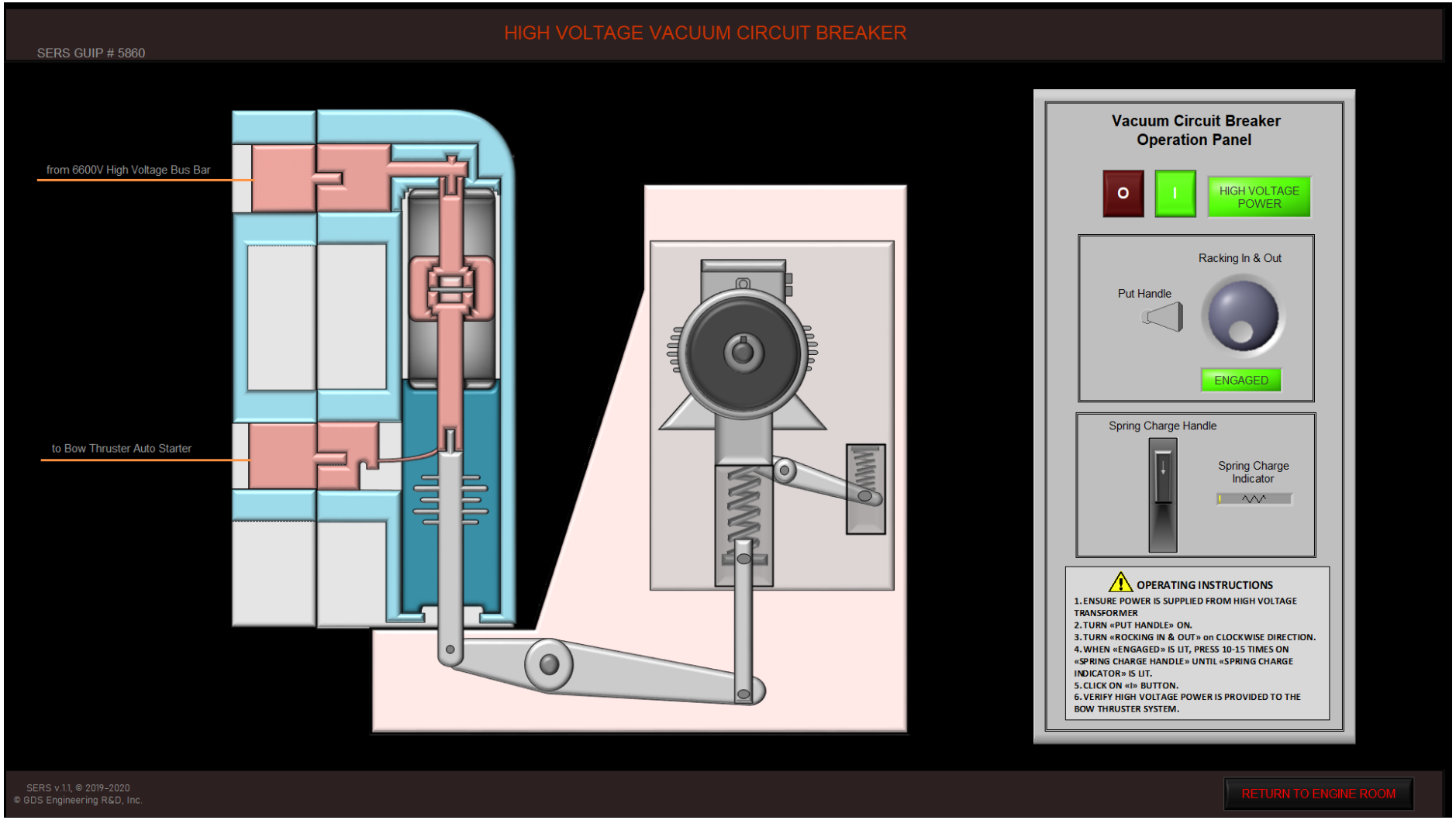

Figure 4.23.4 GUI Panel #5860: Rack is Engaged, VCB it Latched.

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4.24 Bow Thruster, Lining Up and Operation (GUI Panel #7100)

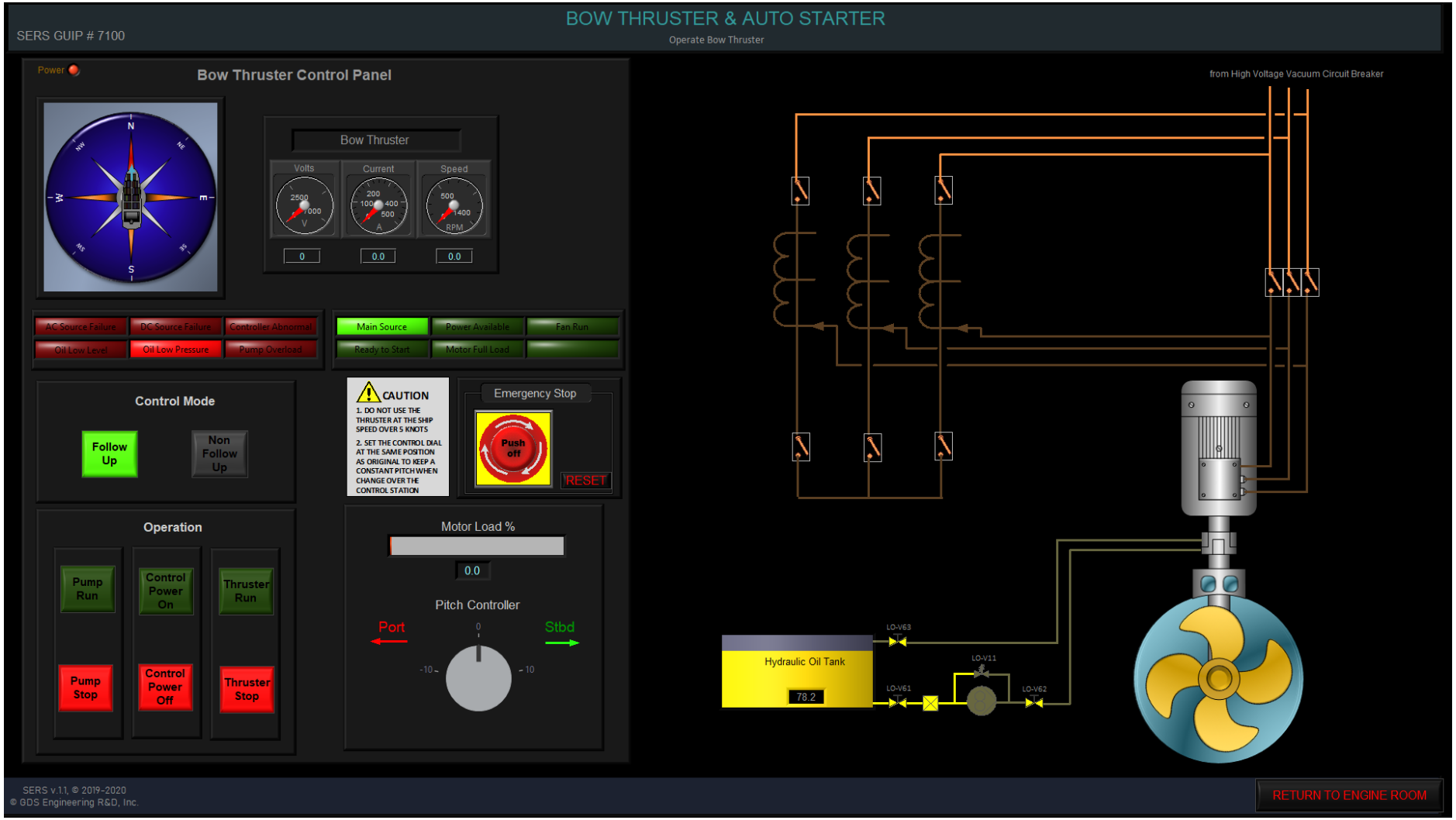

Figure 4.24.1 GUI Panel #5860: Bow Thruster & Auto Starter Panel – Bow Thruster is in not Lined Up.

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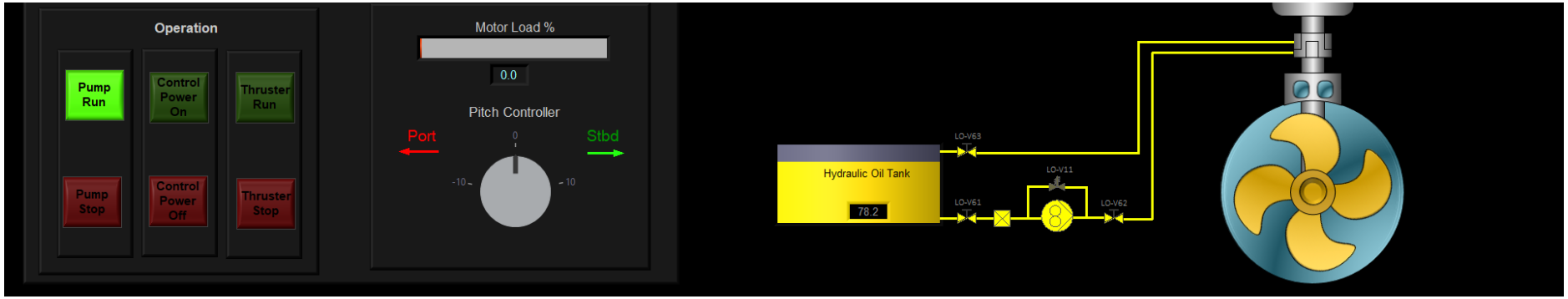
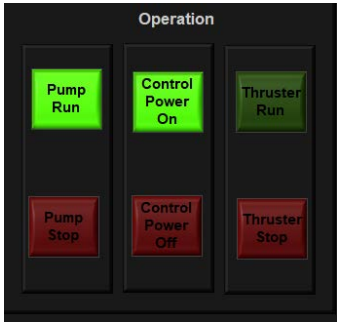
4.24.1 Operating Instructions

- Open Bow Thruster GUI Panel (GUIP #7100) (See Figure 4.24.1).
- Verify “Main Source” indicator is lit.
- Click on “Pump Run” button under the Operation Panel area on lower left corner of the window.



- Click on “Control Power On” button under the Operation Panel area on lower left corner of the window.
- Verify that “Ready to Start” indicator is lit.



- Click on “Thruster Run” button under the Operation Panel area on lower left corner of the window.
- Observe the operation of the Auto Starter, which powers the thruster motor in three stages. Verify the current draw on the meters while thruster motor is becoming on.

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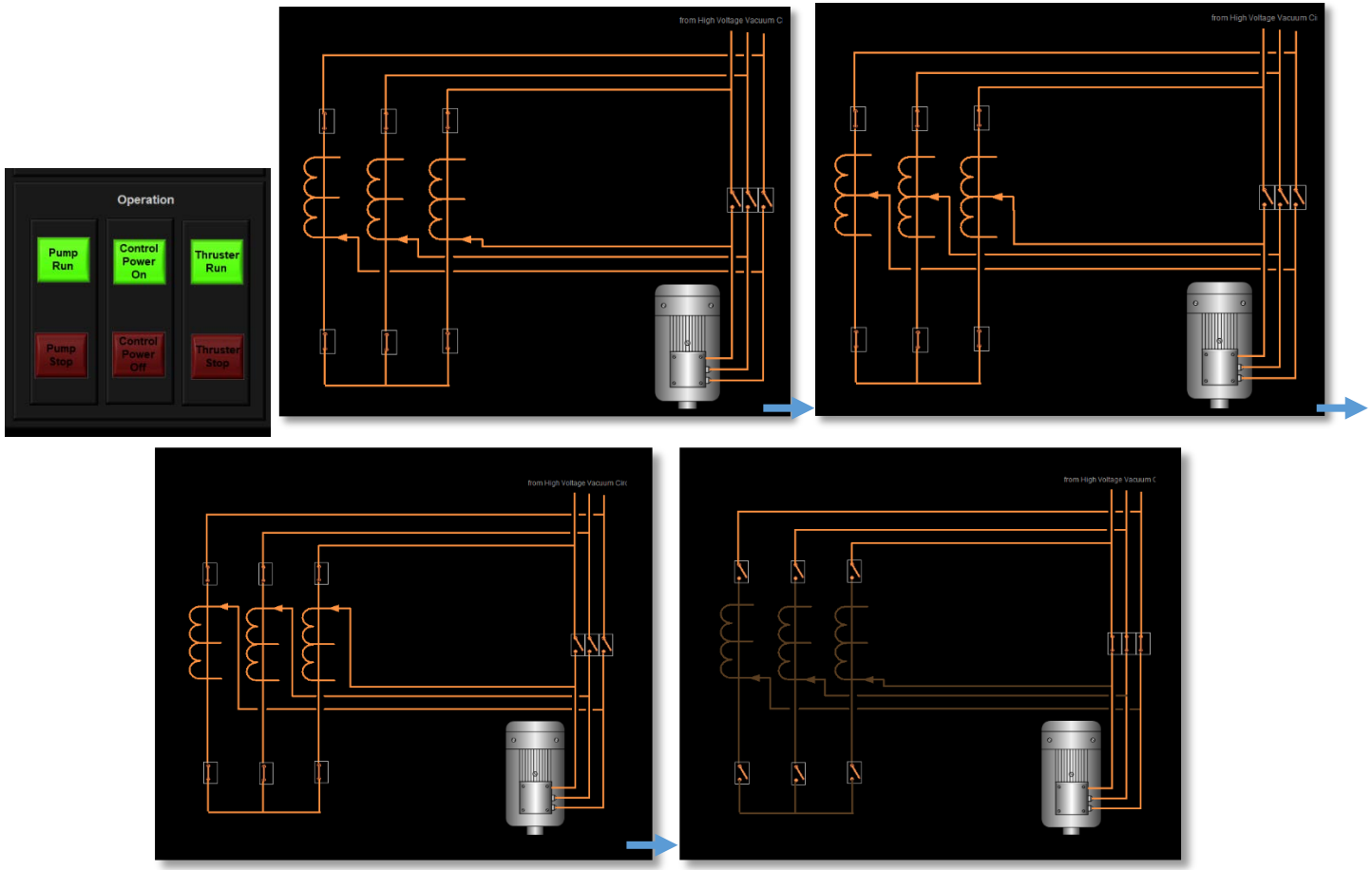

- When Auto Starter wires becomes unlit and amperemeter displays 33 Amps, power becomes available to the Thruster Motor.

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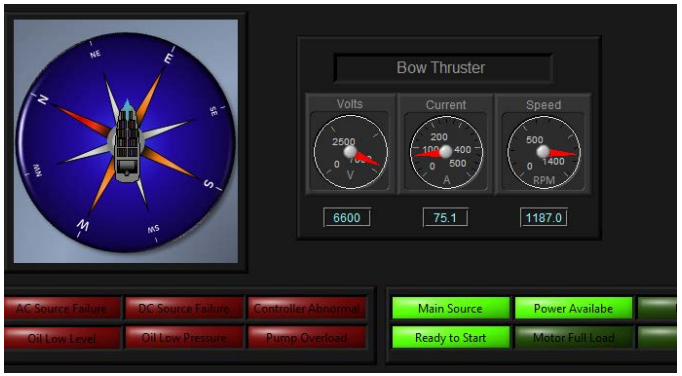
- Change the position of the pitch control by moving the controller on Stbd or Port Sides. Observe the current draw as well as the ships route change while the bow thruster is running under the load.



- Verify that the thruster system draws 136.5 Amps at 100% load.
- See Figure 4.24.2 for a full screen capture of the GUIP #7100 when bow thruster is in operation.

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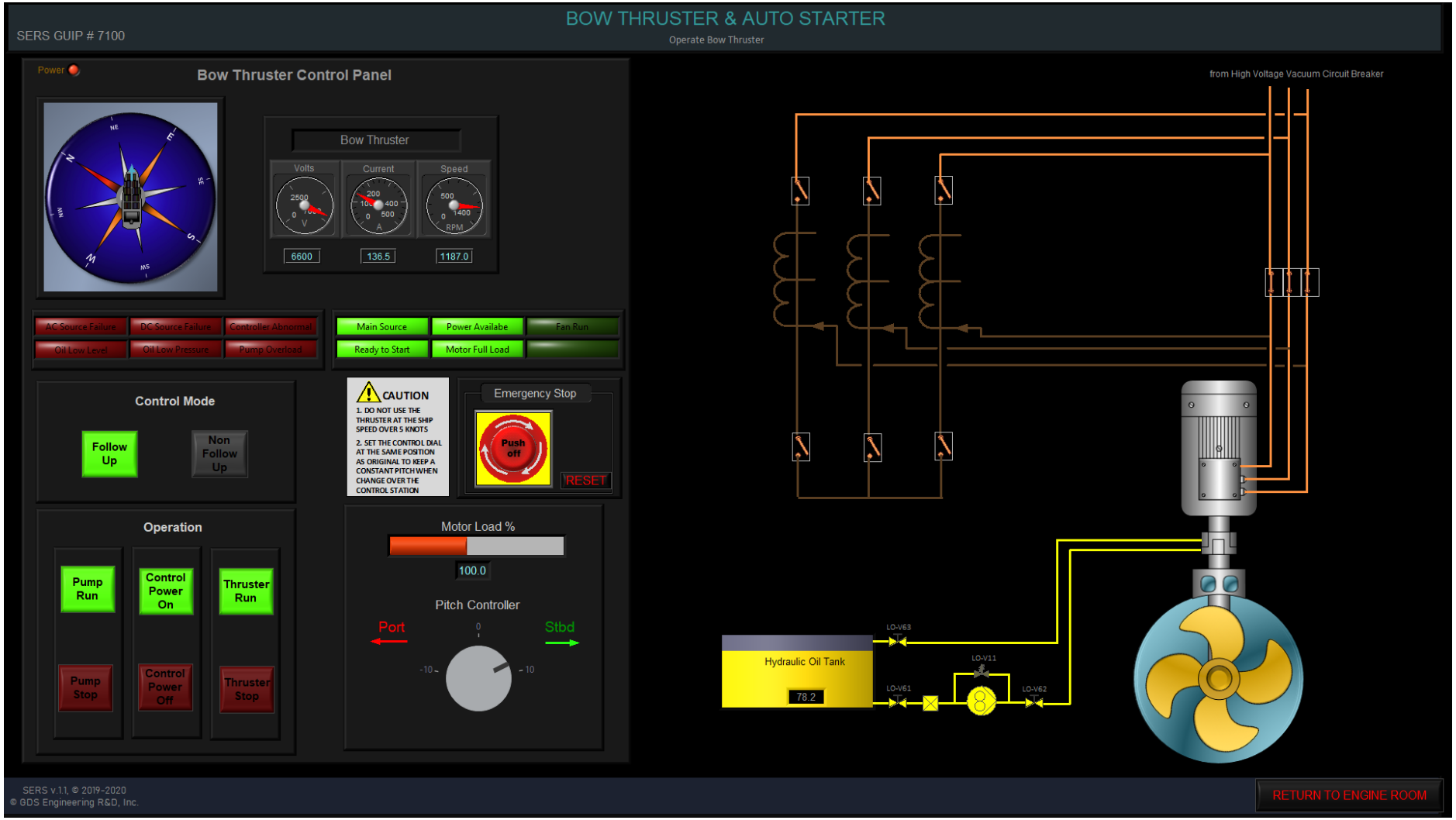

Figure 4.24.2 GUI Panel #5860: Bow Thruster & Auto Starter Panel – Bow Thruster is in Operation at %100 Load.

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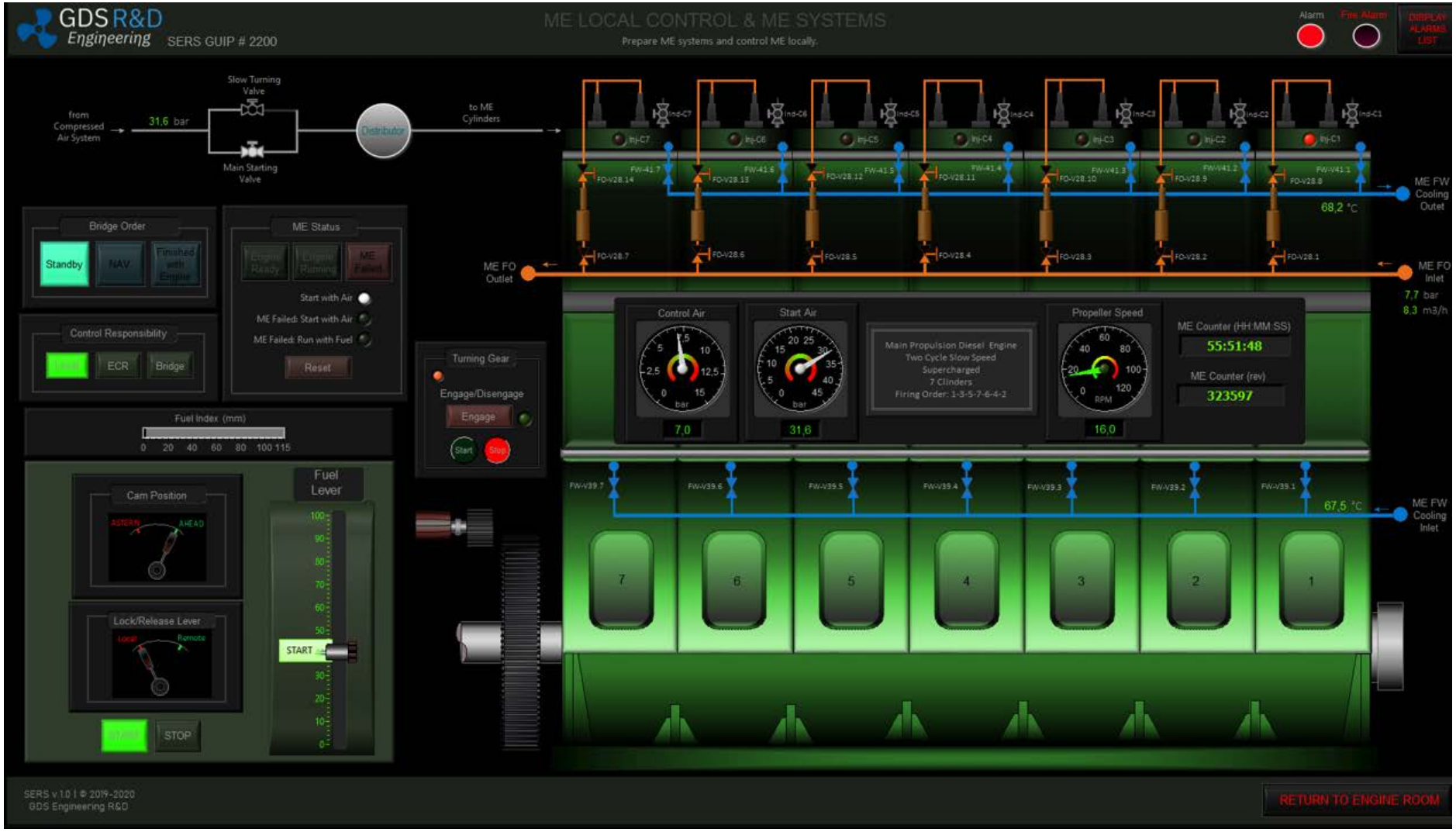
4.25 Preparing of Main Engine for Starting (GUIP #2200)



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4.25.1 Lining Up the ME for Starting

- Open Fresh Water Cooling System GUI Panel. (GUIP #3100)
- Ensure that the Main Engine has been warmed up.
- Open Preheater By-Pass Valve (FW-V36).
- Close Preheater FW Inlet and Outlet Valves (FW-V37 and FW-V38).
- Open HTFW Pump 1 or 2 Suction Valve (FW-V30 or FW-V31).
- Open ECR Panels: Pumps & Compressors GUI Panel (GUIP #5450)
- Set switch corresponding HTFW Pump MAN mode and click START button.
- Observe RUNNING light is changed into GREEN.
- Observe HTFW Pressure and Temperature.
- Open Compressed Air GUI Panel. (GUIP #3200)
- Observe the sufficient compressed air in Air Receiver.
- Open ME Airs Main Inlet Valve (CA-V20).
- Open ME Start Air Inlet Valve (CA-V22).
- Open ME Maneuver System Air Inlet Valve (CA-V23).
- Open Control Systems Air Inlet Valve (CA-V24).
- Open ME Control (ECR) GUI Panel. (GUIP #2100)
- Set Auxiliary Blowers AUTO mode from the Auxiliary Blowers Control Panel.
- Observe Auxiliary Blower is started automatically.
- Click START button Supply Fans from the Supply Fans Control Panel. (When Main Engine is started, Engine Room Ambient Pressure will decrease. Supply Fans prevent this pressure drop.)

4.25.2 Turn ME with Turning Gear

- Inform the responsible Deck Officer for turning ME:
- Open ME Local Control & Systems GUI Panel. (GUIP #2200)
- Ensure Turning Gear Control Panel has been energized.
- Open Indicator Cocks (Ind-C1, Ind-C2, Ind-C3, Ind-C4, Ind-C5, Ind-C6, and Ind-C7).
- Click ENGAGE/DISENGAGE button.
- Observe the Turning Gear has been engaged.
- Click START button from the Turning Gear Control Panel.

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- Observe the any contaminant come from the indicator cocks.
- Click STOP button after turning gear for a while.
- Click ENGAGE/DISENGAGE button.

4.25.3 Start ME with Air (Indicator Valves are Open)

- Inform the responsible Deck Officer for turning ME:
- Observe the sufficient compressed air pressure at ME Local Systems.
- Set the Lock/Release Lever to “Local” position.
- Set Cam AHEAD or ASTERN position.
- Set the FUEL LEVER to 0 position.
- Click STOP button.
- Click START button.
- Observe the Main Starting Valve is opened and distributor is started for distributing compressed air according to the Main Engine Fire Order.
- Observe air is coming out of the indicator cocks.
  Note: Wait only few seconds.
- Stop turning ME via clicking STOP button.
- Close Indicator Cocks (Ind-C1, Ind-C2, Ind-C3, Ind-C4, Ind-C5, Ind-C6, and Ind-C7).

4.25.4 Start ME with Air (Indicator Valves are Closed)

- Inform the responsible Deck Officer for turning ME:
- Observe the sufficient compressed air pressure at ME Local Systems.
- Set the Lock/Release Lever to “Local” position.
- Set Cam AHEAD or ASTERN position.
- Ensure that the Indicator Cocks (Ind-C1, Ind-C2, Ind-C3, Ind-C4, Ind-C5, Ind-C6, and Ind-C7) are all closed.
- Set the FUEL LEVER to 0 position.
- Click STOP button.
- Click START button.
- Observe the Main Starting Valve is opened and distributor is started for distributing compressed air according to the Main Engine Fire Order.
  Note: Wait only few seconds.
- Stop turning ME via clicking STOP button.
- Close Indicator Cocks (Ind-C1, Ind-C2, Ind-C3, Ind-C4, Ind-C5, Ind-C6, and Ind-C7).

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4.25.5 Test ME with Fuel

- Inform the responsible Deck Officer for turning ME:
- Open High Pressure FO Pump FO Inlet Valves (FO-V28.1, FO-V28.2, FO-V28.3, FO-V28.4, FO-V28.5, FO-V28.6, and FO-V28.7)
- Check that the Control Responsibility is at LOCAL mode.
- Set Fuel Lever at about 30% (Place it on START).
- Click STOP button.
- Click START Button.
- When RPM reaches above 20-25, increase Fuel Lever gradually.
- Observe Propeller speed is increasing accordingly with the Fuel Lever (%).

For opening Air Coolers Inlet and Outlet Valves

- Open Fresh Water Cooling GUI Panel (GUIP #3100).
- Open Air Cooler 1 and 2 Inlet Valves (FW-V13 and FW-V15).
- Set Air Cooler 1 and 2 Outlet Valves Position (FW-V14 and FW-V16). (Air Cooler Outlet Valves are adjustable, the user controls the fresh water flow through coolers by adjusting the outlet valve position.)

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4.26 Transferring Control Responsibility in between ME Local Control and Engine Control Room (GUIP #2200 to GUIP #2100)

- Open ME Local Control & Systems GUI Panel. (GUIP #2200)
- Click ECR button from the Control Responsibility Panel.
- After Clicking ECR button will blinking. (This means, control responsibility must be accepted from the Engine Control Room.)
- Open ME Control (ECR) GUI Panel. (GUIP #2100)
- Observe ECR button is blinking.
- Ensure that the Fuel Lever at ECR and ME Local Control is the same position.
- Click ECR button from the Control Responsibility Panel.
- Observe ECR button turn GREEN, and LOCAL button fade out.
- Increase Fuel Lever gradually.
- Observe the following parameters:
    - Ship Speed
    - Propeller Speed
    - Shaft Power
    - Scavenge Air Pressure
    - LO Pressure and Temperature Inlet to ME
    - FO Pressure, Temperature, and Flow Inlet to ME
    - HTFW Temperature ME Inlet and Outlet

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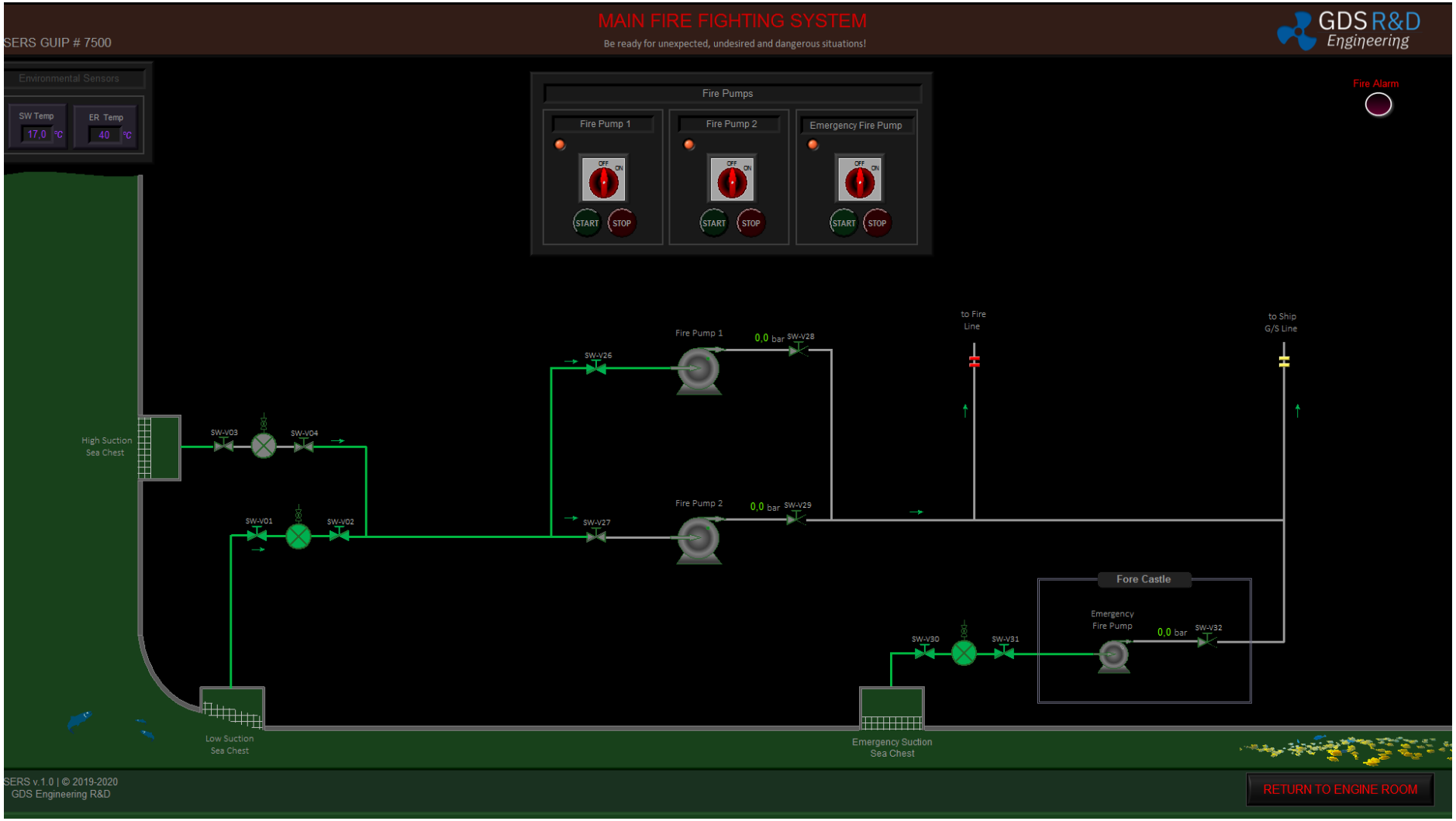
4.27 Main Fire Fighting System (in case of fire) (GUIP #7500)



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4.27.1 Operating Instruction

- Open Main Fire Fighting GUI Panel. (GUIP #7500)
- Ensure the Fire Pump 1, Fire Pump 2, and Emergency Fire Pump Control Panels have been energized.
- Open Low Suction or High Suction Sea Chest Filter Inlet and Outlet Valves (SW-V01 and SW-V02 or SW-V03 and SW-V04).
- Open Fire Pump 1 or Fire Pump 2 Suction and Discharge Valves (SW-V26 and SW-V28 or SW-V27 and SW-V29).
- Set switch ON position and click START button from the corresponding Fire Pump Control Panel.
- Observe the Discharge Pressure.

For operating Emergency Fire Pump:

- Open Emergency Suction Sea Chest Filter Inlet and Outlet Valves (SW-V30 and SW-V31).
- Open Emergency Fire Pump Discharge Valve (SW-V32).
- Set switch ON position and click START button from the Emergency Fire Pump Control Panel.
- Observe the Emergency Fire Pump Discharge Pressure.

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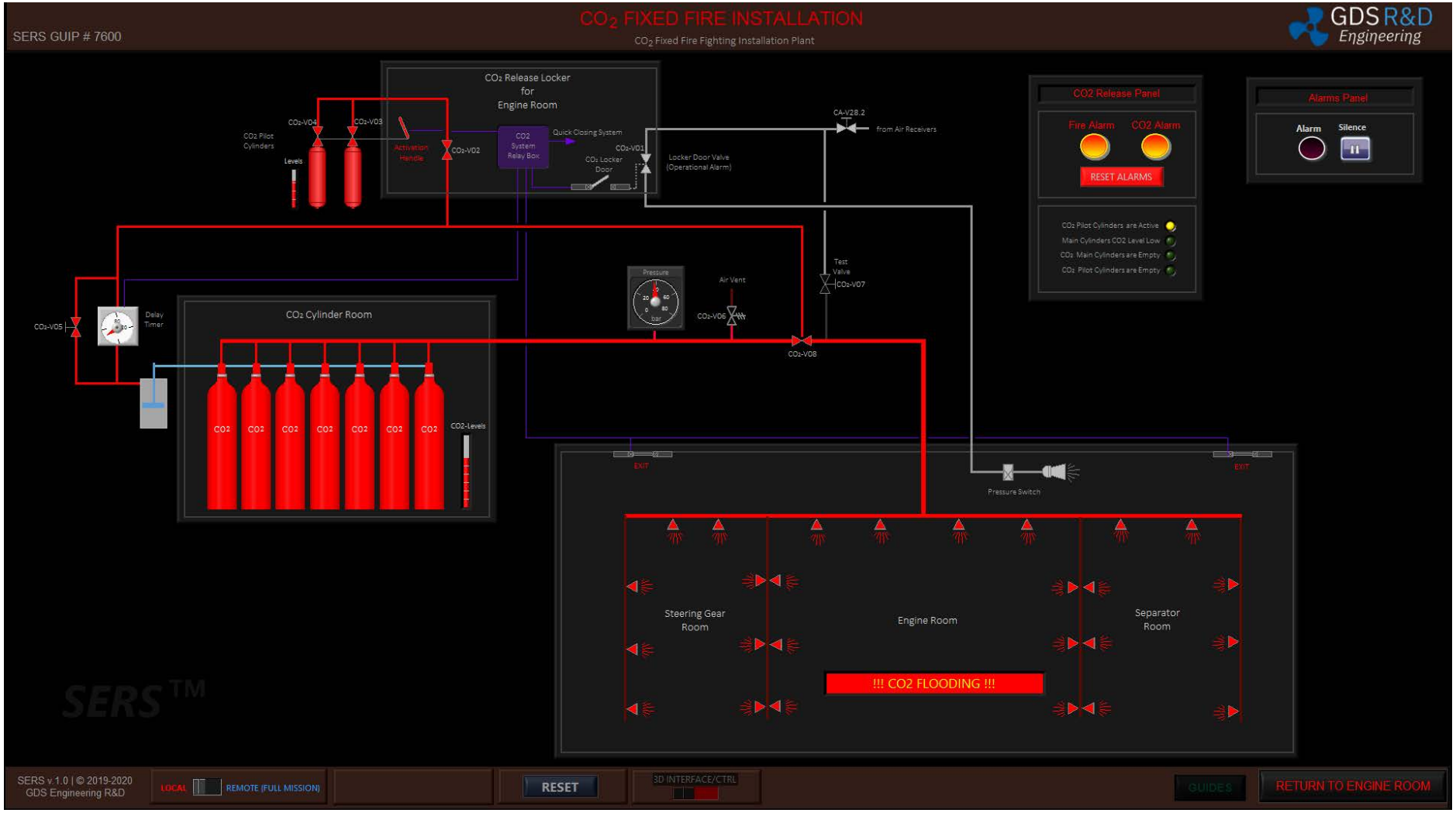
4.28 CO_2 Fixed Fire Installation (in case of fire) (GUIP #7600)



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4.28.1 Operating Instruction

- Open CO_2 Fixed Fire Installation GUI Panel. (GUIP #7600)
- Ensure compressed air reaches the system.
- Open Compressed Air Inlet Valve (CA-V28.2).
- Open CO_2 Locker Door. After the opening the door, Fire Alarm will be rising.
- Activate CO_2 Pilot Cylinders via Activation Handle.
- After the activation of CO_2 Pilot Cylinders, delay timer will be started. (Thus, personnel can evacuate from the engine room.)
- 60-90 seconds later, CO2 Floods through engine room. (Engine room exit door will be closed.)

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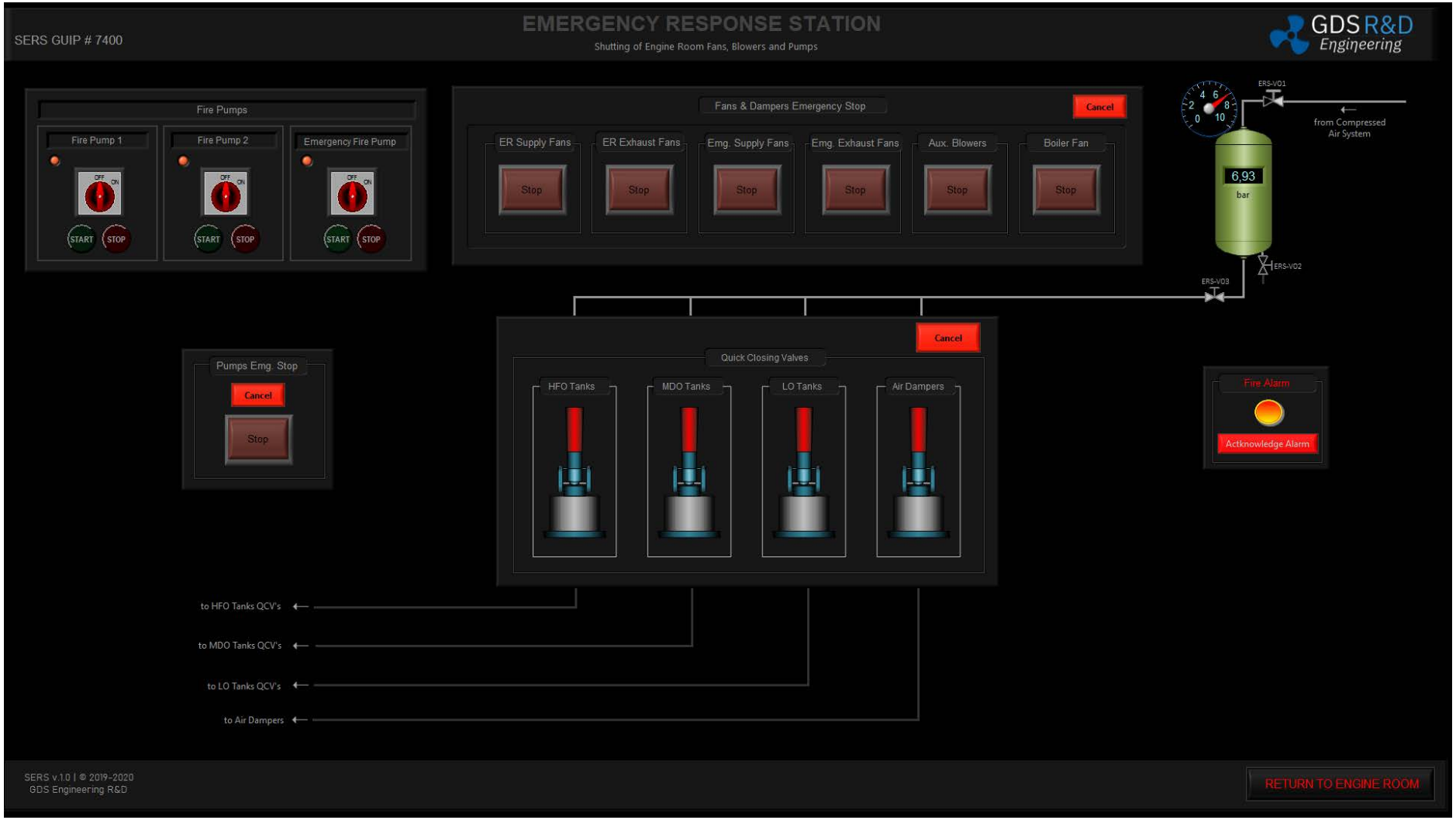
4.29 Emergency Response Panel (GUIP #7400)



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4.29.1 Operating Instructions

- Open Emergency Response GUI Panel. (GUIP #7400)
- Observe that compressed air reached to the system.
- Open Emergency Air Bottle Inlet Valve (ERS-V01).
- Observe the Emergency Air Bottle Pressure is rising.
- For draining, open Emergency Air Bottle Drain Valve (ERS-V02) for a short time.
- Open Emergency Air Bottle Outlet Valve (ERS-V03).
- Click ENABLE button for activation of the Quick Closing Valves from the Quick Closing Valves Panel.
- When the any Quick Closing Valve is closed, corresponding valve will be closed at corresponding system.
- Click ENABLE button for activation Emergency Stop Buttons from the Fans & Dampers Emergency Stop Panel.
- When the any Emergency Stop Button is clicked, corresponding fans or dampers will be closed at corresponding system.
- Click ENABLE button for activation Pumps Emergency Stop Button from the Pumps Emergency Stop Panel.
- When the Pumps Emergency Stop Button is clicked, all fuel and lubrication pumps will be stopped at all systems.
- Fire Pumps can be started from the Emergency Response GUI Panel. For starting fire pumps:
    - Ensure Fire Pumps Control Panel has been energized.
    - Set switch ON position and click START button from the Control Panels.

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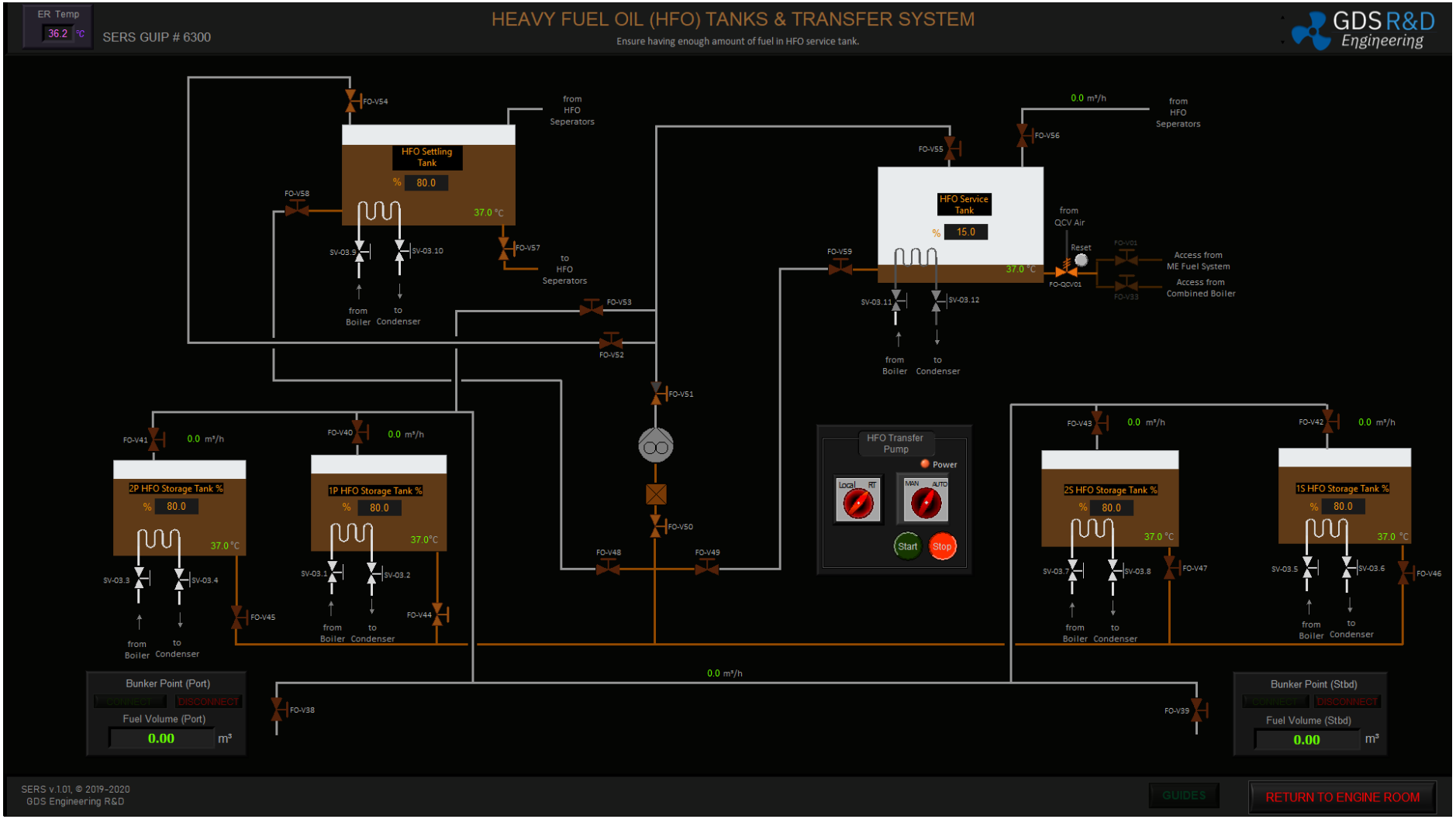
4.30 HFO Tanks & Transfer System (GUIP #6300)



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4.30.1 Operating Instructions

- Open HFO Tanks & Transfer GUI Panel. (GUIP #6300)
- Open one of the HFO Storage Tanks Steam Inlet and Outlet Valves (SV-03.1 and SV-03.2, or SV-03.3 and SV03.4, or SV-03.5 and SV-03.6, or SV-03.7 and SV-03.8).
- Open HFO Settling Tank Steam Inlet and Outlet Valves (SV-03.9 and SV-03.10).
- Open HFO Service Tank Steam Inlet and Outlet Valves (SV-03.11 and SV-03.12).
- Observe the temperature of the tanks is increasing.
- Ensure the HFO Settling Tank Level is sufficient for separating at the HFO Separator. If not, fill up via HFO Storage Tanks. For filling:
    - Ensure HFO Transfer Pump Control Panel has been energized. If not, check circuit breakers of HFO Transfer Pump at ON position. (GUIP #5500)
    - Open corresponding HFO Outlet Valve (FO-V44, or FO-V45, or FO-V46, or FO-V47).
    - Open HFO Transfer Pump Suction and Discharge Valves (FO-V50 and FO-V51).
    - Open HFO Settling Tank Fill Up Valve (FO-V52).
    - HFO Settling Tank Inlet Valve (FO-V54)
    - Open ECR Panels: Pumps & Compressors GUI Panel. (GUIP #5450) (The HFO Transfer Pump cannot be operated locally because it is in REMOTE mode.)
    - Set switch ON position and click START button from the HFO Transfer Pump Control Panel.
    - Set switch AUTO Mode from the HFO Transfer Pump Local Control Panel. (Thus, the HFO Transfer Pump will start automatically according to the HFO Settling Tank Level.)
    - Open HFO Tanks & Transfer GUI Panel (GUIP #6300)
    - Observe the HFO Settling Tank Level is increasing.
- Open HFO Settling Tank HFO Separators Outlet Valve (FO-V57).
- Open HFO Service Tank Inlet Valve (from the HFO Separators) (FO-V56).

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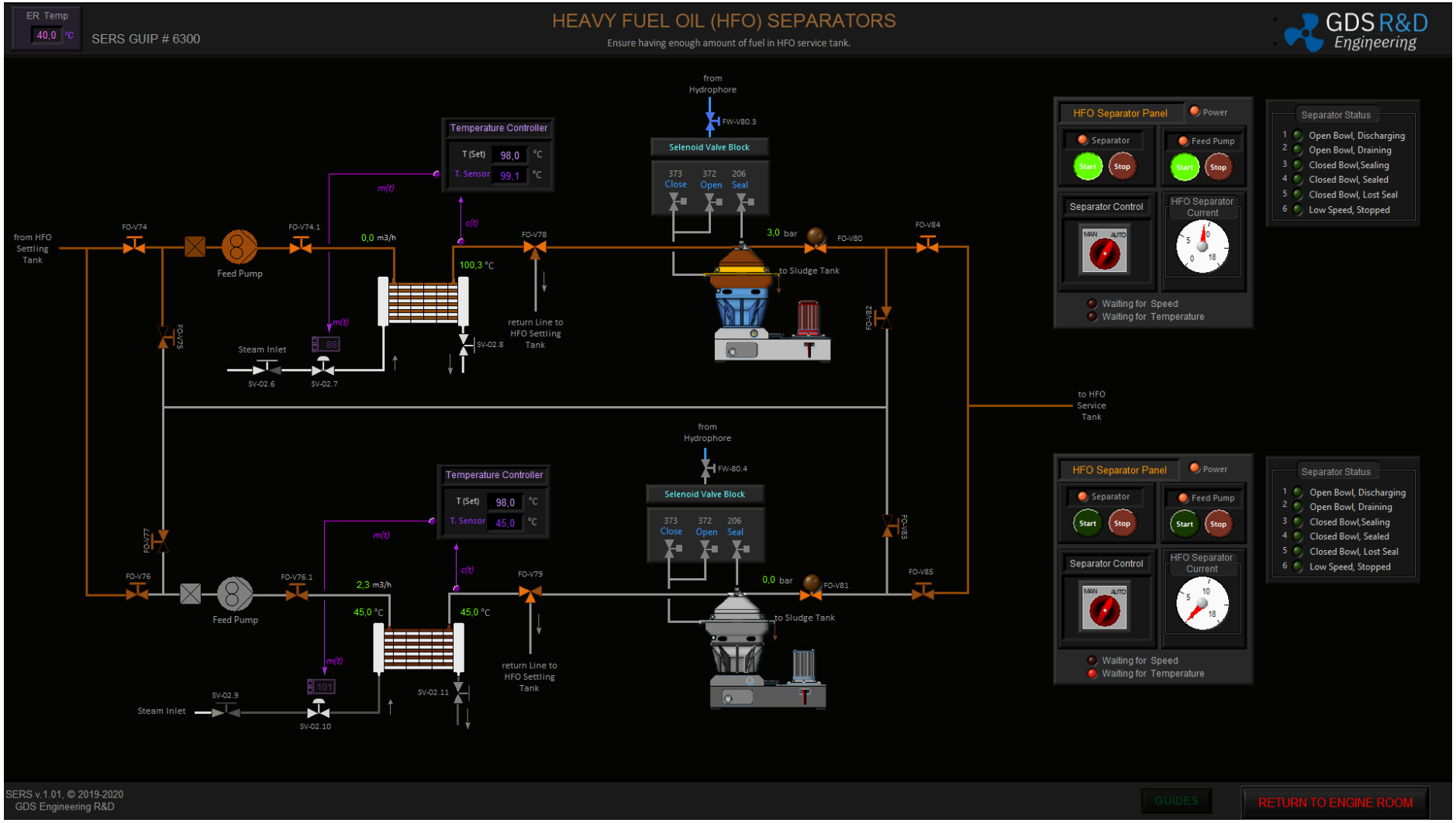
4.31 Lining Up HFO Separators (GUIP #6400)



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4.31.1 Operating Instructions

- Open HFO Separators GUI Panel. (GUIP #6400)
- Ensure the steam is reached at HFO Separators Heaters.
- Open HFO Separator 1 or 2 Feed Pump Suction and Discharge Valves (FO-V74 and FO-V74.1 or FO-V76 and FO-V76.1).
- Click START button from the corresponding Feed Pump Control Panel.
- Observe the Feed Pump is operated and provides the HFO through the Heater.
- Open Heater Steam Inlet and Outlet Valves (SV-02.6 and SV-08 or SV-02.10 and SV-02.11).
- Observe the HFO Temperature is rising.
- Ensure the HFO Separators supplied with Hydrophore Tank. (GUIP #4900)
- Open corresponding Operating FW Inlet Valve (FW-V80.3 or FW-V80.4).
- Set switch MAN position and click START button from the corresponding HFO Separator Control Panel.
- Switch AUTO mode after the rpm of the Separator is stabilized.
- Set corresponding HFO Back Pressure Adjusting Valve (FO-V80 or FO-V81).
- When the HFO temperature reaches the set value and the rpm of the separator reaches the appropriate values, the recirculation valve (FO-V78 or FO-V79) will change position and HFO will start going to the HFO Separator.
- Observe the HFO Separator Outlet Flows.
- Observe the HFO Service Tank Level is rising. (GUIP #6300)

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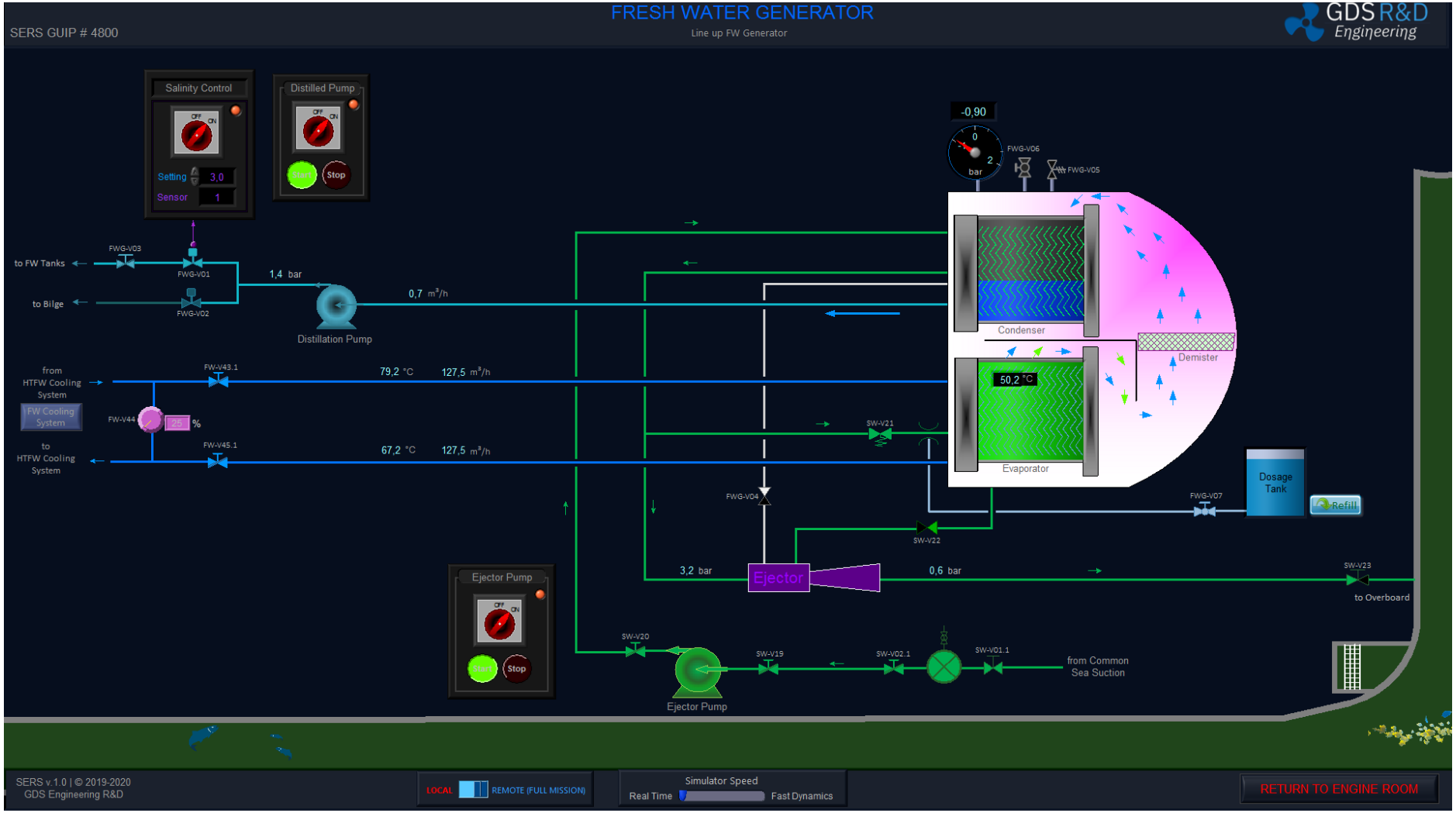
4.32 Fresh Water Generator (FWG) (GUIP #4800)



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4.32.1 Operating Instruction

- Open Sea Suction Filter Inlet and Outlet Valves (SW-V01.1 and SW-V02.1).
- Open Ejector Pump Inlet and Outlet Valves (SW-V19 and SW-V20).
- Open Overboard Valve (SW-V23).
- Ensure Ejector Pump Control Panel has been energized.
- Set switch ON and click START button from the Ejector Pump Control Panel.
- Observe the Vacuum is increasing and Evaporator level is rising.
- Open Fresh Water Cooling GUI Panel. (GUIP #3100)
- Open FWG FW Inlet Valve (FW-V43).
- Open FWG FW Outlet Valve (FW-V45).
- Set FWG FW By-Pass Valve appropriate percentage. (FWG FW By-Pass Valve should be adjusted so that the Fresh Water Generator Case Temperature is 50 °C.)
- Open Fresh Water Generator (FWG) GUI Panel. (GUIP #4800)
- Observe the Vacuum is reached at appropriate value. (FWG vacuum should be at 0.90 bar for generating fresh water.)
- Open Jacket Water Inlet Valve (FW-V43.1).
- Open Jacket Water Outlet Valve (FW-V45.1).
- Observe that Jacket Water Inlet and Outlet Temperature and Flow Rate.
- Observe that Fresh Water Generator Case Temperature is increasing. (When the Fresh Water Generator Case Temperature reached approximately 45 °C, Fresh Water Generator will generate the fresh water.)
- Observe that Condenser Level is increasing.
- Ensure Distilled Pump Control Panel has been energized.
- Ensure Salinity Control Panel has been energized.
- Set switch ON position and set salinity value from the Salinity Control Panel.
- Open FW Tanks Fill Up Valve (FWG-V03).
- Set switch ON position and click START button from the Distilled Pump Control Panel.
- If the fresh water salinity is higher than the set value, Bilge Tank Inlet Valve (FWG-V02) will be energized. If the fresh water salinity is lower than the set value, FW Tank Inlet Valve (FWG-V01) will be energized.
- Open FW System & Hydrophore GUI Panel (GUIP #4900)
- Open Port or Starboard FW Tank Inlet Valve (FW-V61 or FW-V62).

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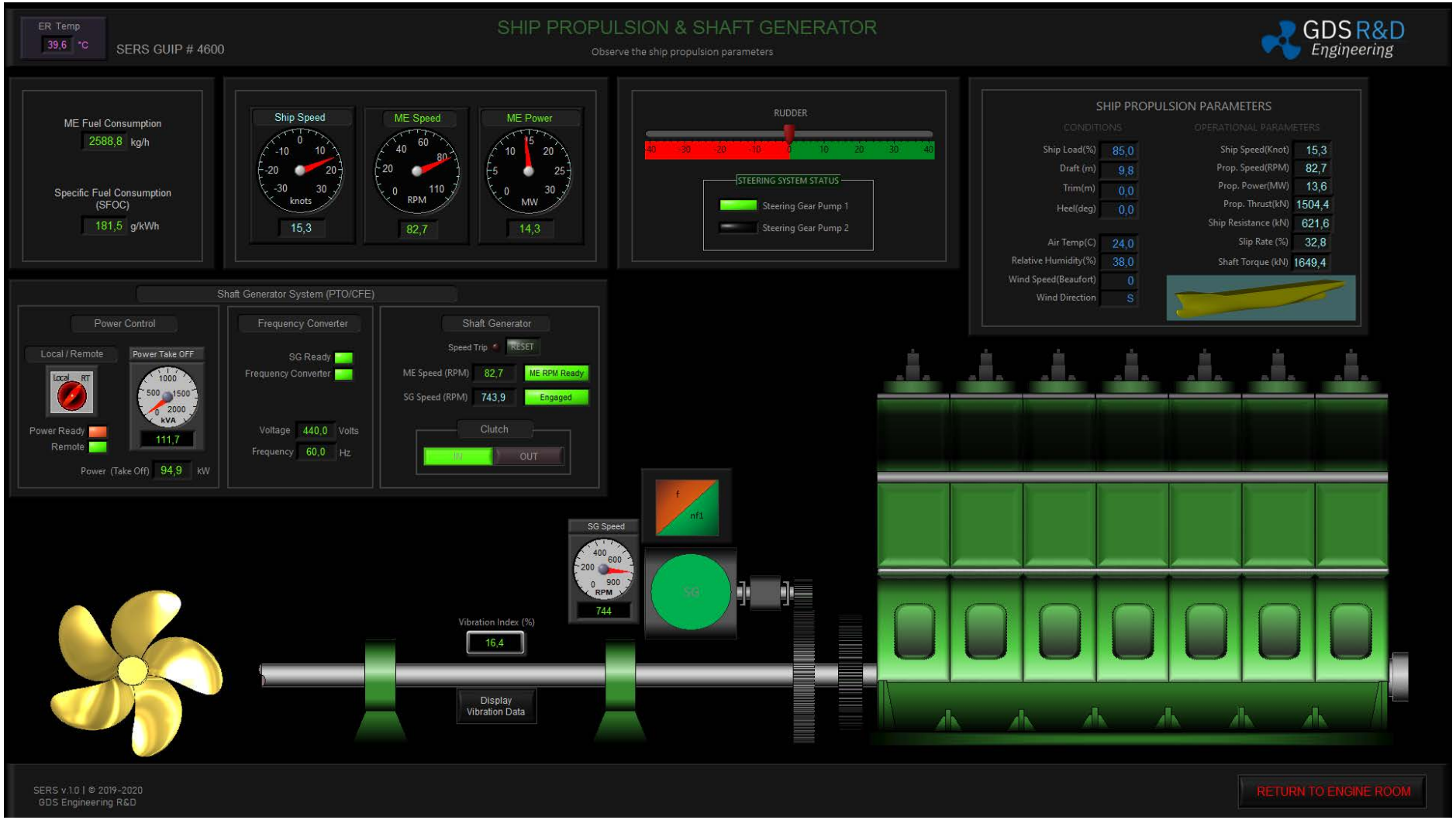
4.33 Lining Up Shaft Generator (GUIP #4600)



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After the ME Status RUNNING lamp lit, shaft generator can be operated from the Ship Propulsion and Shaft Generator GUI Panel. When the shaft generator's clutch is ENGAGED (IN position), the Main Engine Load will slightly increase because of mechanical losses before the shaft generator connected to the main bus bar. When the shaft generator is connected to the main bus bar, the main engine load will increase with the electrical power supplied by the shaft generator to the main bus accordingly. Note that the efficiency of the shaft generator is 90%. The main engine is rpm controlled, therefore, the controller increases the fuel input with the load increase on the ME output.

4.33.1 Operating Instructions

- Open Ship Propulsion and Shaft Generator GUI Panel (GUIP #4600)
- Set switch Local mode from the Shaft Generator Power Control Panel.
- Observe the Engine Speed.
- Observe ME RPM Ready is lit at Shaft Generator Control Panel. (ME RPM Ready button will be lit, when the ME Speed reached at 76 rpm.)
- Click CLUTCH IN Button.
- Observe that Shaft Generator RPM is rising.
- Observe Shaft Generator is engaged.
- Observe Shaft Generator Ready is lit at the Frequency Converter Panel.
- Observe Frequency Converter is lit at the Frequency Converter Panel.
- Observe Power Ready is lit at the Power Control Panel.
- Open Fresh Water Cooling GUI Panel (GUIP #3100).
- Open Shaft Generator (SG) LO Cooler Inlet and Outlet Valves (FW-V27 and FW-V28).
- Open Electrical Power Plant GUI Panel (GUIP #5000)
- Select Shaft Generator (SG) from the Synchronization Panel for synchronizing.
- Set switch AUTO mode from the Synchronization Panel. (Thus, shaft generator will be synchronized automatically.)
- Click CONNECT button from the Shaft Generator Control Panel.
- Observe the load is equally shared with Diesel Generators from the Shaft Generator Control Panel.

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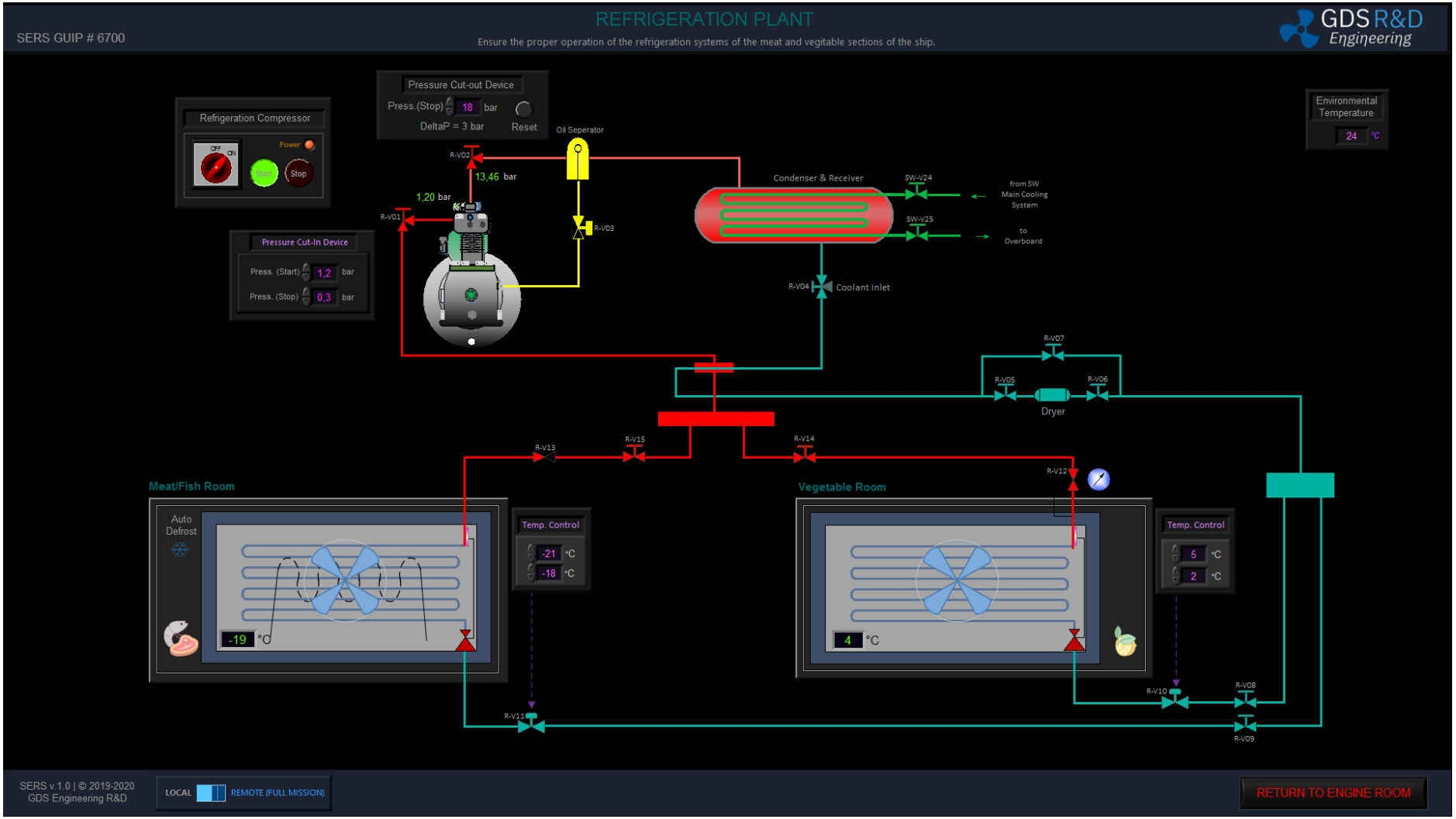
4.34 Refrigeration System (GUIP #6700)



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4.34.1 Operating Instructions

Lining up if the refrigeration system is not a priority when preparing the main engine. If the main engine will be prepared quickly, the refrigeration system can be lined up later.

The rooms where food is preserved on ships are called refrigeration rooms. Refrigeration rooms are divided into two as vegetable room and meat/fish room. The gaseous low pressure refrigerant coming to the refrigeration compressor inlet through the evaporator is compressed with the refrigeration compressor and its pressure and temperature are increased and sent to the condenser. The oil separator separates the oil contained in the refrigerant in the high pressure circuit and allows it to return to the refrigerant compressor housing. Air dryers are used to prevent the moisture that has entered the cooling circuit for any reason from freezing and causing heat losses in the system. Thermostatic Expansion Valve (TEV) where is located at the entrance of the refrigerant rooms, reduce the pressure of the refrigerant in the fixed enthalpy and at the same time adjust the amount of fluid to be sent to the refrigerant rooms.

- Open Oil Separator Outlet Valve (R-V03).
- Open Condenser Sea Water Inlet and Outlet Valves (SW-V24 and SW-V25).
- Open Dryer Inlet and Outlet Valve (R-V05 and R-V06).
- Open Vegetable Room and Meat/Fish Room Refrigerant Inlet Valve (R-V08).
- Open Vegetable Room and Meat/Fish Room Vapor Outlet Valve (R-V09)
- Open Refrigerant Compressor Discharge Valve (R-V02).
- Open Refrigerant Compressor Suction Valve (R-V01).
- Set Temperature of the Vegetable Room from Temperature Control Panel.
- Set Temperature of the Meat/Fish Room from Temperature Control Panel.
- Set Cut-in and Cut-out pressure from Pressure Cut-in/Cut-out Device.
- Ensure Refrigeration Compressor Panel has been energized. If not, check circuit breaker of the Refrigeration Plant at ON position. (GUIP #5500).
- Set ON Positon and Click START Button from Refrigeration Compressor Control Panel.
- Observe the compressor inlet and outlet pressure.
- Observe the Vegetable and Meat/Fish Room temperature is being decreasing.

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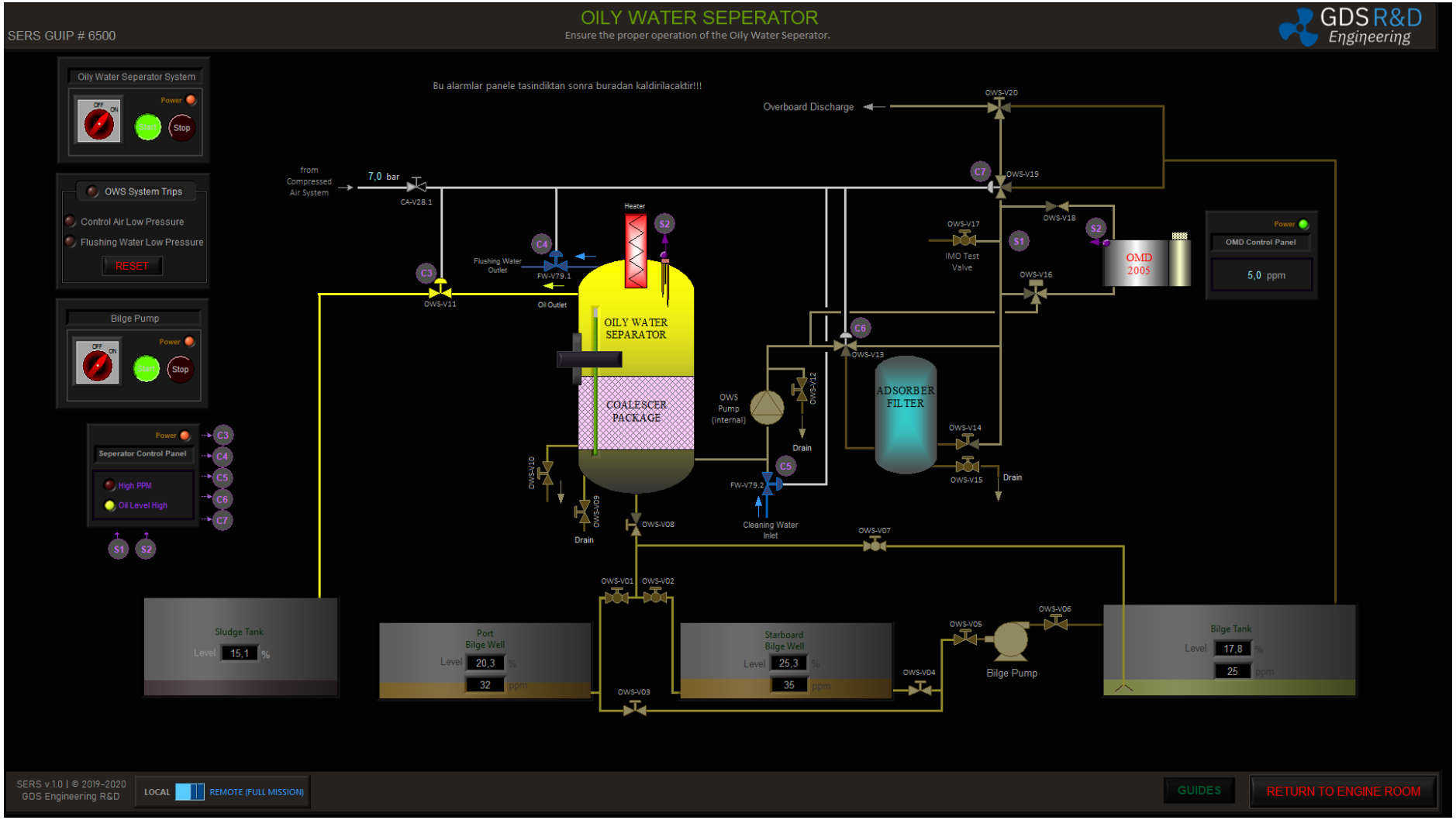
4.35 Oily Water Separator (GUIP #6500)



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4.35.1 Operating Instruction

- Open Oily Water Separator (OWS) GUI Panel. (GUIP #6500)
- Ensure that compressed air reaches at Oily Water Separator System.
- Ensure Oily Water Separator and pumps control panels has been energized.
- Ensure that fresh water reaches at Oily Water Separator System.
- Open Compressed Air Inlet Valve (CA-V28.1).
- Open Starboard and Port Aft Wells Outlet Valves (OWS-V03 and OWS-V04).
- Open Bilge Pump Suction and Discharge Valves (OWS-V05 and OWS-V06).
- Set switch ON position and click START button from the Bilge Pump Control Panel.
- Observe the Aft Wells level is decreasing and Bilge Tank level is increasing.
- Click STOP button from the Bilge Pump Control Panel when the Aft Wells are empty.
- Open Bilge Tank Outlet Valve (OWS-V07).
- Open Oily Water Separator Inlet Valve (OWS-V08).
- Set ON and click START button from the Oily Water Separator Pump Control Panel.
- Open Overboard Valve (OWS-V20).

Bilge water, which is sucked from the bilge by Oily Water Separator Pump and passed through the first stage separation unit, separates here in two different ways. While the oils floating on water are separated by gravity, emulsified oils are separated by COALESCER FILTER. After the separation, the oils are collected at the top of the tank in the first stage and measured with the oil sensor. The facilitate separation, a heater is placed on the tank.

In the second stage, separation is provided with ADSORBER FILTER. In order to prolong life of this filter, an automatic by-pass valve (OWS-V13) is installed between the two stages. The OMD device periodically measures the pollution of bilge water and discharge it through overboard without pass at Adsorber Filter, if the bilge water below 14 ppm. Thus, the adsorber filter is prevented from getting dirty very frequently.

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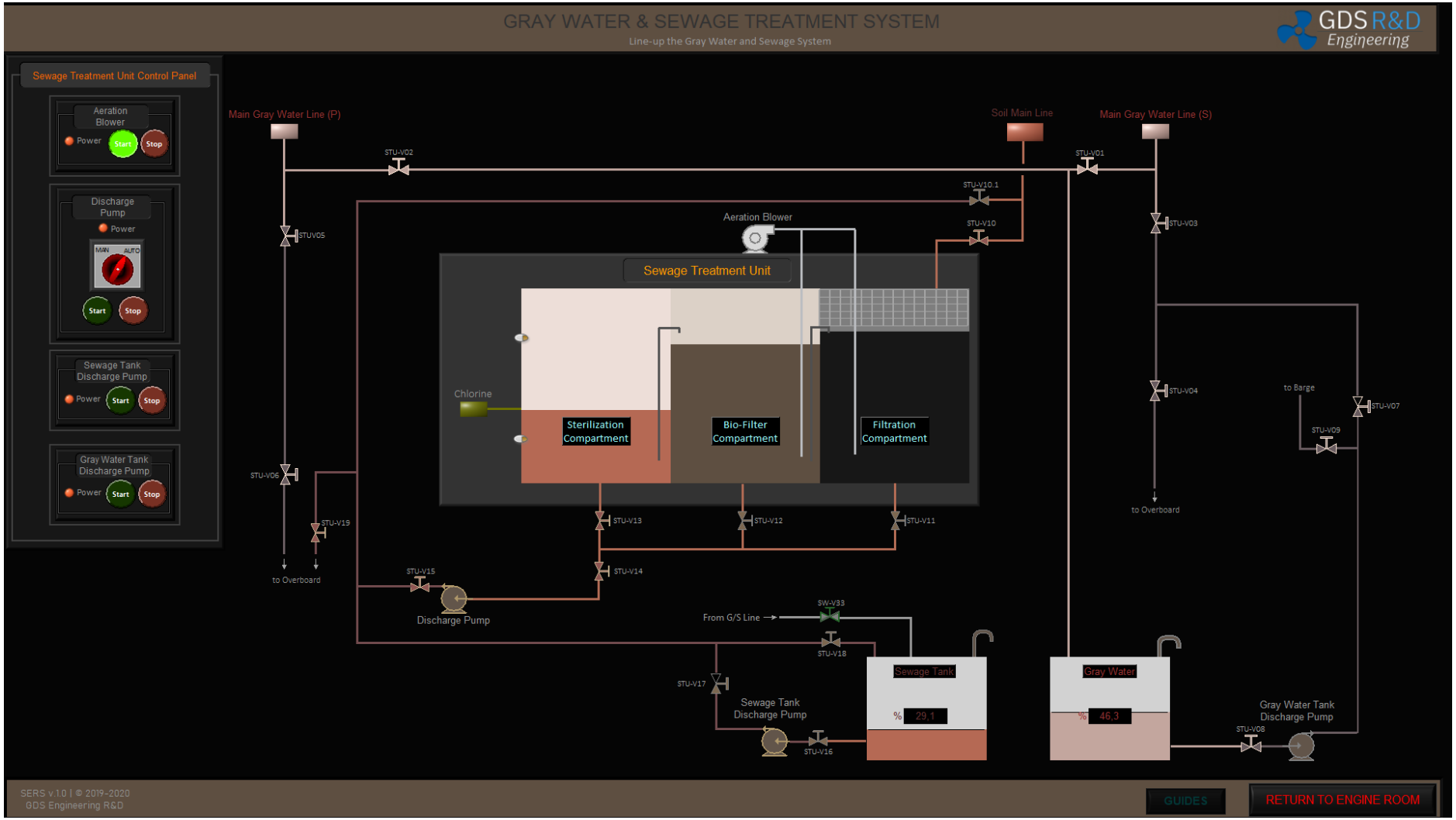
4.36 Gray Water & Sewage Treatment Unit (GUIP #6600)



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4.36.1 Operating Instruction

- Open Gray Water & Sewage Treatment GUI Panel (GUIP #6600)
- Ensure Aeration Blower, Discharge Pump, Sewage Tank Discharge Pump, and Gray Water Tank Discharge Pump Control Panels have been energized.
- Open Port and Starboard Gray Water Line Tank Inlet Valves (STU-V01 and STU-V02).
- Open Sewage Treatment System Inlet Valve (STU-V10).
- Click START button from the Aeration Blower Control Panel.
- Set switch AUTO position from the Discharge Pump Control Panel. (Thus, when the sterilization compartment level reached upper, the discharge pump will start automatically until level decrease at lowest level.)
- Open Sterilization Compartment Outlet Valve (STU-V13).
- Open Discharge Pump Suction and Discharge Valves (STU-V14 and STU-V15).
- Open Overboard Valve (STU-V19)

For discharging Sewage Tank:

- Open Sewage Tank Suction and Discharge Valves (STU-V16 and STU-V17).
- Open Overboard Valve (STU-V19).
- Click START button from the Sewage Tank Discharge Pump Control Panel.
- After the discharging, click STOP button from the Sewage Tank Discharge Pump Control Panel.
- Close Overboard Valve (STU-V19).

For discharging Gray Water Tank:

- Open Gray Water Tank Discharge Pump Suction and Discharge Valves (STU-V08 and STU-V07).
- Open Overboard Valve (STU-V04) or Barge Discharge Valve (STU-V09).
- Click START button from the Gray Water Tank Discharge Pump Control Panel.
- After the discharging, click STOP button from the Gray Water Tank Discharge Pump Control Panel.
- Close Overboard Valve (STU-V04) or Barge Discharge Valve (STU-V09).

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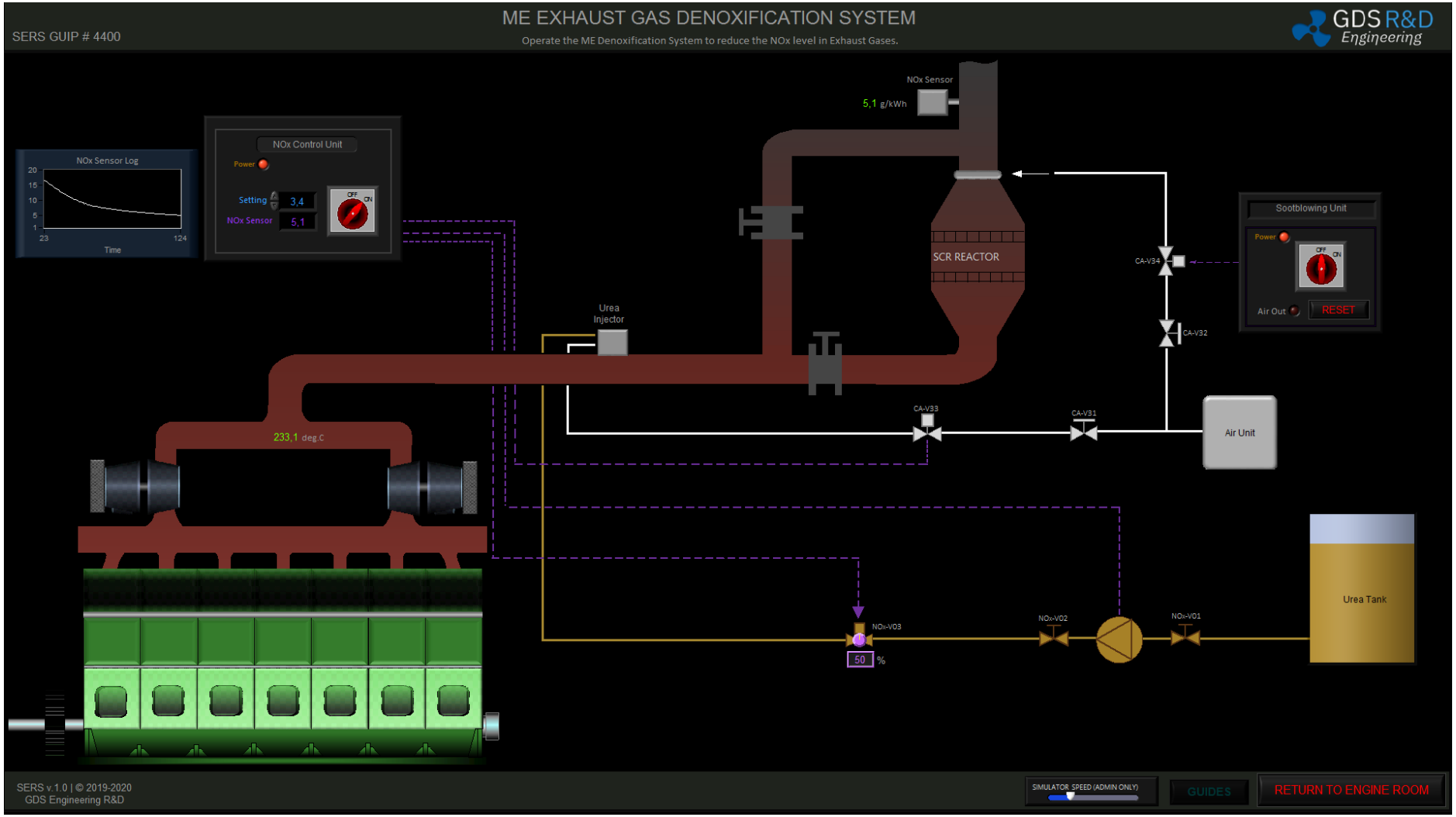
4.37 Lining Up Exhaust Gas Denoxification System (GUIP #4750)



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4.37.1 Operating Instructions

- Open Exhaust Gas Denoxification GUI Panel. (GUIP #4750)
- Observe the Sootblowing and NO_x Control Unit Panels have been energized.
- Open Urea Pump Suction and Discharge Valves (NO_x-V01 and NO_x-V02).
- Open Urea Injector Compressed Air Inlet Valve (CA-V31).
- Open Sootblowing Compressed Air Inlet Valve (CA-V32).
- Set switch ON position from the NO_x Control Unit.
- Set NO_x appropriate value from the NO_x Control Unit.
- Observe that the Urea Pump is started and Urea Amount Control Valve position is changing.
- Set switch ON position from the Sootblowing Unit Control Panel.
- Observe that the Sootblowing Air Pressure Control Valve position is changing.
- Observe that the amount of NO_x is decreasing.

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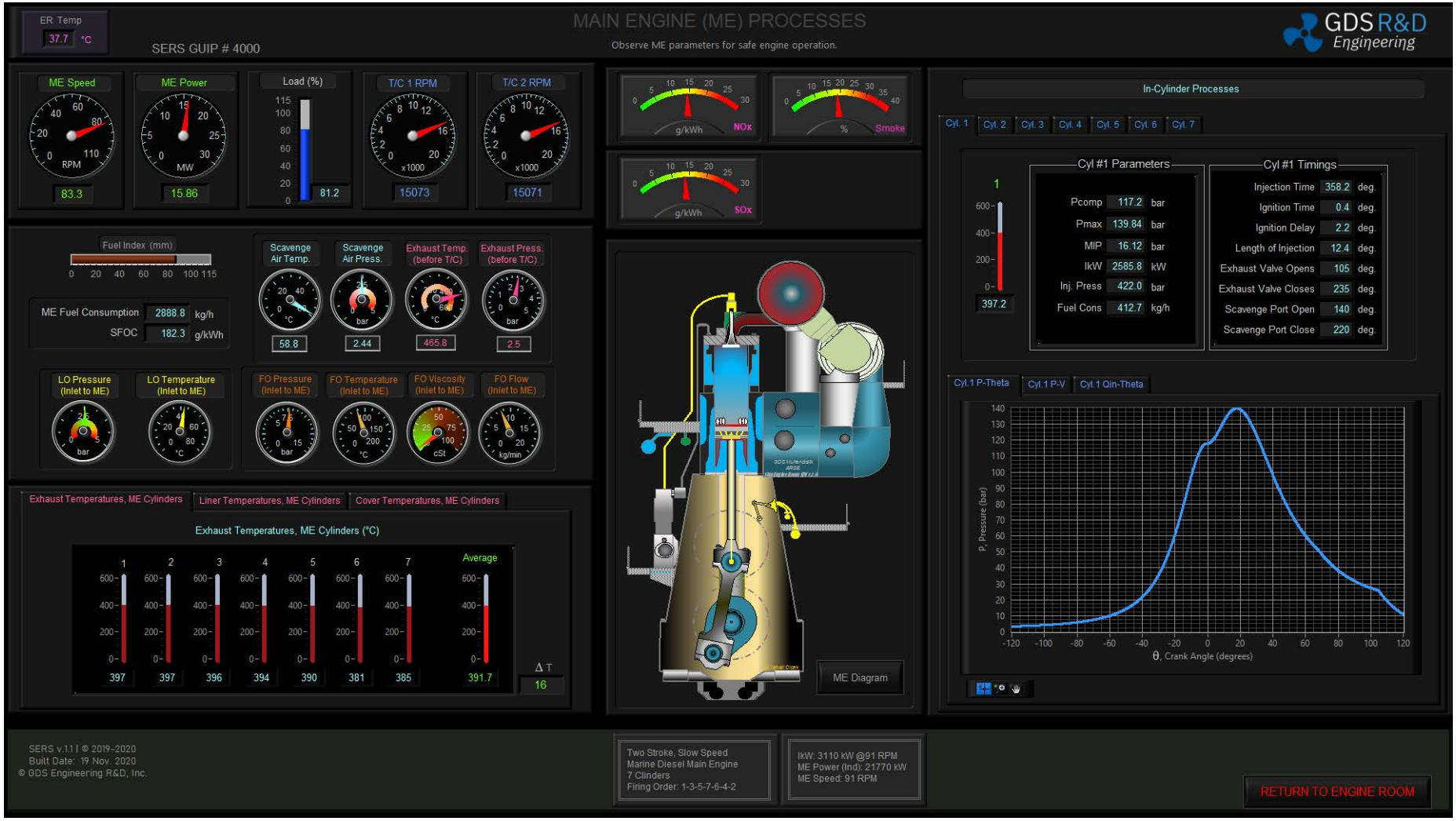
4.38 Observation of the Main Engine Parameters (GUIP #4000)



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4.38.1 Operating Instructions

The user must observe the main engine parameters for safe engine operations.

- Open Main Engine (ME) GUI Panel. (GUIP #4000)
- Observe the ME RPM and Shaft Power.
- Observe the Load, Fuel Index, ME Fuel Consumption and SFOC.
- Observe Scavenge Air Temperature and Pressure.
- Observe Exhaust Temperature before T/C.
- Observe Exhaust Pressure before T/C.
- Observe the LO Pressure and Temperature (Main Engine Inlet).
- Observe the FO Pressure, Temperature, Viscosity, and Flow (Main Engine Inlet).
- Observe ME Cylinders Exhaust Temperature.
- Observe the following parameters in cylinder process:
    - P_{comp}
    - P_{max}
    - MIP
    - IkW
    - Injection Pressure
    - Fuel Consumption
    - Injection Time
    - Ignition Time
    - T_{max}
    - Length of Injection
    - Exhaust Valve Opens and Closes Time
    - Scavenge Port Opens and Closes Time

- Click DISPLAY GRAPH button for P-θ diagram of the Main Engine.
- Observe the for P-θ, P-V, and Q_{in} diagrams.
- Click POWER, PRESS., P_{sca}, Exhaust T., etc. buttons for observation of stated diagram.

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4.39 Change Over Main Engine Fuel Oil (MDO to HFO) (GUIP #3500)

After the HFO gets warm, the main engine can be fed with HFO.

4.39.1 Operating Instruction

- Ensure that sufficient Heavy Fuel Oil at HFO Service Tank.
- Open HFO Service Tank Quick Closing Valve (FO-QCV01).
- Open HFO Service Tank (to Main Engine) Outlet Valve (FO-V01).
- Open Steam Tracing Valve (FO-V27).
- Set Pressure Regulating Valve (FO-V26) appropriate value.
- Open corresponding Heater Steam Inlet Valve (FO-V23 or FO-V24).
- Set Fuel Oil Viscosity and click AUTO button from the Viscosity Controller Panel. (HFO Viscosity should be at 15 cSt)
- Increase Mixing Valve (FO-V03) percentage gradually.
- Observe the viscosity.
- Observe that FO Viscosity Control Valve (FO-V25) position is changing according to the FO Viscosity.

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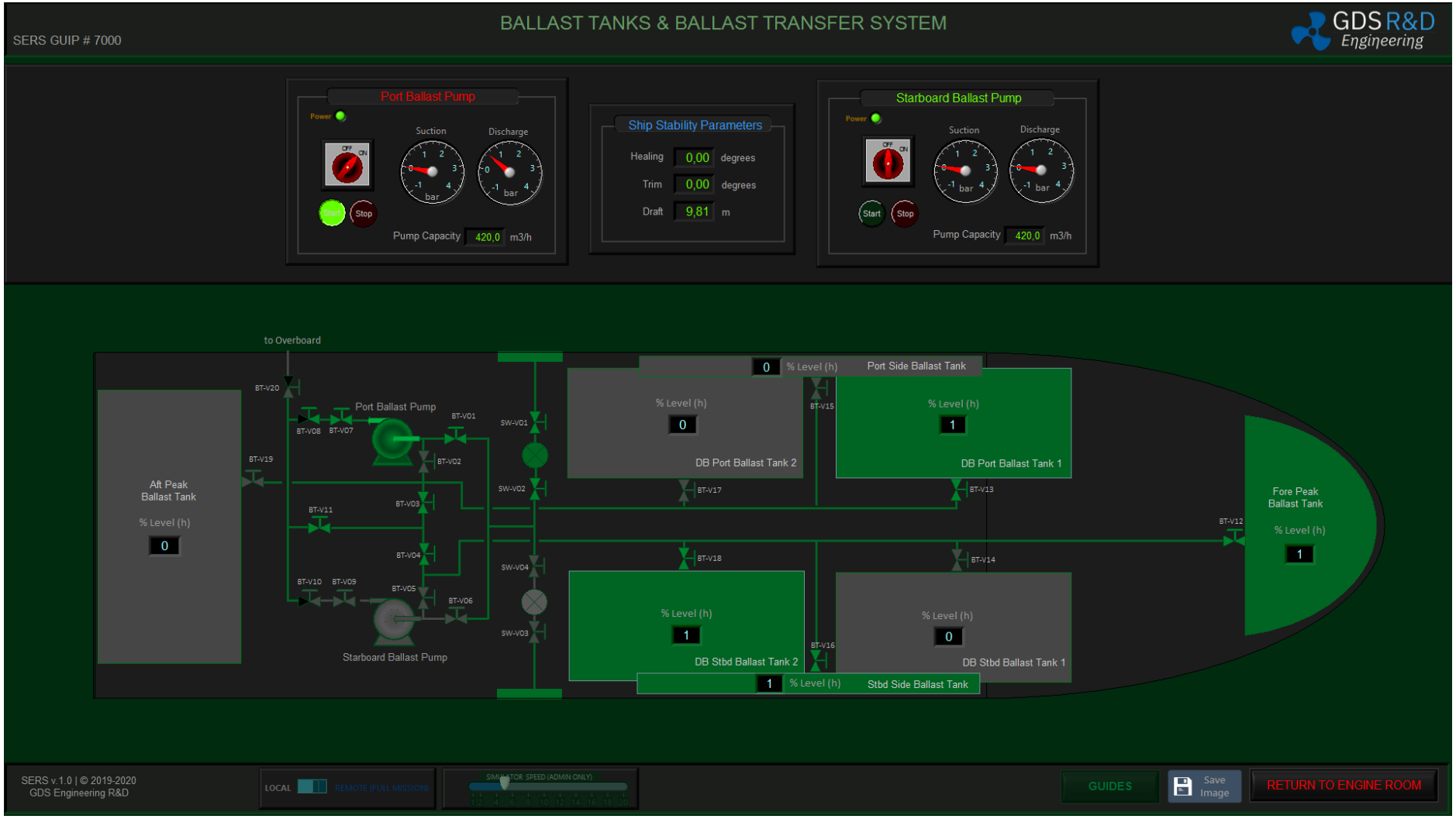
4.40 Ballast Transfer Operation (GUIP #7000)



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4.40.1 Operating Instructions

For filling up ballast tanks from sea:

- Open Ballast Tanks & Transfer GUI Panel. (GUIP #7000)
- Open Low or High Sea Chest Filter Inlet and Outlet Valves (SW-V01 and SW-V02 or SW-V03 and SW-V04).
- Open Port or Starboard Ballast Pumps Sea Water Suction and Discharge Valves (BT-V01, BT-V07, and BT-V08 or BT-V06, BT-V09, and BT-V10).
- Open Main Interconnection Valve (BT-V11).
- Open Port and/or Starboard Interconnection Valves (BT-V03 and/or BT-V04).
- Open corresponding Ballast Tanks Inlet Valves (BT-V12, BT-V13, BT-V14, BT-V15, BT-V16, BT-V17, BT-V18, and BT-V19).
- Ensure Port and Starboard Ballast Pump Control Panels have been energized.
- Set switch ON position and click START button from the corresponding Ballast Pump Control Panel.
- Observe corresponding Ballast Tanks Level is increasing and Healing, Trim and Draft is changing according to the which ballast tanks is filled up.

For discharging of ballast tank:

- Open corresponding Ballast Tanks Inlet Valves (BT-V12, BT-V13, BT-V14, BT-V15, BT-V16, BT-V17, BT-V18, and BT-V19).
- Open Port or Starboard Ballast Pump Tank Suction and Discharge Valves (BT-V02, BT-V07, and BT-V08 or BT-V05, BT-V09, or BT-V10).
- Open Overboard Valve (BT-V20).
- Ensure Port and Starboard Ballast Pump Control Panels have been energized.
- Set switch ON position and click START button from the corresponding Ballast Pump Control Panel.
- Observe corresponding Ballast Tanks Level is decreasing and Healing, Trim and Draft is changing according to the which ballast tanks is discharged.

Ship Stability Parameters (Healing, Trim, and Draft) will change according to the Ballast Transfer Operation.

Ship Stability Parameters	Minimum Value	Maximum Value
Healing	-6°	6°
Trim	-2.02° Fore Trimmed	3.2° Aft Trimmed
Draft	9.8 m	11.2 m

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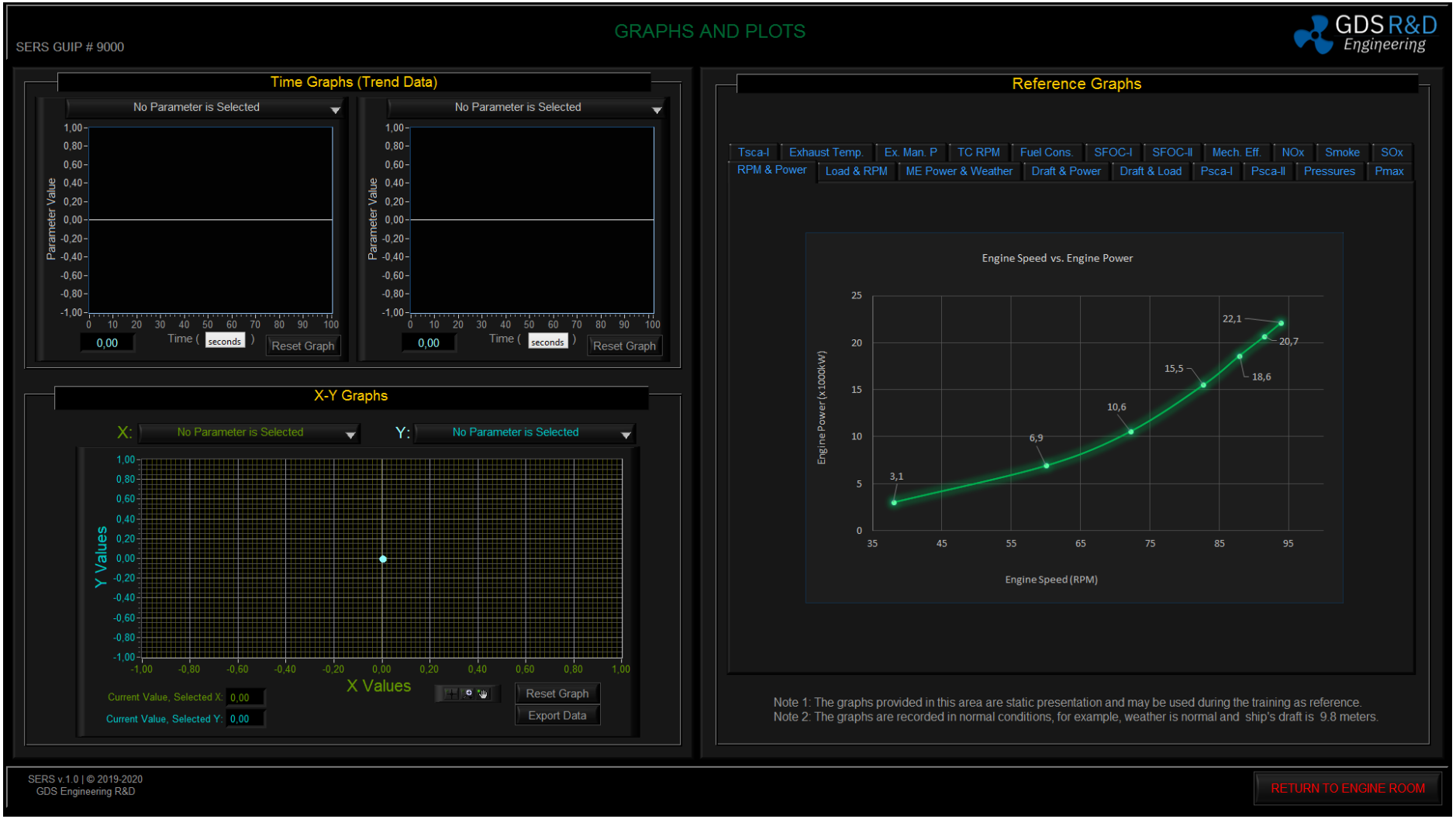
4.41 Observation Using Graphs and Plots (GUIP #9000)



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4.41.1 Operating Instructions

The user must observe the main engine parameters according to the graphics for safe engine operations.

- Open Graphs & Plots GUI Panel (GUIP #9000)
- Select a reference graph of interest on the Reference Graphs section.
- Follow instructions on User Manual Vol 1 Section 4.47 for selecting and plotting parameters simultaneously.
- Section 7.1 of this manual provides more details on the reference graphs
- Section 6.9 provides an example of plotting various parameters for demonstrating the effect of draft change on ME parameters.

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5. MONITORING ALARMS (SERS GUIP #8000)

5.1 Alarm Page Description

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 ones remain displaying the status being TRUE.

See Sections 5.1 thru 5.xx for all of the ALARMS implemented in the SERS software.

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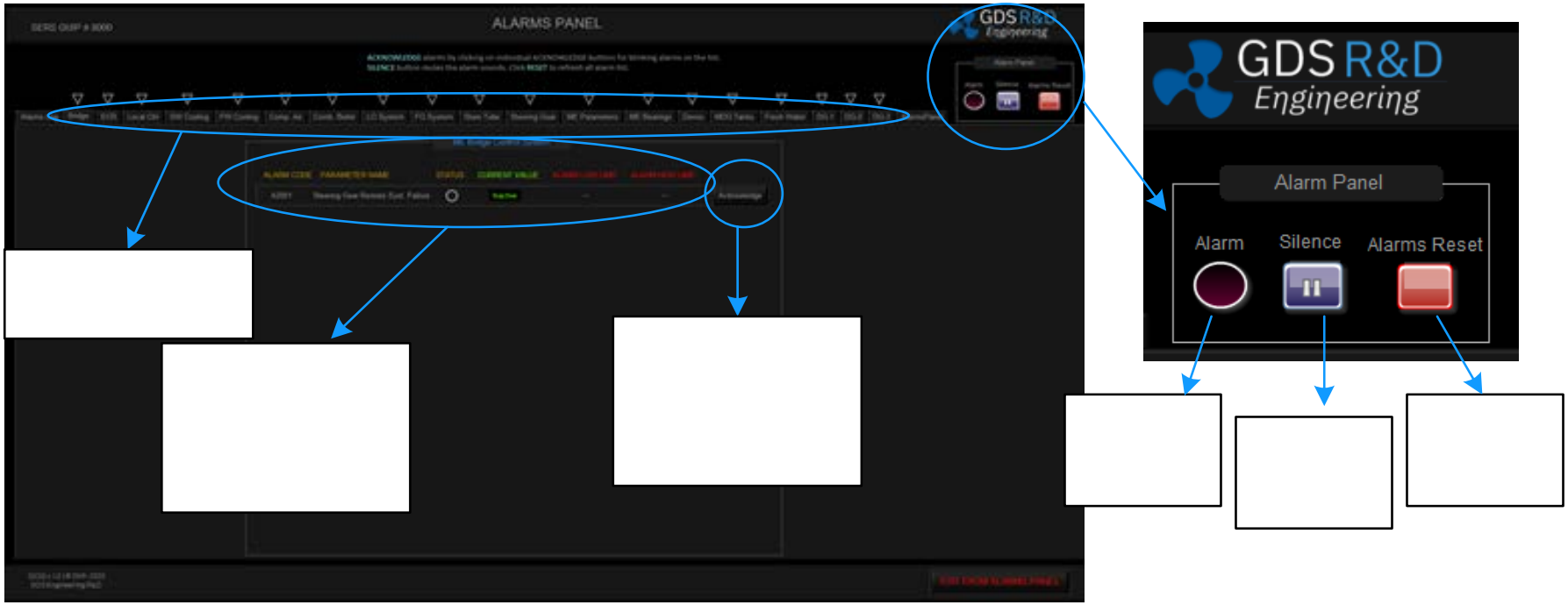

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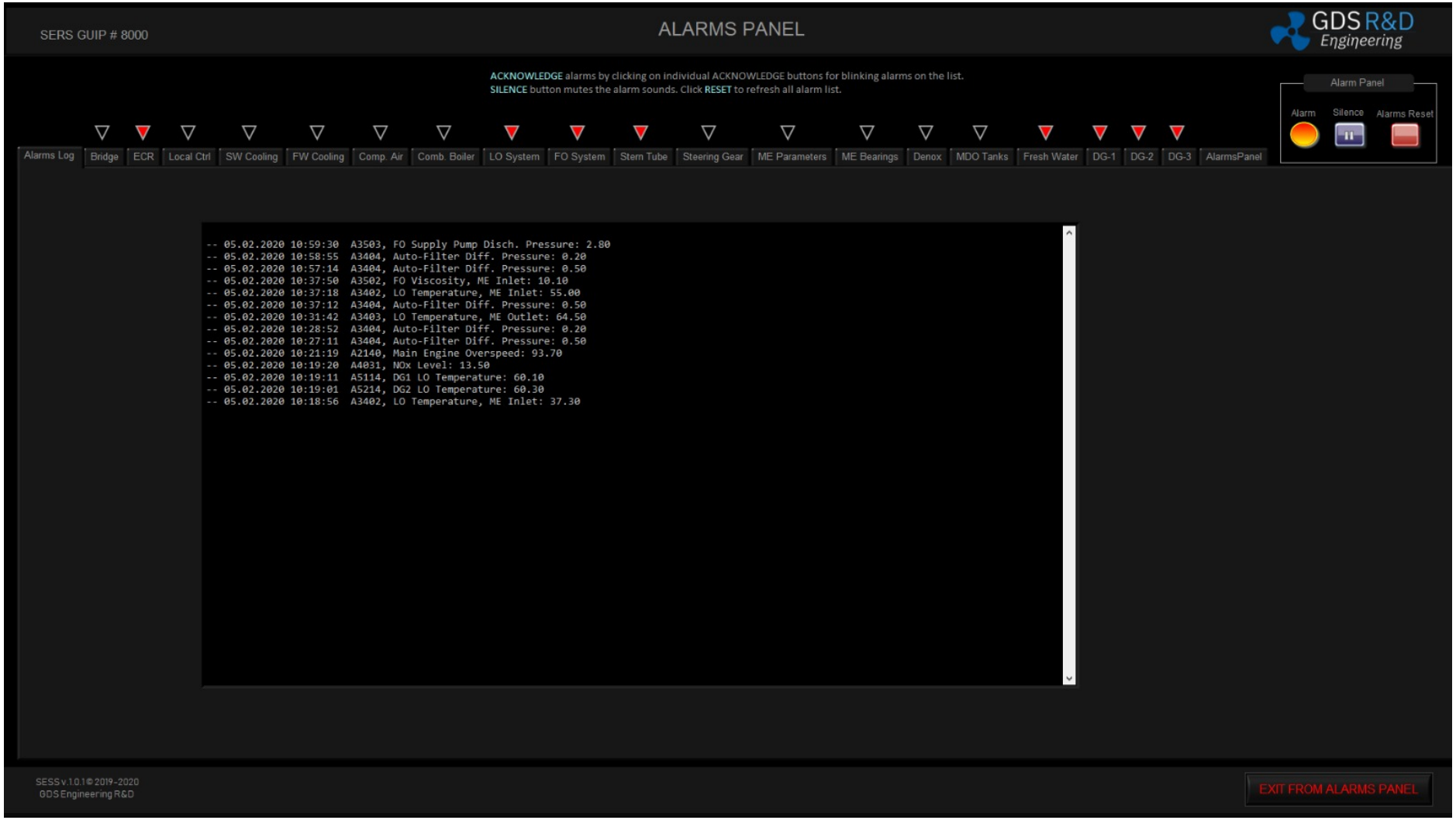
5.2 Alarm Log Page



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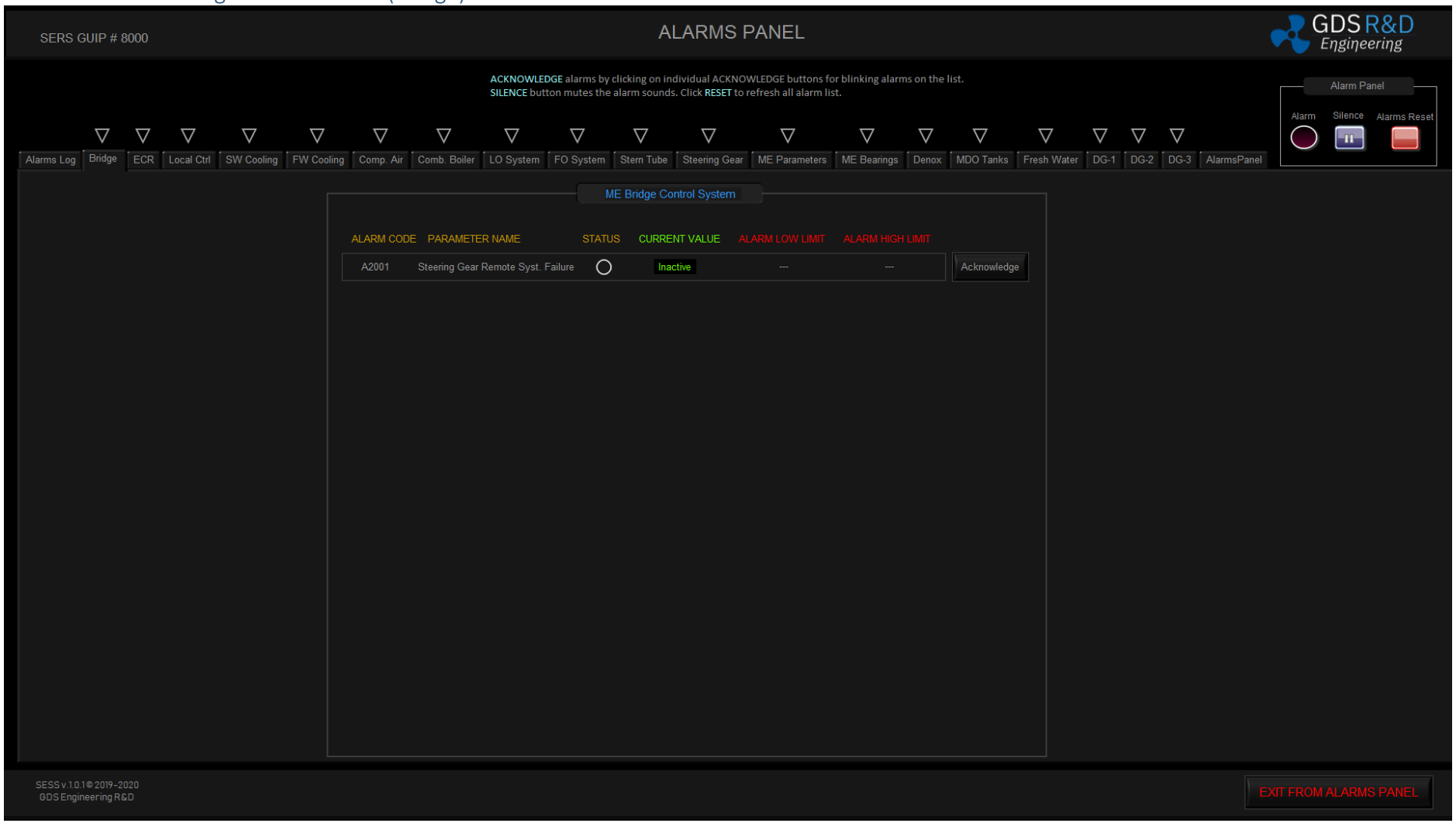
5.3 Alarm Pages

5.3.1 Alarms Page 1: ME Control (Bridge)



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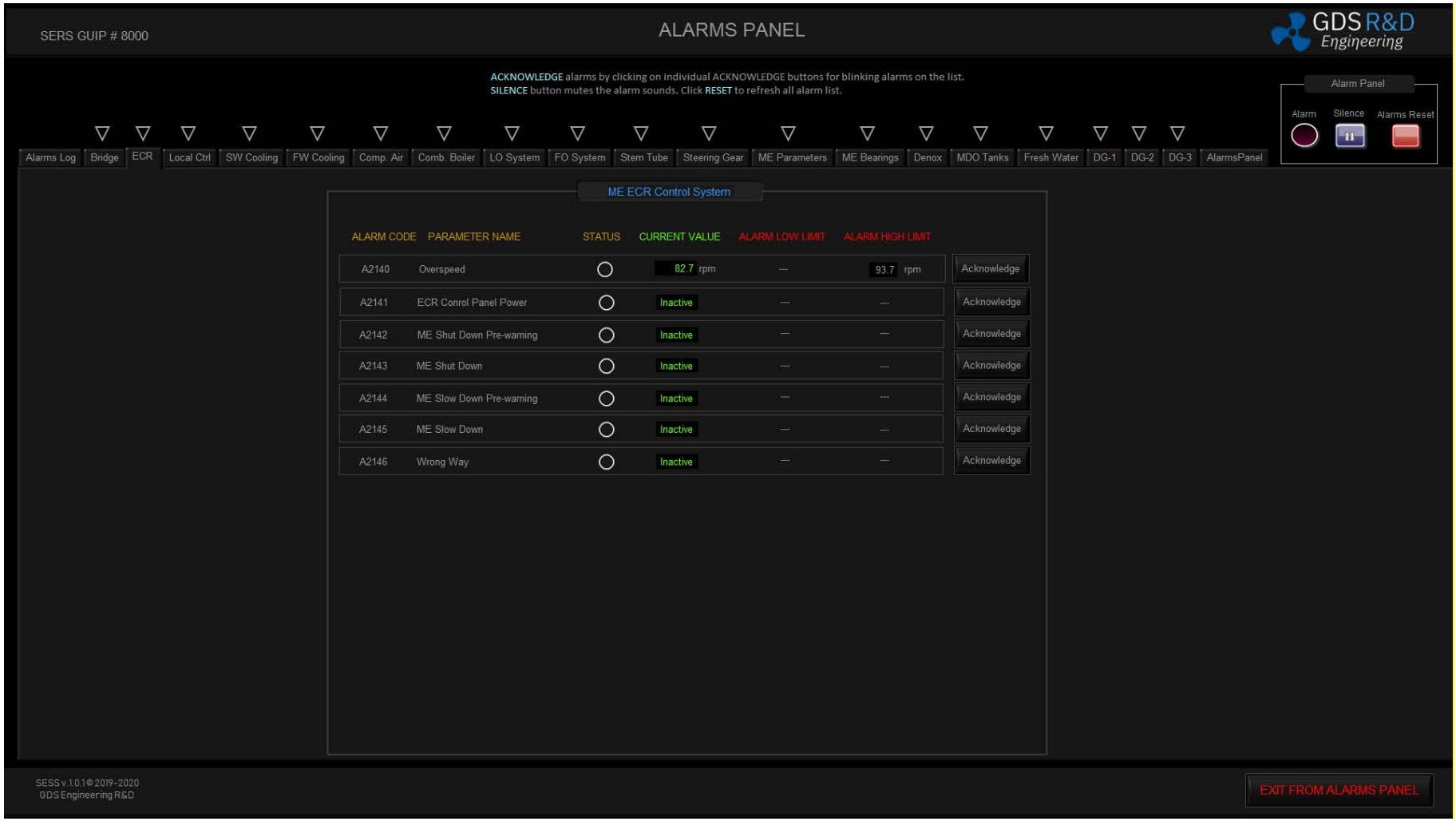
5.3.2 Alarms Page 2: ME Control (ECR)



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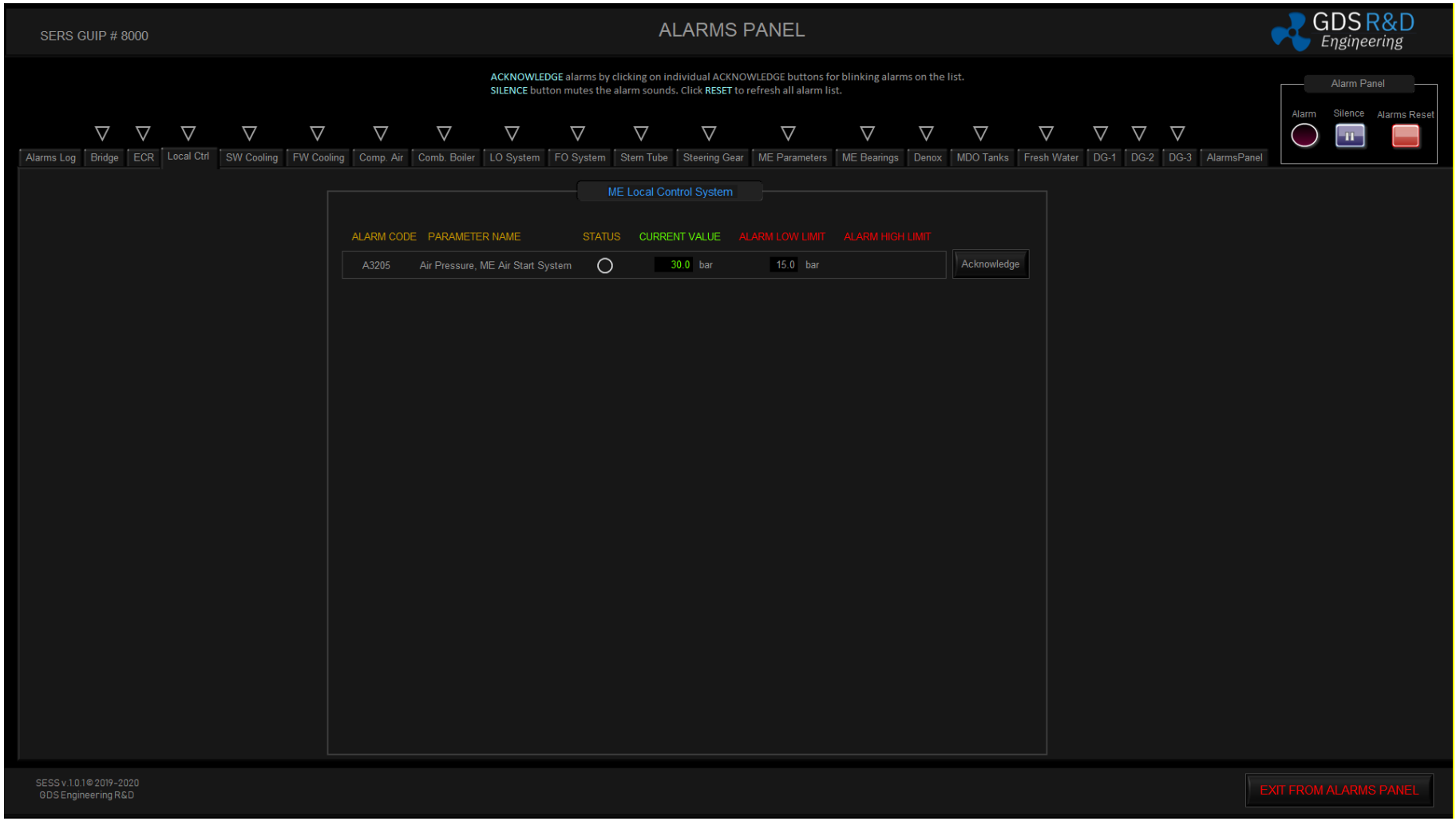
5.3.3 Alarms Page 3: ME Control (Local)



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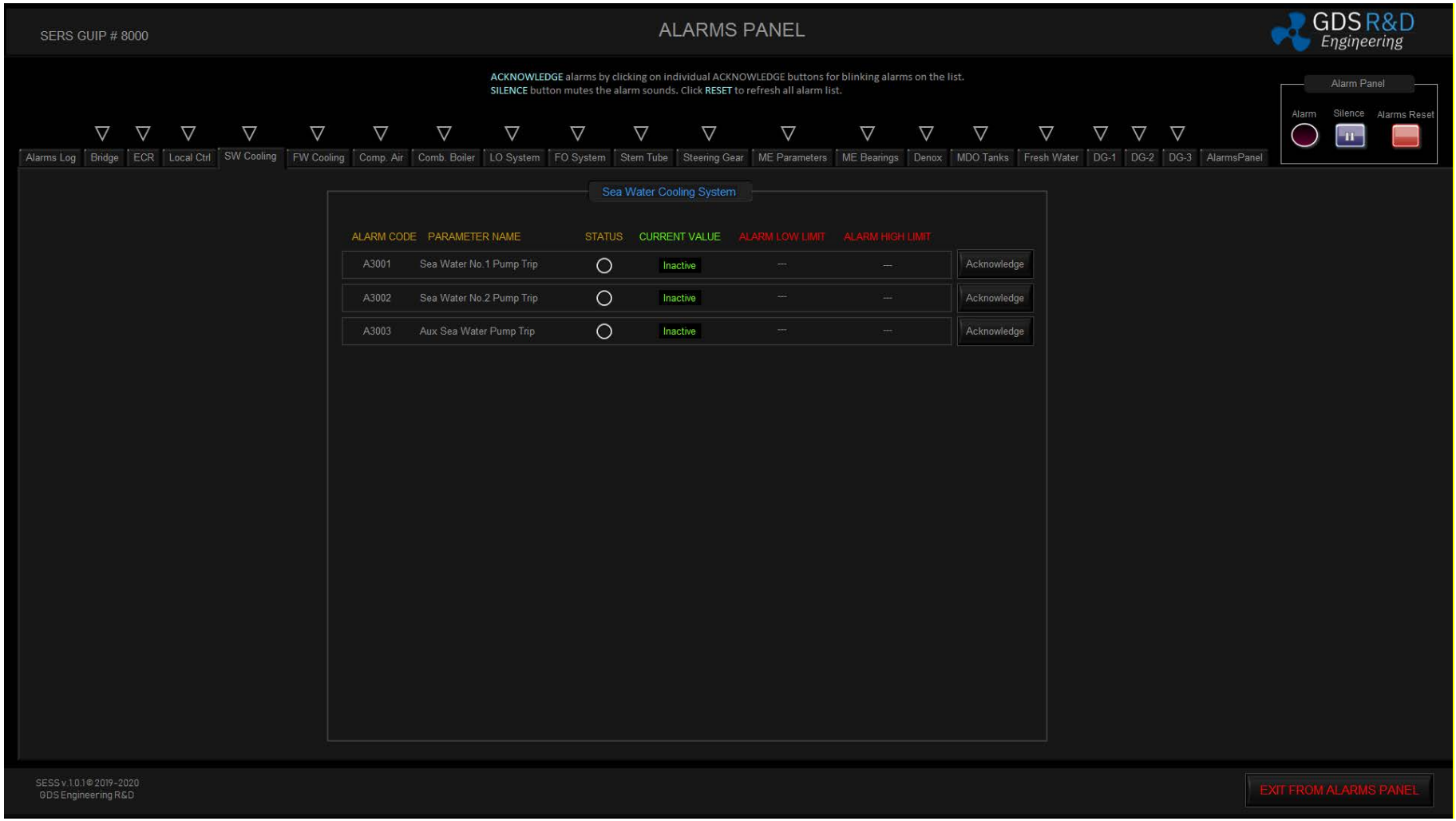
5.3.4 Alarm Page 4: SW Main Cooling System



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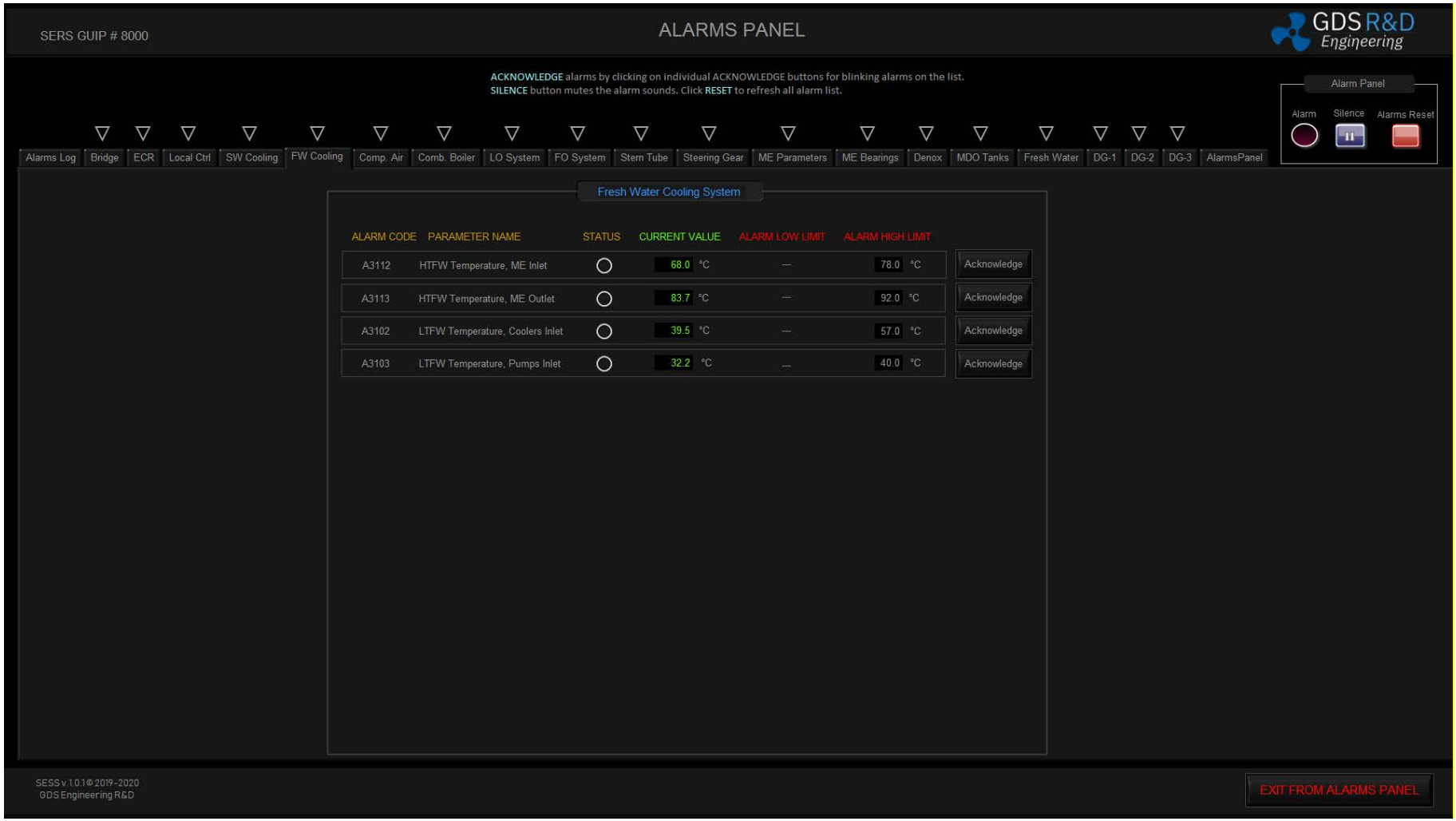
5.3.5 Alarm Page 5: FW Cooling System



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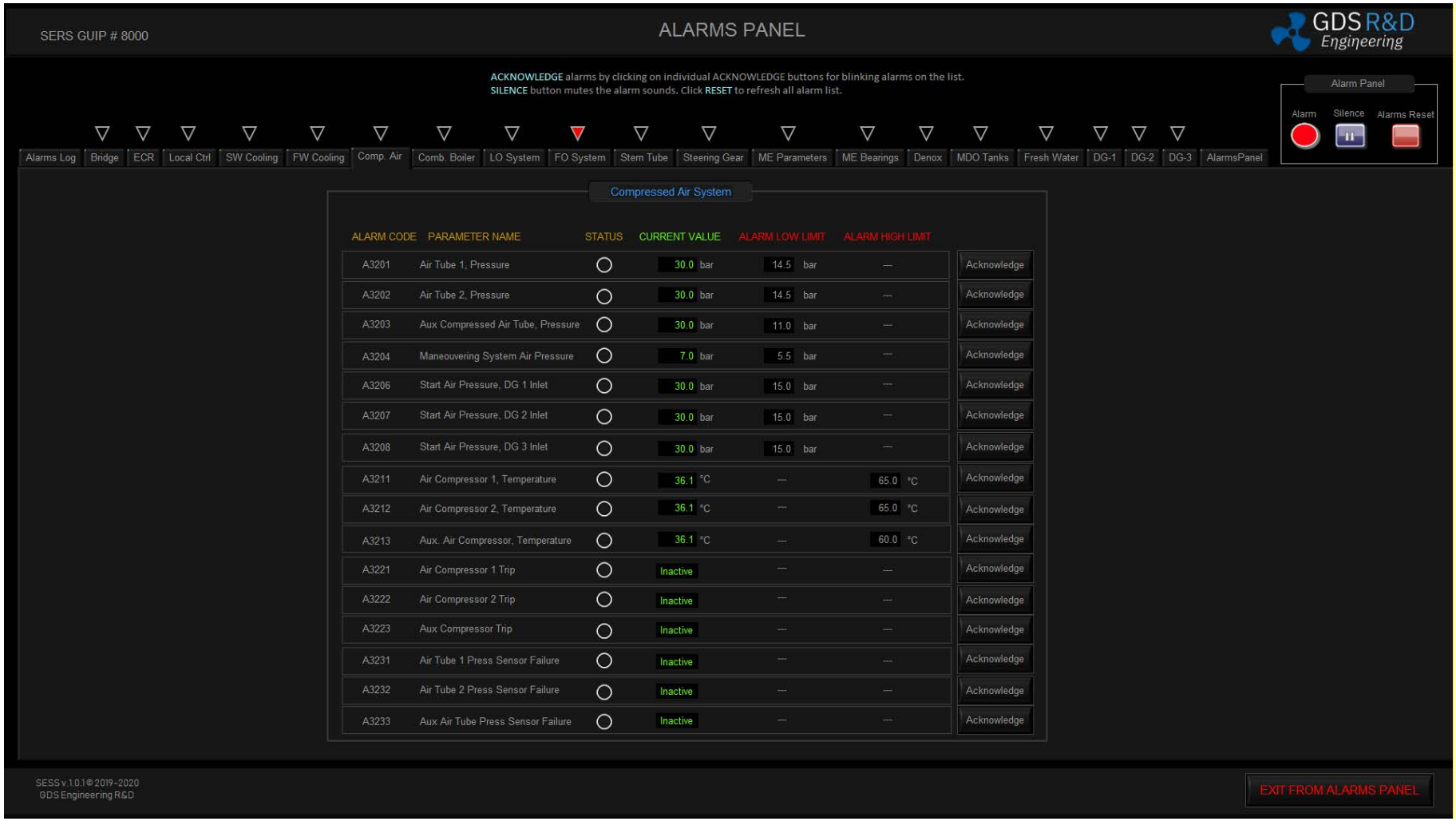
5.3.6 Alarm Page 6: Compressed Air System



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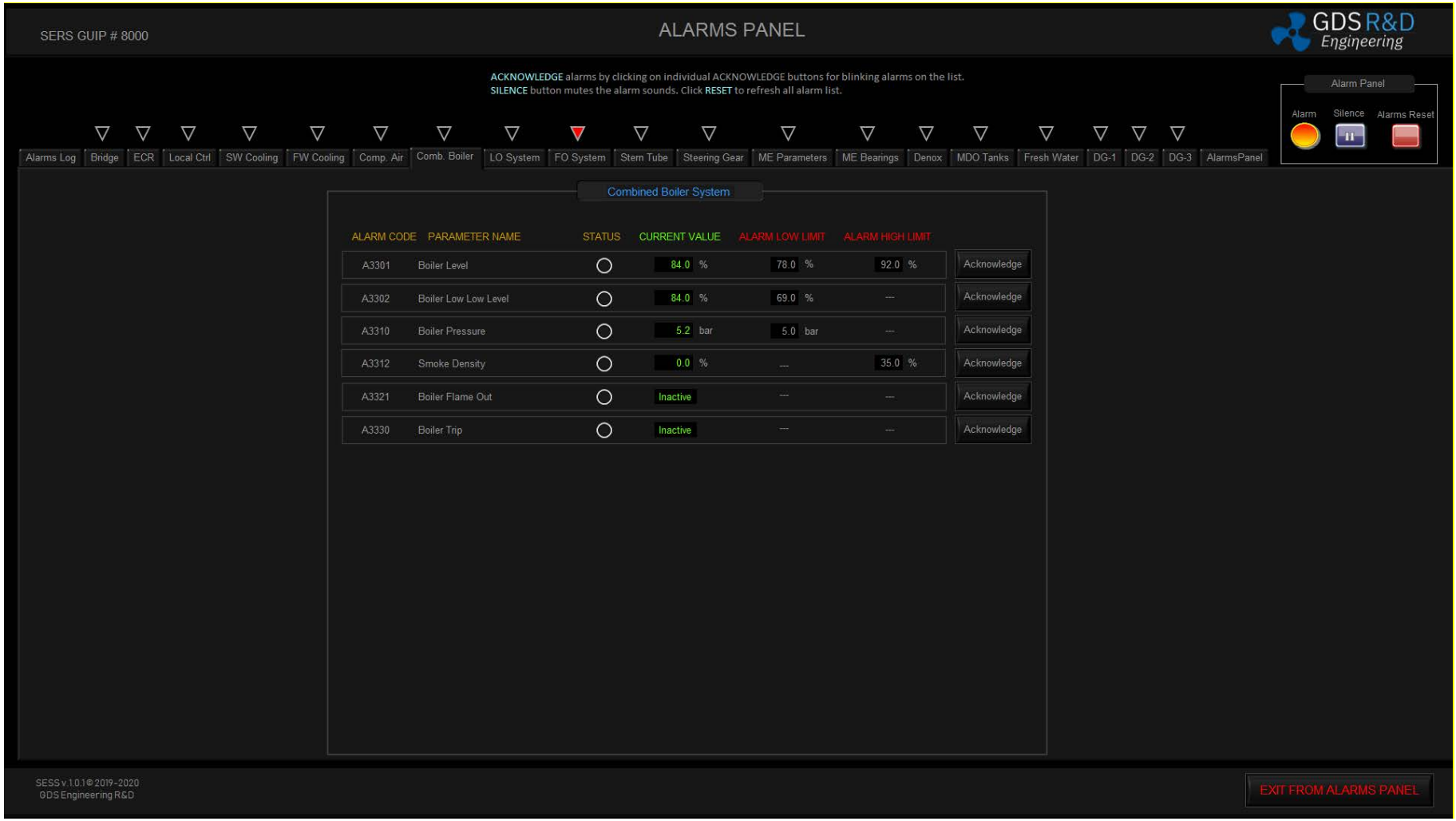
5.3.7 Alarm Page 7: Combined Boiler and Steam System



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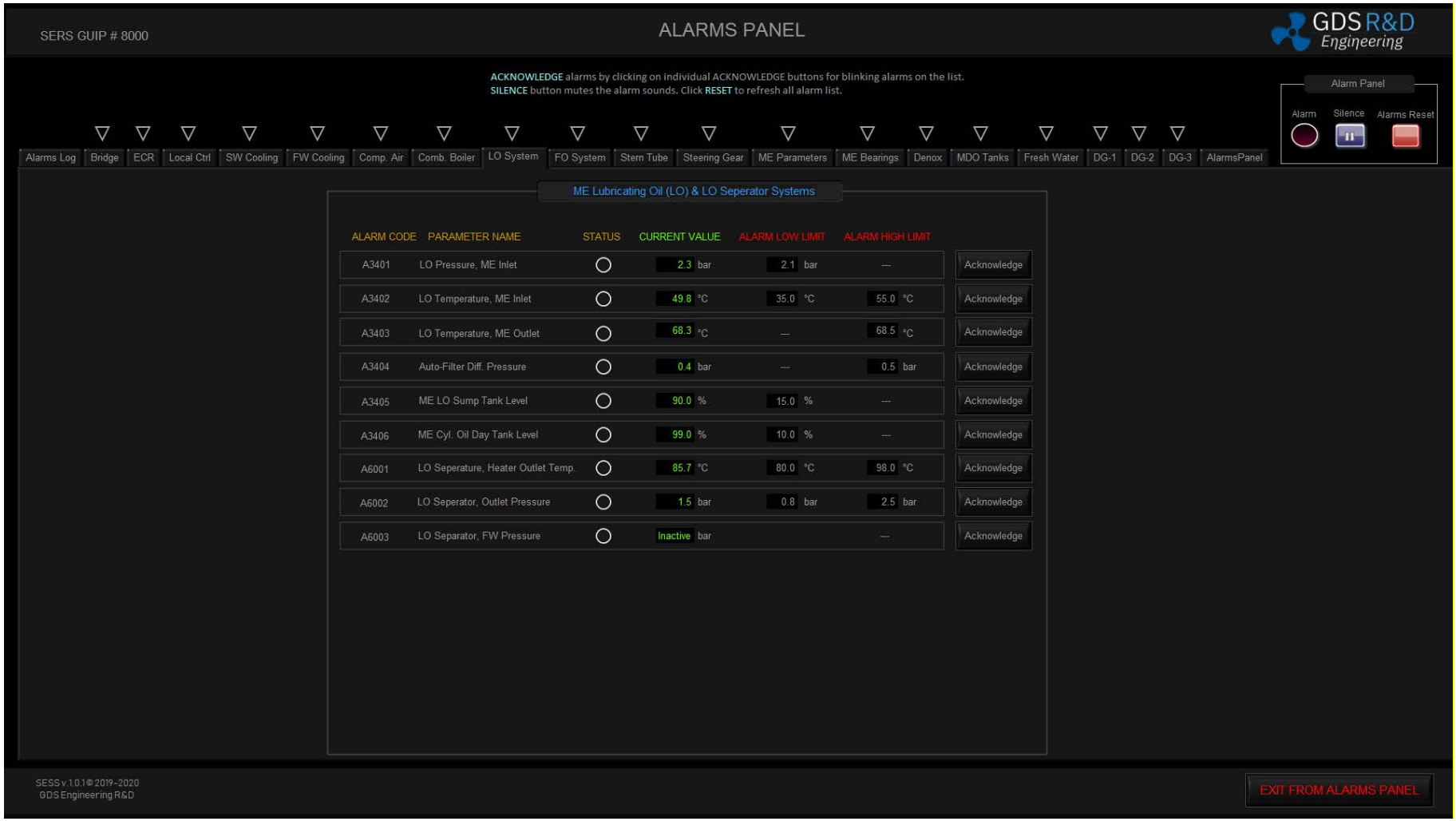
5.3.8 Alarm Page 8: ME LO System



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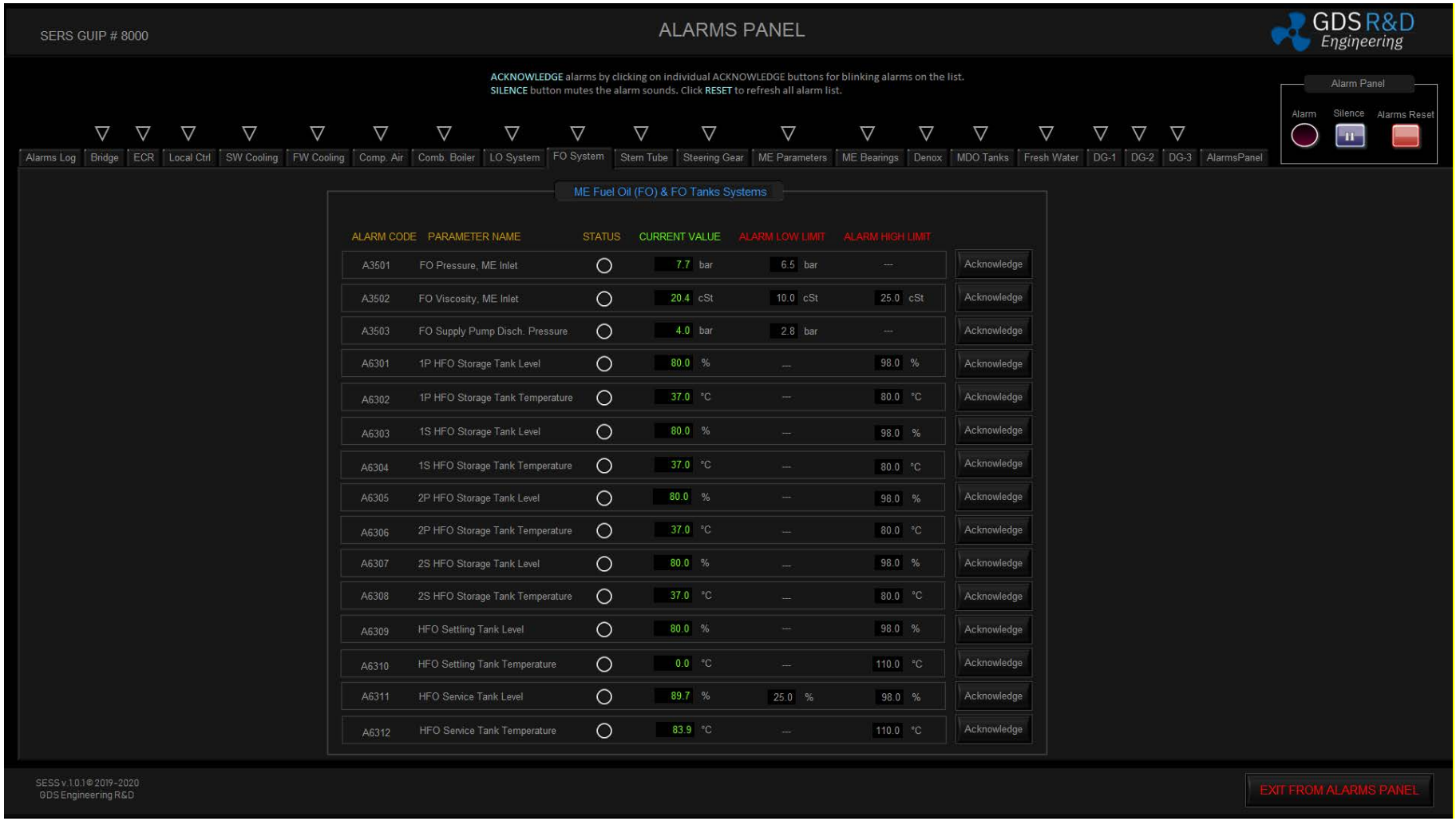
5.3.9 Alarm Page 9: FO System



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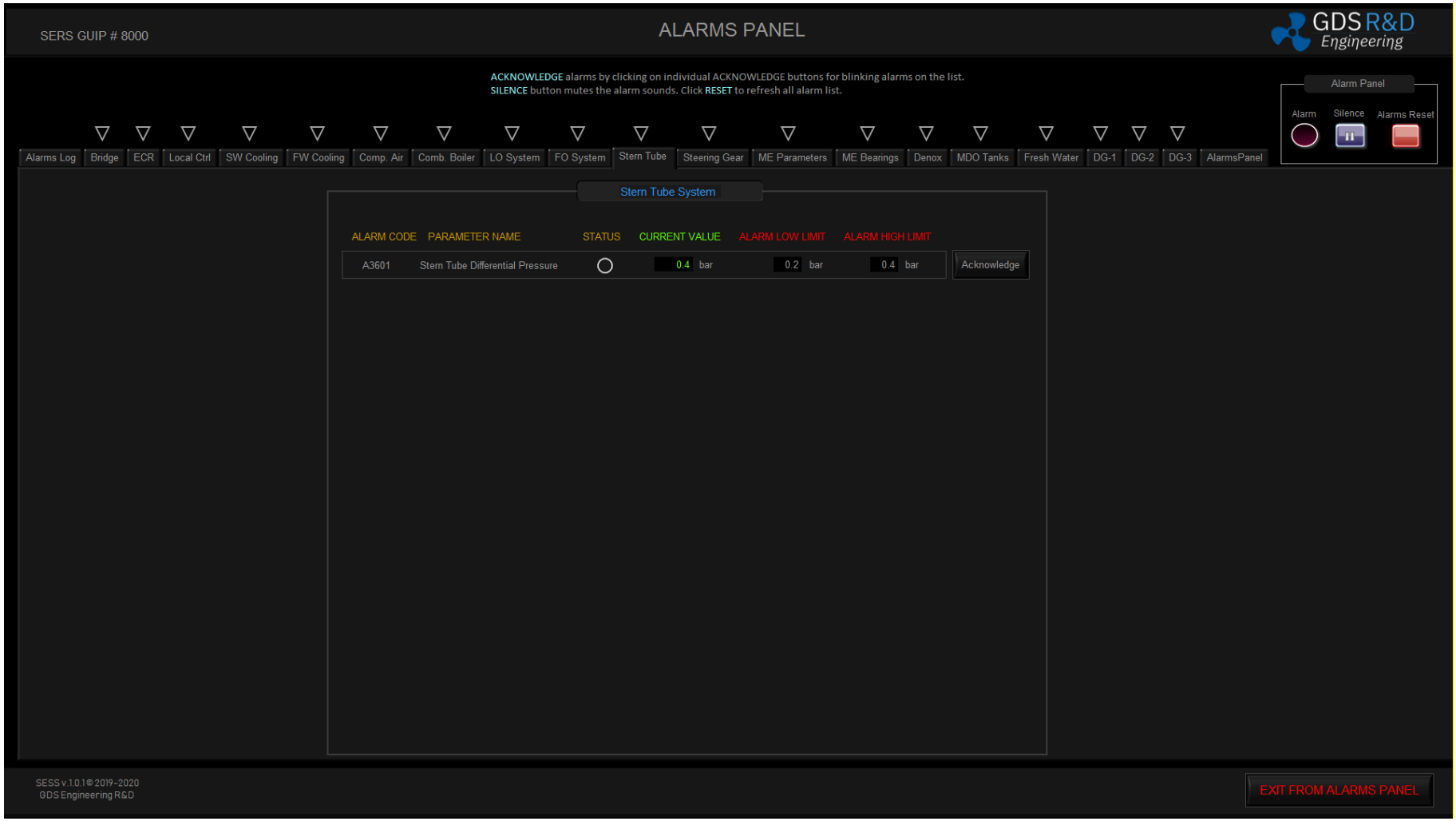
5.3.10 Alarm Page 10: Stern Tube System



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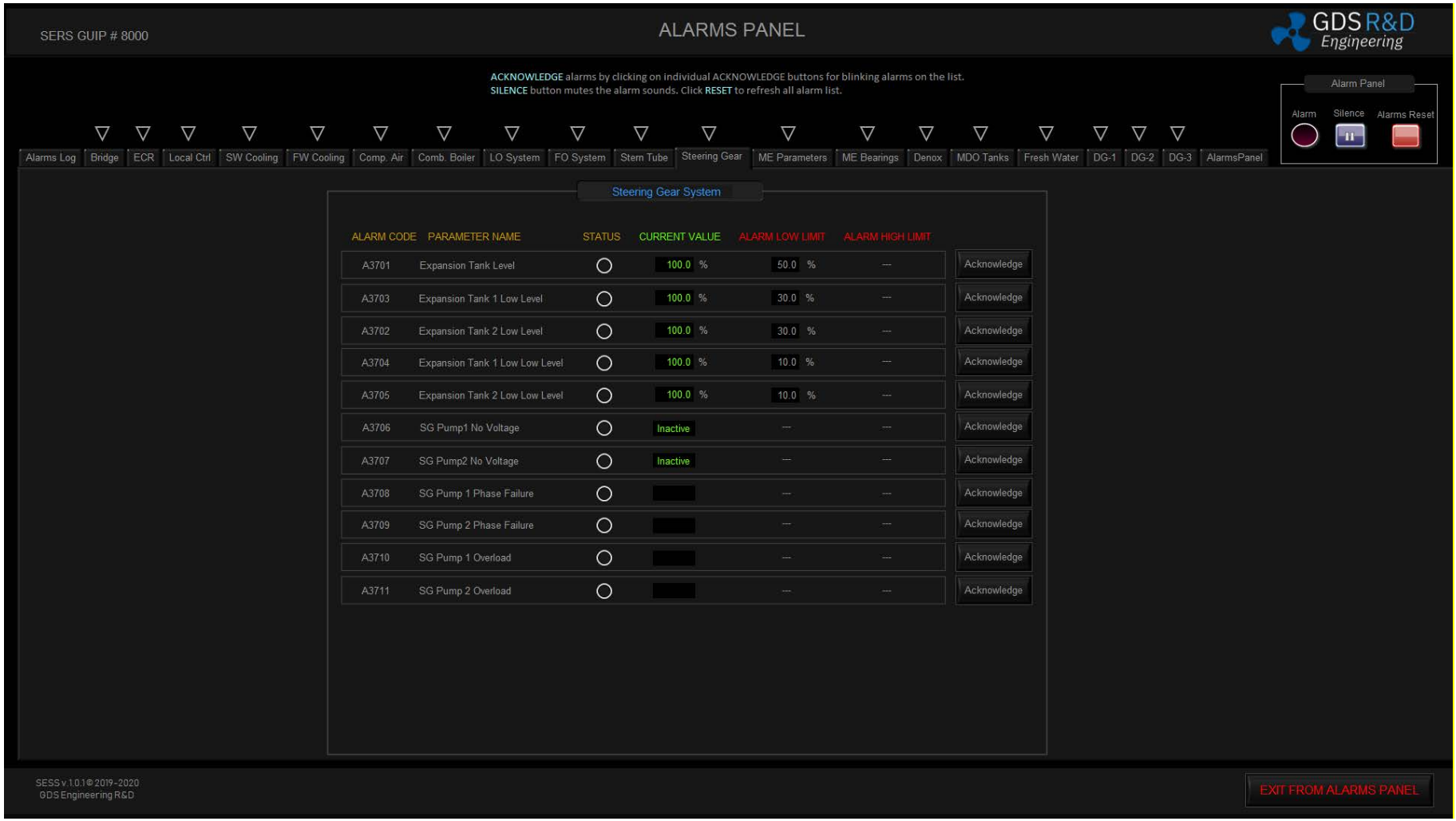
5.3.11 Alarm Page 11: Steering Gear System



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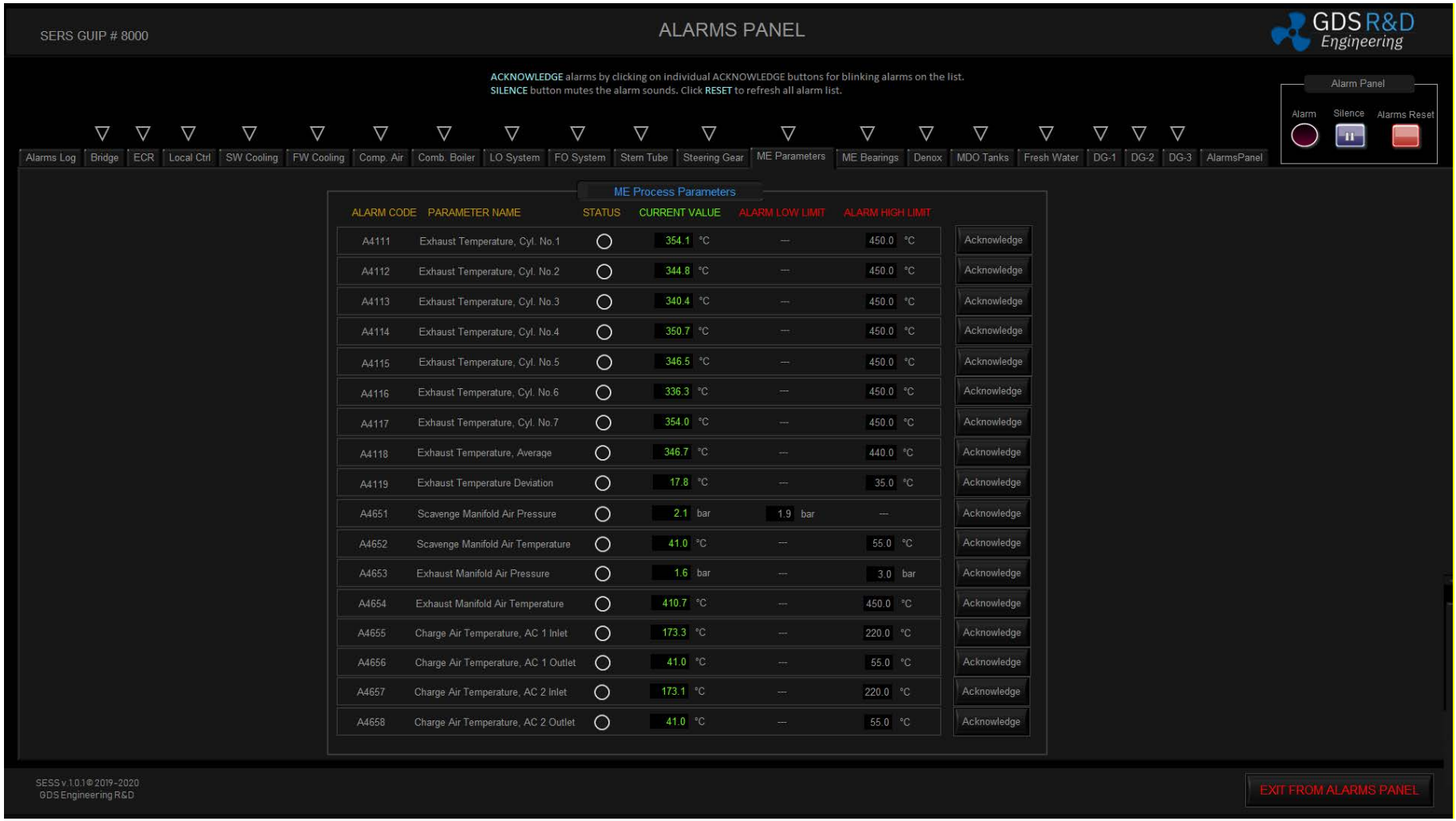
5.3.12 Alarm Page 12: ME Process Parameters



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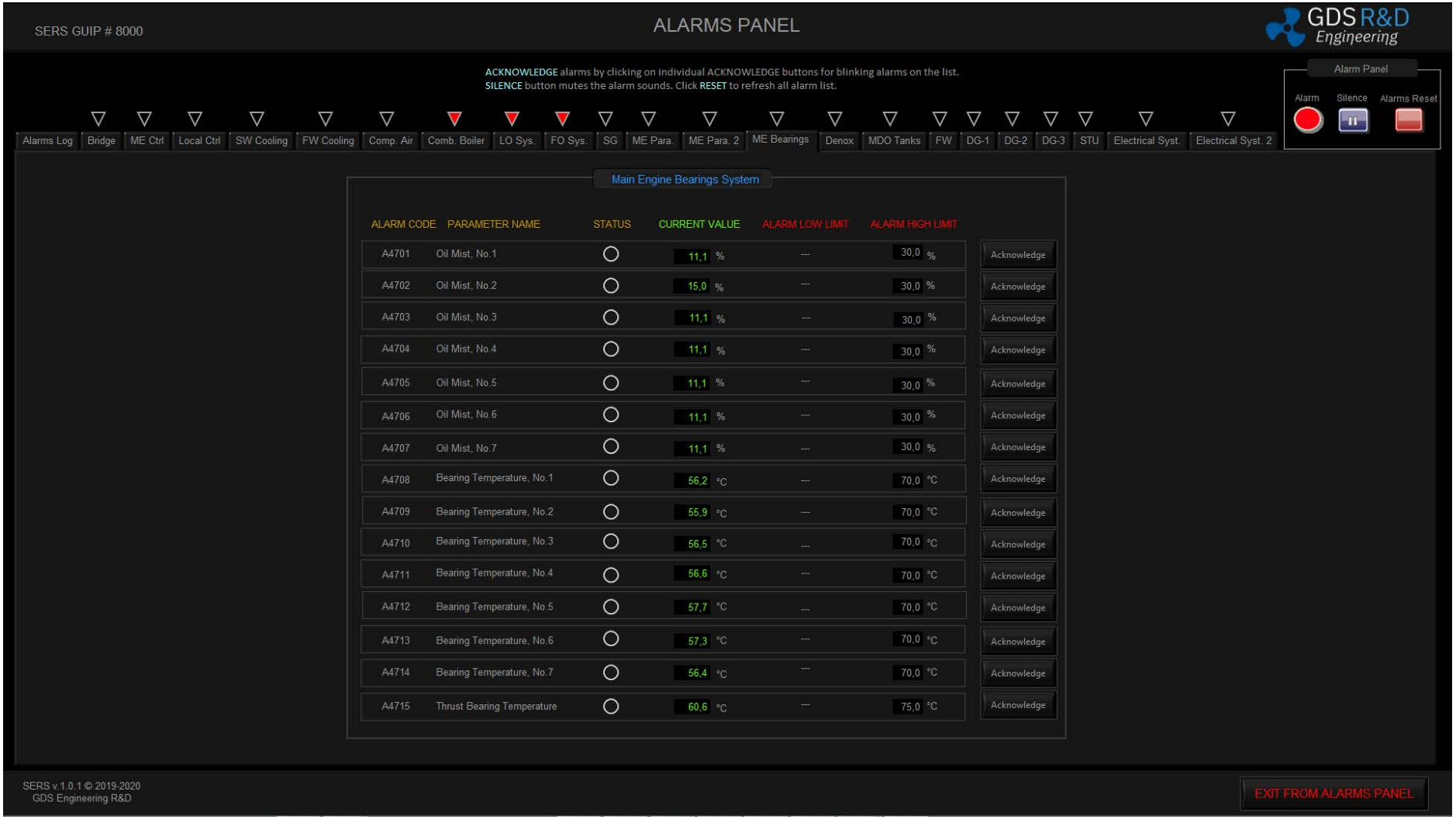
5.3.13 Alarm Page 13: ME Bearings



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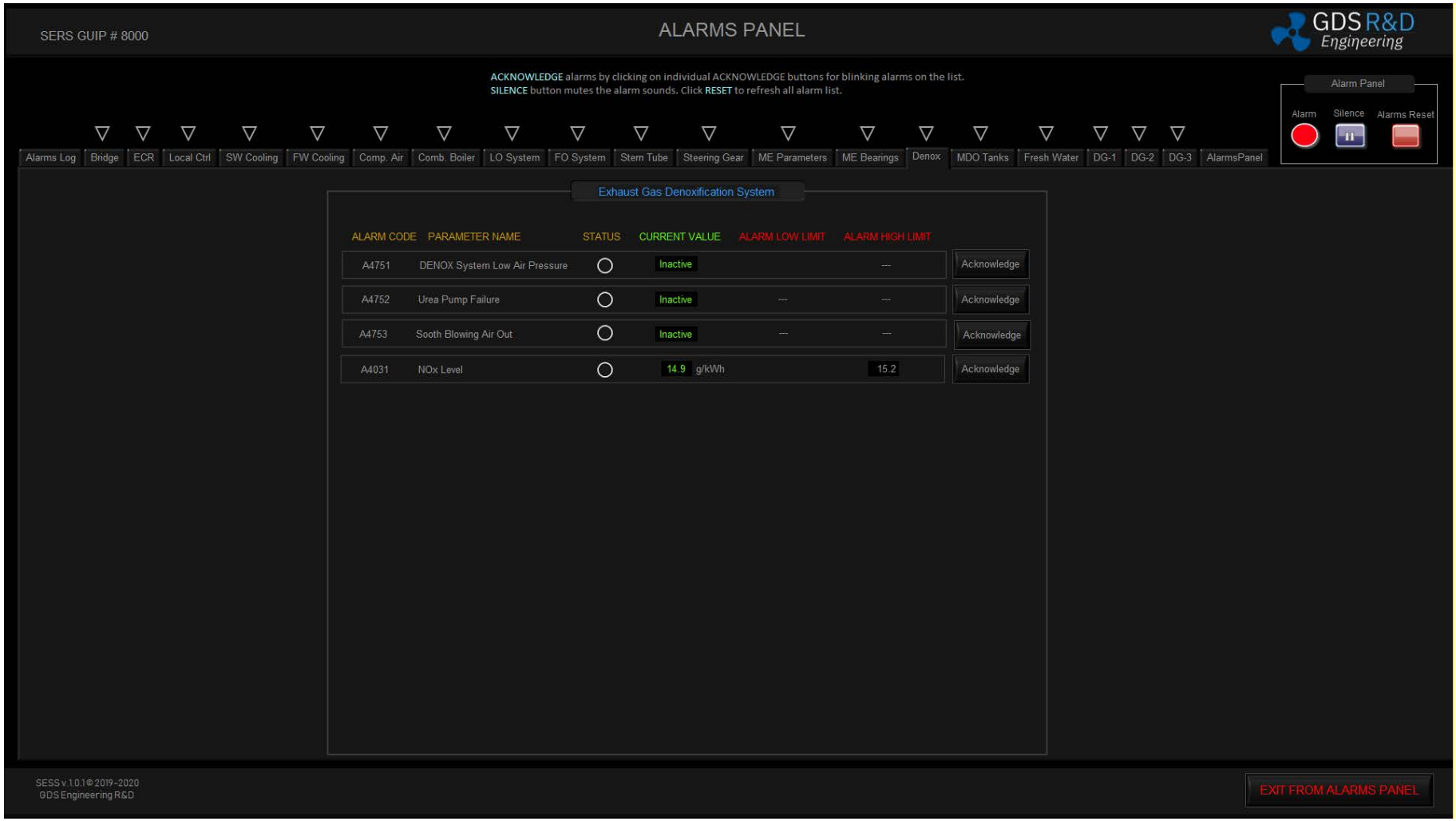
5.3.14 Alarm Page 14: Exhaust Gas ME Denoxification System



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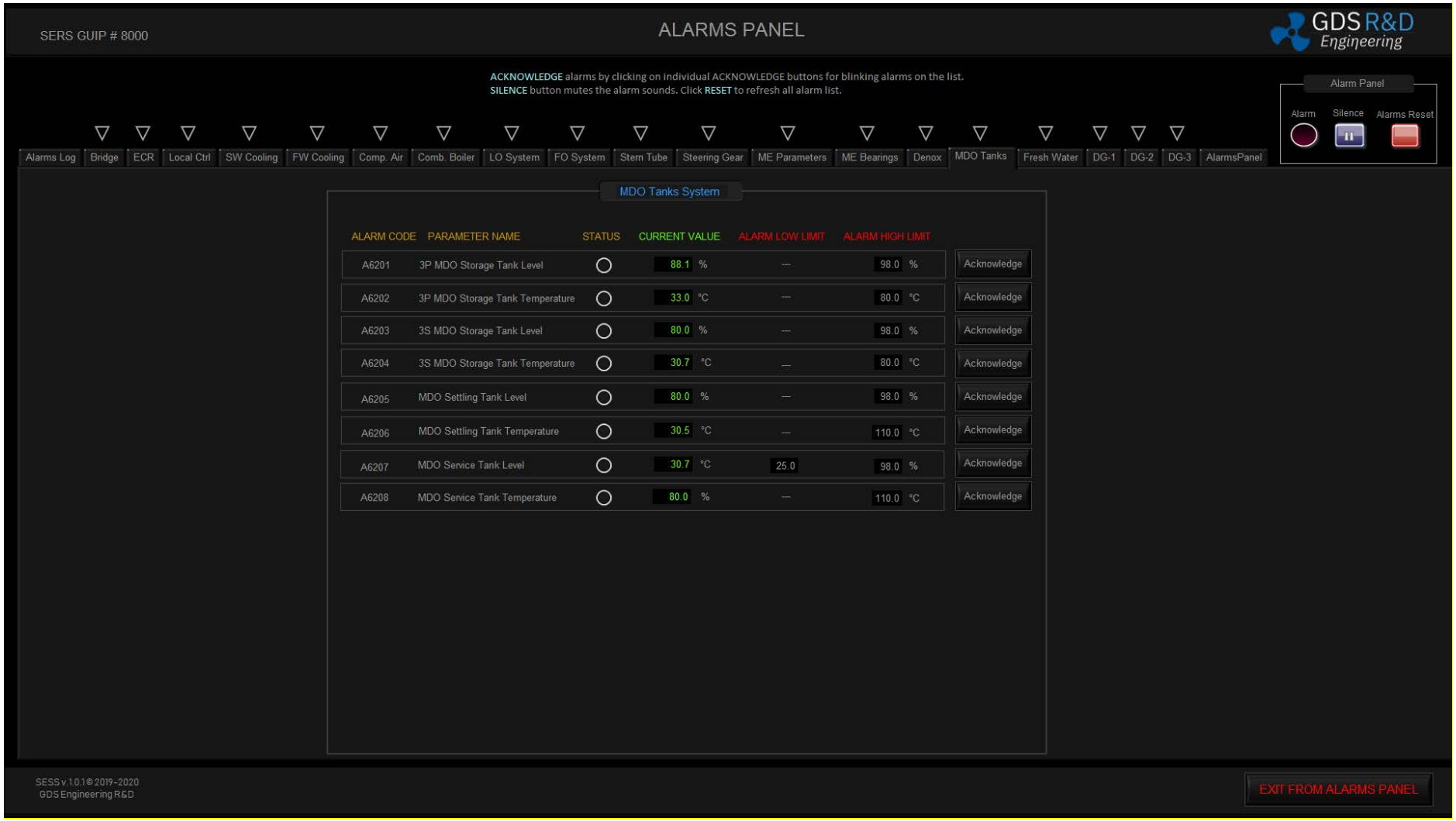
5.3.15 Alarm Page 15: MDO Tanks



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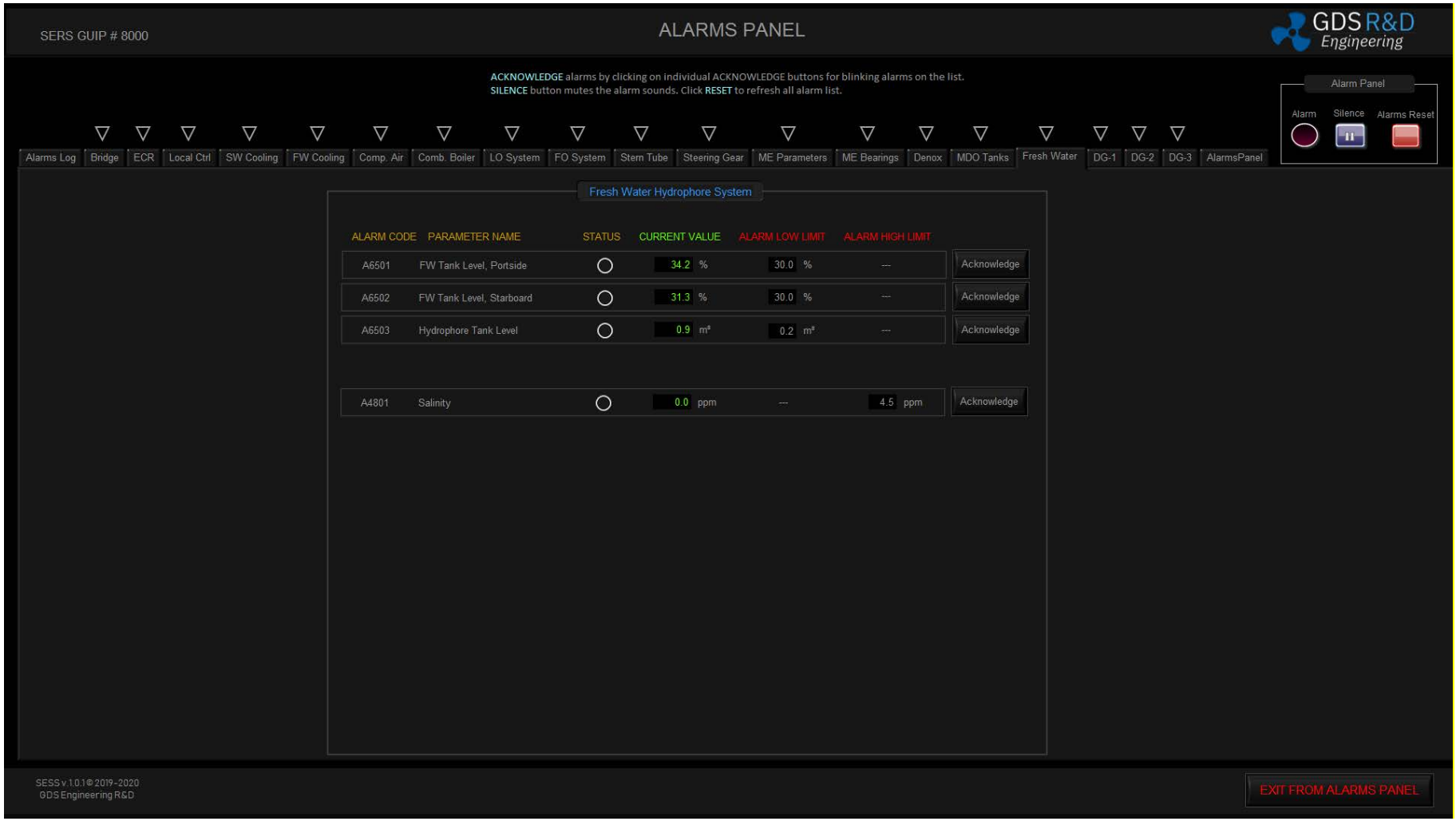
5.3.16 Alarm Page 16: Fresh Water and Hydrophore System



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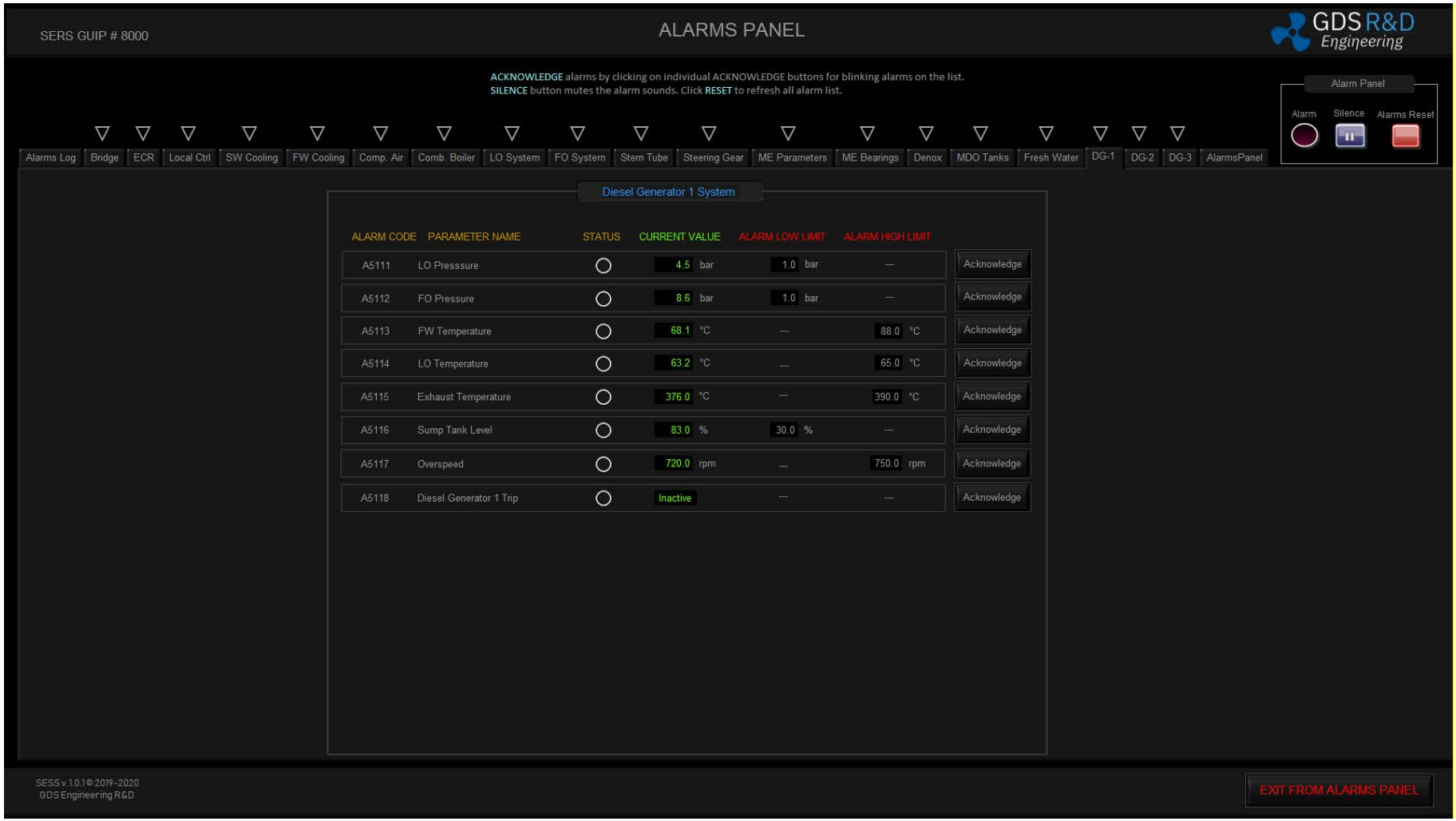
5.3.17 Alarm Page 17: DG 1



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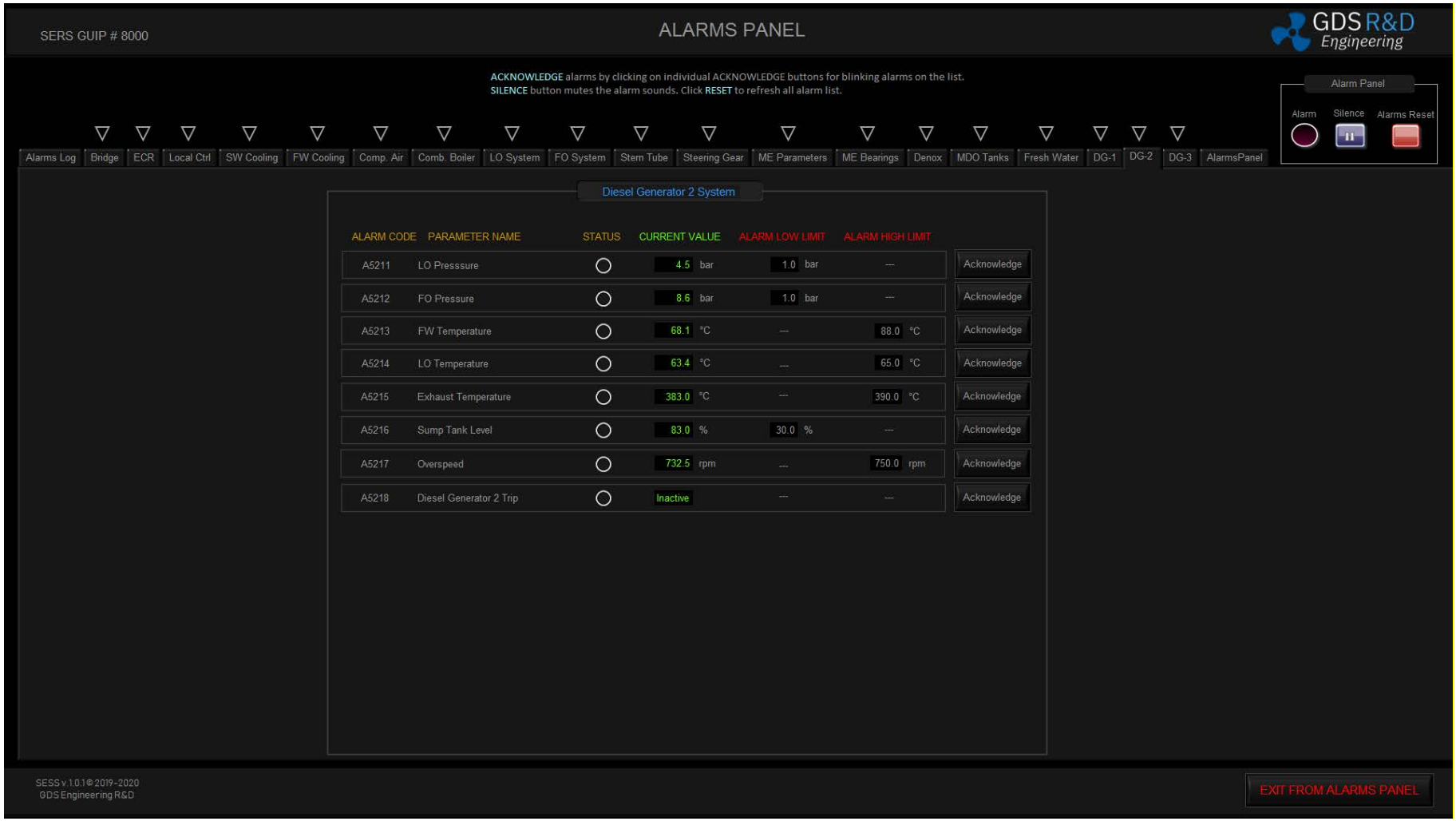
5.3.18 Alarm Page 17: DG 2



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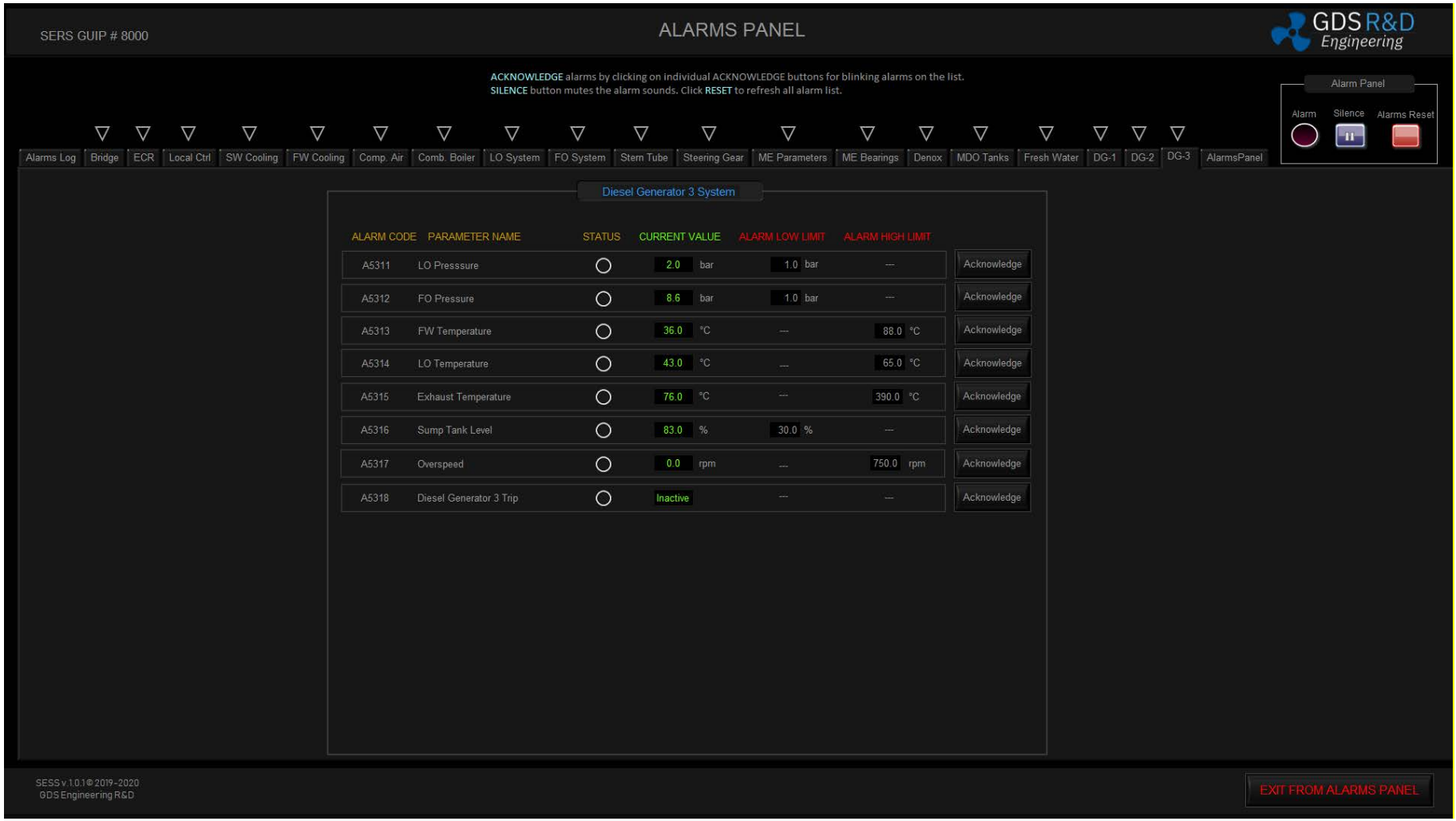
5.3.19 Alarm Page 17: DG 3



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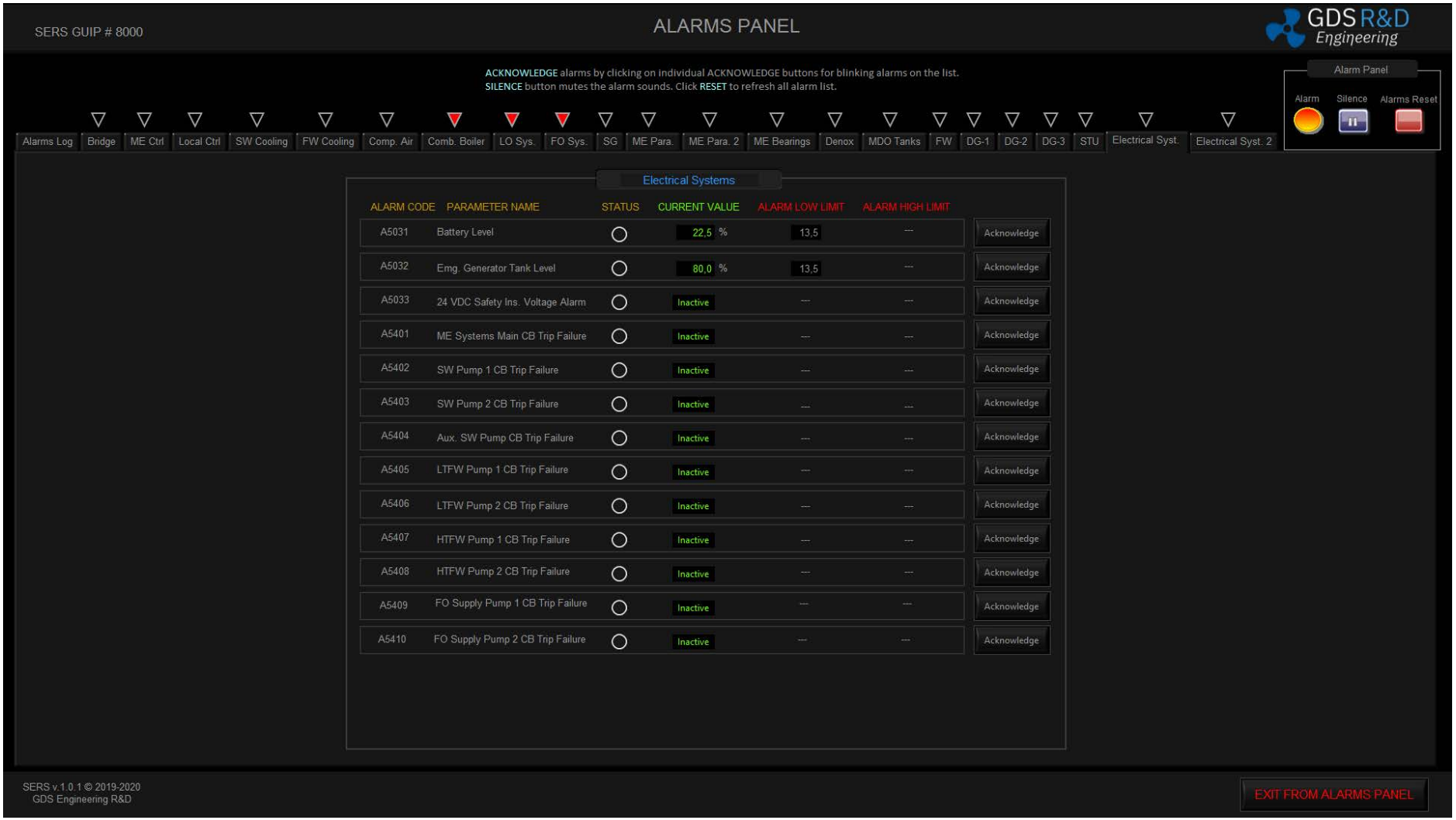
5.3.20 Alarm Page 17: Electrical Power



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5.4 Alarms Tables (Lists of Alarms) and Alarm Limits

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	-	-	-	-

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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	-	-	-	-	-	-	-

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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	-	-

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	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				

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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	-	-	-	-	-	-	-

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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	-	-	-	-	-	-	-

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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	-	-	-	-	-

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6. OPERATINAL GUIDES

6.1 ME Start & ME Processes

6.1.1 ME Start from LOCAL CONTROL

Figure 6.1 depicts the process for the starting the ME from the LOCAL CONTROL Panel. Figure 1 also shows ME speed (RPM is increasing with fuel with the proper conditions. Refer to Figure 6.1 when ME cannot start and/or “ME Failed” light is lit.

6.1.2 ME Start from REMOTE CONTROL (BRIDGE OR ECR PANELS)

Figure 6.2 depicts the process for the starting the ME remotely from either the BRIDGE PANEL or ECR. Refer to Figure 6.2 when ME cannot start and/or “ME Failed” light is lit when starting the ME from remote locations.

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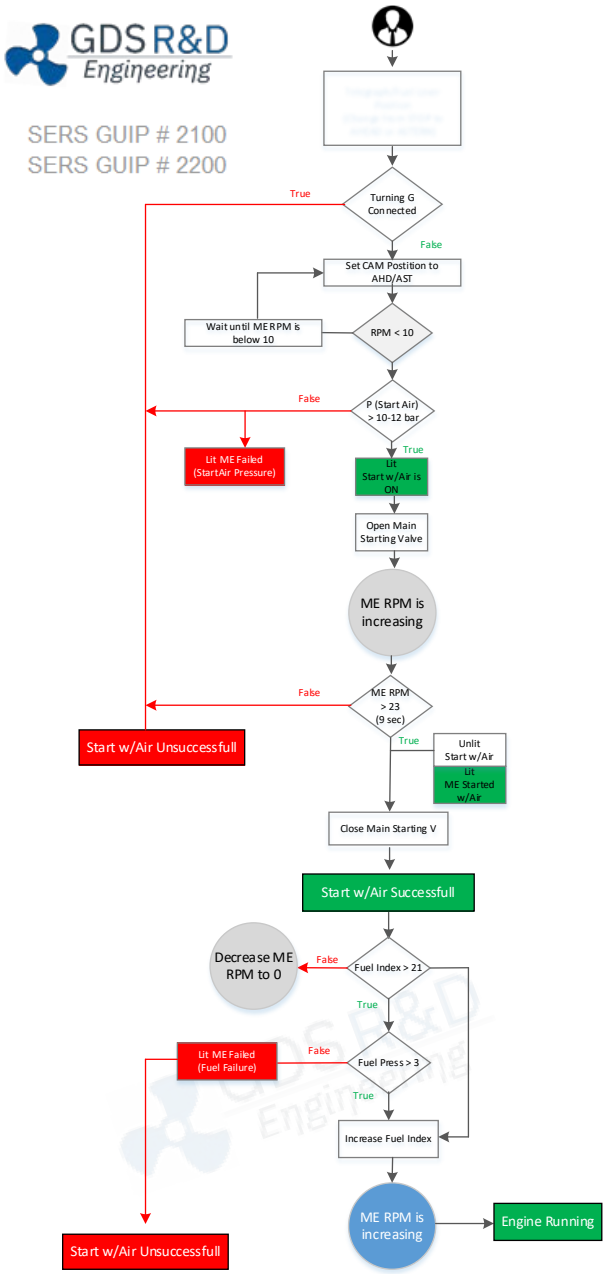
Figure 6.1 ME Start from LOCAL CONTROL



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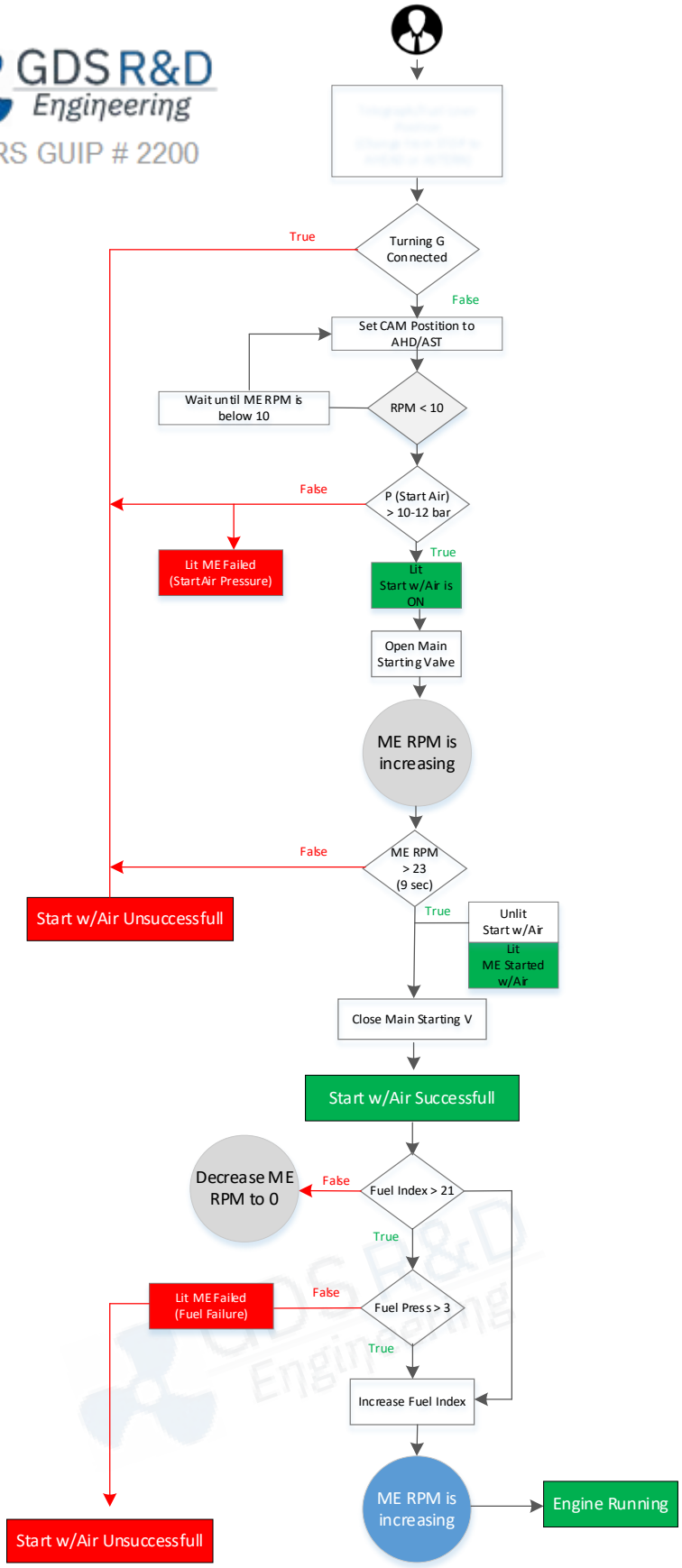

Figure 6.2 ME Start from REMOTE CONTROL

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6.2 ME Slow Turn Process

Figure 6.2 depicts the ME SLOW TURN process.

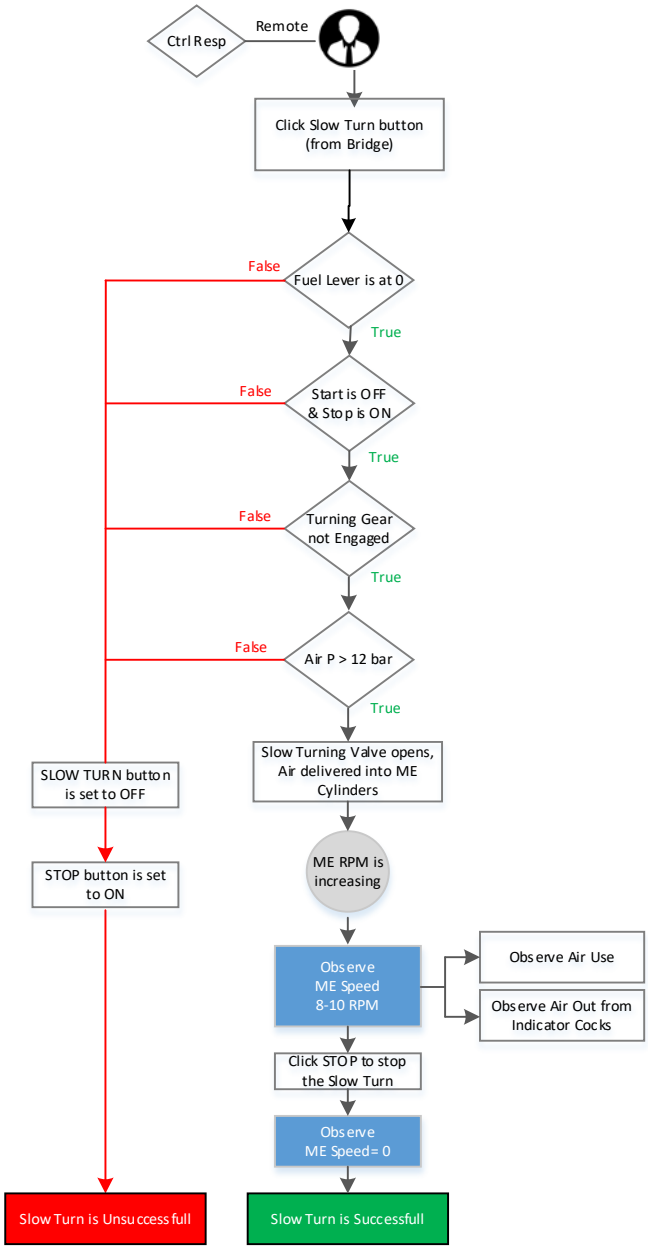

Figure 6.3 ME Slow Turn Process.

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6.3 ME RPM Control and ME Parameters: Gas Lever, Fuel Consumption & Power Process

Figure 6.2 provides a general diagram for all ME processes in RPM control mode. Refer to this figure for better understanding of the relationships between the RPM control and other ME processes while monitoring the engine parameters.

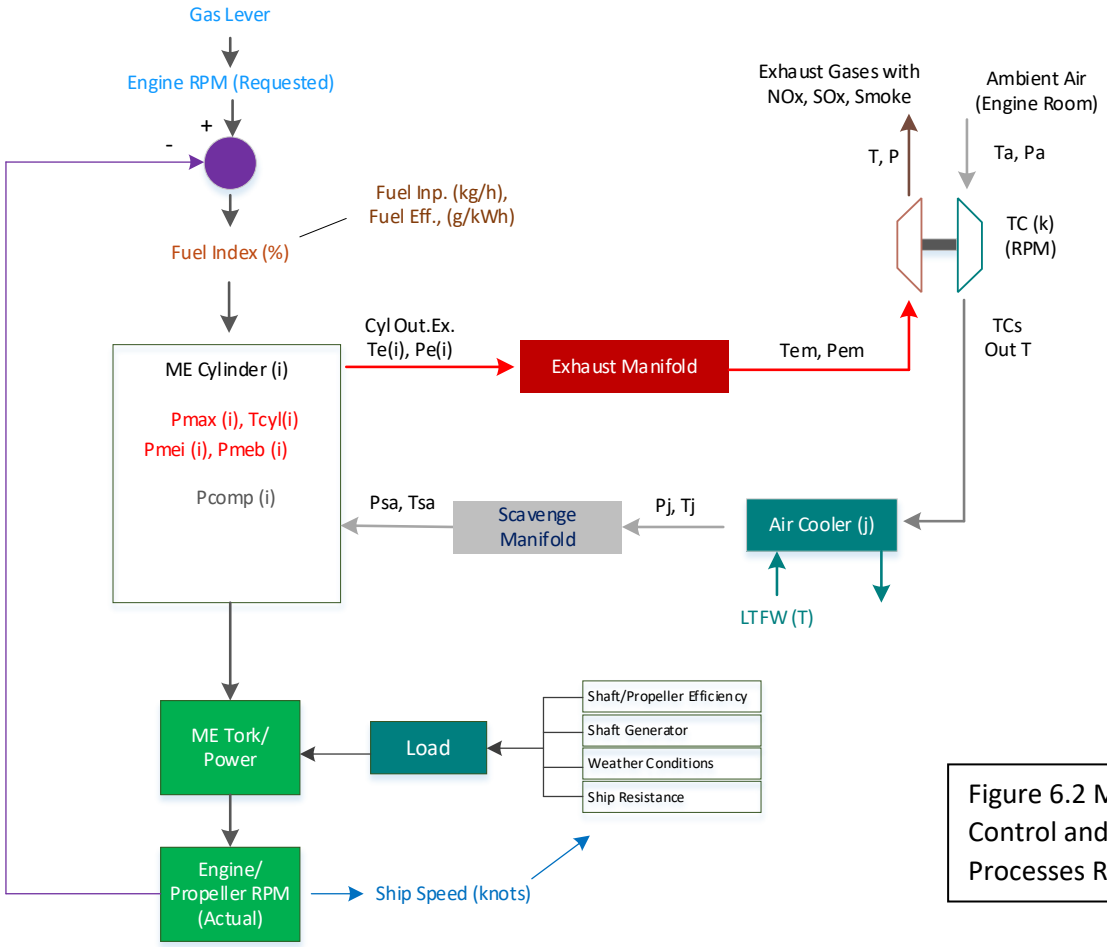

Figure 6.2 ME RPM Control and ME Processes Review

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6.4 Compressed Air Delivery Parameters and Consumers

Number	Compressed Air System (SERS GUIP #3200) Air Outlets	Nominal Value (bar)	Min. Value (bar)	Max. Value (bar)	Consumers	SERS GUI Panel #
1	to ME Start Air	30	12	33.5	Main Engine Air Start System	SERS GUIP #2200
					Main Engine Slow Turn	
2	to ME Maneuvering System	7	5	8	Main Engine Maneuvering	SERS GUIP #3800
3	to Control Systems	4.5	3	6	ME Control System	SERS GUIP #2100
						SERS GUIP #2200
					Generator Control Systems	SERS GUIP #5100
						SERS GUIP #5200
						SERS GUIP #5300
					Control of Pneumatic Valves	Applicable Panels
4	to DG 1 Start Air	30	7	33.5	Starting DG 1	SERS GUIP #5100
5	to DG 2 Start Air	30	7	33.5	Starting DG 2	SERS GUIP #5200
6	to DG 3 Start Air	30	7	33.5	Starting DG 3	SERS GUIP #5300
7	to Engine Room Systems	7	5	8	Safety Control Systems	SERS GUIP #7400
						SERS GUIP #7600
						Applicable Panels
					Combined Boiler (for SootBlowing)	SERS GUIP #3300

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Number	Compressed Air System (SERS GUIP #3200) Air Outlets	Nominal Value (bar)	Min. Value (bar)	Max. Value (bar)	Consumers	SERS GUI Panel #
					FW Hydrophore Tank	SERS GUIP #4900
					High and Low Chest	SERS GUIP #3000
					Shaft Generator	SERS GUIP #4600
					Oily Water Separator	SERS GUIP #6500
8	to Deck Systems	7	5	8	Horns & Whistles	SERS GUIP #2000
					Service Air, Deck	-
9	to Misc. Systems	7	5	8	Workshop	-
					Service Air, Engine Room	-

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6.5 Steam Delivery Parameters and Consumers

Number	Combined Boiler (SERS GUIP #3300) Steam Outlets	Nominal Inlet Value (°C)	Min. Inlet Value (°C)	Max. Inlet Value (°C)	Consumer	SERS GUI Panel
1	to Separators	175	110	-	LO Separator Heater	SERS GUIP #6000
					MDO Separator Heater	SERS GUIP #6200
					HFO Separators Heaters	SERS GUIP #6400
2	to Tanks	175	110	-	1P HFO Storage Tank Heating Coil	SERS GUIP #6300
					1S HFO Storage Tank Heating Coil	SERS GUIP #6300
					2P HFO Storage Tank Heating Coil	SERS GUIP #6300
					2S HFO Storage Tank Heating Coil	SERS GUIP #6300
					HFO Settling Tank Heating Coil	SERS GUIP #6300
					HFO Service Tank Heating Coil	SERS GUIP #6300
						SERS GUIP #3500
3	to Miscellaneous Systems	175	110	-	ME FO System Heaters and Steam Tracing	SERS GUIP #3500
					ME Preheater	SERS GUIP #3100

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6.6 Fresh Water Delivery Parameters and Consumers

Number	FW Hydrophore Tank (SERS GUIP #4900) FW Outlets	Nominal Values (m^3/h)	Min. Value (m^3/h)	Max. Value (m^3/h)	Consumer	SERS GUI Panel
1	to Accommodation Use	2.5	0	10	Various Locations	-
2	to Deck Use	3	0	10	Various Locations	-
3	to Engine Room FW Systems				FW Expansion Tank	SERS GUIP #3100
					LO Separator	SERS GUIP #6000
					MDO Separator	SERS GUIP #6200
					HFO Separator	SERS GUIP #6400
					Distilled Water Tank	SERS GUIP #3300
					FW Expansion Tank	SERS GUIP #5100
					FW Expansion Tank	SERS GUIP #5200
					FW Expansion Tank	SERS GUIP #5200
4	to General Purpose Use	1	0	3	Various Locations	-

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6.7 Electrical Consumers and Loads to Pertaining Bus Bars

Number	Component Name	Location (SERS GUI Panel #)	Power	Bus
1	Sea Water Pump 1	Sea Water Main Cooling (SERS GUIP #3000)	55 kW	Main 440 V
2	Sea Water Pump 2	Sea Water Main Cooling (SERS GUIP #3000)	55 kW	Main 440 V
3	LTFW Pump 1	Fresh Water Cooling (SERS GUIP #3100)	21.7 kW	Main 440 V
4	LTFW Pump 2	Fresh Water Cooling (SERS GUIP #3100)	21.7 kW	Main 440 V
5	HTFW Pump 1	Fresh Water Cooling (SERS GUIP #3100)	17.3 kW	Main 440 V
6	HTFW Pump 2	Fresh Water Cooling (SERS GUIP #3100)	17.3 kW	Main 440 V
7	FO Supply Pump 1	ME Fuel (SERS GUIP #3500)	2.5 kW	Main 440 V
8	FO Supply Pump 2	ME Fuel (SERS GUIP #3500)	2.5 kW	Main 440 V
9	FO Circulation Pump 1	ME Fuel (SERS GUIP #3500)	5.7 kW	Main 440 V
10	FO Circulation Pump 2	ME Fuel (SERS GUIP #3500)	5.7 kW	Main 440 V
11	Main LO Pump 1	ME Lubrication Oil (SERS GUIP #3400)	40.3 kW	Main 440 V
12	Main LO Pump 2	ME Lubrication Oil (SERS GUIP #3400)	40.3 kW	Main 440 V
13	Air Compressor 1	Compressed Air (SERS GUIP #3200)	50 kW	Main 440 V
14	ME Turning Gear	ME Local Control & Systems (SERS GUIP #2200)	3.5 kW	Main 440 V
15	ME Aux. Blower 1	ME Control (ECR) (SERS GUIP #2100)	50 kW	Main 440 V
16	ME Aux. Blower 2	ME Control (ECR) (SERS GUIP #2100)	50 kW	Main 440 V
17	Air Compressor 2	Compressed Air (SERS GUIP #3200)	50 kW	Main 440 V
18	Steering Gear Pump 1	Steering Gear (SERS GUIP #3700)	18.6 kW	Main 440 V

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Number	Component Name	Location (SERS GUI Panel #)	Power	Bus
19	HFO Separator System	HFO Separator (SERS GUIP #6400)	11.8 kW	Main 440 V
20	LO Separator System	LO Separator (SERS GUIP #6000)	11.8 kW	Main 440 V
21	MDO Separator System	MDO Tanks & Transfer (SERS GUIP #6200)	8.6 kW	Main 440 V
22	HFO Transfer Pump	HFO Tanks & Transfer (SERS GUIP #6300)	15.7 kW	Main 440 V
23	MDO Transfer Pump	MDO Tanks & Transfer (SERS GUIP #6200)	3.7 kW	Main 440 V
24	LO Transfer Pump	LO Tanks & Transfer (SERS GUIP #6100)	3.7 kW	Main 440 V
25	Cyl. Oil Transfer Pump	LO Tanks & Transfer (SERS GUIP #6100)	2.9 kW	Main 440 V
26	FW Generator	FW Generator (FWG) (SERS GUIP #4800)	15.7 kW	Main 440 V
27	Bilge Pump	Oily Water Separator (OWS) (SERS GUIP #6500)	2.2 kW	Main 440 V
28	Stern Tube Pumps	Stern Tube (SERS GUIP #3600)	0.8 kW	Main 440 V
29	Sewage Treatment Plant	Gray Water & Sewage Treatment (SERS GUIP #6600)	4.5 kW	Main 440 V
30	Hydrophore System	FW System & Hydrophore (SERS GUIP #4900)	3.7 kW	Main 440 V
31	Refrigeration Plant	Refrigeration Plant (SERS GUIP #6700)	12.3 kW	Main 440 V
32	Air Condition Plant	-	17.7 kW	Main 440 V
33	Ballast Pump Port	Ballast Tanks & Transfer (SERS GUIP #7000)	36.1 kW	Main 440 V
34	Ballast Pump Starboard	Ballast Tanks & Transfer (SERS GUIP #7000)	36.1 kW	Main 440 V
35	Combined Boiler Fuel Circulation Pump	Combined Boiler (SERS GUIP #3500)	1.5 kW	Main 440 V
36	Combined Boiler Feed Water Pump 1	Combined Boiler (SERS GUIP #3500)	35.5 kW	Main 440 V
37	Combined Boiler Feed Water Pump 2	Combined Boiler (SERS GUIP #3500)	35.5 kW	Main 440 V

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Number	Component Name	Location (SERS GUI Panel #)	Power	Bus
38	Combined Boiler FW Make Up Pump	Combined Boiler (SERS GUIP #3500)	7.5 kW	Main 440 V
39	Fire Pump 1	Main Fire Fighting (SERS GUIP #7500)	70 kW	Main 440
40	Fire Pump 2	Main Fire Fighting (SERS GUIP #7500)	70 kW	Main 440 V
41	ER Air Supply Fan 1	ME Control (ECR) (SERS GUIP #2100)	5.9 kW	Main 440 V
42	ER Air Supply Fan 2	ME Control (ECR) (SERS GUIP #2100)	5.9 kW	Main 440 V
43	ER Air Supply Fan 3	ME Control (ECR) (SERS GUIP #2100)	5.9 kW	Main 440 V
44	ER Air Exhaust Fan 1	ME Control (ECR) (SERS GUIP #2100)	5.9 kW	Main 440 V
45	ER Air Exhaust Fan 2	ME Control (ECR) (SERS GUIP #2100)	5.9 kW	Main 440 V
46	ER Air Exhaust Fan 3	ME Control (ECR) (SERS GUIP #2100)	5.9 kW	Main 440 V
47	Purifier Room Exhaust Fan	ME Control (ECR) (SERS GUIP #2100)	3.7 kW	Main 440 V
48	Bow Thruster	Bow Thruster (SERS GUIP #7100)	250 kW	Main 440 V
49	Hose Crain	-	7.2 kW	Main 440 V
50	Anchor Windlass Power Pack 1	-	22 kW	Main 440 V
51	Anchor Windlass Power Pack 2	-	22 kW	Main 440 V
52	Rescue Boat & Life Raft	-	12.7 kW	Main 440 V
53	Accommodation Ladder Port	-	9.4 kW	Main 440 V
54	Accommodation Ladder Starboard	-	9.4 kW	Main 440 V
55	No. 1 Deck Crane (45t)	-	60 kW	Main 440 V
56	No. 2 Deck Crane (45t)	-	60 kW	Main 440 V

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Number	Component Name	Location (SERS GUI Panel #)	Power	Bus
57	No. 3 Deck Crane (45t)	-	60 kW	Main 440 V
58	Aft Deck Crane (35t)	-	60 kW	Main 440 V
59	Auto Pilot	ME Control (Bridge) (SERS GUIP #2000)	0.6 kW	Main 440 V
60	Electric Whistle	ME Control (Bridge) (SERS GUIP #2000)	0.2 kW	Main 440 V
61	Accommodation Heating	-	2.5 kW	Main 440 V
62	Galley Exhaust Fan	-	4.5 kW	Main 440 V
63	Welding Area Exhaust Fan	-	3.6 kW	Main 440 V
64	Deck Store Exhaust Fan	-	3.1 kW	Main 440 V
65	Light Panel-Bridge	-	2.2 kW	Main 220 V
66	Light Panel-Engine Room	-	3.8 kW	Main 220 V
67	Light Panel-Deck	-	6.5 kW	Main 220 V
68	Light Panel-Accommodation	-	8.7 kW	Main 220 V
69	Washer Extractors	-	2.2 kW	Main 220 V
70	Refrigerator	-	1.5 kW	Main 220 V
71	Water Boiler	-	3.2 kW	Main 220 V
72	Universal Mixing Machine	-	1.8 kW	Main 220 V
73	Waste Disposer	-	1.1 kW	Main 220 V
74	Drying Tumbler	-	3.2 kW	Main 220 V
75	Galley Appliance	-	15.3 kW	Main 220 V

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Number	Component Name	Location (SERS GUI Panel #)	Power	Bus
76	Control Console-ECR	-	1.2 kW	Main 220 V
77	Control Console-Boiler	-	0.4 kW	Main 220 V
78	Miscellaneous Control Panel	-	0.4 kW	Main 220 V
79	Minor Panels	-	0.4 kW	Main 220 V
80	Computer Equipment	-	0.8 kW	Main 220 V
81	Electric Clock System	-	0.06 kW	Main 220 V
82	DGPS Navigator 1	-	2.7 kW	Main 220 V
83	DGPS Navigator 2	-	2.7 kW	Main 220 V
84	ECDIS 1	-	0.7 kW	Main 220 V
85	ECDIS 2	-	0.7 kW	Main 220 V
86	Gyro Compass 1	-	0.5 kW	Main 220 V
87	Gyro Compass 2	-	0.5 kW	Main 220 V
88	GMDSS	-	0.8 kW	Main 220 V
89	AIS System	-	2.3 kW	Main 220 V
90	INMARSAT-C	-	2.2 kW	Main 220 V
91	Window Wipers	-	0.7 kW	Main 220 V
92	ER Sensor &Control System	-	0.4 kW	Main 24 V DC
93	Auto Pilot Alarm Power	-	0.1 kW	Main 24 V DC
94	Gyro Comp. Alarm Power 1	-	0.1 kW	Main 24 V DC

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Number	Component Name	Location (SERS GUI Panel #)	Power	Bus
95	Gyro Comp. Alarm Power 2	-	0.1 kW	Main 24 V DC
96	220 V Emergency Transformer	440 V Emg. Distribution Network (SERS GUIP #5650)	0.6 kW	Emg. 440 V
97	Emergency Fire Pump	Main Fire Fighting (SERS GUIP #7500)	35 kW	Emg. 440 V
98	24 V DC Emergency Transformer	440 V Emg. Distribution Network (SERS GUIP #5650)	0.4 kW	Emg. 440 V
99	Steering Gear Pump 2	Steering Gear (SERS GUIP #3700)	18.6 kW	Emg. 440 V
100	Aux. Air Compressor	Compressed Air (SERS GUIP #3200)	26 kW	Emg. 440 V
101	Life Boat Winches	-	6.4 kW	Emg. 440 V
102	Navigation Equipment	-	1.25 kW	Emg. 440 V
103	Elevator System	-	8.3 kW	Emg. 440 V
104	DG 1 Aux. Pumps	Diesel Generator 1 (SERS GUIP #5100)	4.2 kW	Emg. 440 V
105	DG 2 Aux. Pumps	Diesel Generator 2 (SERS GUIP #5200)	4.2 kW	Emg. 440 V
106	SG LO Priming Pump	-	2.2 kW	Emg. 440 V
107	ER Air Supply Fans	ME Control (ECR) (SERS GUIP #2100)	5.9 kW	Emg. 440 V
108	ER Air Exhaust Fans	ME Control (ECR) (SERS GUIP #2100)	5.9 kW	Emg. 440 V
109	Aux. SW Pump	Sea Water Main Cooling (SERS GUIP #3000)	38 kW	Emg. 440 V
110	Aux. LTFW Pump	Fresh Water Cooling (SERS GUIP #3100)	11.6 kW	Emg. 440 V
111	ME Preheating Pump	Fresh Water Cooling (SERS GUIP #3100)	6.4 kW	Emg. 440 V
112	Oily Water Separator	Oily Water Separator (OWS) (SERS GUIP #6500)	7.3 kW	Emg. 440 V

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Number	Component Name	Location (SERS GUI Panel #)	Power	Bus
113	Light Panel-Bridge	-	1.6 kW	Emg. 220 V
114	Light Panel-Engine Room	-	2.2 kW	Emg. 220 V
115	Light Panel-Deck	-	3.8 kW	Emg. 220 V
116	Light Panel-Accommodation	-	1.9 kW	Emg. 220 V
117	Signal Lights Column	-	1.2 kW	Emg. 220 V
118	Nautical Distribution Panel	-	0.1 kW	Emg. 220 V
119	Radar System Panel	-	0.1 kW	Emg. 220 V
120	Radio Equipment Panel	-	0.1 kW	Emg. 220 V
121	Lifeboat Battery Charger	-	0.2 kW	Emg. 220 V
122	ER Deadman Alarm	-	0.1 kW	Emg. 220 V
123	Auto Tel. Exchanger	-	0.1 kW	Emg. 220 V
124	Battery Charger	24 V DC Distribution Network (SERS GUIP #5750)	0.2 kW	Emg. 24 V DC
125	Main Switchboard	-	0.3 kW	Emg. 24 V DC
126	Nautical Instruments	-	0.8 kW	Emg. 24 V DC
127	ME Remote Control	-	0.2 kW	Emg. 24 V DC
128	Elevator Control	-	0.2 kW	Emg. 24 V DC
129	Fire Alarm System	-	0.4 kW	Emg. 24 V DC
130	Gyro Compass 2	-	0.1 kW	Emg. 24 V DC
131	CO_2 Fixed Fire Station	CO_2 Fixed Fire Installation (SERS GUIP #7600)	0.2 kW	Emg. 24 V DC

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Number	Component Name	Location (SERS GUI Panel #)	Power	Bus
132	DC 24 V Lighting	-	1.6 kW	Emg. 24 V DC

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6.8 Sea Water System Pressure Tests (GUIP#3000)

Below tables indicate the flow rates and pressures measured while only 1 LTFW cooler is permitting flow in the Sea Water Main Cooling System (Panel #3000). Trainees may test the flowrates and pressure in this system by opening various line valves.

This exercise help understanding the draft, static pressure, suction and discharge pressures, and flow friction.

Sea Water Pump 1, Max Capacity: 800m3/h Test with 1 LTFW Cooler	Flowrate (m3/h)	Discharge Pressure (bar)	Suction Pressure (bar)
Nominal Values:	689	2.3	0.7
Max Head (Otlet valve closed):	0	3.1	-0.7

Sea Water Pump 2 Max Capacity: 800m3/h Test with 1 LTFW Cooler	Flowrate (m3/h)	Discharge Pressure (bar)	Suction Pressure (bar)
Nominal Values:	689	2.3	0.7
Max Head (Otlet valve closed):	0	3.1	-0.7

Sea Water Aux. Pump Max Capacity: 580 m3/h Test with 1 LTFW Cooler	Flowrate (m3/h)	Discharge Pressure (bar)	Suction Pressure (bar)
Nominal Values:	482	2.2	0.7
Max Head (Otlet valve closed):	0	2.9	-0.7

Sea Water Pumps 1&2 Max Capacity: 890 m3/h Test with 1 LTFW Cooler	Flowrate (m3/h)	Discharge Pressure (bar)	Suction Pressure (bar)
Nominal Values:	848	2.9	0.7

Sea Water Pumps 1&3 Max. Capacity: 840 m3/h Test with 1 LTFW Cooler	Flowrate (m3/h)	Discharge Pressure (bar)	Suction Pressure (bar)
Nominal Values:	759	2.7	0.7

Sea Water Pumps 2&3 Max. Capacity: 840 m3/h Test with 1 LTFW Cooler	Flowrate (m3/h)	Discharge Pressure (bar)	Suction Pressure (bar)
Nominal Values:	760	2.5	0.7

Sea Water Pumps 1&2&3 Max. Capacity: 910 m3/h Test with 1 LTFW Cooler	Flowrate (m3/h)	Discharge Pressure (bar)	Suction Pressure (bar)
Nominal Values:	867	2.9	0.7

6.9 ME Parameters Exercise: Effect of Draft Change on ME Load and Other ME Parameters

In order to perform an exercise to demonstrate how draft change effect the ME performance, follow the steps below:

a. Open the SERS with Full Ahead (Navigation) mode (see Section 2.1).

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b. Ensure all variables are in steady state conditions. For example, check the ME RPM and Power using the ME Parameters GUI Panel #4000 and compare the values against the ME Performance Graphs (provided in this Manual's Section 7 or in the software on GUI Panel #9000 (Parameter Plots)
c. Record the draft, as shown in GUI Panel #1600.
d. Line up the Ballast Transfer System (see Section 4.39, GUI Panel #7000).
    a. Also verify the draft shown on this panel. Record time.
    b. Operate the Ballast Pumps 1, 2, or both for providing seawater into the Ballast Tanks (GUI Panel #7000).
    c. Ensure the tanks levels are increasing.
e. Prepare for recording the parameters
    a. Open GUI Panel #9000
    b. Refer to User Manual Vol I Section 4.47 for understanding all functions on this GUI Panel.
    c. Select "Draft & Power" tab under "Main Engine Parameter Graphs" section for reference.
    d. Select "Draft (m) for displaying the draft parameter plot on the "Time Plot (Trend Data)" area.
    e. Select "ME Speed (RPM)" for the "X" value on the "X-Y Graph" to associate the "ME Speed" values with the X-axis.
    f. Select "ME Shaft Power (MW)" for the "Y" value on the "X-Y Graph" to associate the "ME Shaft Power" values with the Y-axis.
    g. Click on "Reset Graph" below both graphic sections.
    h. Ensure both graphs start plotting draft on "Time Graph" and ME RPM vs ME Power on "X-Y Graph".
    i. Record time.
f. 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 as well as time graph for the draft.
g. Open ME Parameters GUI Panel #4000 to observe and record the relevant variables periodically: ME Load (%), Index (mm), Fuel Consumption (kg/h), SFOC (g/kWh), Cylinder (Average) Exhaust Temperatures (deg.C), Turbocharger 1/2 Speeds (RPMs), etc.
h. Although they are already recorded on the graph sections, it is also a good practice to record the draft, ballast tank levels, ME Speed, and ME Power values periodically, for example every 10-15 minutes.
i. Continue all necessary observations and recording periodically until all ballast tanks are full.
j. Compare the ME RPM vs Shaft Power graph, along with the draft change, against the one provided on the software or in Section 7.2.15 of this manual.
k. Write your learnings and discussion items.

Also refer to the screen captures provided below for seeing an example of recordings captured on an ongoing exercise using SERS.

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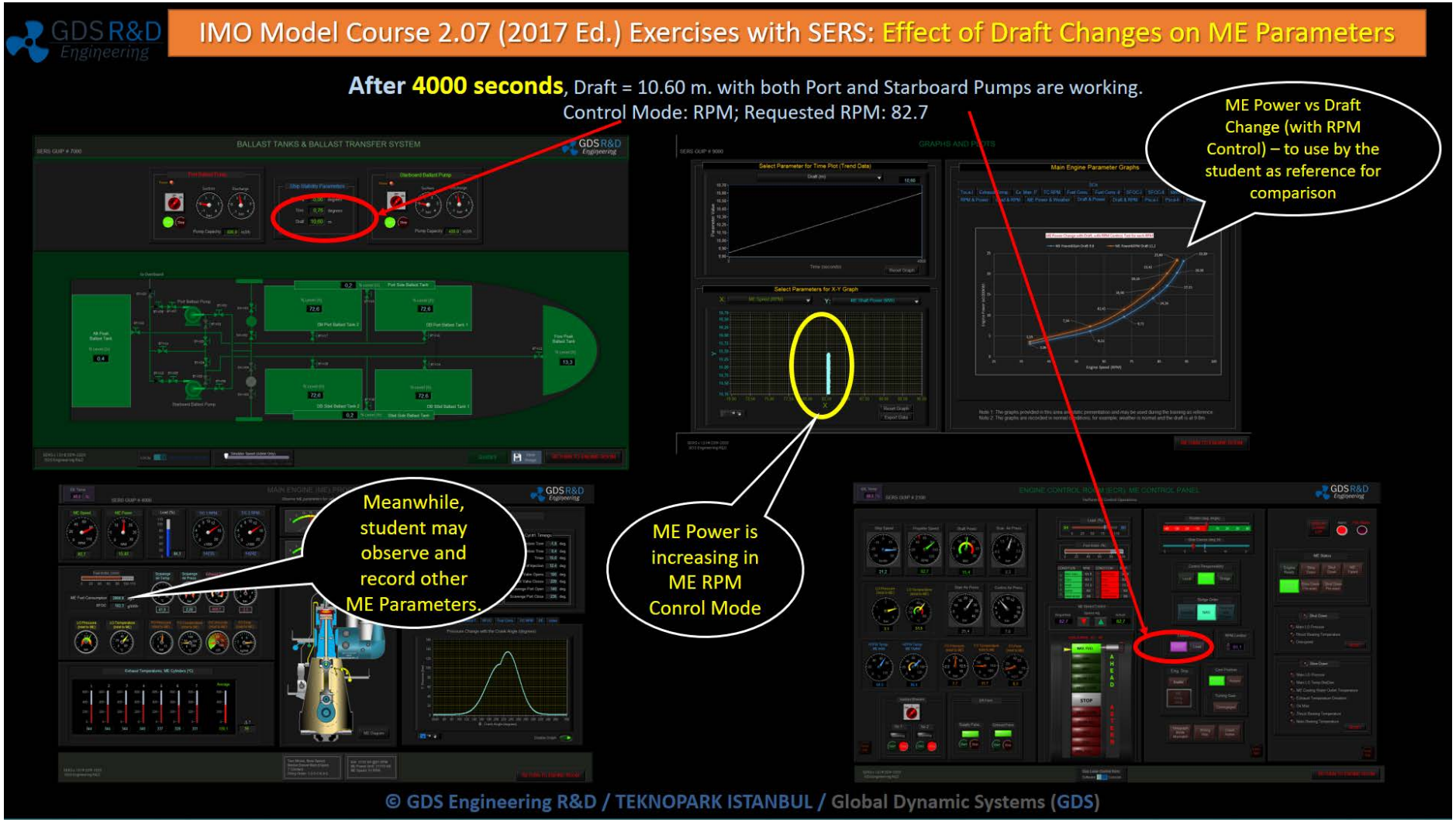

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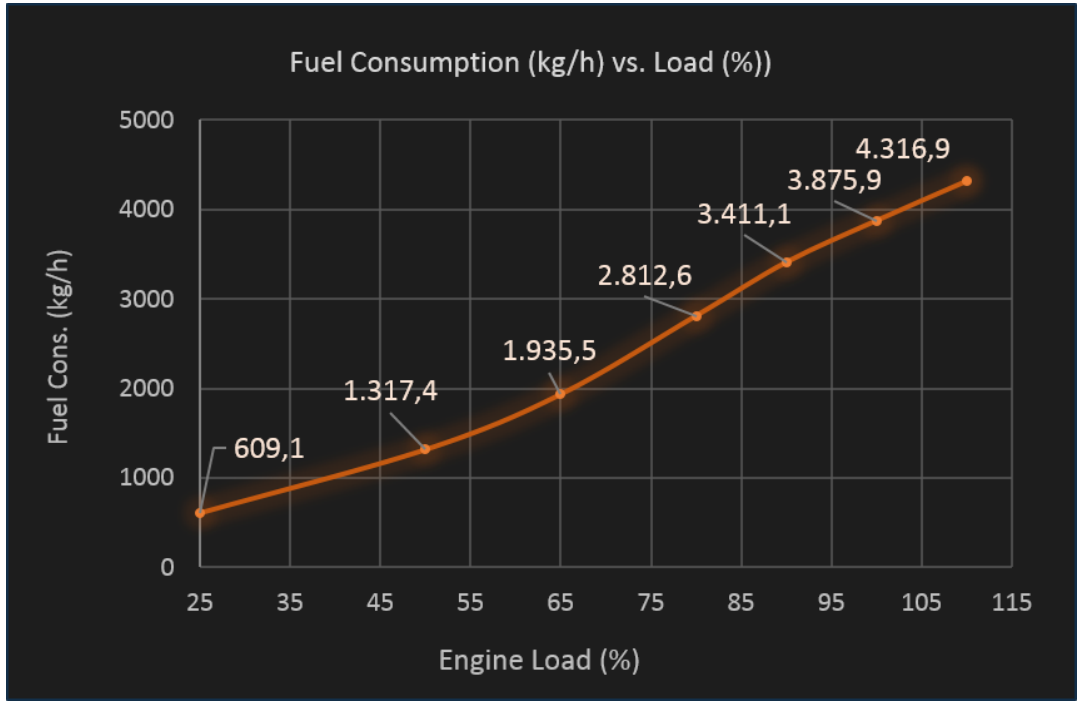
7. MAIN ENGINE PERFORMANCE GRAPHS

7.1 Main Engine Load Graphs

7.1.1 Fuel Consumption (kg/h) vs. Load (%)



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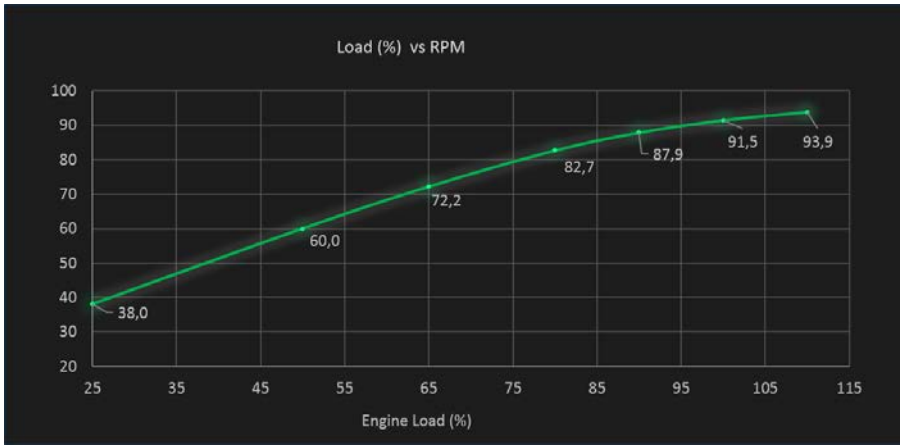
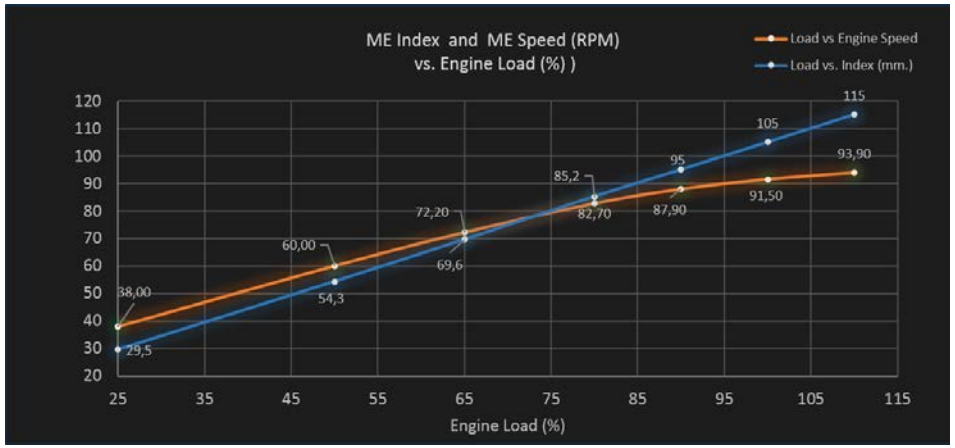
7.1.2 Load (%) vs. ME Speed (RPM) and ME Index, ME Speed (RPM) vs. Engine Load (%)





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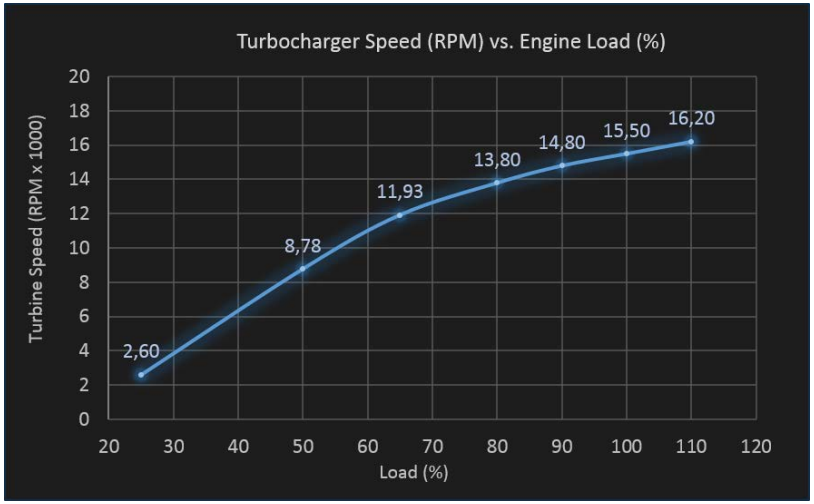
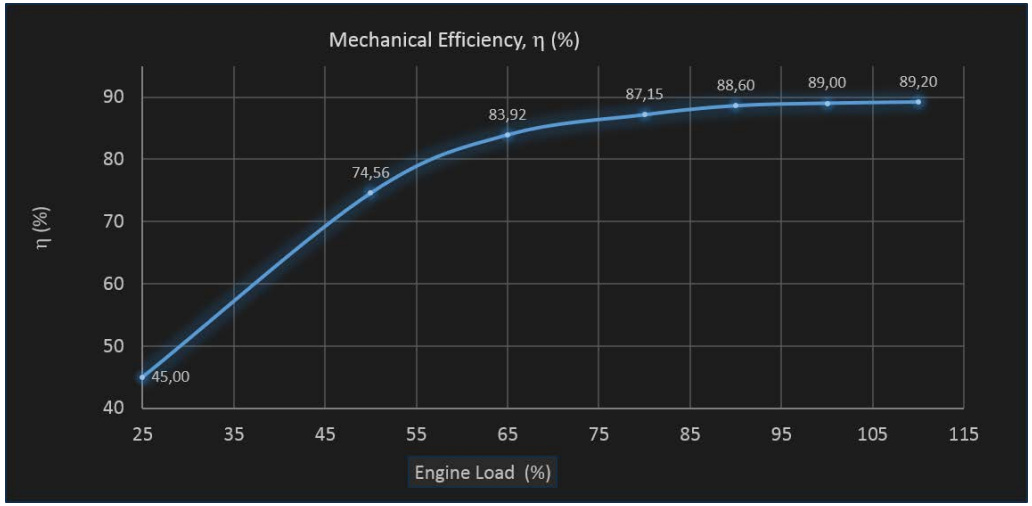
7.1.3 Turbocharger Speed (RPM) vs. Engine Load (%) and Mechanical Efficiency (%) vs. Engine Load (%)





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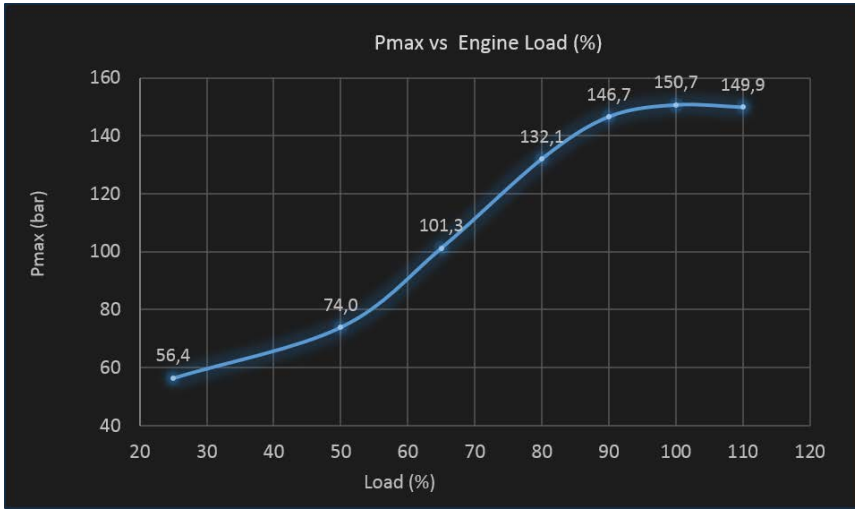
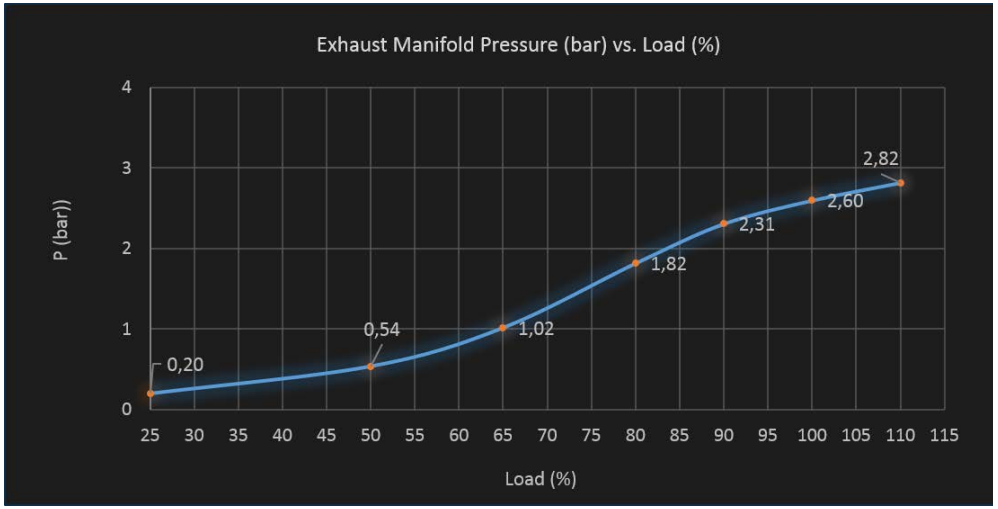
7.1.4 P_{max} vs. Engine Load (%) and Exhaust Manifold Pressure (bar) vs. Load (%)





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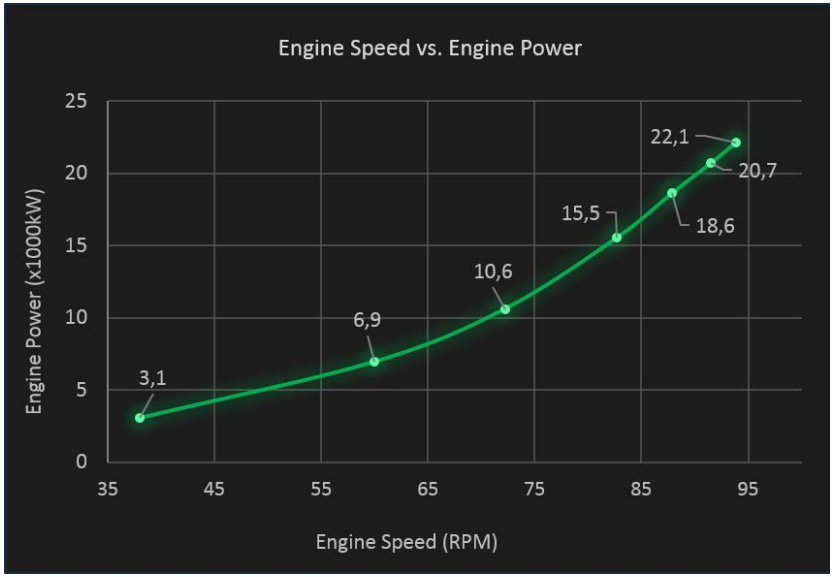
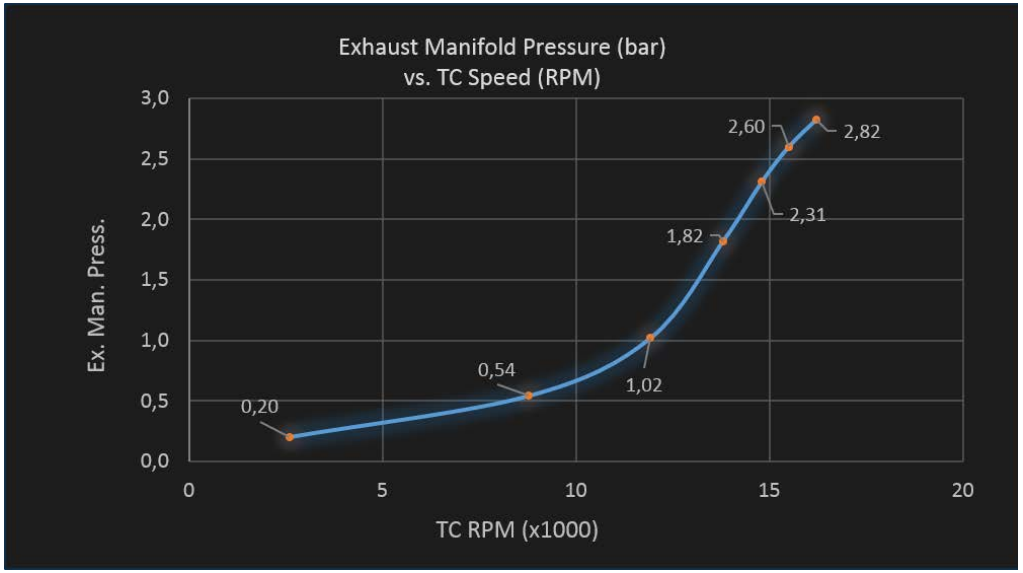
7.2 Main Engine Performance Graphs

7.2.1 Engine Speed (RPM) vs. Engine Power (MW) and Exhaust Manifold Pressure vs. TC RPM





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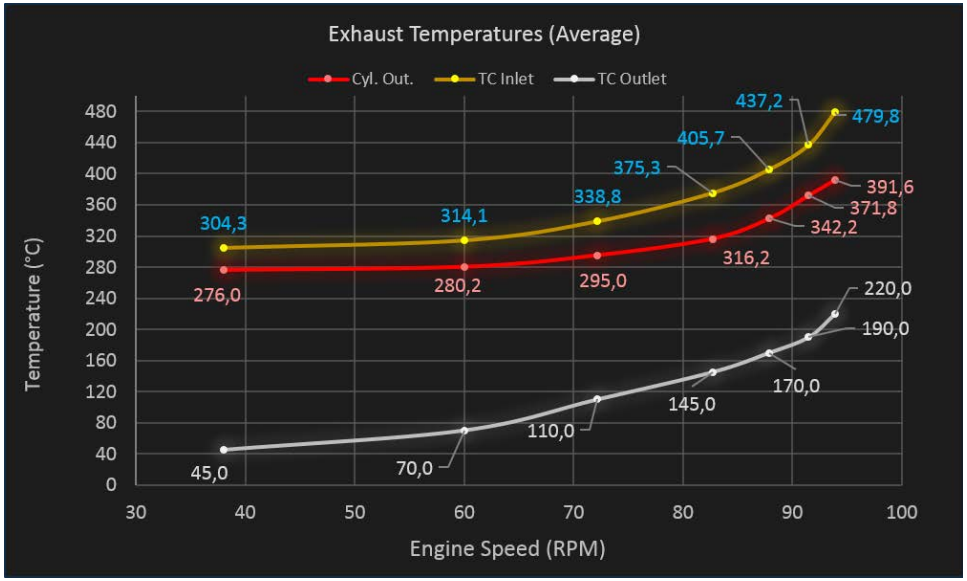
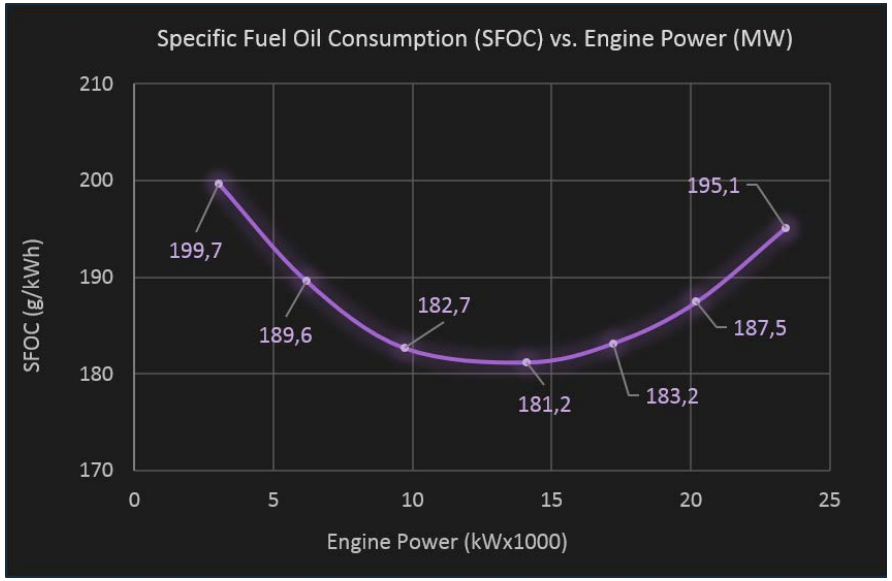
7.2.2 Exhaust Temperatures (Average) and Specific Fuel Oil Consumption (SFOC) vs. Engine Power





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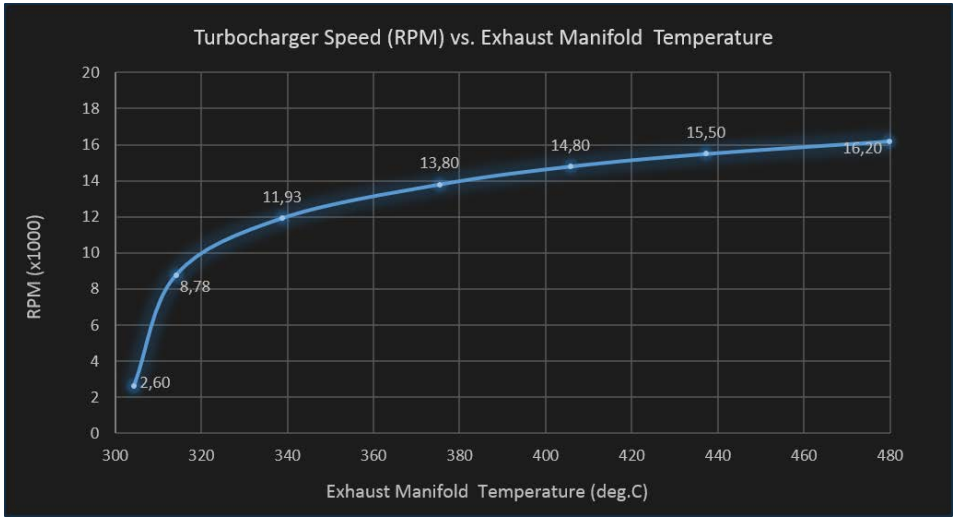
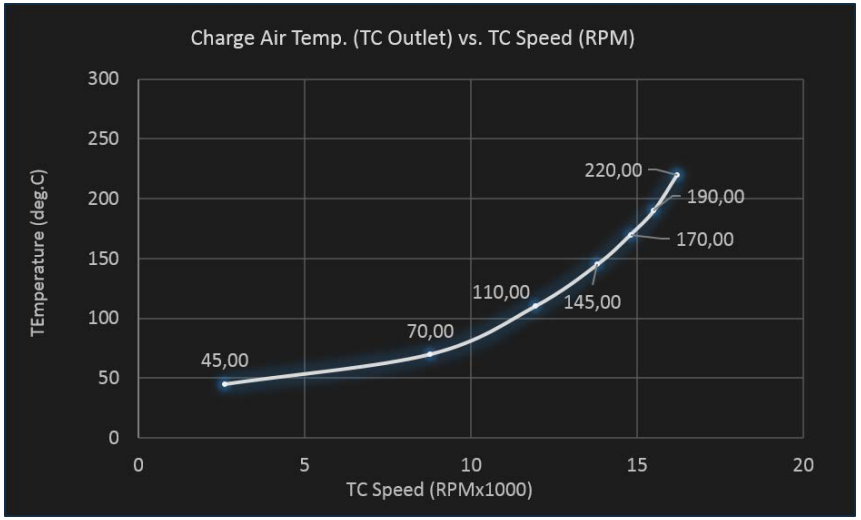
7.2.3 Turbocharger Speed (RPM) vs. Exhaust Manifold Temperature and Charge Air Temp. (TC Outlet) vs. TC Speed (RPM)





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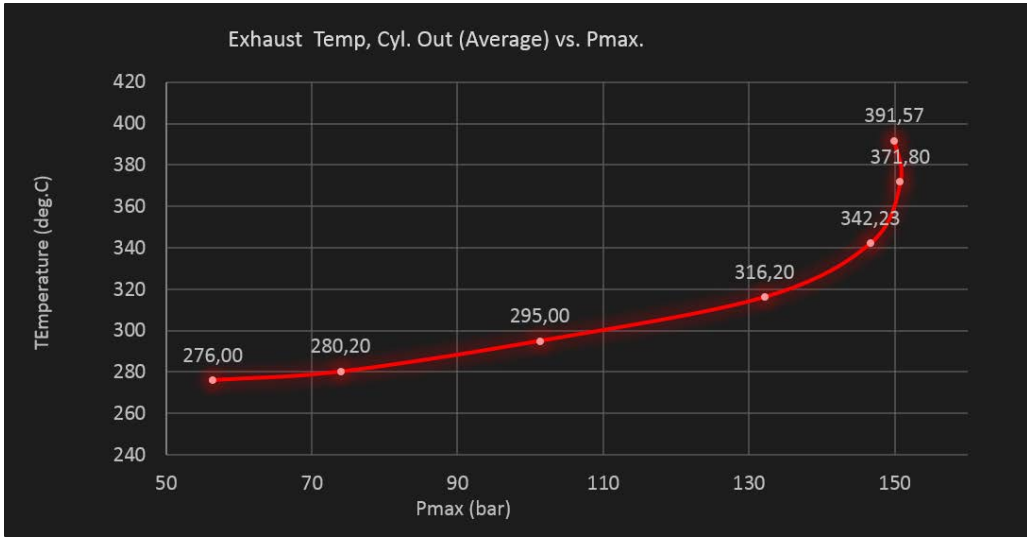
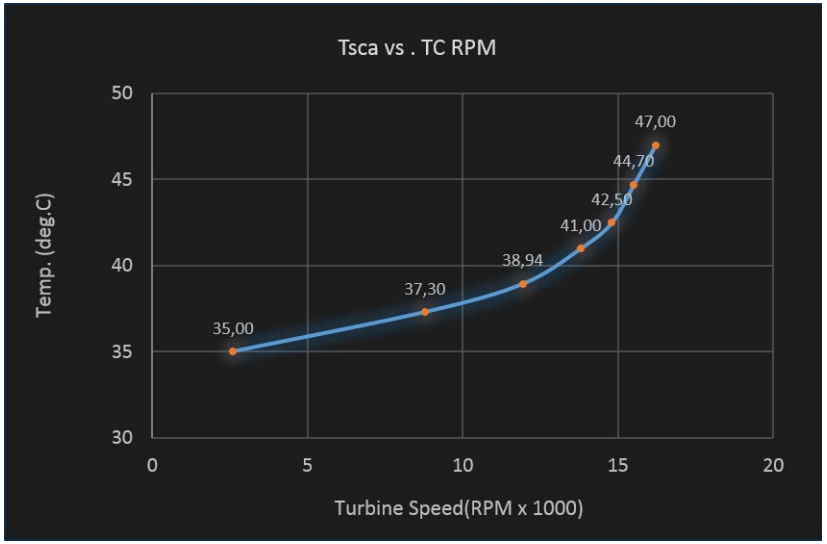
7.2.4 Exhaust Temperature, Cyl. Out. (Average) vs P_{max} and T_{sca} vs TC RPM





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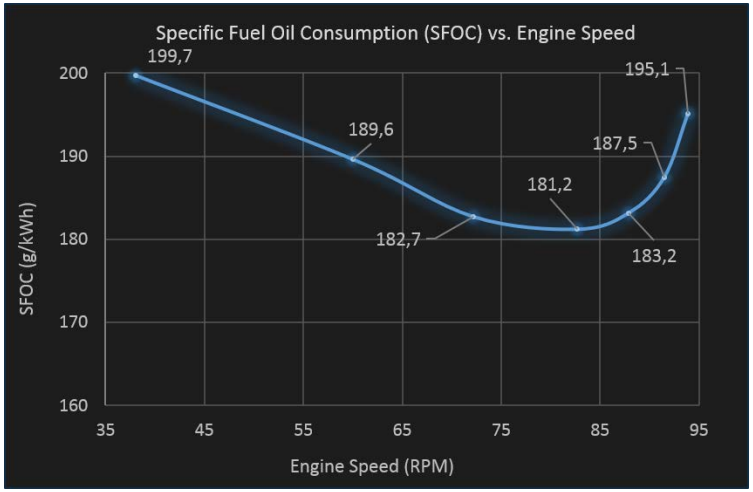
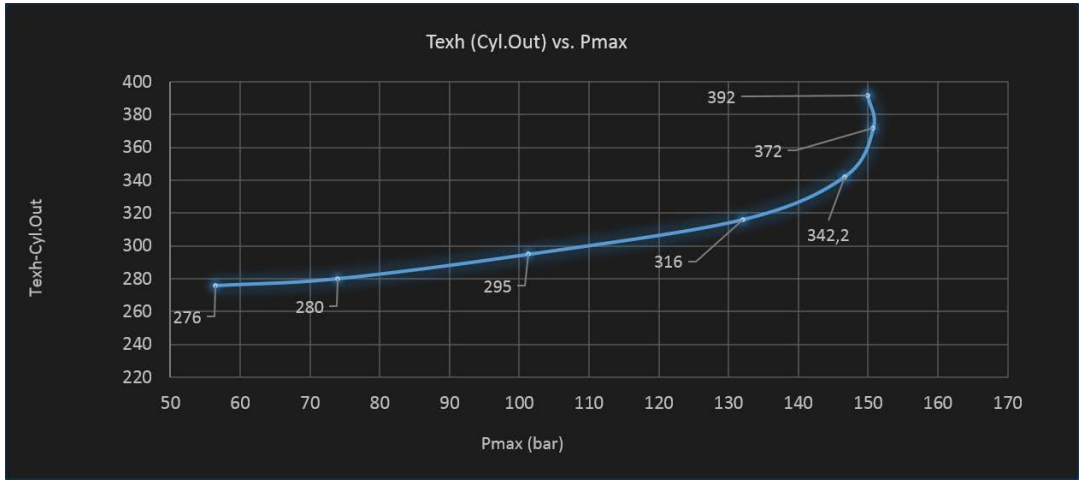
7.2.5 Specific Fuel Oil Consumption (SFOC) vs. Engine Speed and T_{exh} vs. P_{max}





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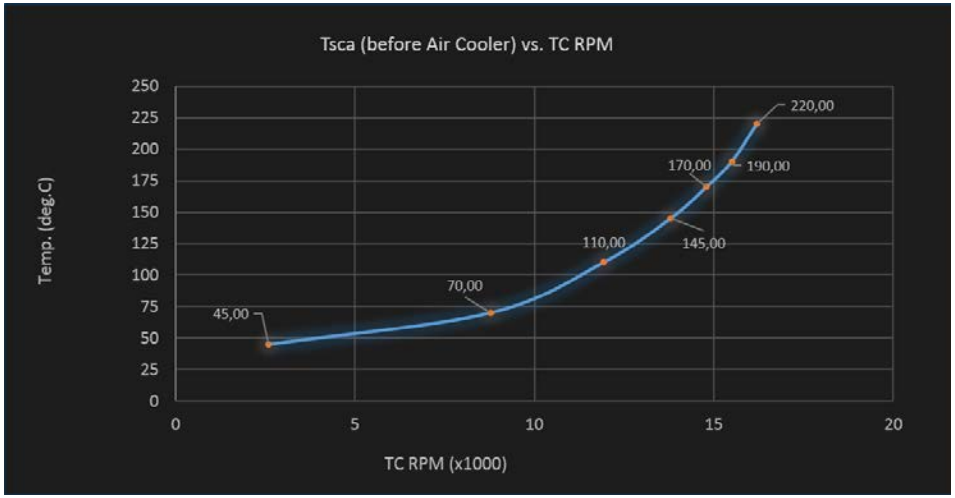
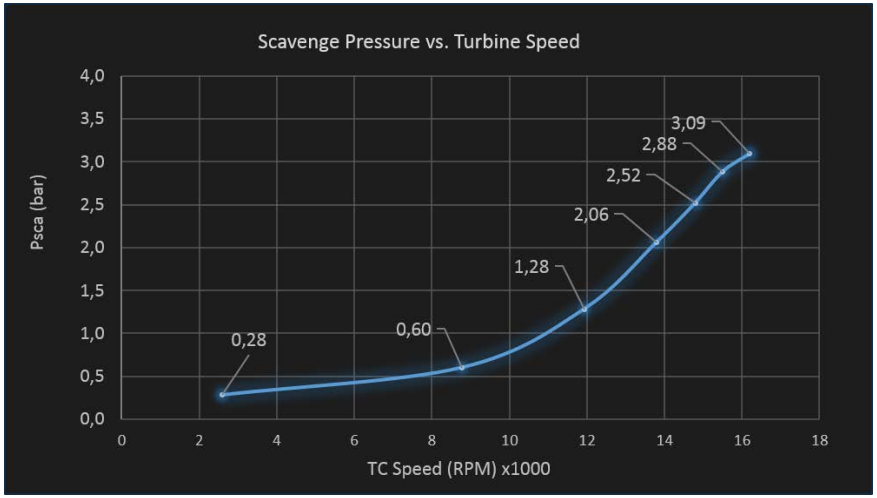
7.2.6 T_{sca} (before Air Cooler) vs. TC RPM and Scavenge Pressure vs. Turbine Speed





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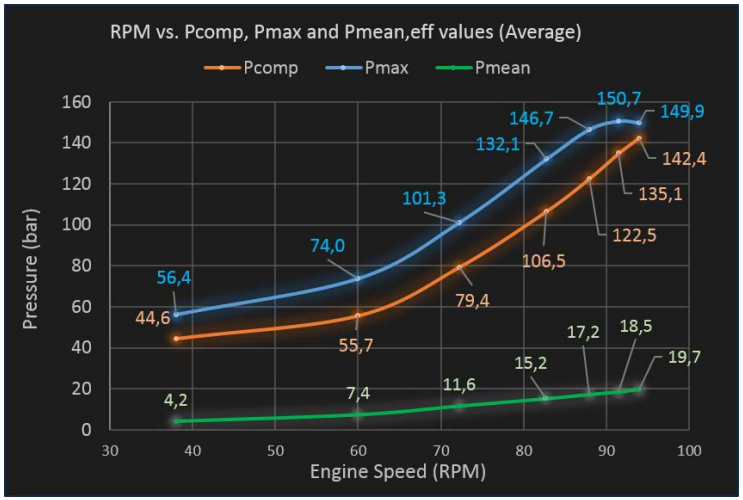
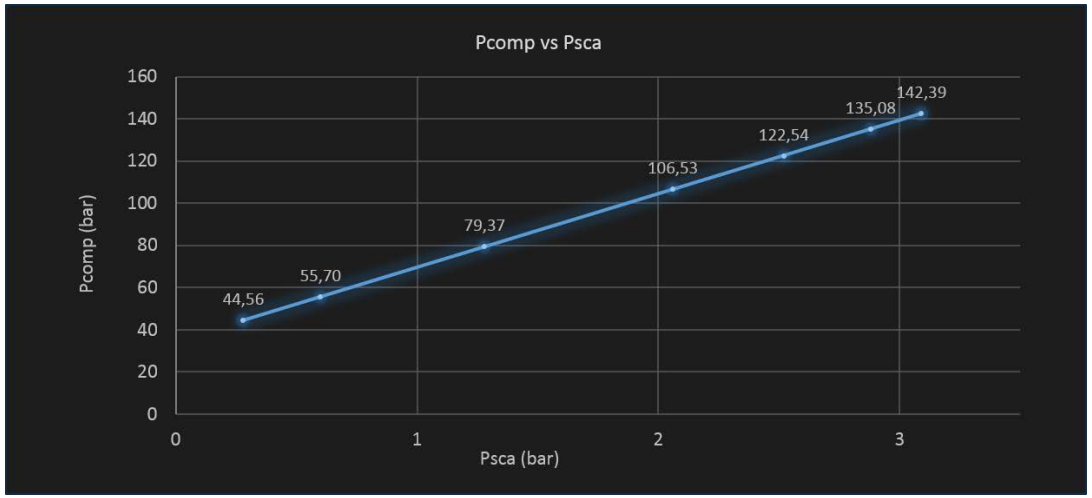
7.2.7 RPM vs. P_{comp}, P_{max}, $P_{mean, eff.}$ values and P_{comp} vs P_{sca}





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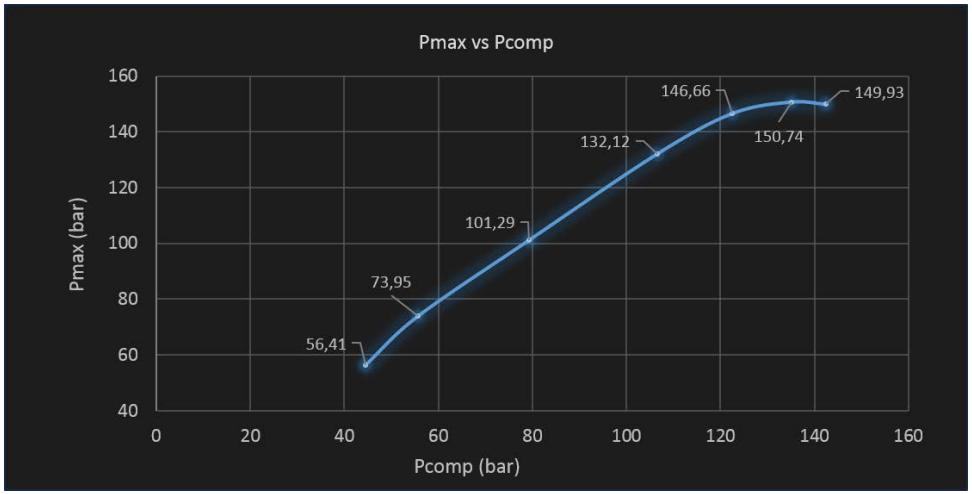
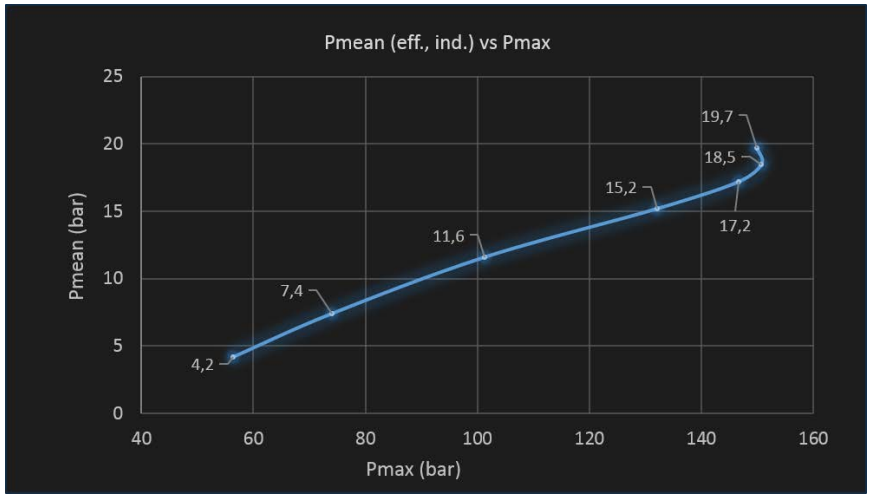
7.2.8 P_{max} vs. P_{comp} and P_{mean} (eff., ind.) vs. P_{max}





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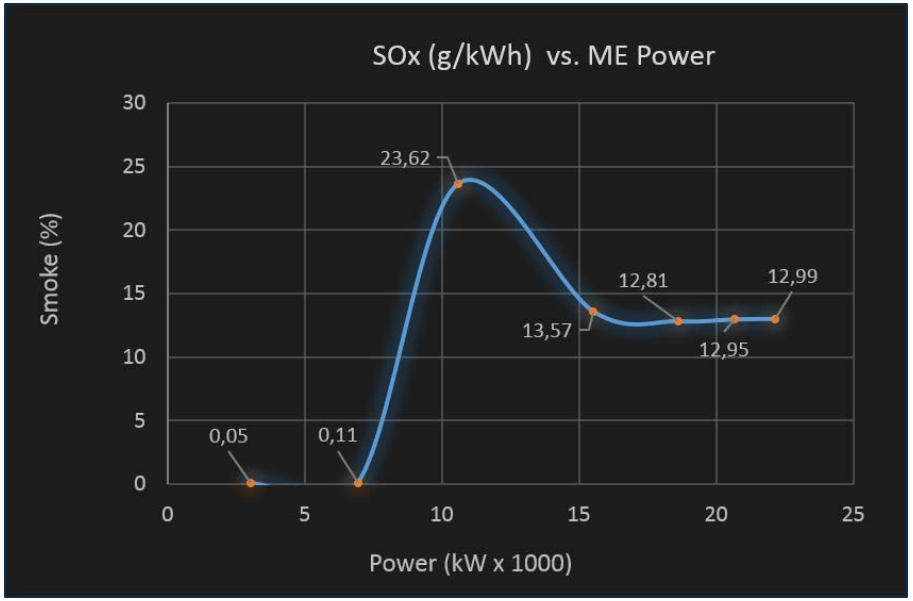
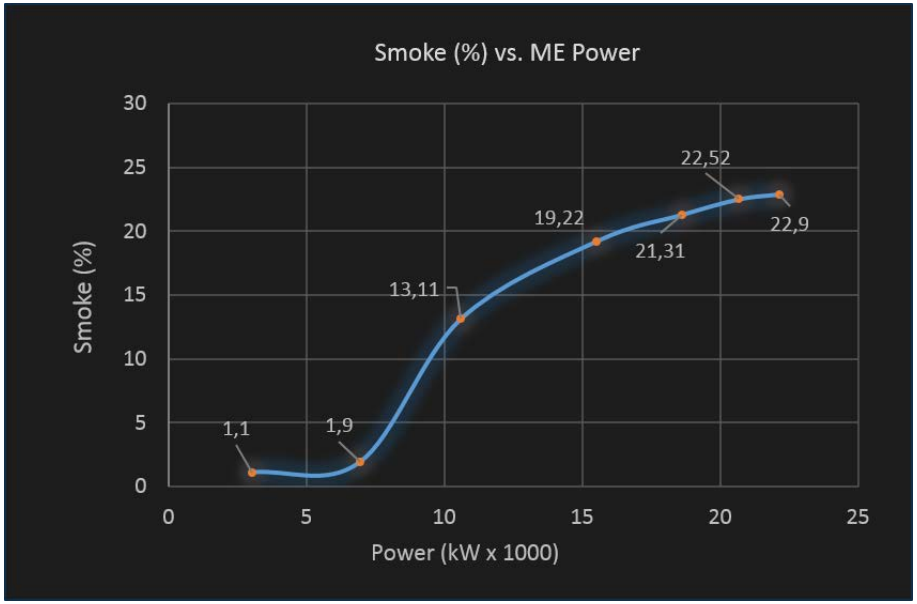
7.2.9 SO_x (g/kWh) vs. ME Power and Smoke (%) vs. ME Power





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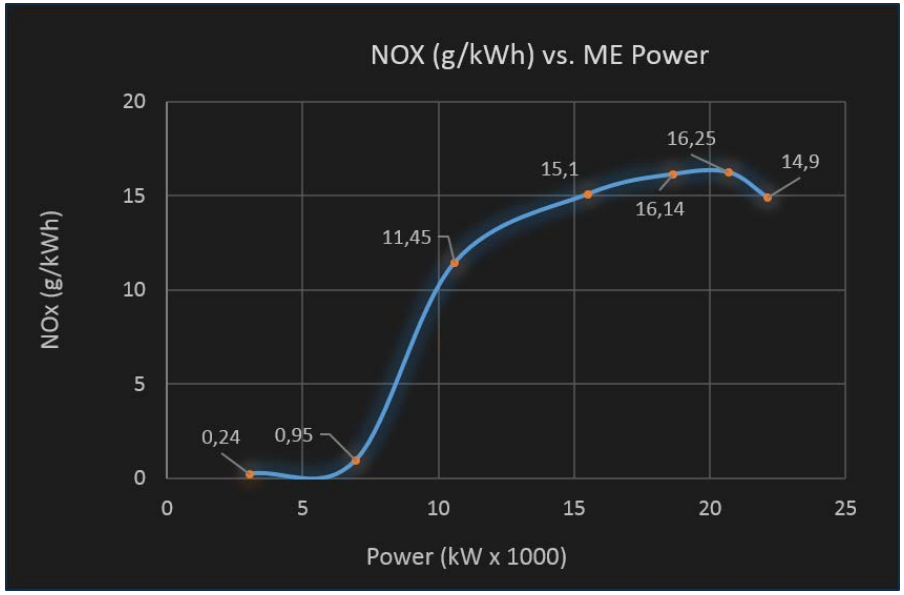
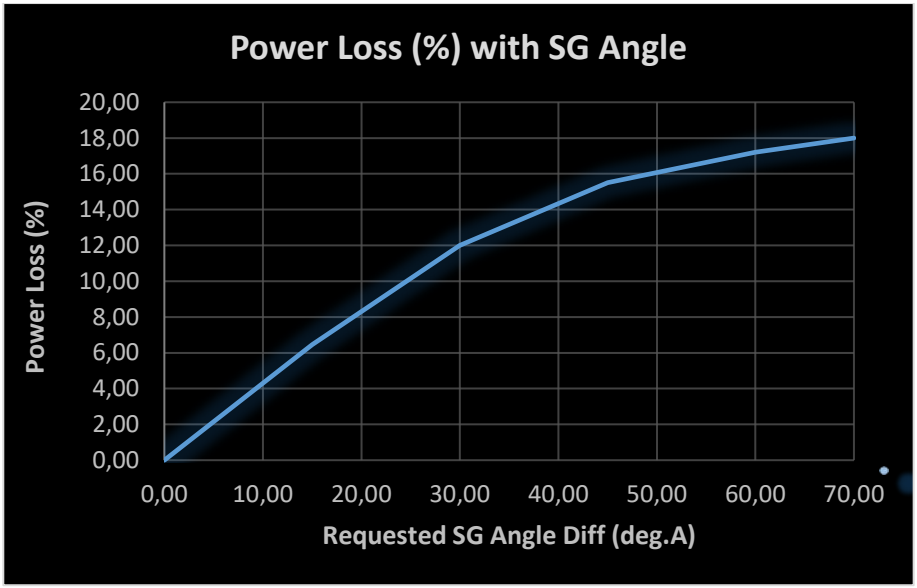
7.2.10 NO_x (g/kWh) vs. ME Power and Power Loss with Steering Gear Angle





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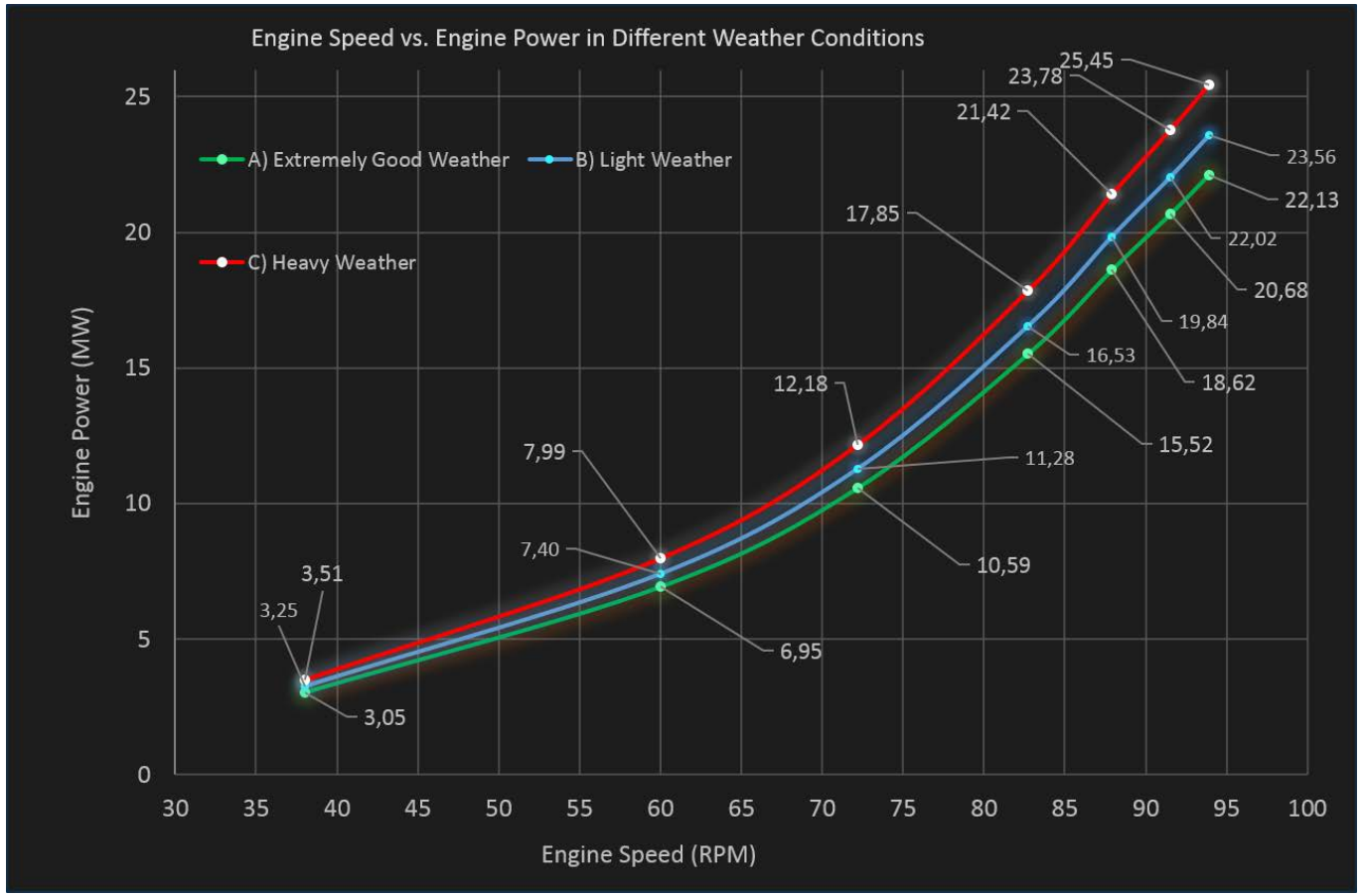
7.2.11 ME Power Change in Different Weather Conditions:

Below graphs shows the change of engine speed and engine power in various weather conditions. Notice that all ME graphs under Section 7 is based on "Extremely Good Weather" condition. Section 8.2.5 provides exercise for operating the ME in different weather conditions.



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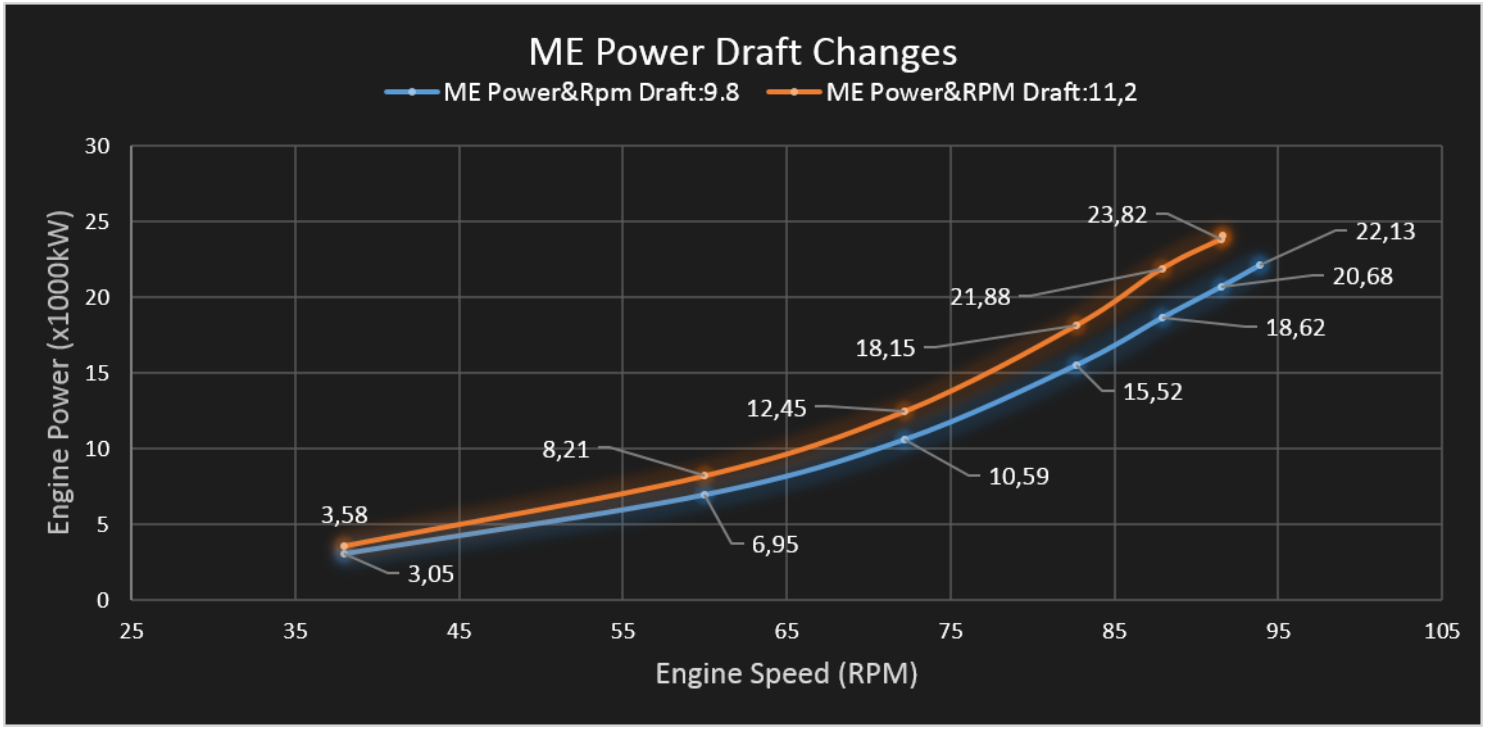
7.2.12 ME Power vs. Draft Changes

Below graph shows the change of Main Engine Power in light condition (draft: 9.8 m) and loaded condition (draft: 11.2 m). The graph may be viewed in SERS GUI Panel #9000 and can be used during a training exercise as reference for comparison.



See Section 6.9 for the instructions on performing an exercise using SERS, for demonstrating the effect of the draft on ME parameters.

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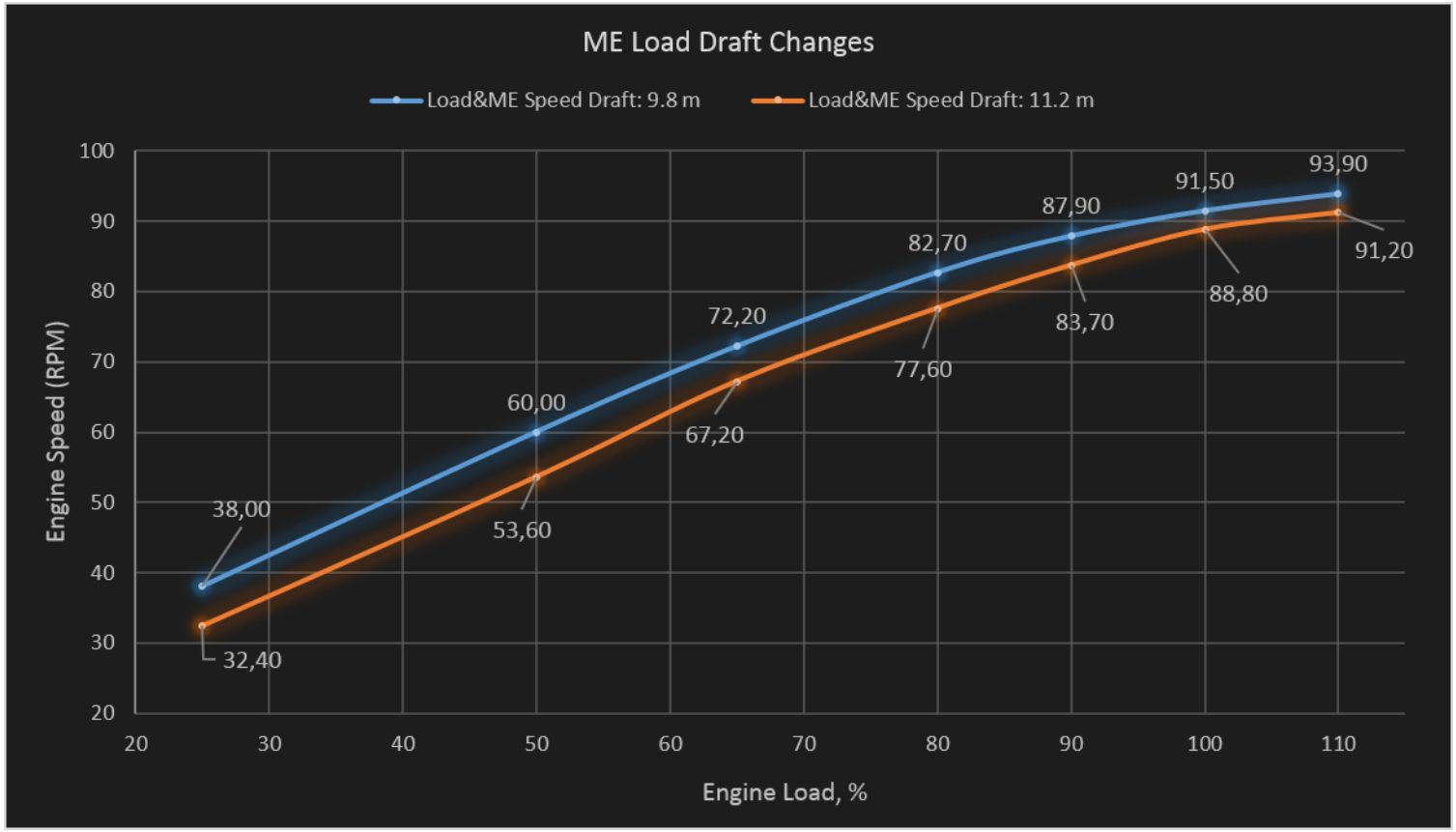
7.2.13 ME Load vs. Draft Changes

Below graph shows the change of Main Engine Load in light condition (draft: 9.8 m) and loaded condition (draft: 11.2 m). The graph may be viewed in SERS GUI Panel #9000 and can be used during a training exercise as reference for comparison.



See Section 6.9 for the instructions on performing an exercise using SERS, for demonstrating the effect of the draft on ME parameters.

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8. MALFUNCTIONS & EVENTS

Malfunctions that can be selected by the Instructor is shown in Table below. Please note that the SERS Team is updating the SERS software for providing more malfunctions and event tools. Please check this document is the latest and reflect the correct version of the software to ensure that you have the updated list of malfunctions utilized during the malfunction scenario trainings. Currently, there are total of 53 malfunctions and 3 events are implemented in SERS, as examples.

8.1 Malfunctions List

No	M Codes	Mulf. Name
1	M2201	ME Air Start Valve Stuck Closed
2	M2211	ME Fuel Pump No. 1, ME Inlet, Stuck Closed
3	M2212	ME Fuel Pump No. 2, ME Inlet, Stuck Closed
4	M2213	ME Fuel Pump No. 3, ME Inlet, Stuck Closed
5	M2214	ME Fuel Pump No. 4, ME Inlet, Stuck Closed
6	M2215	ME Fuel Pump No. 5, ME Inlet, Stuck Closed
7	M2216	ME Fuel Pump No. 6, ME Inlet, Stuck Closed
8	M2217	ME Fuel Pump No. 7, ME Inlet, Stuck Closed
9	M4001	ME Cyl No.1, Injection Time Late (%)
10	M4002	ME Cyl No.2, Injection Time Late (%)
11	M4003	ME Cyl No.3, Injection Time Late (%)
12	M4004	ME Cyl No.4, Injection Time Late (%)
13	M4005	ME Cyl No.5, Injection Time Late (%)

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No	M Codes	Mulf. Name
14	M4006	ME Cyl No.6, Injection Time Late (%)
15	M4007	ME Cyl No.7, Injection Time Late (%)
16	M4011	ME Cyl No.1, Inj. Nozzle Wear (%)
17	M4012	ME Cyl No.2, Inj. Nozzle Wear (%)
18	M4013	ME Cyl No.3, Inj. Nozzle Wear (%)
19	M4014	ME Cyl No.4, Inj. Nozzle Wear (%)
20	M4015	ME Cyl No.5, Inj. Nozzle Wear (%)
21	M4016	ME Cyl No.6, Inj. Nozzle Wear (%)
22	M4017	ME Cyl No.7, Inj. Nozzle Wear (%)
23	M4021	ME Cyl No.1, Inj. Nozzle Clogged
24	M4022	ME Cyl No.2, Inj. Nozzle Clogged
25	M4023	ME Cyl No.3, Inj. Nozzle Clogged
26	M4024	ME Cyl No.4, Inj. Nozzle Clogged
27	M4025	ME Cyl No.5, Inj. Nozzle Clogged
28	M4026	ME Cyl No.6, Inj. Nozzle Clogged
29	M4027	ME Cyl No.7, Inj. Nozzle Clogged
30	M4031	ME Cyl No.1, Piston Rings Wear
31	M4032	ME Cyl No.2, Piston Rings Wear
32	M4033	ME Cyl No.3, Piston Rings Wear
33	M4034	ME Cyl No.4, Piston Rings Wear
34	M4035	ME Cyl No.5, Piston Rings Wear
35	M4036	ME Cyl No.6, Piston Rings Wear
36	M4037	ME Cyl No.7, Piston Rings Wear
37	M4041	ME Cyl No.1, Exhaust Valve Closes Late
38	M4042	ME Cyl No.2, Exhaust Valve Closes Late
39	M4043	ME Cyl No.3, Exhaust Valve Closes Late
40	M4044	ME Cyl No.4, Exhaust Valve Closes Late

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No	M Codes	Mulf. Name
41	M4045	ME Cyl No.5, Exhaust Valve Closes Late
42	M4046	ME Cyl No.6, Exhaust Valve Closes Late
43	M4047	ME Cyl No.7, Exhaust Valve Closes Late
44	M4051	ME Cyl No.1, Exhaust Valve Leakage
45	M4052	ME Cyl No.2, Exhaust Valve Leakage
46	M4053	ME Cyl No.3, Exhaust Valve Leakage
47	M4054	ME Cyl No.4, Exhaust Valve Leakage
48	M4055	ME Cyl No.5, Exhaust Valve Leakage
49	M4056	ME Cyl No.6, Exhaust Valve Leakage
50	M4057	ME Cyl No.7, Exhaust Valve Leakage
51	M4061	ME Cyl No.1, Liner Crack
52	M4062	ME Cyl No.2, Liner Crack
53	M4063	ME Cyl No.3, Liner Crack
54	M4064	ME Cyl No.4, Liner Crack
55	M4065	ME Cyl No.5, Liner Crack
56	M4066	ME Cyl No.6, Liner Crack
57	M4067	ME Cyl No.7, Liner Crack
58	M4301	ME Cyl. No. 1, Score in ME Bearing
59	M4302	ME Cyl. No. 2, Score in ME Bearing
60	M4303	ME Cyl. No. 3, Score in ME Bearing
61	M4304	ME Cyl. No. 4, Score in ME Bearing
62	M4305	ME Cyl. No. 5, Score in ME Bearing
63	M4306	ME Cyl. No. 6, Score in ME Bearing
64	M4307	ME Cyl. No. 7, Score in ME Bearing
65	M4311	ME Cyl. No. 1, Oil Mist Detector, Sensor Failure

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No	M Codes	Mulf. Name
66	M4312	ME Cyl. No. 2, Oil Mist Detector, Sensor Failure
67	M4313	ME Cyl. No. 3, Oil Mist Detector, Sensor Failure
68	M4314	ME Cyl. No. 4, Oil Mist Detector, Sensor Failure
69	M4315	ME Cyl. No. 5, Oil Mist Detector, Sensor Failure
70	M4316	ME Cyl. No. 6, Oil Mist Detector, Sensor Failure
71	M4317	ME Cyl. No. 7, Oil Mist Detector, Sensor Failure
72	M4327	ME Croshead Bearing No 7, Temp is high.
73	M5101	DG1 LO Filter dirty(%30)
74	M5102	DG1 LO Filter clogged
75	M5201	DG2 LO Filter dirty(%30)
76	M5202	DG2 LO Filter clogged
77	M5301	DG3 LO Filter dirty(%30)
78	M5302	DG3 LO Filter clogged
79	M5401	ECR Control Systems Panel, Circuit Breaker Failure
80	M5402	SW Pump No 1 Overload

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No	M Codes	Mulf. Name
81	M5403	SW Pump No 2 Overload
82	M5404	ME Systems Main CB Overload
83	M5405	Aux. SW Pump Overload
84	M5406	LTFW Pump 1 Overload
85	M5407	LTFW Pump 2 Overload
86	M5408	HTFW Pump 1 Overload
87	M5409	HTFW Pump 2 Overload
88	M5410	FO Supply Pump 1 Overload
89	M5411	FO Supply Pump 2 Overload
90	M5412	FO Circulation Pump 1 Overload
91	M5413	FO Circulation Pump 2 Overload
92	M5414	LO Pump 1 Overload
93	M5415	LO Pump 2 Overload
94	M5416	Air Compressor 1 Overload
95	M5417	Air Compressor 2 Overload
96	M5418	ME Turning Gear Overload
97	M5419	Auxiliary I Circuit Breaker Overload
98	M5420	Steering Gear Pump 1 Malfunction
99	M5421	Steering Gear Pump 2 Malfunction
100	M5422	Engine Room Supply Fans Trip
101	M5602	SW pump 1 current leakage
102	M5704	220V Main Bus Low insulation failure(due to Galley)

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No	M Codes	Mulf. Name
103	M3001	SW leakage in delivery piping line.
104	M3002	SW Pump 1 Wear
105	M3003	SW Pump 2 Wear
106	M3004	Aux SW Pump Wear
107	M3201	Starting Air to DG2 Valve Stuck Closed or Clogged
108	M3202	Air Tube 1 Drain Valve Leakage / Cannot be Closed
109	M3203	Air Tube 2 Drain Valve Leakage / Cannot be Closed
110	M3204	Aux Air Tube Drain Valve Leakage / Cannot be Closed
111	M3301	Boiler Deep Blow Down Valve Stuck Open
112	M3302	Feed pump 1 sensor failure
113	M3303	Fire in Exhaust Boiler Economizer
114	M3401	LO cooler 1 dirty
115	M3402	LO cooler 2 dirty
116	M3501	FO Heater 1 Dirty
117	M3502	FO Heater 2 Dirty
118	M3503	FO circulation pump 1 wear (%50)
119	M3504	FO circulation pump 2 wear (%50)
120	M4801	High salinity alarm

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8.2 Events List

E Codes	Event Name
E100(1-3)	Weather Condition
E1004	Engine Room Air Pressure Change
E1005	Seawater temperature

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8.3 Malfunction and Event Exercises

In this section, several malfunction studies are provided, as example exercise to use during trainings. Many other similar exercises may be produced using SERS.

8.3.1 Score in No.3 Main Engine Bearing (M4301)

When this malfunction activated, Oil Mist Detector will be activated and ME will be going slow down. When the user heard alarm sound, please check ME Bearing Temperatures. According to the temperatures, find which bearing worn. If you sure about problem, identify it from the Identifying & Acknowledge Malfunctioning Components GUI Panel (GUIP #8500).

M4301 Score in ME Bearing #3					
Parameters	***Initial Values***	***Values after 3 min. of malfunction injected***	***Values after 5 min. of malfunction injected***	***Values after 10 min. of malfunction injected***	***Alarms***
No.1 Crankcase Oil Mist (%)					
No.2 Crankcase Oil Mist (%)					
No.3 Crankcase Oil Mist (%)					
No.4 Crankcase Oil Mist (%)					
No.5 Crankcase Oil Mist (%)					
No.6 Crankcase Oil Mist (%)					
No.7 Crankcase Oil Mist (%)					

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M4301 Score in ME Bearing #3

Parameters	*Initial Values*	*Values after 3 min. of malfunction injected*	*Values after 5 min. of malfunction injected*	*Values after 10 min. of malfunction injected*	*Alarms*
No.1 Crosshead Bearing Temperature (°C)					
No.2 Crosshead Bearing Temperature (°C)					
No.3 Crosshead Bearing Temperature (°C)					
No.4 Crosshead Bearing Temperature (°C)					
No.5 Crosshead Bearing Temperature (°C)					
No.6 Crosshead Bearing Temperature (°C)					
No.7 Crosshead Bearing Temperature (°C)					

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M4301 Score in ME Bearing #3

Parameters	*Initial Values*	*Values after 3 min. of malfunction injected*	*Values after 5 min. of malfunction injected*	*Values after 10 min. of malfunction injected*	*Alarms*
No.1 Crankpin Temperature (°C)					
No.2 Crankpin Temperature (°C)					
No.3 Crankpin Temperature (°C)					
No.4 Crankpin Temperature (°C)					
No.5 Crankpin Temperature (°C)					
No.6 Crankpin Temperature (°C)					
No.7 Crankpin Temperature (°C)					

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M4301 Score in ME Bearing #3

Parameters	*Initial Values*	*Values after 3 min. of malfunction injected*	*Values after 5 min. of malfunction injected*	*Values after 10 min. of malfunction injected*	*Alarms*
No.1 Main Bearing Temperature (°C)					
No.2 Main Bearing Temperature (°C)					
No.3 Main Bearing Temperature (°C)					
No.4 Main Bearing Temperature (°C)					
No.5 Main Bearing Temperature (°C)					
No.6 Main Bearing Temperature (°C)					
No.7 Main Bearing Temperature (°C)					
Thrust Bearing Temperature (°C)					

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8.3.2 DG 1 LO Filter is Dirty (30%) (M5101)

When this malfunction or M5102 activated, DG's LO pressure will be decreasing. Only difference between them; M5102 DG 1 LO Filter Clogged alarm can cause immediate black out event. Both Malfunction will activate Low LO Pressure alarm. If you are seeing low pressure on DG inlet that means oil can flow and filter is dirty. If it is 0 or around 0 that means it is completely choked. Once you are sure about which malfunction is activated on your system, identify it from Identify Malfunction Panel.

M5101 DG 1 LO Filter Dirty (%30)					
Parameters	***Initial Values***	***Values after 3 min. of malfunction injected***	***Values after 5 min. of malfunction injected***	***Values after 10 min. of malfunction injected***	***Alarms***
LO Cooler Inlet Temperature (°C)					
LO Cooler Outlet Temperature (°C)					
LO Inlet Presssure (bar)					
Average Exhaust Temperature (°C)					
Average FW Temperature (°C)					

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8.3.3 Boiler Deep Blown Down Valve Stuck (M3301)

When you see Boiler water level low alarm, you have to find exact cause of it. When this malfunction activated, Boiler water level will decrease. Also Feed Pump 1 Sensor failure can cause boiler level problem. So you have to be sure about root cause of Boiler Level Problem. If you can't close Boiler Deep Blown Down Valve, that means M3301 is injected to your system. You have to identify it from Identify Malfunction Panel.

M3301 Boiler Deep Blown Down Valve Stuck Open					
Parameters	***Initial Values***	***Values after 3 min. of malfunction injected***	***Values after 5 min. of malfunction injected***	***Values after 10 min. of malfunction injected***	***Alarms***
Boiler Water Level (%)					
Steam Temperature (°C)					
Steam Pressure (bar)					
Steam Flow (kg/h)					
Feed Pump 1 Status					
Feed Pump 2 Status					

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8.3.4 LO Cooler 1 or 2 is Dirty (M3401 or M3402)

When this malfunction activated in the system, LO temperature will be raising. You have the check system for finding root cause. It can be cooling system problem or cooler problem. After finding exact cause of LO Temperature rising problem, identify it from Identify Malfunction Panel.

M3401 or M3402 LO Cooler 1 or 2 Dirty					
Parameters	***Initial Values***	***Values after 3 min. of malfunction injected***	***Values after 5 min. of malfunction injected***	***Values after 10 min. of malfunction injected***	***Alarms***
Main Engine LO Inlet Temperature (°C)					
Main Engine LO Outlet Temperature (°C)					
Main Engine LO Inlet Pressure (bar)					
LTFW Flow Rate through LO Coolers (m^3/h)					
LO By-pass line flow rate (m^3/h)					

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8.3.5 Weather Condition Event (E100[1-3])

In normal operation of SERS, vessel is sailing on extremely good weather condition, weather is not affecting at all. When ship speed, main engine load, exhaust gas temperatures, fuel consumption is not at their normal ranges, the root cause can be Weather Condition. Following table is an example for use by instructors for assigning student exercises for recording ME parameters in different weather conditions. Students then may be asked to submit a report with their observations.

E100(1-3) Weather Condition Events					
Parameters	***Initial Values***	***Values after 3 min. of malfunction injected***	***Values after 5 min. of malfunction injected***	***Values after 10 min. of malfunction injected***	***Alarms***
Ship Speed (knots)					
Main Engine Load (%)					
Main Engine Speed (rpm)					
Fuel Consumption (kg/h)					
SFOC (g/kWh)					
No.1 Cylinder Exhaust Temperature (°C)					
No.2 Cylinder Exhaust Temperature (°C)					
No.3 Cylinder Exhaust Temperature (°C)					
No.4 Cylinder Exhaust Temperature (°C)					
No.5 Cylinder Exhaust Temperature (°C)					
No.6 Cylinder Exhaust Temperature (°C)					
No.7 Cylinder Exhaust Temperature (°C)					

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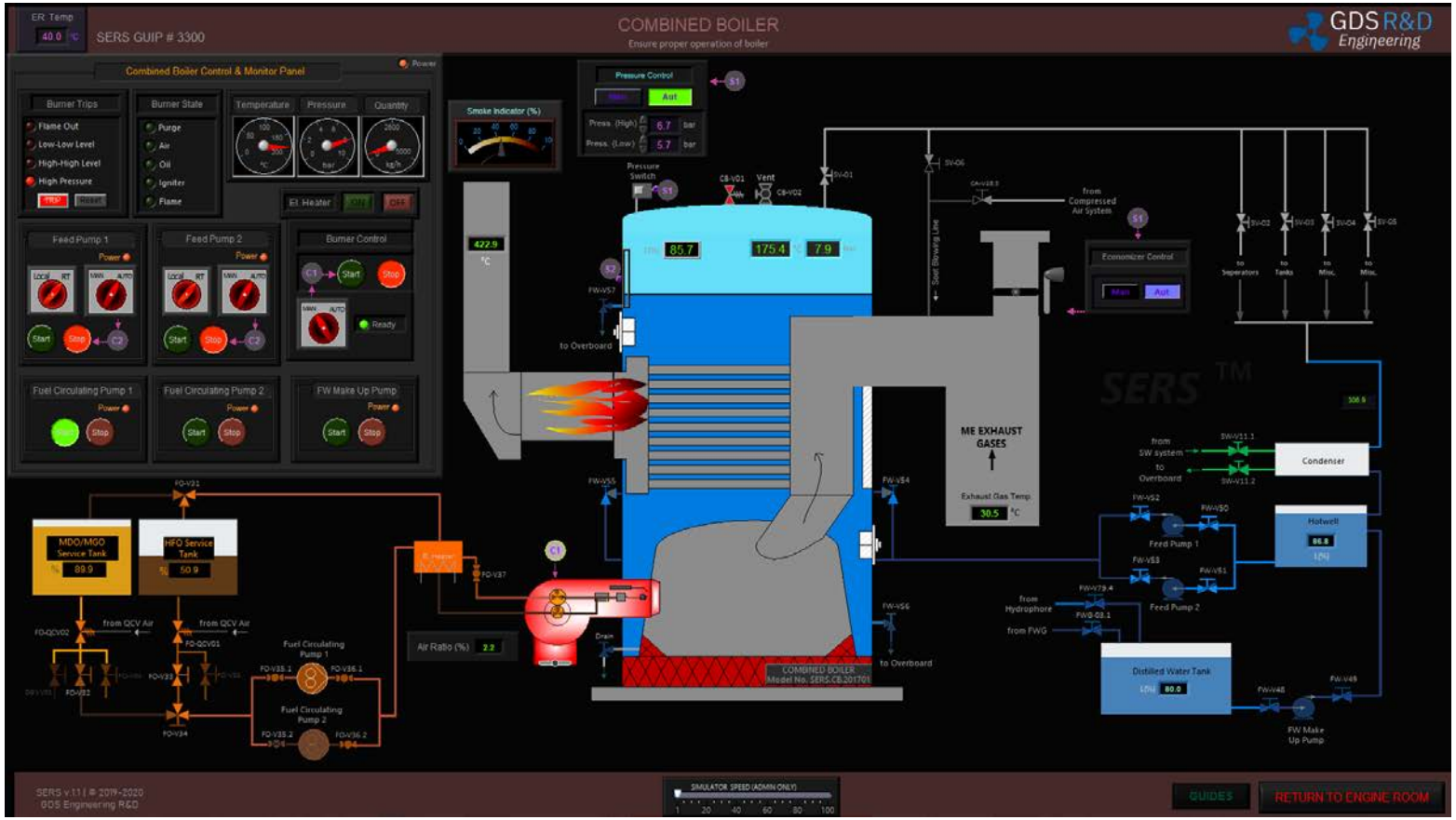
8.3.6 Fire in Economizer (M3303)

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.



When malfunction “M3303 Fire in Exhaust Boiler Economizer” is introduced, the following will be observed consecutively:

- A fire image on economizer appears.
- Exhaust Gas Outlet Temperature starts rising and alarm will be activated at 300 deg.C.

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- An audible fire alarm is activated.
- Fire alarm indicator on Main GUI Panel (#1000) is activated.

The following actions are expected to do by the trainee

- Inform Chief Engineer.
- If it is a team training, communicate with the deck officer in charge and request for ME stop.
- If stop is not allowed, bring the ME to slow down or to the lowest RPM that the steering gear may still be controlled.
- Open the damper manually (and quickly) without waiting for pressure increase and the damper is opened automatically.
- Ensure the Burner is stopped or stop is immediately.
- Observe the Exhaust Gas Temperature increase is slowed down.
- These actions only slow down the fire in economizer.
- Follow the instructions in Section 8.5 for identifying and acknowledging malfunctions. When the root case (Fire in Economizer) is identified correctly, the malfunction will be cleared and the parameters will be stored slowly.

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8.4 GUI Panels for Identifying a Malfunction (GUIP # 8500)

For identifying a malfunction:

- Click on “IDENTIFY MALFUNCTION” button on the SERS Main GUI Panel (GUIP #1000).
- “IDENTIFY MALFUNCTIONS” GUI window will be displayed (GUIP # 8500) with instructions (Figure 6.2).

- Select appropriate tab for identifying the ROOT CAUSE of the problem (Figure 6.3).
- Select the problem listed in this tab.
- Select “ACKNOWLEDGE SELECTION” button below the GUI window to acknowledge your selection.
- “End Note” tab with additional information is displayed (Figure 6.4).

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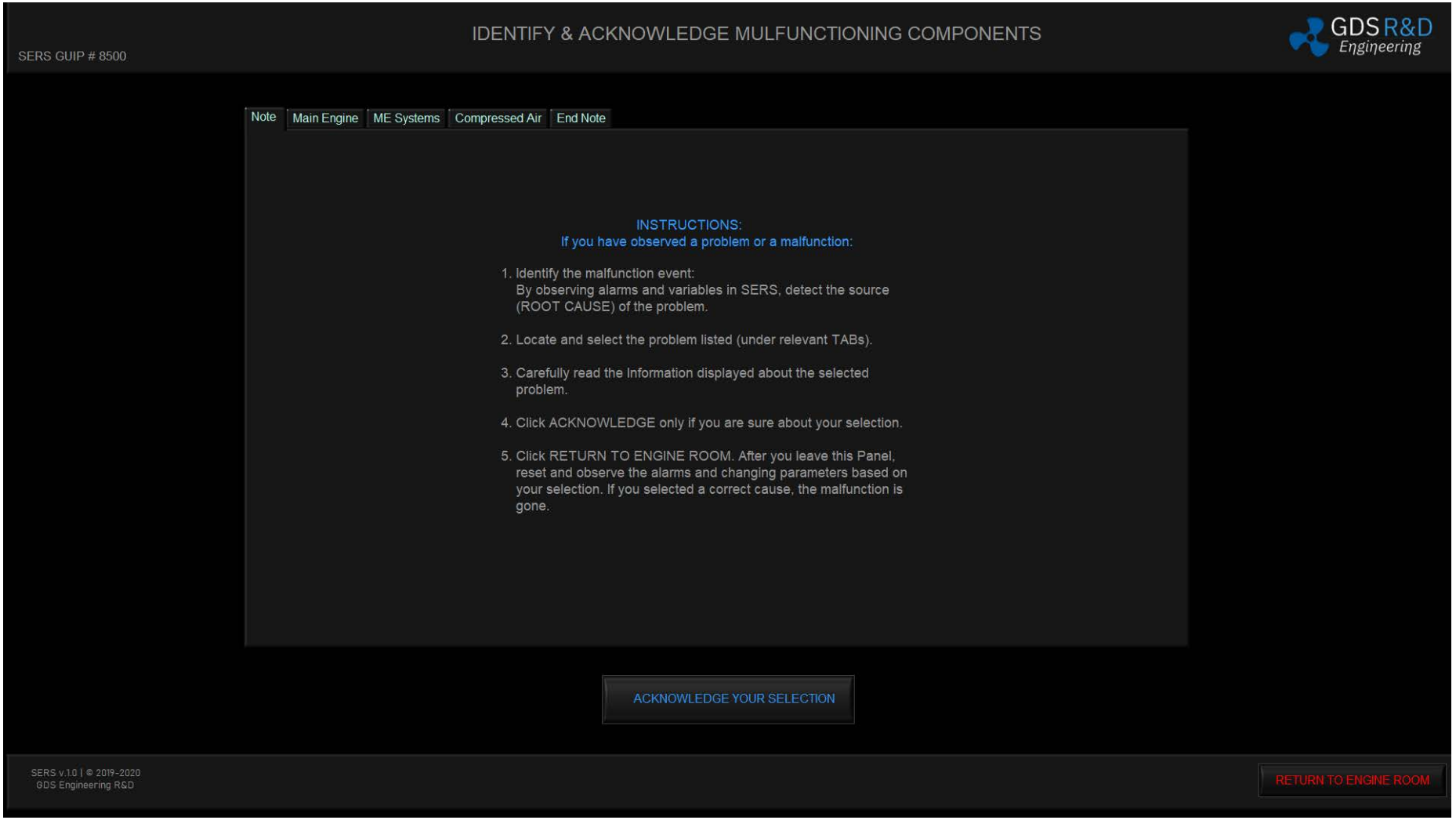

Figure 6.2 “IDENTIFY & ACKNOWLEDGE MAULFUNCTIONS” GUI Panel: Instructions Tab.

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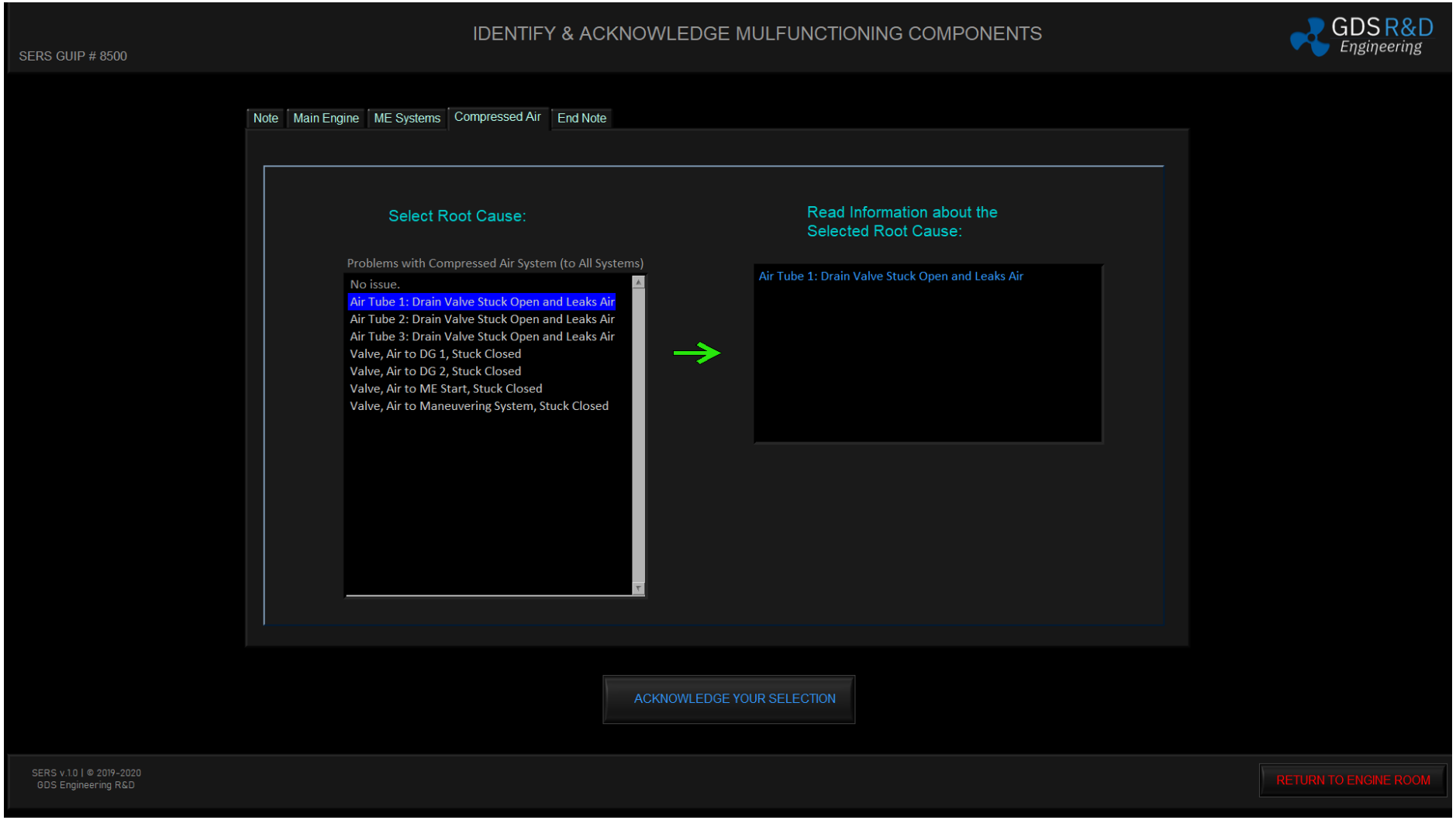

Figure 6.3 “IDENTIFY & ACKNOWLEDGE MAULFUNCTIONS” GUI Panel: Selecting the ROOT-CAUSE of the Problem.

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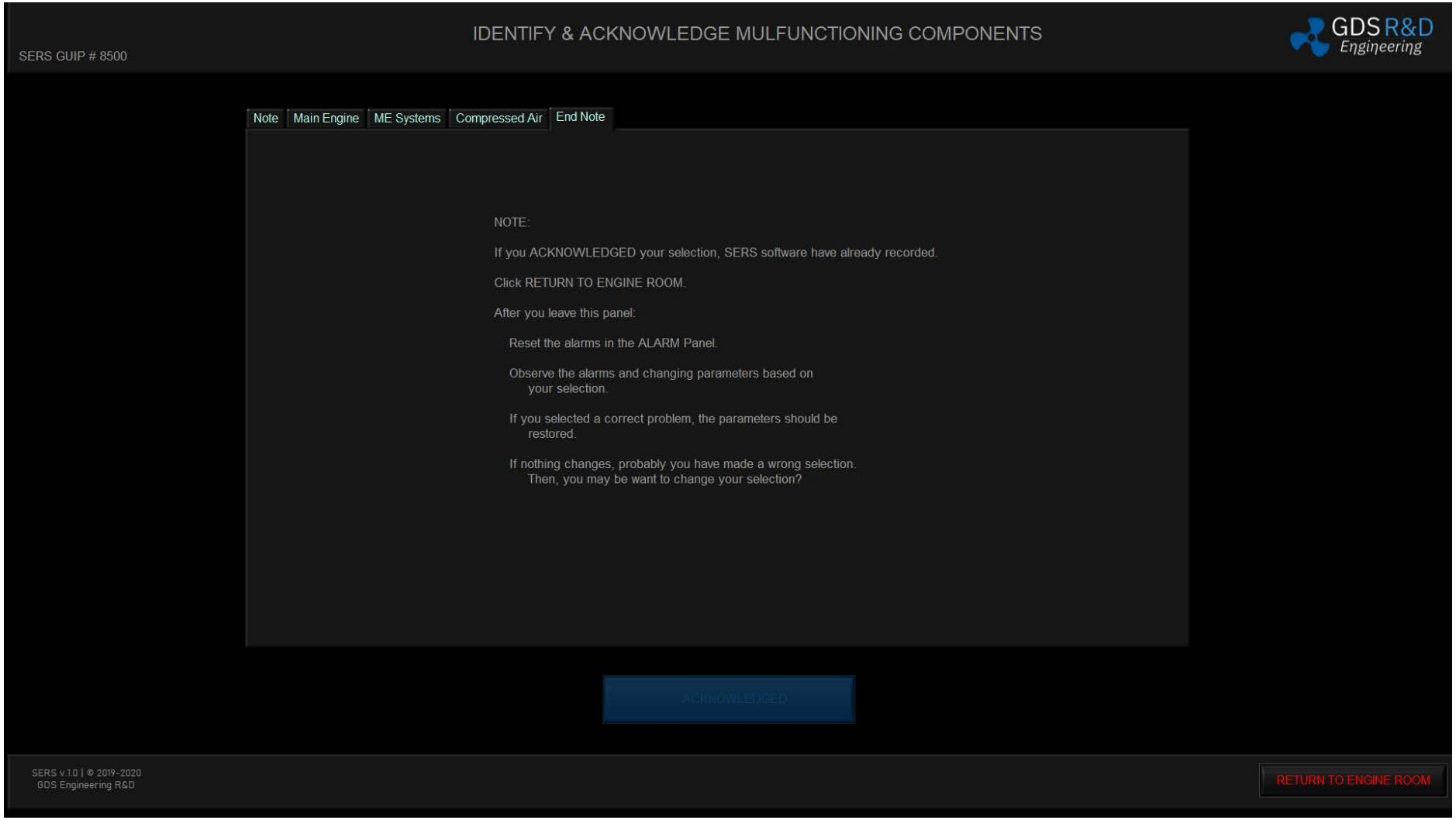

Figure 6.4 “IDENTIFY & ACKNOWLEDGE MAULFUNCTIONS” GUI Panel: End Note Instructions Displayed after ACKNOWLEDGE is clicked.

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8.1 Identifying and Acknowledging a Malfunction with Response Time Measurement

The general process for malfunction generation and identification by the trainee is shown in Figure 6.1. If the SERS Instructor Station software is loaded to the same SERS station, Trainee can switch between GUI windows to generate and exercise the malfunction identification. This alternative method may be preferred when the Trainees want to exercise malfunctions themselves.

When a malfunction activated activation is shown on the Instructor Station GUI Panel (GUI Panel # 100) with a timestamp. Similarly, when the malfunction is identified by the Trainee, the timestamp for this is also shown on the Instructor Station GUI Panel. Instructors may use this future this response time for the evaluation of the Trainee.

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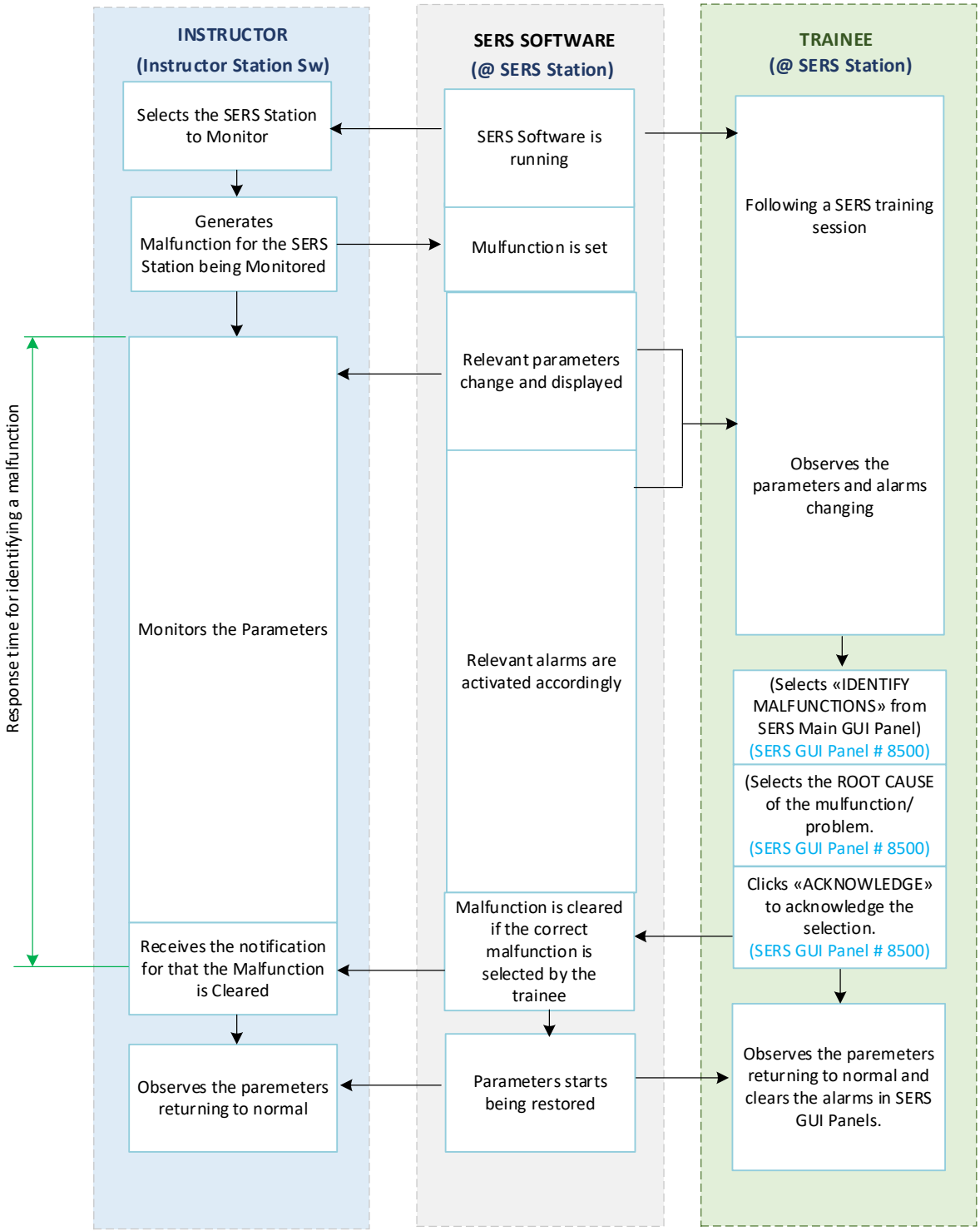

Figure 6.1 SERS Process for Generating (by the Instructor) and Identifying a Malfunction (by the Trainee)

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