MARINE OPERATIONS MANUAL

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Issue and Update Control

This manual is provided with a system of issue and update control.

Controlling documents ensures that:

- Documents conform to a standard format;
- Amendments are carried out by relevant personnel;
- Each document or update to a document is approved before issue;
- A history of updates is maintained;
- Updates are issued to all registered holders of documents;
- Sections are removed from circulation when obsolete.

Document control is achieved by the use of the footer provided on every page and the issue and update table below.

In the right hand corner of each footer are details of the pages section number and title followed by the page number of the section. In the left hand corner of each footer is the issue number.

Details of each section are given in the first column of the issue and update control table. The table thus forms a matrix into which the dates of issue of the original document and any subsequent updated sections are located.

The information and guidance contained herein is produced for the assistance of certificated officers who by virtue of such certification are deemed competent to operate the vessel to which such information and guidance refers. Any conflict arising between the information and guidance provided herein and the professional judgement of such competent officers must be immediately resolved by reference to BP Shipping Technical Operations Office.

This manual was produced by:

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Mechanical Symbols

Stop Valve	Electric Motor Driven	Y-Type Strainer	Foam Box
Gate Valve	Pneumatic Piston Actuator	Steam Trap With Strainer and Drain Cock	Not Connected Crossing Pipe
Butterfly Valve	Solenoid Actuator	Sounding Head With Filling Cap	Connected Crossing Pipe
Screw Down Non-Return Valve	Pneumatic Diaphragm Actuator	Hopper Without Cover	Branch Pipe
Lift Check Non-Return Valve	Pneumatic Diaphragm Actuator With Hand Wheel	Air Vent Pipe	Blind (Blank) Flange
Swing Check Valve	Spring	Sounding Head With Self - Closing Sampling Cock	Spectacle Flange (○ Open ● Shut)
Hose Valve	Float	Flow Meter	Orifice
3-Way Valve	Reciprocating Pump	Observation Glass	Spool Piece
Regulating Valve	Centrifugal Pump	Deck Stand (Manual)	Glass Level Gauge
Needle Valve / 'V' Port Valve	Rotary (Gear, Screw, Mono) Type Pump	Deck Stand (Hydraulic)	Overboard Discharge
Self-Closing Valve	Hand Pump	Manometer	
Emergency Shut-off Valve	Eductor (Ejector)	Filter Regulating Valve With Strainer	
Safety / Relief Valve	Rose Box	Suction Bellmouth	
P1 P2 Pressure Reducing Valve	Mud Box	Water Line	
2-Way Cock	Tank Penetration	Float Type Air Vent (With Flame Screen)	
3-Way Cock (L-Type/T-Type)	Discharge/Drain	Flexible Hose Joint	
Hand Operated (Locked Shut) Hand Operated (Locked Open)	Simplex Strainer	Air Horn	
Air Motor Driven	Duplex Strainer With Changeover Cock	Fire Hose Box	

Colour Scheme

- LNG Liquid
- LNG Vapour
- Inert Gas
- Spray Line
- Superheated Steam
- Desuperheated Steam
- Exhaust Steam
- Condensate/Distilled Water
- Fresh Water
- Fresh Water (Jacket Cooling Water)
- Sea Water/Glycol/Nitrogen
- Heavy Fuel Oil
- Marine Diesel Oil
- Air
- Lubricating Oil/Hydraulic Oil
- Bilges
- Fire Main/CO_2
- Refrigerant Gas
- Refrigerant Liquid
- Electrical Signal
- Instrumentation

Electrical and Instrumentation Symbols

I/P Current to pressure converter	Solenoid valve	Pushbutton (start/stop/running)	Air Circuit Breaker
I/P Pressure to current converter	M Motor operated valve	Pushbutton switch (alternative)	
C/P Control panel	J NWT joint box	Pushbutton switch (alternative)	
UPS Uninterruptible Power Supply	J (J) WT joint box 2 glands (4 glands)	Pushbutton (start/stop)	
Rectifier	HS Humidistat	BL Bell	
Battery	WT Water transducer	110 Central meter	
Space heater (element type)	AMS Alarm monitoring system	Rectifier equipment	
TG Turbine generator	Overcurrent relay	Making contact — Auxiliary relay contact	
DG Diesel generator	Normally Open switch	Breaking — Auxiliary relay contact	
EG Emergency generator	Normally Closed switch	Making contact — With time limit in closing	
M AC induction motor	10A Fuse	Breaking — With time limit in closing	
GM Governor motor	RL Indicator lamp	Making contact — With time limit in opening	
Earth	D-D Relay coil	Breaking — With time limit in opening	
Transformer	BZ Buzzer	Making contact — Flicker relay	
Power supply unit	SIG RB Whistle relay box	Breaking — Flicker relay	
LD Liquid sensor	GJB/XX Group junction box xx (xx = location)	O Emergency stop pushbutton box	
ZBK Zener barrier box	Resistor	Trip Automatic Trip	
LM Limit switch	Variable resistor	Vacuum Circuit Breaker	

CP	Capacitance
CI	Compound Indication
CO_2	CO_2 Meter
O_2	O_2 Meter
DP	Differential Pressure
DPAH	Differential Pressure Alarm (High)
DPS	Differential Pressure Switch
DPX	Differential Pressure Transmitter
DPI	Differential Pressure Indicator
DTAH	Differential Temperature Alarm (High)
EM	Electromagnetic Flow Meter
FAL	Flow Alarm (Low/Non)
FOC	Flow Controller
FX	Flow Transmitter
FI	Flow/Frequency Indication
FS	Flow Switch
FSL	Flow Slowdown (Low/Non)
FLG	Float Type Level Gauge
HY	Hydrazine Detector/Meter
H_2O	Hydrometer
LAH	Level Alarm (High)
LAVH	Level Alarm (Very High)
LAEH	Level Alarm (Extremely High)
LAHH	Level Alarm (High High)
LAL	Level Alarm (Low)
LOC	Level Controller
LCH	Level Controller (High Alarm)
LCL	Level Controller (Low Level)
LCG	Local Content Gauge
LI	Level Indication
LIAL	Level Alarm/Indicator (Low)
LIAH	Level Alarm/Indicator (High)
LIAHL	Level Alarm/Indicator (High/Low)
LR	Level Recorder
LS	Level Switch
MS	Microswitch
MC	Motor Control and Indication
MI	Motor Indication (Run/Normal)
OAH	Oil Content Alarm (High)
OI	Oil Content / O_2 Indicator
PAH	Pressure Alarm (High)
PAL	Pressure Alarm (Low)
PIAL	Pressure Alarm/Indicator (Low)
PIAH	Pressure Alarm/Indicator (High)
PIAHL	Pressure Alarm High/Low Indicator
PICAHL	Pressure Alarm High/Low Indicator/Control
POT	Proportional Position Indicator
PX	Pressure Transmitter
POC	Pressure Controller
PR	Pressure Recorder
PI	Pressure Indication
PS	Pressure Switch
PSH	Pressure Shutdown
PSL	Pressure Slowdown
PH	PH Detector/Meter
RI	RPM Indicator
RCO	RPM Counter
RX	Revolution Transmitter
RC	Revolution Controller
SAH	Salinity Alarm (High)
SI	Salinity Indication
SX	Salinity Transmitter
SM	Smoke Indication
SMX	Smoke Transmitter
TR	Temperature Recorder
TOC	Temperature Control
TI	Temperature Indication
TIAH	Temperature Alarm/Indicator (High)
TIAL	Temperature Alarm/Indicator (Low)
TIAHL	Temperature Alarm High/Low Indicator
TS	Temperature Switch
TT	Temperature Transmitter
TSH	Temperature Shutdown (High)
TSL	Temperature Shutdown (Low)
VX	Vacuum Transmitter
VS	Vacuum Switch
VA	Vacuum Alarm
VSH	Vibration Shutdown
VI	Viscosity Indication
VC	Valve Control
VAH	Viscosity Alarm (High)
VAHL	Viscosity Alarm (High/Low)
VAL	Viscosity Alarm (Low)
XA	Binary Contact
XSH	Other Shutdown
XSL	Other Slowdown
ZI	Position Indication
ZS	Limit Switch

XXX — Function is Locally Available

XXX / XXXX — Functions are Available in Control Room

XXX / XXXX — Functions are Available on a Local Panel

H / XXX / XXXX / L — Letters outside the circle of an instrument symbol indicate whether high (H), high-high (HH), low (L) or low-low (LL) function is involved
O = Open
C = Closed

Introduction

General

Although the ship is supplied with shipbuilder's plans and manufacturer's instruction books, there is no single handbook which gives guidance on operating complete systems, as distinct from individual items of machinery.

The purpose of this manual is to fill some of the gaps and to provide the ship's officers with additional information not otherwise available on board. It is intended to be used in conjunction with the other plans and instruction books already on board and in no way replaces or supersedes them.

In addition to containing detailed information of the bridge equipment and related systems, the MARINE OPERATING MANUAL contains safety procedures and procedures to be observed in emergencies and after accidents. Quick reference to the relevant information is assisted by division of the manual into parts and sections, detailed in the general list of contents on the preceding pages. Reference is made in this book to appropriate plans or instruction books.

Safe Operation

The safety of the ship depends on the care and attention of all on board. Most safety precautions are a matter of common sense and good housekeeping and are detailed in the various manuals available onboard. However, records show that even experienced operators sometimes neglect safety precautions through over-familiarity and the following basic rules must be remembered at all times.

1 Never continue to operate any machine or equipment which appears to be potentially unsafe or dangerous and always report such a condition immediately.

2 Make a point of testing all safety equipment and devices regularly. Always test safety trips before using any equipment. In particular, the emergency Shut Down system is tested before the vessel arrives in port and again in the port before the commencement of cargo operations.

3 Never ignore any unusual or suspicious circumstances, no matter how trivial. Small symptoms often appear before a major failure occurs.

4 Never underestimate the fire hazard of petroleum products, whether fuel oil or cargo vapour.

In the design of equipment and machinery, devices are included to ensure that, as far as possible, in the event of a fault occurring, whether on the part of the equipment or the operator, the equipment concerned will cease to function without danger to personnel or damage to the machine. If these safety devices are neglected, the operation of any machine is potentially dangerous.

Description

The concept of this Operating Manual is based on the presentation of operating procedures in the form of one general sequential chart (algorithm) which gives a step-by-step procedure for performing operations. In many cases the best operating practice can only be learned by experience. Where the information in this manual is found to be inadequate or incorrect, details should be sent to the BP Shipping Technical Operations Office so that revisions may be made to the manuals.

The manual consists of introductory sections which describe the systems and equipment fitted and their method of operation related to a schematic diagram where applicable. This is then followed where required by detailed operating procedures for the system or equipment involved.

Each machinery operation consists of a detailed introductory section which describes the objectives and methods of performing the operation related to the appropriate flow sheet which shows pipelines in use and directions of flow within the pipelines.

Details of valves which are OPEN during the different operations are provided in-text for reference.

The valves and fittings identifications used in this manual are the same as those used by BP Shipping.

Illustrations

All illustrations are referred to in the text and are located either in-text where sufficiently small or above the text, so that both the text and illustration are accessible when the manual is laid face up. When text concerning an illustration covers several pages the illustration is duplicated above each page of text.

Where flows are detailed in an illustration these are shown in colour. A key of all colours and line styles used in an illustration is provided on the illustration. Details of colour coding used in the illustrations are given in the colour scheme.

Symbols given in the manual adhere to international standards and keys to the symbols used throughout the manual are given on the following pages.

Notices

The following notices occur throughout this manual:

WARNING
Warnings are given to draw reader's attention to operations where DANGER TO LIFE OR LIMB MAY OCCUR.

CAUTION
Cautions are given to draw reader's attention to operations where DAMAGE TO EQUIPMENT MAY OCCUR.

(**Note:** Notes are given to draw reader's attention to points of interest or to supply supplementary information.)

Checklists

Checklists included in this manual are EXAMPLES ONLY and are not to be used for operations. Operational checklists are issued by the Owner/Operating Company and the latest edition should be in use.

PART 1: SHIP PERFORMANCE

1.1 Principal Data

1.1.1 Dimensions

1.1.3 Tank Capacity Plan

Illustrations

1.1a General Arrangement

1.1b General Arrangement - Upper Deck

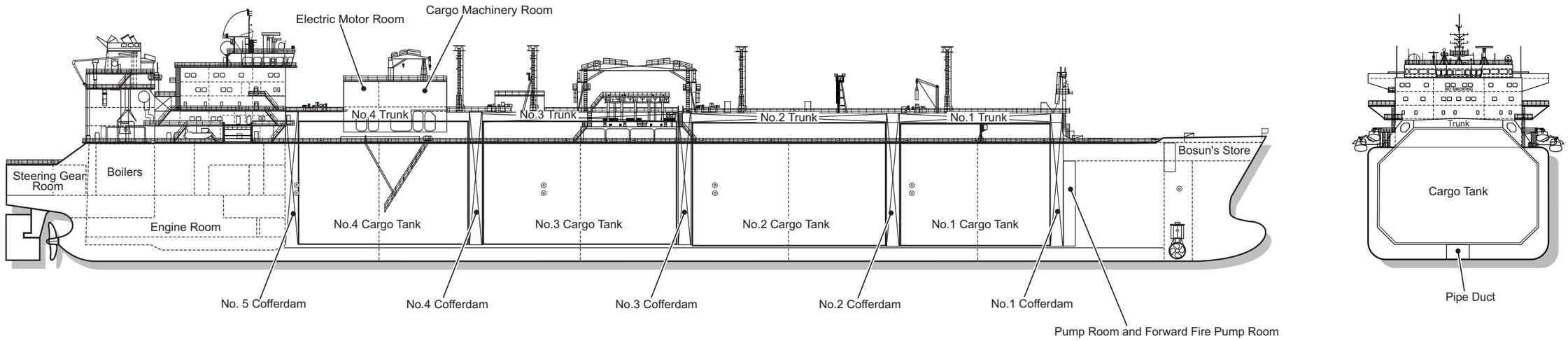
1.1c General Arrangement - A and B Decks

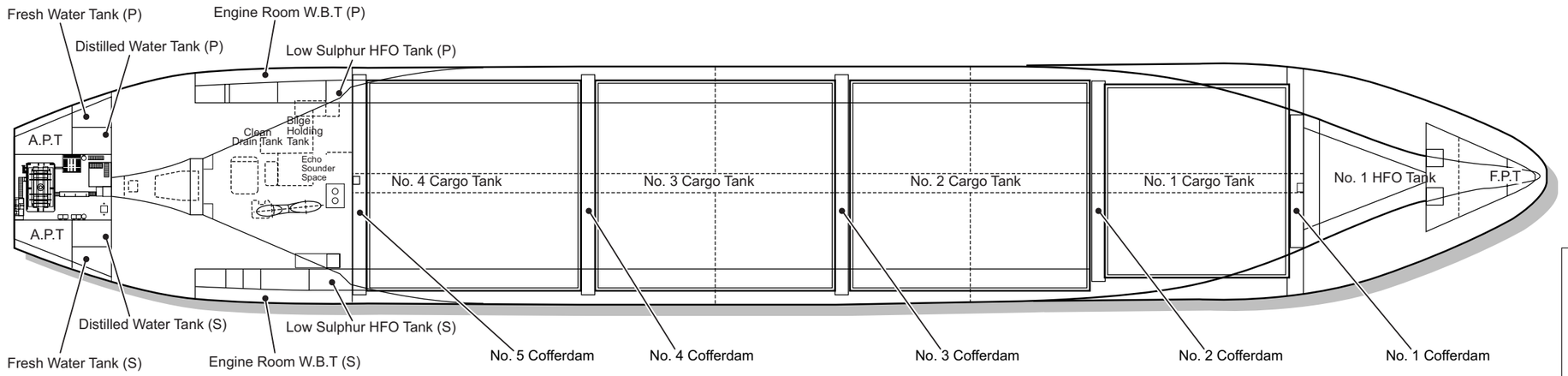
1.1d General Arrangement - C and D Decks

1.1e General Arrangement - Navigation Bridge and Wheelhouse Top

1.1.3a Tank Location Plan

Illustration 1.1a General Arrangement

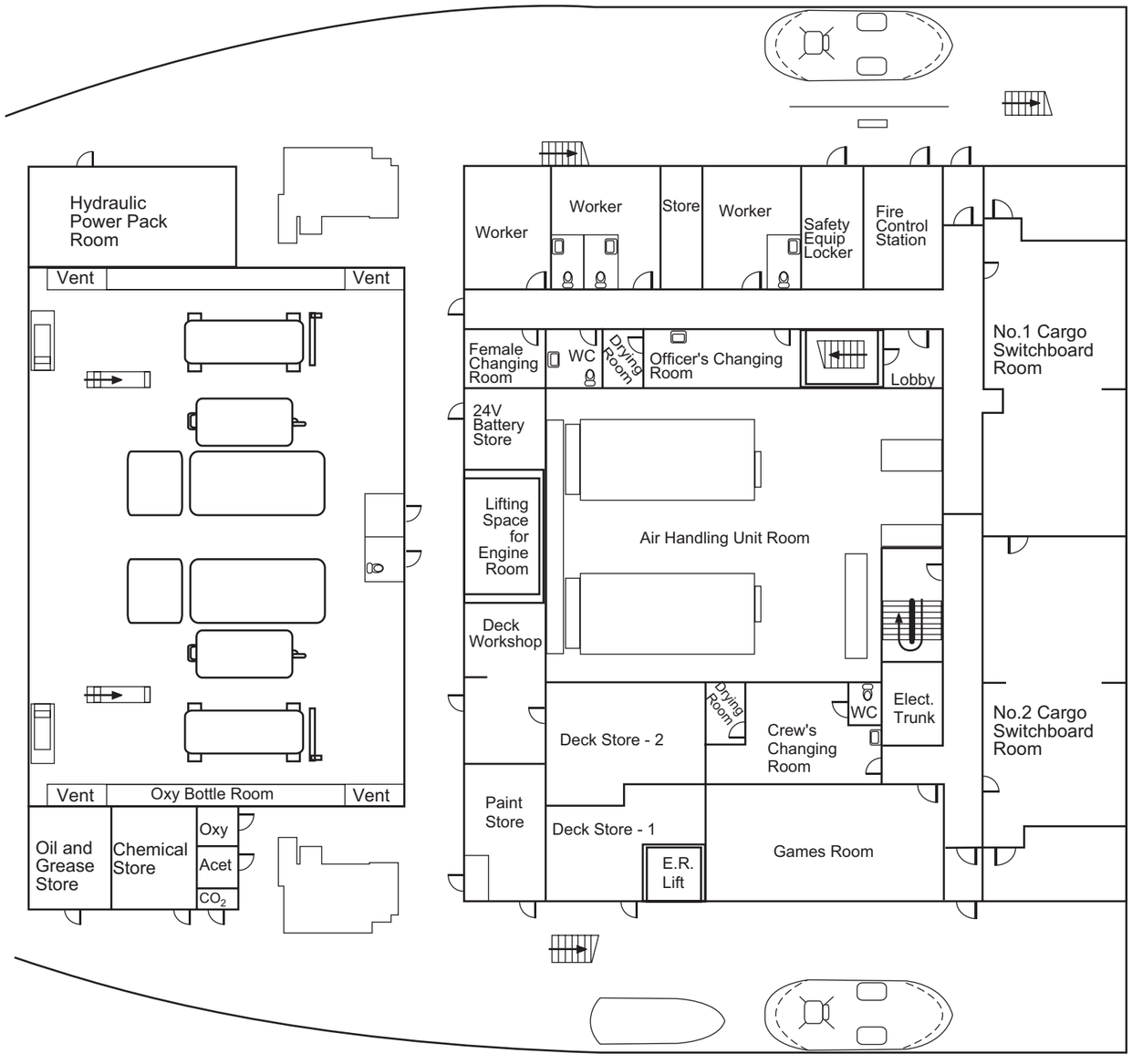




Principal Dimensions

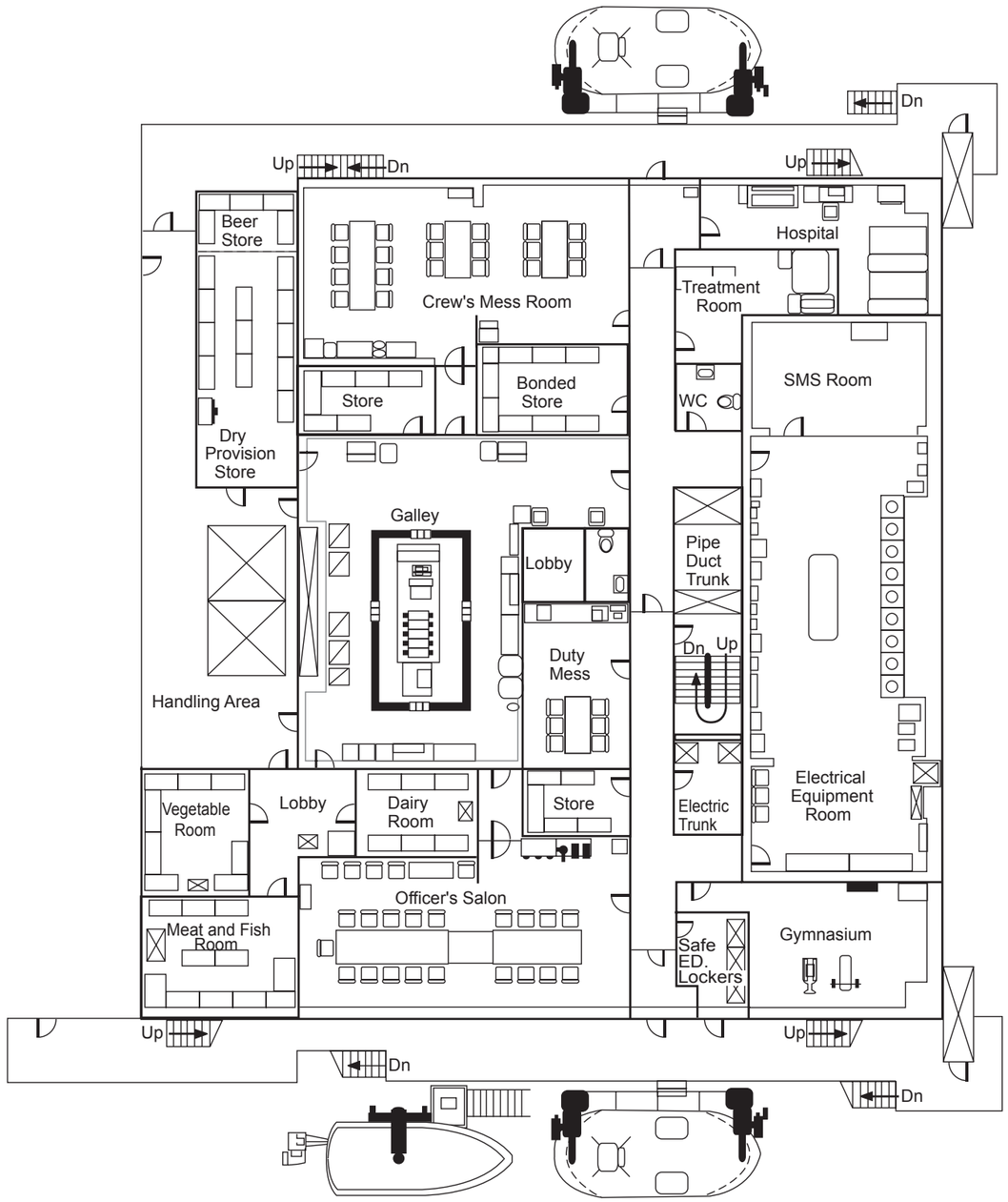
Overall Length	278.8m
Length Between Perpendiculars	266.0m
Breadth (Moulded)	42.6m
Depth (Moulded)	26.0m
Draught Design (Moulded)	11.35m
Displacement 105,000 Tonnes (Extruded)	12.09m
Scantling Draught (Moulded)	12.3m
Air Draught (Mast lowered)	50.0m
Keel to Top of Mast	55.41m
LWT	29,887.8T
LCG (From AP)	114.117m
VCG	16.829m
TCG (Stbd)	0.136m

Illustration 1.1b General Arrangement - Upper Deck

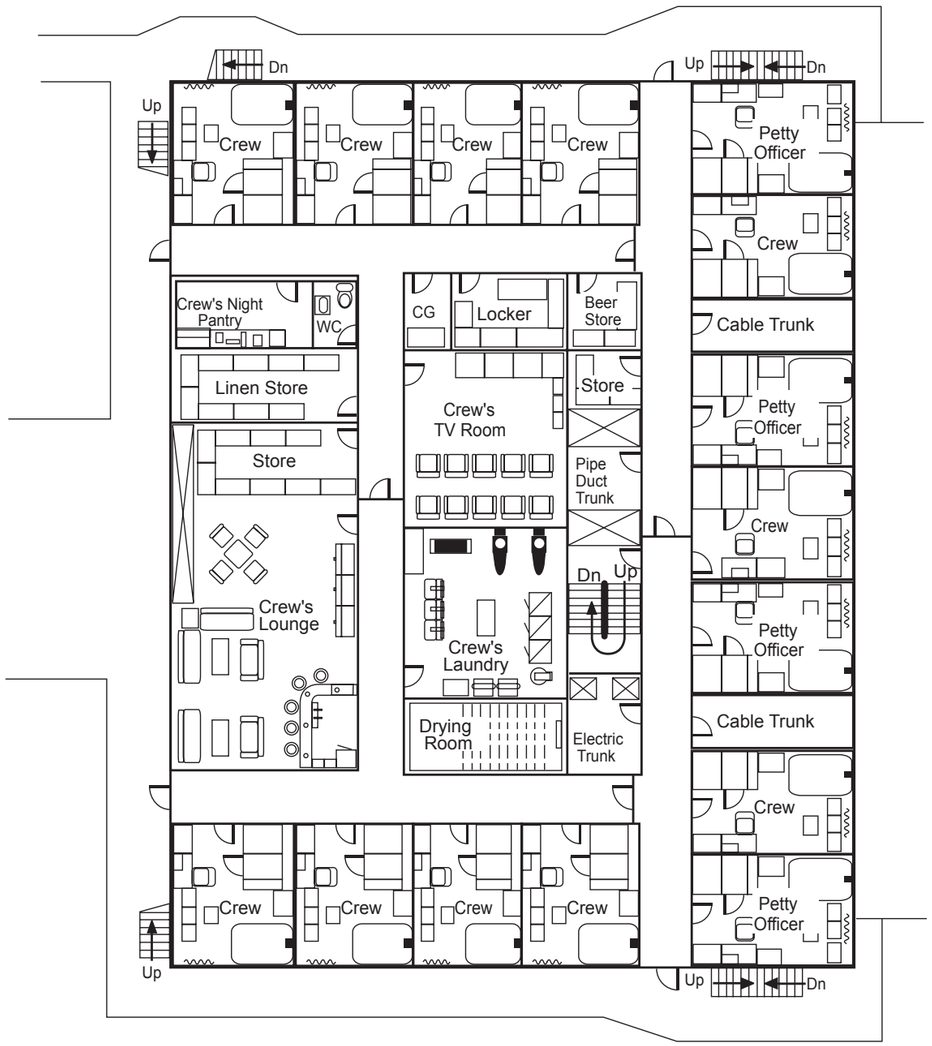


Upper Deck

Illustration 1.1c General Arrangement - A and B Decks

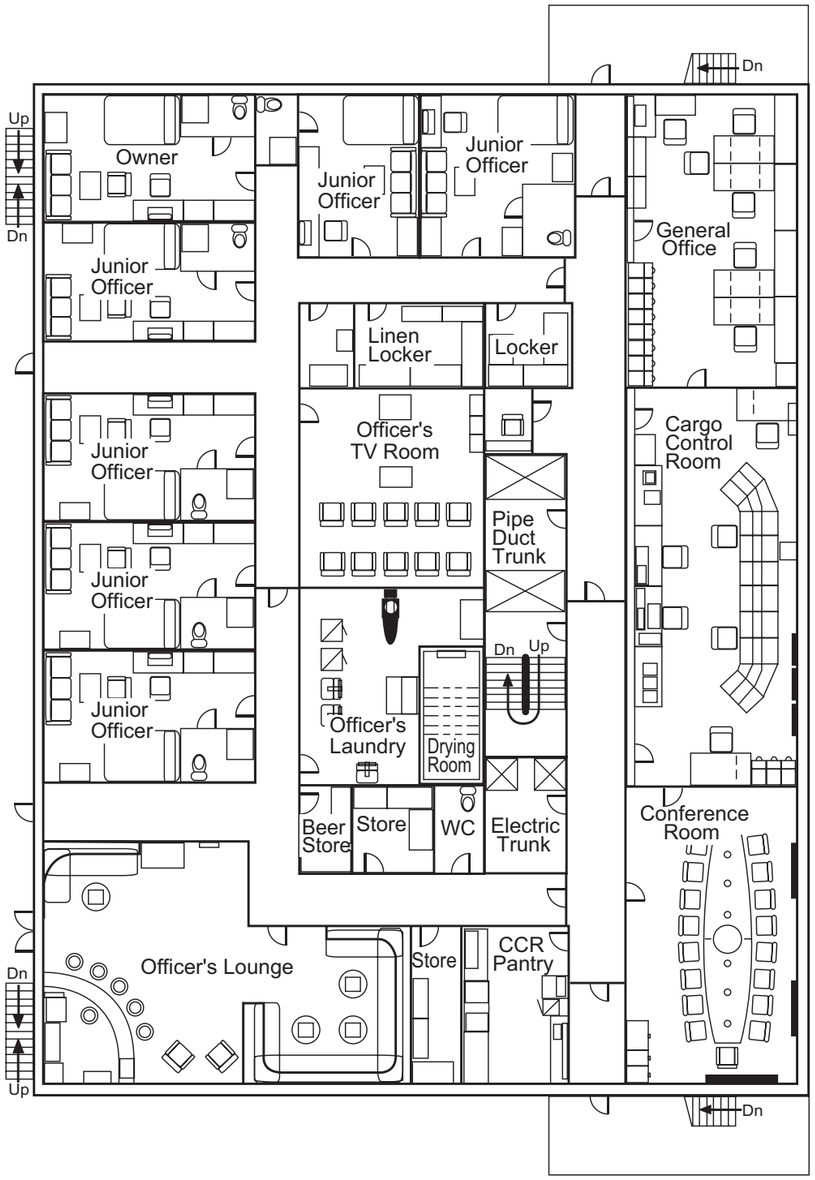


A Deck

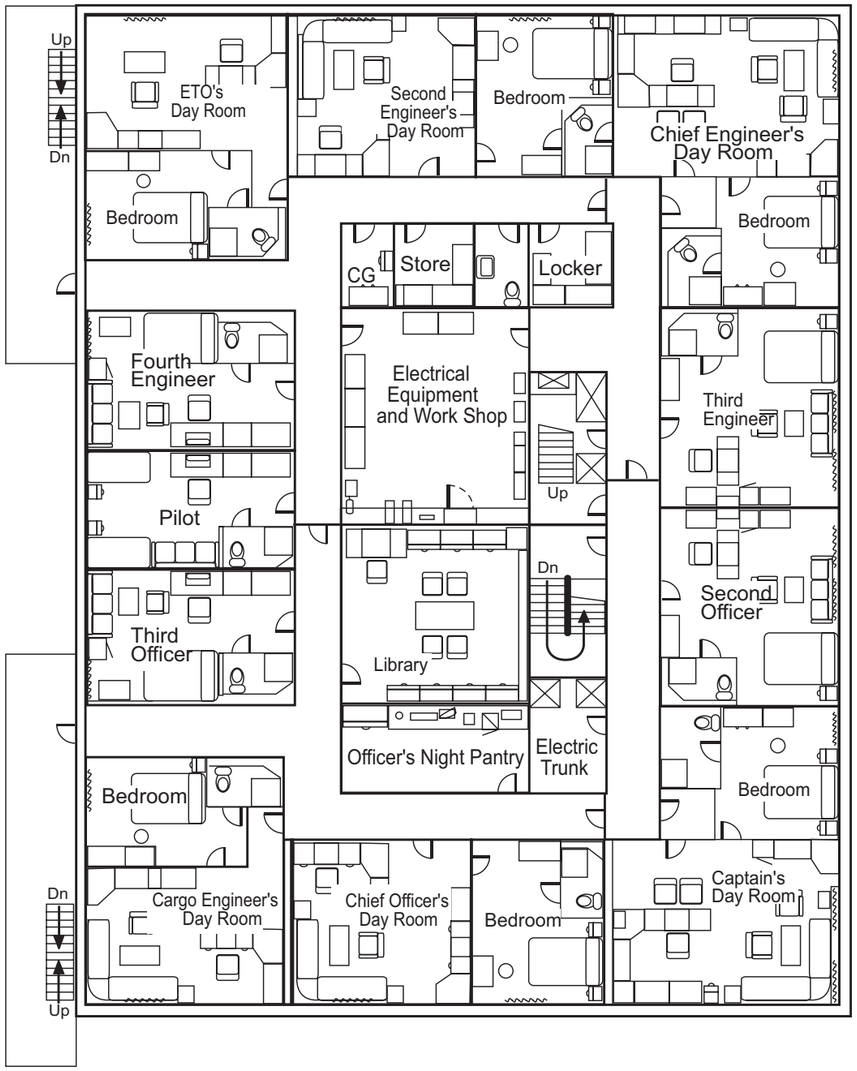


B Deck

Illustration 1.1d General Arrangement - C and D Decks

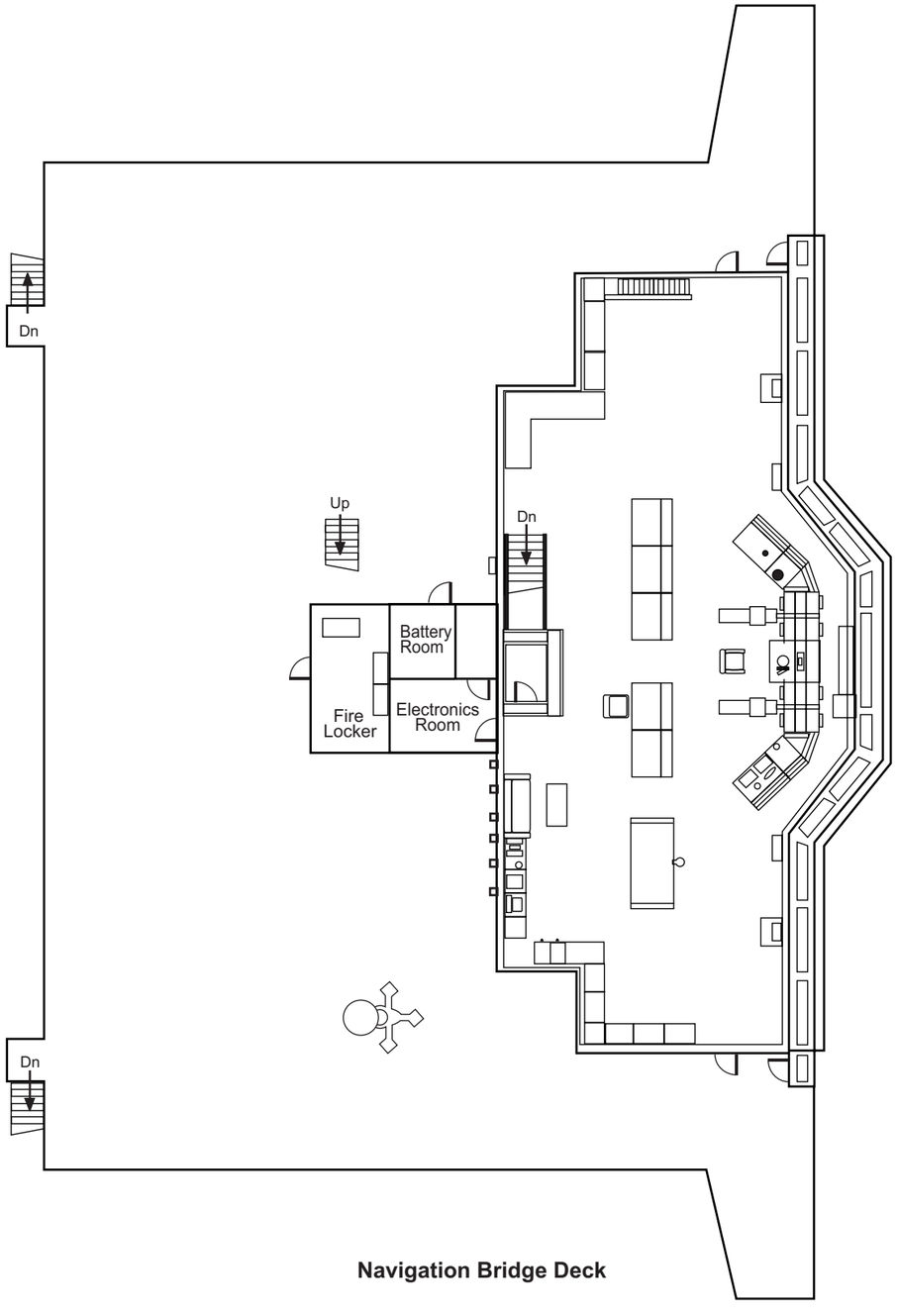


C Deck

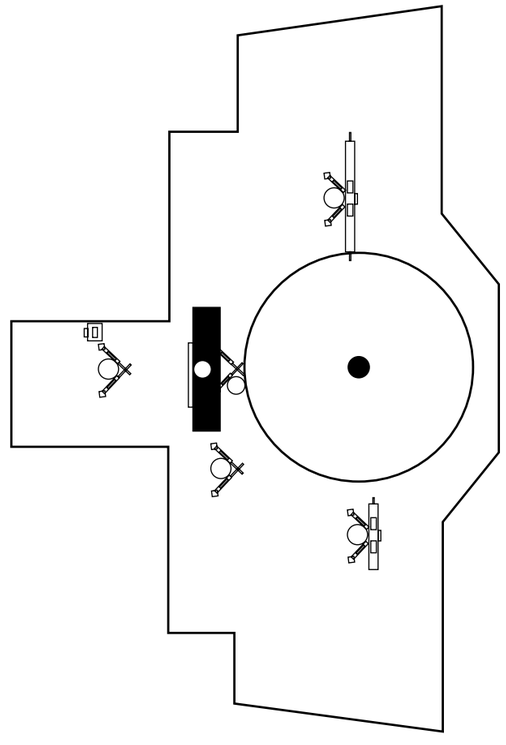


D Deck

Illustration 1.1e General Arrangement - Navigation Bridge Deck and Wheelhouse Top



Navigation Bridge Deck



Wheelhouse Top

PART 1: SHIP PERFORMANCE

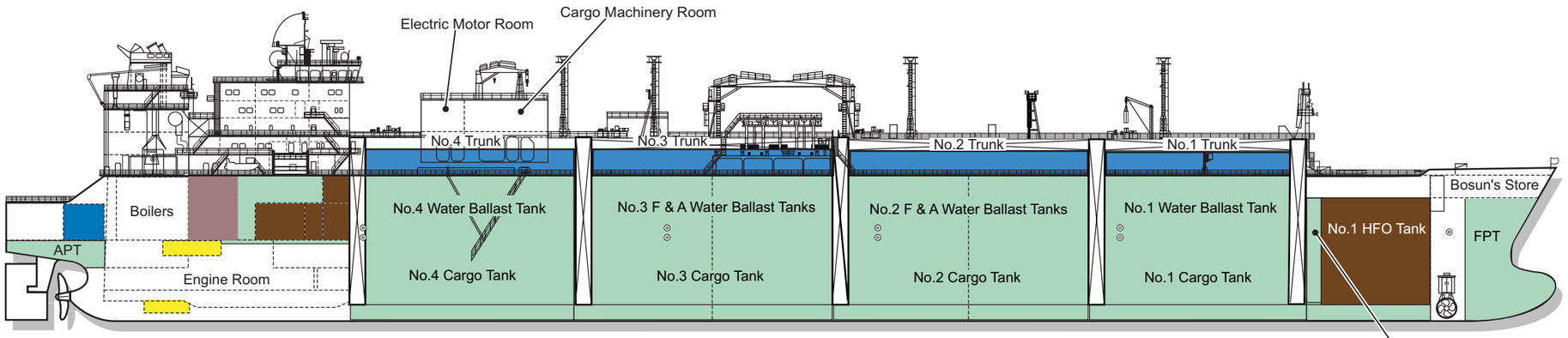
1.1 PRINCIPAL DATA

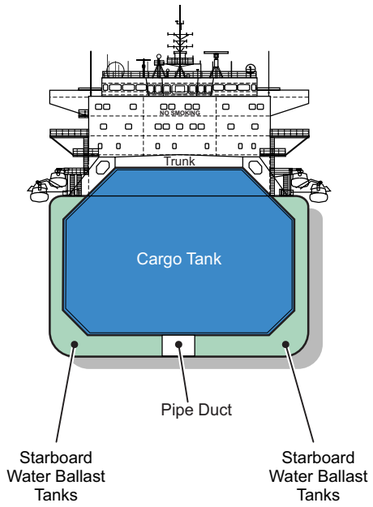
Ship's Name:	British Innovator
Port of registration:	Hamilton, Bermuda
Call sign:	xxxxxxx
Official Number:	xxxxxxx
Imo Number:	xxxxxxx
Ship's I.D. Number:	
Inmarsat B Tel.	xxxxxxx
Inmarsat B Fax	xxxxxxx
Inmarsat B Telex.	xxxxxxx
MMSI (Dsc).	xxxxxxx
Inmarsat C (1):	xxxxxxx
Inmarsat B (2):	xxxxxxx
Mini M Telephone	xxxxxxx
	xxxxxxx
Date Keel Laid:	xxxxxxx
Delivered:	xx.xx.2003
Class Notation:	Lloyds Register of Shipping +100A1, Liquified Gas Carrier, Ship type 2G (Membrane Tank, Maximum Pressure 25kPaG and Minimum Temperature -163°C Specific Gravity 500kg/cm^3), Shipright (SDA, FDA, CM, HCM, SEA(R)), +LMC, NAV1, UMS, CCS, ICC, IWS, PMS(CM) and SCM and Classification Integrated Condition Monitoring System Survey
Operator:	BP Shipping
Owner:	BP Shipping
Yard:	Samsung Heavy Industries Co. Ltd.
Yard Number:	1381

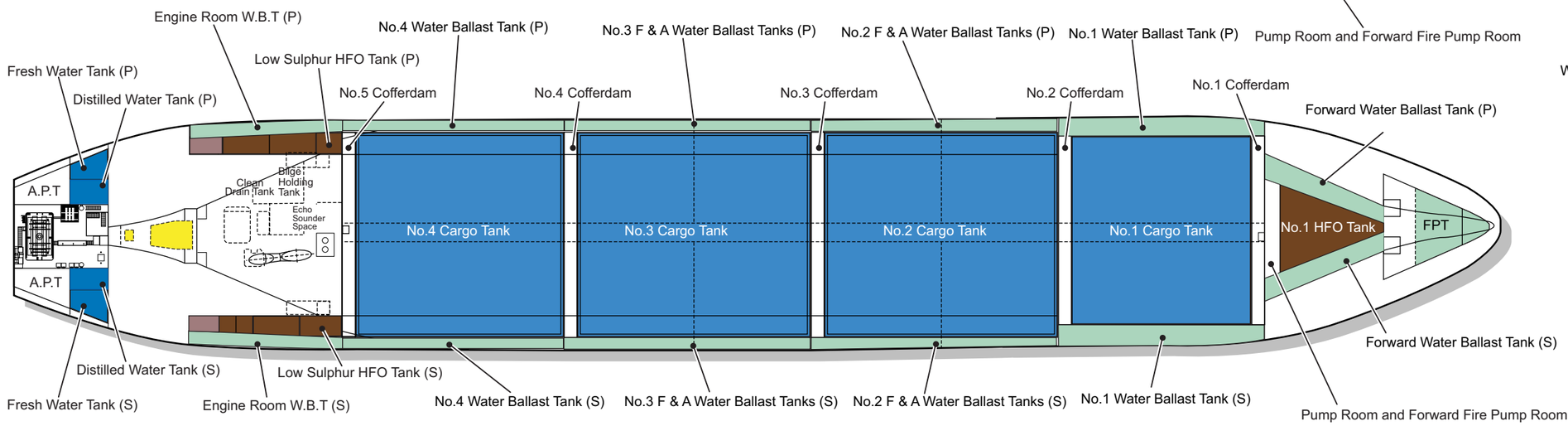
1.1.1 DIMENSIONS

Length Overall:	278.80 m
Length BP:	266.00 m
Freeboard Length:	268.238 m
Moulded Breadth:	42.60 m
Moulded Depth:	26.00 m
Design Draught:	11.35 m
Displacement Draught:	12.09 m
Displacement:	104,966 mt
Air Draught	50.0m (top mast down)
Height to Top of Mast:	55.41m

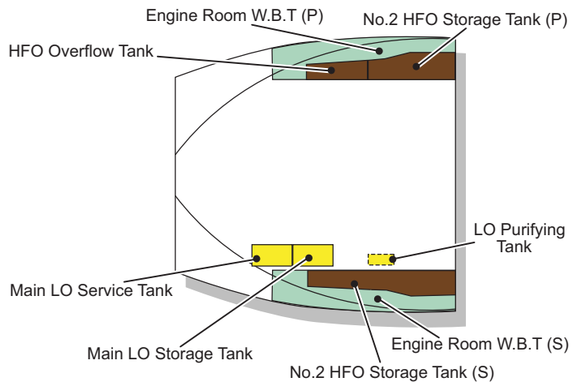
Illustration 1.1.3a Tank Location Plan



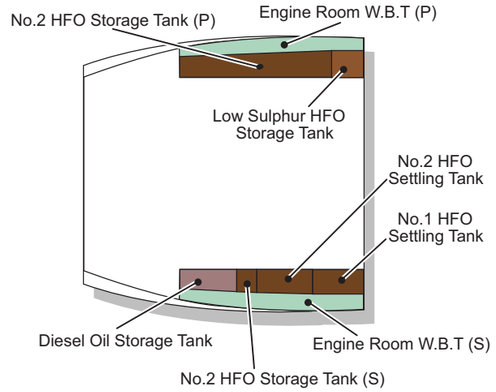




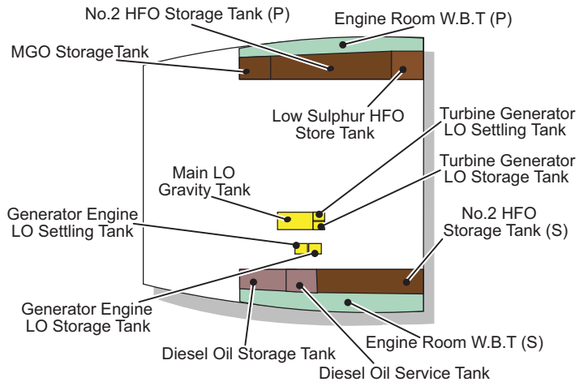
4th DECK



3rd DECK



2nd DECK



1.1.3 Tank Capacity Tables

CARGO TANKS (Specific Gravity = 0.47)					
Compartment	Between Frames	Capacities		Centres of Gravity	
		100% Full	98.5% Full	L.C.G. From Aft Peak (M)	V.C.G. Above B.L. (M)
		M^3	M^3		
No. 1 Cargo Tank (Centre)	122 - 135	24566.1	24197.6	209.592	17.373
No. 2 Cargo Tank (Centre)	105 - 121	39426.9	38835.5	168.593	16.275
No. 1 Cargo Tank (Centre)	88 - 104	39426.9	38835.5	122.518	16.275
No. 1 Cargo Tank (Centre)	72 - 87	35049.3	34523.6	78.823	16.277
Total		138469.2	136395.2		

FUEL OIL TANKS (Specific Gravity = 0.95)						
Compartment	Between Frames	Capacities		Centres of Gravity		
		100% Full	95% Full	L.C.G. From Aft Peak (M)	V.C.G. Above B.L. (M)	Max. Moment of Inertia (M^4)
		M^3	Tonnes			
No.1 Heavy Fuel Oil Storage Tank (Centre)	136 - 164	5104.5	648.3	-70.282	16.108	16.108
No.1 Heavy Fuel Oil Storage Tank (Port)	35 - 71	1165.7	648.3	-70.282	16.108	16.108
No.2 Heavy Fuel Oil Storage Tank (Starboard)	42 - 71	802.4	925.4	109.310	18.999	18.999
No.1 Heavy Fuel Oil Settling Tank (Starboard)	61 - 71	210.9	920.0	109.341	19.000	19.000
No.1 Heavy Fuel Oil Settling Tank (Starboard)	50 - 61	226.2	497.5	-74.943	16.108	16.108
Low Sulphur Heavy Fuel Oil Tank (Port)	65 - 71	221.1	497.5	-74.943	16.108	16.108
Total		7730.8	4629.2			

FRESH WATER TANKS (Specific Gravity = 1.000)						
Compartment	Between Frames	Capacities - 100% Full		Centres of Gravity		
		M^3	Tonnes	L.C.G. From Aft Peak (M)	V.C.G. Above B.L. (M)	Max. Moment of Inertia (M^4)
Distilled Water Tank (Port)	7 - 16	227.5	227.5	9.182	17.778	71.0
Distilled Water Tank (Starboard)	7 - 16	229.1	229.1	9.200	17.797	71.0
Domestic FW Tank (Port)	7 - 16	195.5	195.5	9.569	18.053	90.0
Domestic FW Tank (Starboard)	7 - 16	195.5	195.5	9.569	18.053	90.0
Total		849.2	849.2			

MISCELLANEOUS TANKS					
Compartment	Between Frames	Capacities - 100% Full	Centres of Gravity		
		M^3	L.C.G. From Aft Peak (M)	V.C.G. Above B.L. (M)	Max. Moment of Inertia (M^4)
Heavy Fuel Oil Overflow Tank (Port)	42 - 54	89.8	39.277	13.044	40.0
Bilge Holding Tank (Port)	62 - 71	96.3	53.614	1.604	278.0
Separated Bilge Oil Tank (Port)	54 - 62	33.1	46.400	1.958	112.0
Clean Drain Tank (Port)	50 - 62	67.8	45.745	1.583	156.0
LO Purifier Sludge Tank (Starboard)	51 - 56	5.8	45.800	9.064	1.0
Bilge Primary Tank (Port)	58 - 62	15.5	48.000	6.120	4.0
Stern Tube LO Drain Tank (Centre)	20 - 22	3.6	16.835	3.022	1.0
Engine Room Aft Bilge Well (Centre)	16 - 19	9.2	14.030	3.095	13.0
Engine Room Mid Bilge Well (Port)	37 - 39	2.3	30.435	2.027	1.0
Engine Room Mid Bilge Well (Starboard)	37 - 39	2.3	30.435	2.027	1.0
Engine Room Forward Bilge Well (Port)	65 - 68	4.3	53.334	1.977	5.0
Engine Room Forward Bilge Well (Starboard)	65 - 68	4.3	53.334	1.977	5.0
Total		334.3			

1.1.3 Tank Capacity Tables

WATER BALLAST TANKS (Specific Gravity = 1.025)						
Compartment	Between Frame	Capacities		Centres of Gravity		
		M^3	Tonnes	L.C.G. From Aft Peak (M)	V.C.G. Above B.L. (M)	Max. Moment of Inertia (M^4)
Fore Peak Tank	172 - F.E.	913.0	926.5	262.436	12.279	777.0
Forward W.B. Tank (Port)	136 - 164	1965.4	1994.4	239.095	11.681	1418.0
Forward W.B. Tank (Starboard)	136 - 164	1968.9	1994.4	239.079	11.665	1418.0
No.1 W.B. Tank (Port)	121 - 136	5933.8	6021.3	206.224	10.317	10717.0
No.1 W.B. Tank (Starboard)	121 - 136	5933.8	6021.3	206.224	10.317	10717.0
No.2 (F) W.B. Tank (Port)	113 - 121	2687.0	2726.6	179.359	8.565	11035.0
No.2 (F) W.B. Tank (Starboard)	113 - 121	2687.0	2726.3	179.359	8.565	11035.0
No.2 (A) W.B. Tank (Port)	104 - 113	3053.9	3099.0	156.397	8.479	12893.0
No.2 (A) W.B. Tank (Starboard)	104 - 113	3053.9	3099.0	156.397	8.479	12893.0
No.3 (F) W.B. Tank (Port)	96 - 104	2719.9	2760.0	133.360	8.482	11480.0
No.3 (F) W.B. Tank (Starboard)	96 - 104	2719.9	2760.0	133.360	8.482	11480.0
No.3 (A) W.B. Tank (Port)	87 - 96	3055.2	3100.3	110.323	8.482	12896.0
No.3 (A) W.B. Tank (Starboard)	87 - 96	3055.2	3100.3	110.323	8.482	12896.0
No.4 W.B. Tank (Port)	71 - 87	4969.8	5043.1	78.032	8.772	19843.0
No.4 W.B. Tank (Starboard)	71 - 87	4969.8	5043.3	78.032	8.772	19843.0
Engine Room W.B. Tank (Port)	35 - 71	1726.1	1751.6	43.275	14.552	398.0
Engine Room W.B. Tank (Stbd)	35 - 71	1726.1	1751.6	43.275	14.552	398.0
Aft Peak Tank	A.E. - 16	1670.8	1695.4	3.797	15.277	15956.0
Stern Tube C.W. Tank	9 - 16	56.7	57.6	11.285	4.209	15.0
Total		54,866.2	55,675.6			

DIESEL OIL TANKS (Specific Gravity = 0.90)						
Compartment	Between Frames	Capacities		Centres of Gravity		
		100% Full	95% Full	L.C.G. From Aft Peak (M)	V.C.G. Above B.L. (M)	Max. Moment of Inertia (M^4)
		M^3	Tonnes			
Diesel Oil Storage Tank (Starboard)	35 - 46	286.6	245.1	32.035	19.382	30.0
Diesel Oil Service Tank (Starboard)	42 - 46	55.3	47.3	35.211	23.500	12.0
Gas Oil Storage Tank (Port)	35 - 43	105.2	89.9	31.245	23.501	21.0
Total		447.1	382.3			

LUBRICATING OIL TANKS (Specific Gravity = 0.900)						
Compartment	Between Frames	Capacities		Centres of Gravity		
		100% Full	98% Full	L.C.G. From Aft Peak (M)	V.C.G. Above B.L. (M)	Max. Moment of Inertia (M^4)
		M^3	Tonnes			
Main LO Storage Tank (Starboard)	39 - 47	73.8	65.1	34.400	11.880	19.0
Main LO Settling Tank (Starboard)	31 - 39	73.8	65.1	28.000	11.880	19.0
Main LO Sump Tank (Centre)	26 - 36	76.0	67.1	24.810	2.497	24.715
Main LO Gravity Tank (Starboard)	39 - 45	39.4	34.8	33.600	22.811	82.0
Generator Engine LO Storage Tank (Starboard)	44 - 46	8.0	7.9	36.000	22.664	6.0
Generator Engine LO Settling Tank (Starboard)	42 - 44	8.0	7.0	34.400	22.664	1.0
Generator Turbine LO Storage Tank (Starboard)	45 - 47	6.6	5.8	36.800	22.811	1.0
Generator Turbine LO Settling Tank (Starboard)	45 - 47	6.6	5.8	36.800	22.811	
LO Storage Tank (Starboard)	-6 - -4	1.8	1.6	-5.414	20.598	
Total		294.0	259.3			

1.2 Ship Handling

1.2.1 General Information

1.2.2 Turning Circles

1.2.3 Manoeuvring

1.2.4 Visibility

Illustrations

1.2.2a Turning Circle Diagrams

1.2.3a Manoeuvring Crash Stop Test

1.2.3b Stopping Characteristics

1.2.4a Visibility Diagrams

1.2.1 General Information

Time and Distance to Stop				
Ahead to Full Astern	Normal Loaded Condition		Normal Ballast Condition	
	Time	Distance	Time	Distance
Full Sea Speed	799 seconds	20.1 cables	723 seconds	19.6 cables
Half Speed	717 seconds	13.8 cables	548 seconds	11.9 cables

Engine Order/RPM/Speed Table			
Engine Order	RPM	Speed	
		Loaded Condition	Ballast Condition
Full Sea Speed	90	21.07	20.78
Full Ahead	53	12.61	12.37
Half Ahead	45	10.83	10.64
Slow Ahead	35	8.84	8.24
Dead Slow Ahead	25	5.38	5.15
Dead Slow Astern	25		
Slow Astern	35		
Half Astern	45		
Full Astern	53		
Em'cy Full Astern	63		

1.2.2 Turning Circles

See Illustration 1.2.2a

1.2.3 Manoeuvring

See Illustration 1.2.3a

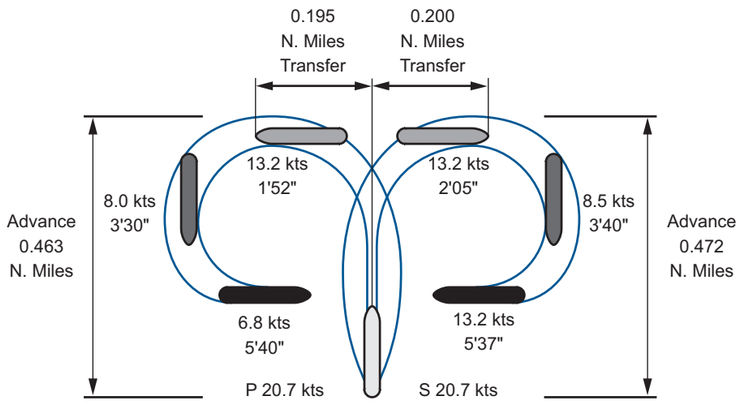
1.2.4 Visibility

See Illustration 1.2.4a

Illustration 1.2.2a Turning Circle Diagrams

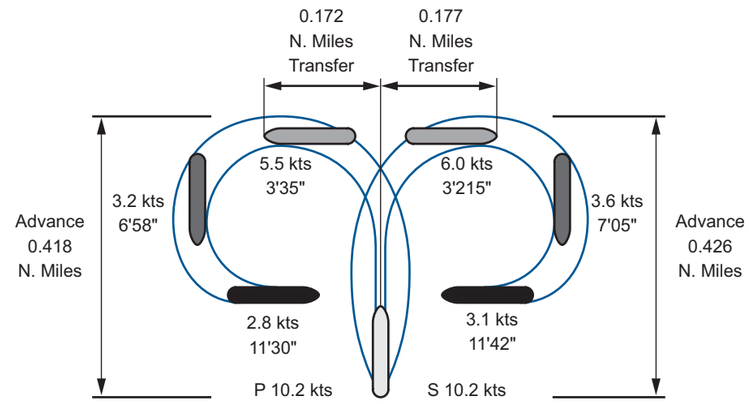
Summer Load Condition

Full Sea Speed (90 rpm)



Note: Maximum Rudder angle (35°)/constant angle order

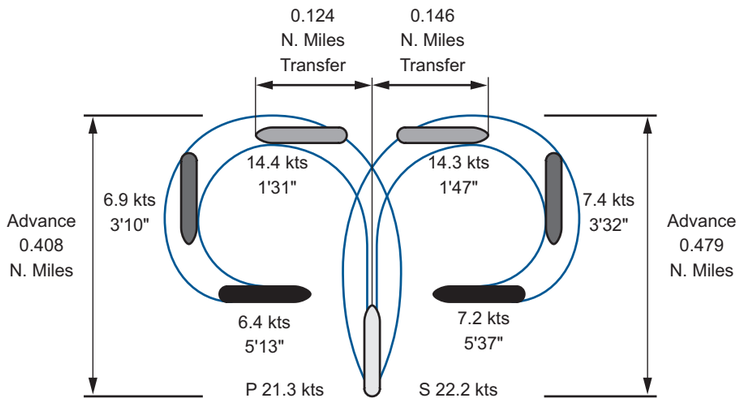
Harbour Full Speed (53 rpm)



Note: At slow speed transfer and advance about the same as harbour full speed but speeds proportionally less and times proportionally greater.

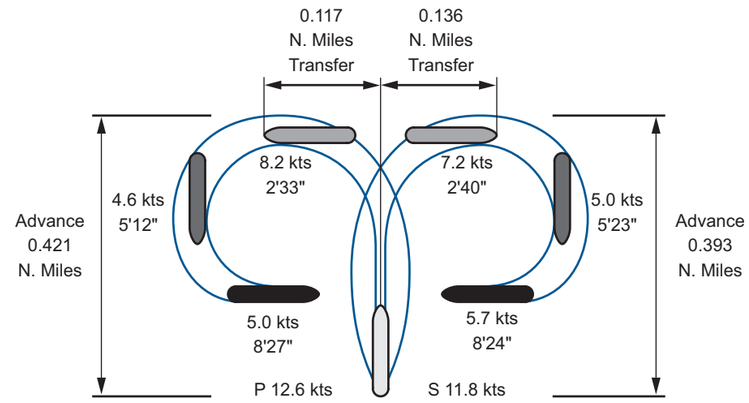
Deep Ballast Condition

Full Sea Speed (90 rpm)



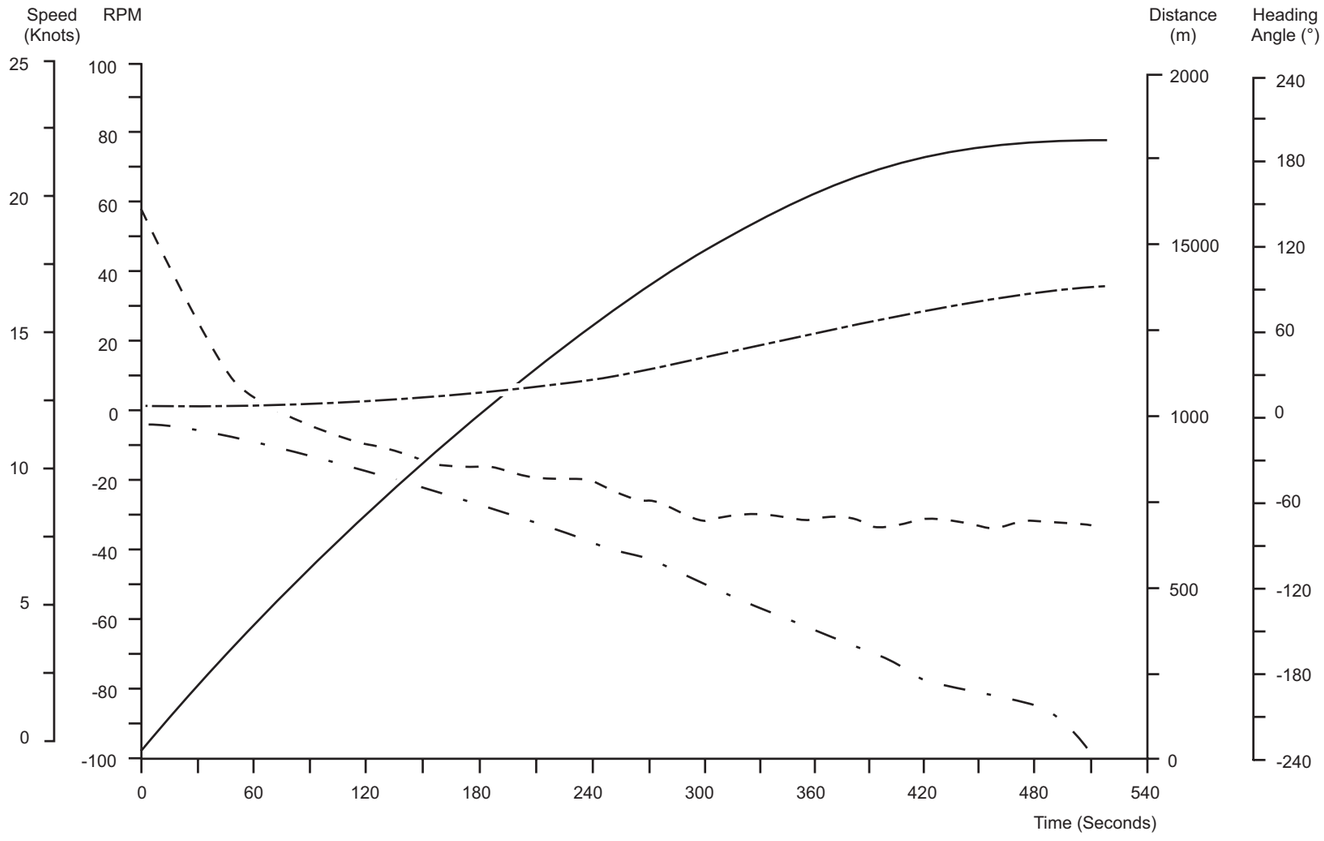
Note: Maximum Rudder angle (35°)/constant angle order

Harbour Full Speed (53 rpm)



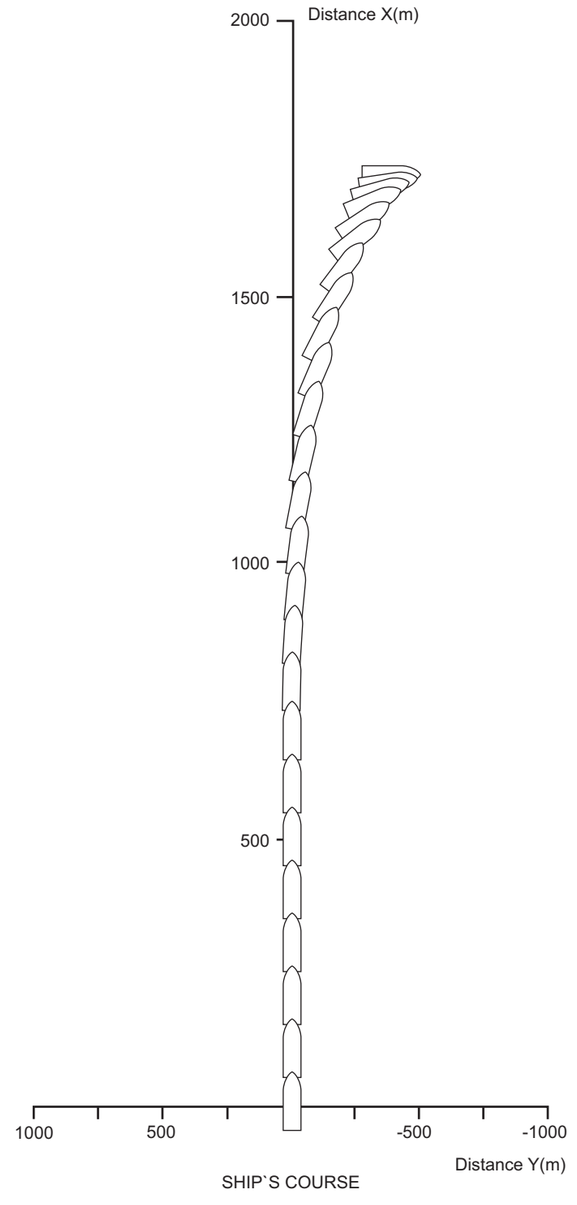
Note: At slow speed transfer and advance about the same as harbour full speed but speeds proportionally less and times proportionally greater.

Illustration 1.2.3a Manoeuvring Crash Stop Test



Key

- Sailing Distance
- Heading Angle Change
- RPM
- Speed



Ship`s Condition	Deep Ballast
Wind Direction	0°
Wind Velocity	37kts
Sea Condition	Beaufort No.4

Illustration 1.2.3b Stopping Characteristics

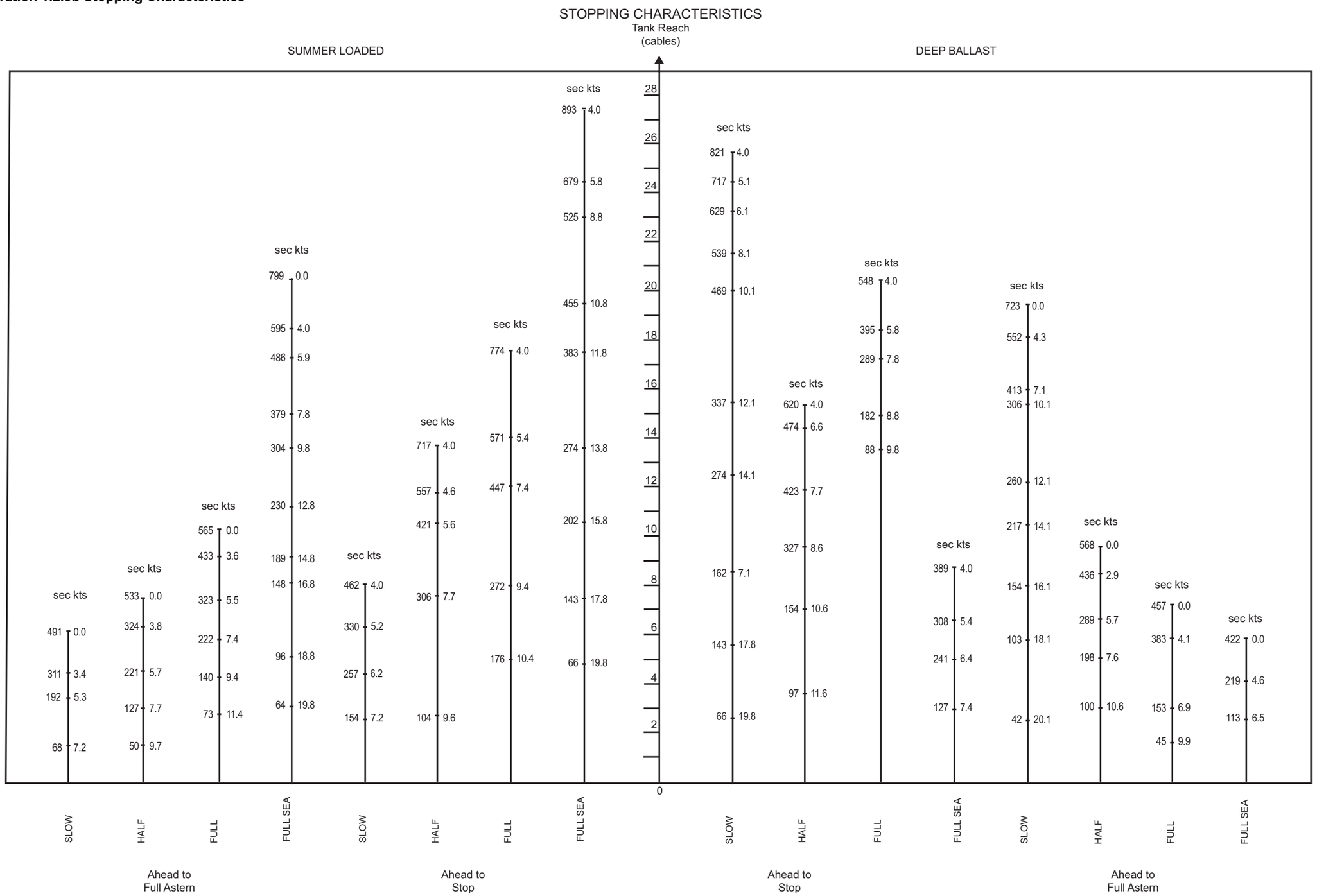
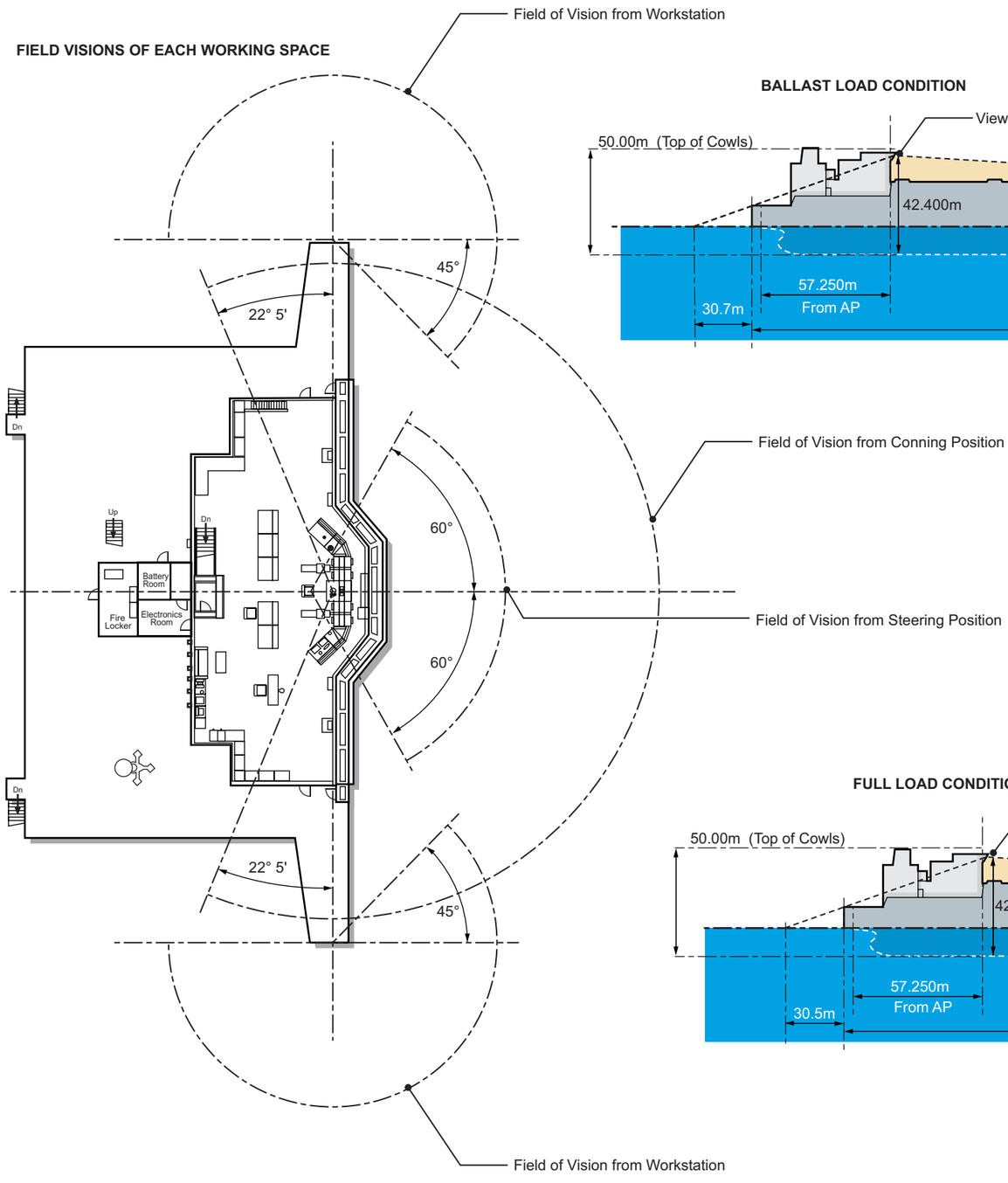
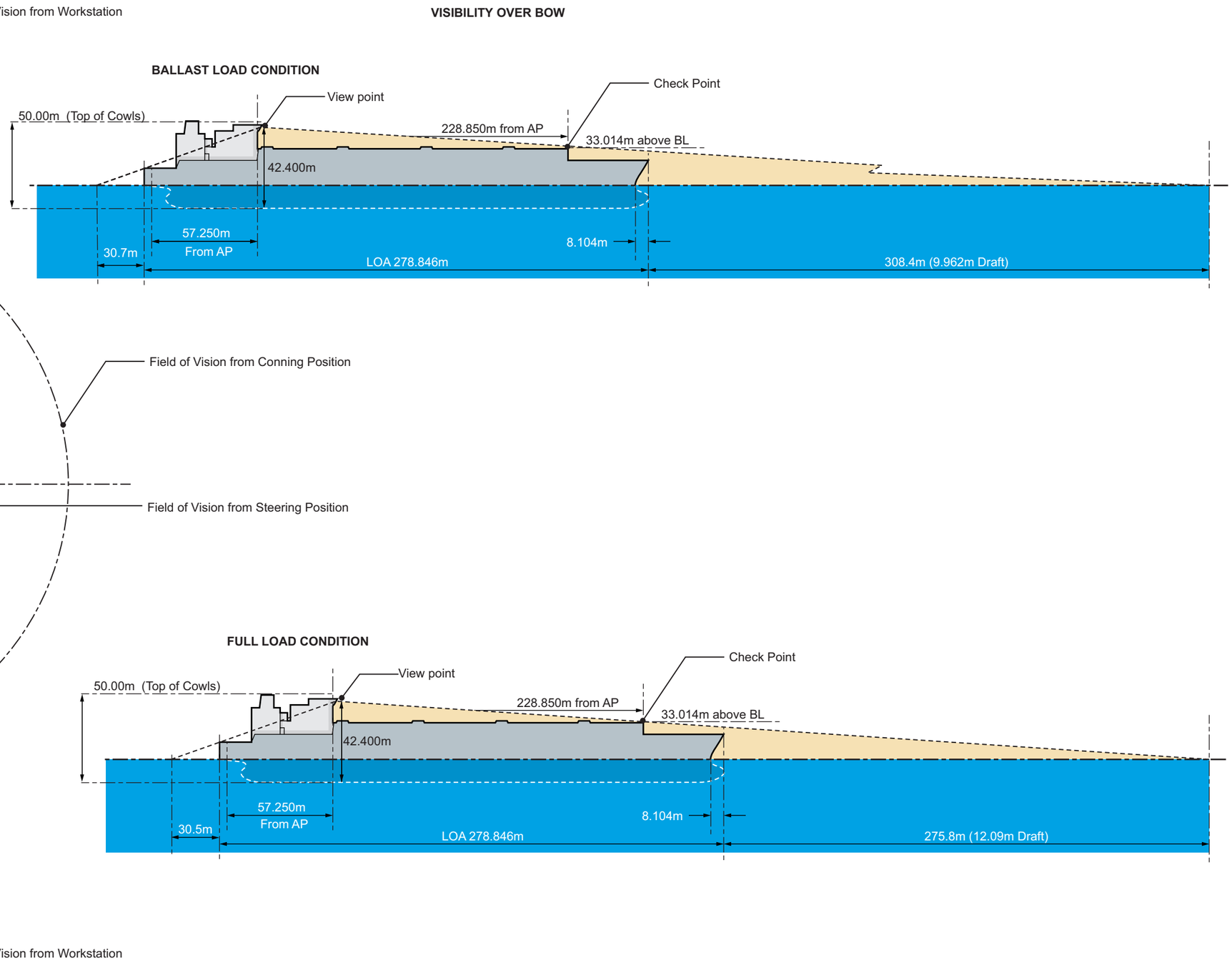


Illustration 1.2.4a Visibility Diagrams





1.3 Performance Data

1.3.1 Fuel/Power Data

1.3.2 Propulsion and Squat Particulars

Illustrations

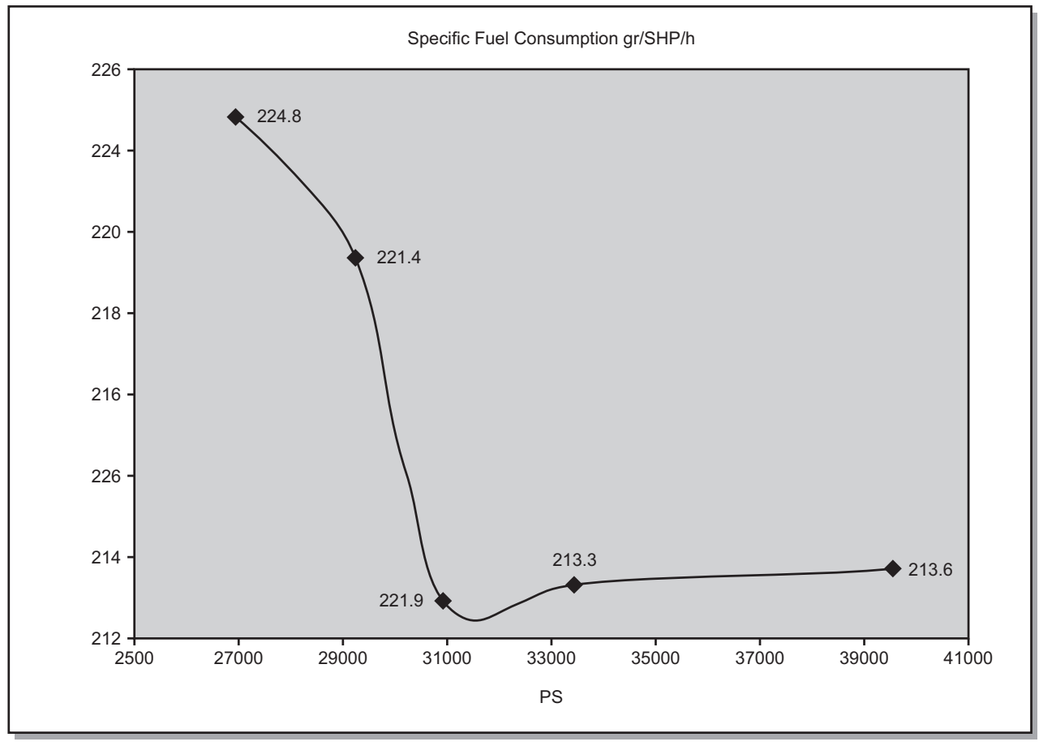
1.3.1a Fuel and Shaft Horsepower Graphs

1.3.2a Propulsion and Squat Tables

Illustration 1.3.1a Fuel and Shaft Horsepower Graph

Fuel Oil Firing

Power (PS)	gr/SHP.h	t/d
26960	224.8	145.5
29200	221.4	155.2
31000	212.9	158.4
33580	213.3	171.9
39500	213.6	202.5



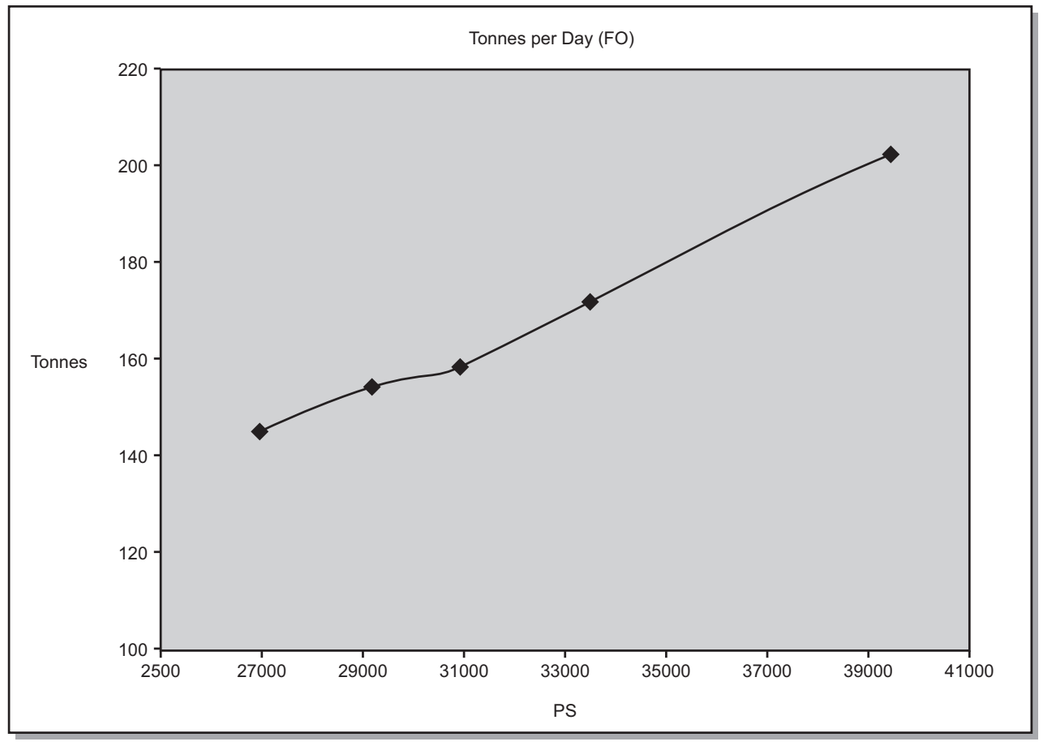


Illustration 1.3.2a Propulsion and Squat Tables

Propulsion Particulars

Type of Turbine		CROSS COMPOUND MARINE STEAM TURBINE					39500 bhp
Type of Propeller		FPP 6 BLADES					
	Engine Order	Rpm/Pitch Setting	Loaded	Ballast		Engine Order	Rpm/Pitch Setting
Ahead	Full Sea Speed	90/7699	21.07	20.78	Astern	Full Sea Speed	63/7699
Ahead	Full	53/7699	12.61	12.37	Astern	Full	53/7699
Ahead	Half	45/7699	10.83	10.64	Astern	Half	45/7699
Ahead	Slow	35/7699	8.44	8.24	Astern	Slow	35/7699
Ahead	Dead Slow	25/7699	5.38	5.18	Astern	Dead Slow	25/7699
Critical Revolutions							- rpm
Minimum Revolution			- rpm=				- kts
Time Limit Astern							- min
Time Limit at Minimum Revolutions							- min
Emergency Full Ahead to Full Astern							525 s
Stop to Full Astern							- s
Astern Power				Approximately 70% of Normal Speed			

Thruster Effect at Trial Conditions

Thruster	kW	Time Delay for Full Thrust	Turning Rate at Zero Speed	Time Delay to Full reverse Thrust	Not Effective Above Speed
Bow	2500	8.0s	12.86 deg./min	14.7 s	5 kts
Stern	-	- s	- /min	- min -s	- kts
Combined	-	- s	- /min	- min -s	- kts

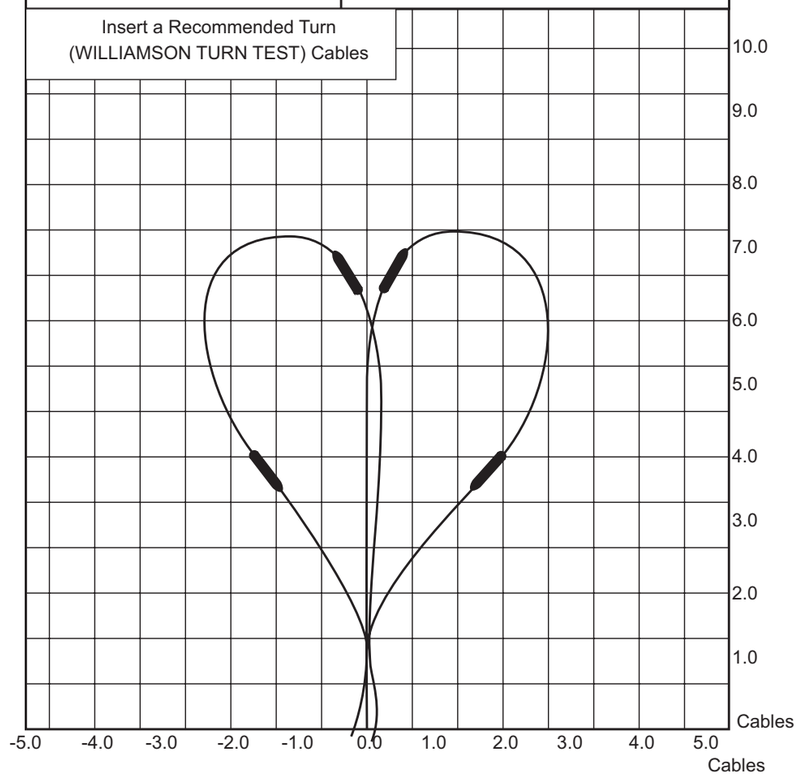
Draught Increase (Summer Loaded)

Estimated Squat Effect		
Under Keel Clearance	Ship's Speed	Maximum Squat at Bow/Stern
Corresponding H/d=1.2 (H=14.482 m)	2.00 kts	0.02 m
	6.00 kts	0.15 m
	10.00 kts	0.40 m
Corresponding H/d=1.5 (H=18.102 m)	6.00 kts	0.12 m
	10.00 kts	0.32 m

Heel Effect	
Heel Angle	Draught Increase
2	0.598 m
4	1.182 m
8	2.310 m
12	3.378 m
16	4.381 m

Man Overboard Rescue Manoeuver

Sequence of Actions to be Taken:	Procedure (to Attain Following Result)
- To Cast a Lifebuoy	Start Test with Rudder to 35° Starboard (Port)
- To Give the Helm Order	When course change 60° from base course put rudder to 35° Port (Starboard). And when course change -135° from base course put Rudder to Amidships. And when course change -180° from base course adjust rudder and rpm to reach MOB position
- To Sound the Alarm	
- To Keep the Look-Out	

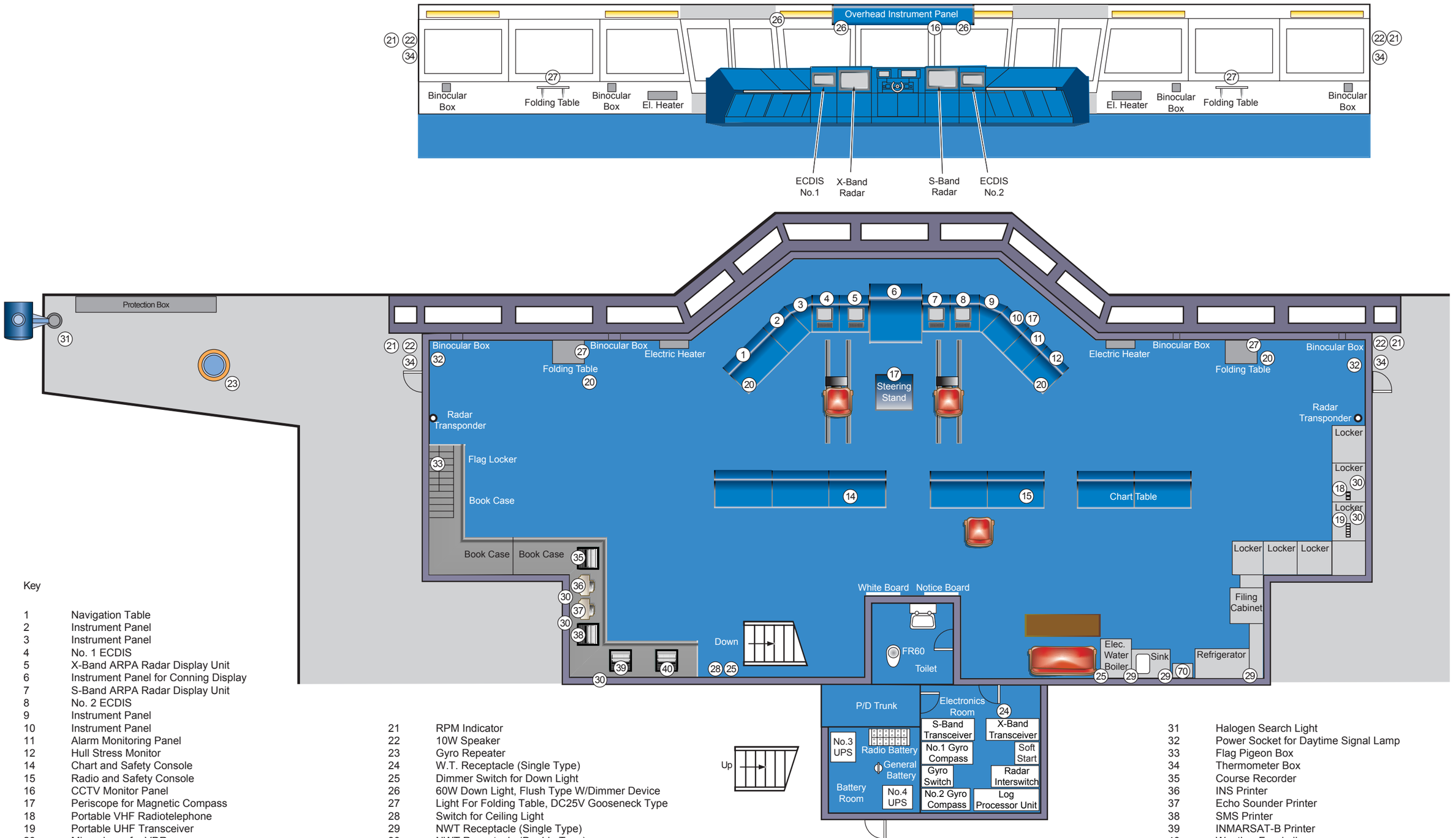


PART 2: BRIDGE EQUIPMENT AND OPERATION

2.1 Bridge Layout and Equipment

Illustrations

Illustration 2.1a Bridge Layout



Key

1	Navigation Table	21	RPM Indicator	31	Halogen Search Light
2	Instrument Panel	22	10W Speaker	32	Power Socket for Daytime Signal Lamp
3	Instrument Panel	23	Gyro Repeater	33	Flag Pigeon Box
4	No. 1 ECDIS	24	W.T. Receptacle (Single Type)	34	Thermometer Box
5	X-Band ARPA Radar Display Unit	25	Dimmer Switch for Down Light	35	Course Recorder
6	Instrument Panel for Conning Display	26	60W Down Light, Flush Type W/Dimmer Device	36	INS Printer
7	S-Band ARPA Radar Display Unit	27	Light For Folding Table, DC25V Gooseneck Type	37	Echo Sounder Printer
8	No. 2 ECDIS	28	Switch for Ceiling Light	38	SMS Printer
9	Instrument Panel	29	NWT Receptacle (Single Type)	39	INMARSAT-B Printer
10	Instrument Panel	30	NWT Receptacle (Double Type)	40	Weather Facsimile
11	Alarm Monitoring Panel				
12	Hull Stress Monitor				
14	Chart and Safety Console				
15	Radio and Safety Console				
16	CCTV Monitor Panel				
17	Periscope for Magnetic Compass				
18	Portable VHF Radiotelephone				
19	Portable UHF Transceiver				
20	Microphone for VDR				

2.1 BRIDGE LAYOUT AND EQUIPMENT

The wheelhouse is of open plan design, with the necessary equipment placed to the best advantage in various consoles.

In the centre of the wheelhouse is the navigator's console where the normal watchkeeping operations are carried out. Directly behind is the helmsman's steering position where manual steering of the vessel is carried out. Behind this area are three consoles, two of which are chart tables for the stowage of the chart folios with the centre one as the GMDSS console. Situated in the rear of the wheelhouse is the electronics room which houses the radar transceiver units, gyrocompass units and the log processor unit amongst other items.

The next compartment is the battery locker, but the entrance to this is from outside the wheelhouse.

Across the front of the wheelhouse are placed a variety of instruments to assist in the smooth operation of the vessel, and are displayed on a console situated above the central forward windows.

They consist of the following:

- Clock
- Rudder angle indicator
- Wind speed / direction indicator
- Speed log indicator
- Gyro digital repeater
- Rate of turn indicator
- Tachometer
- Digital depth indicator
- Clinometer
- CCTV screen

Situated on the wheelhouse deckhead is a rudder angle indicator that is designed to be visible from all areas of the wheelhouse.

Around the sides of the wheelhouse ample cupboard space is provided for the stowage of flags and other bridge equipment which includes the public address system with a combined alarm generator unit and the fire monitor panel. Two SARTS, pyrotechnics and line throwing apparatus are also stowed on the bridge. An EPIRB in a float free container is situated on the starboard bridge wing.

On each bridge wing there is the following:

- Pedestal stand with gyro repeater
- RPM indicator
- Rudder angle indicator
- Speaker for the talkback system
- Microphone for VSS sound signal reception system
- Searchlight
- Microphone socket for public address system
- Quick release MOB lifebelt with attached smokefloat and light

Bridge Consoles and Equipment

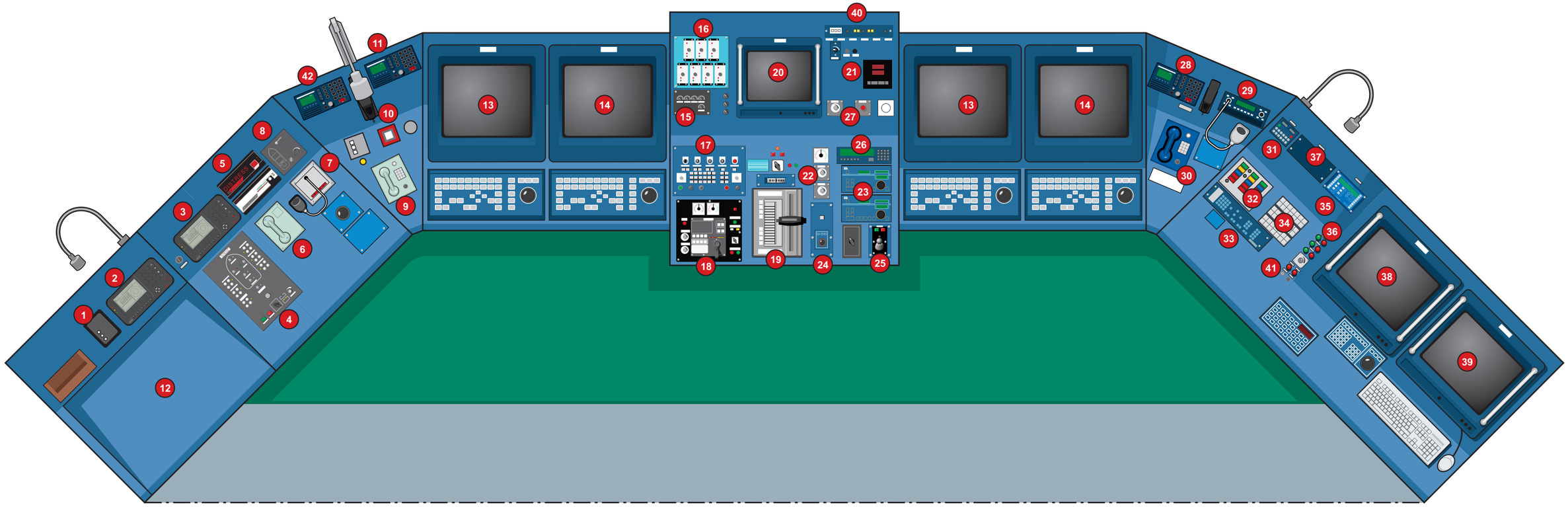
Main Console

- NABCO remote control system for the main engine
- Bow thruster controll unit
- Conning display unit
- ECDIS No.1 and 2
- X-band radar
- S-band radar
- Harbour speed table
- Automatic telephone
- Sound powered telephone
- NFU tiller override
- Selector switch for radar
- Steering repeater compass
- Compass monitor
- Steering gear motor selection and alarm panel
- Steering selection switch
- Override tiller
- Indicator panel for autopilot
- Autopilot NavPilot unit
- MF/HF control unit and handset
- Satcom B distress box
- Satcom B remote alarm box
- Fire alarm button
- General alarm button
- Morse key
- Whistle
- Window wiper control unit and demister controls
- PA controller
- Main engine rpm indicator
- Speed indicator
- Trip distance indicator
- Equipment dimmer switches
- CCTV controls
- IAS system monitor and keypad
- Stress monitor
- DGPS navigator
- DGPS selection switch
- VHF outline for DSC printer
- No.1 VHF telephone and and handset
- No.2 VHF telephone and and handset
- No.2 automatic telephone
- Bridge watch alarm panel
- Extension alarm panel
- Sound reception unit
- Whistle controller
- Emergency stops switch box
- Intrinsically safe telephone

Navigation /Chart consoles

- Navigation light indicator panel
- Signal light indicator panel
- Lighting control panel
- Echo sounder
- Master clock
- DGPS
- Loran C receiver
- Navtex receiver
- Speed log indicator

Illustration 2.1b Layout of Wheelhouse Consoles



Key

1. Voyage Recorder Alarm Panel
2. DGPS Navigator
3. DGPS Navigator
4. Navigation Lights
5. Sat B Distress Panel
6. Sat B telephone
7. PA Control Panel
8. Sound Reception Control Panel
9. Telephone
10. General Alarm Control
11. VHF DCS Control
12. Chart Table
13. Electronic Chart Display
14. Automatic Radar Plotting
15. Window Wipers Panel
16. Heated Windows Panel
17. Main Turbine Sub Panel
18. Bow Thruster Control
19. Main Turbine Telegraph Control
20. Conning Display Screen
21. Speed Log
22. Telegraph Dimmers
23. Autopilot Control Panels
24. Conning DisplayTrackball
25. Overide Unit
26. Gyrocompass Monitor
27. Whistle
28. No.2 VHF Unit
29. UHF Main Unit
30. Sound Power Phone
31. Whistle Control Panel
32. Steering Gear Panel
33. CCTV Control
34. Steering Gear Alarm Panel
35. Bridge Watch Call Panel
36. Steering Gear Stop/Starts
37. Fog Bell and Gong Panel
38. SMS Monitor
39. Hull Stress Monitor
40. Overhead Console Dimmers
41. Alarm Stops
42. GMDS Alarm Panel

Radio Console

The radio console provides all the equipment necessary to comply with GMDSS regulations, along with additional communication equipment such as:

- Standard Satcom C
- Telephone for the Satcom B
- Sound powered telephone
- Automatic exchange internal telephone
- Radio telex printer
- Inmarsat C printer
- DSC receiver
- Keyboards and monitors
- Bridge watch alarm panel
- Voyage Data Recorder - Alarm/Data Download Module
- AIS transponder in cupboard

Chart Table

Underneath the full size chart table are drawers with sufficient space to carry a worldwide set of charts for the vessel's trading routes. The following equipment is supplied at the chart table.

- Weather facsimile machine
- ECDIS planning station
- No.1 receiver for Navtex
- No.2 DGPS
- Repeater display for No.1 DGPS
- Atlas Dolog
- Echo sounder and printer
- Course recorder
- Master clock
- Chronometer in a recessed box

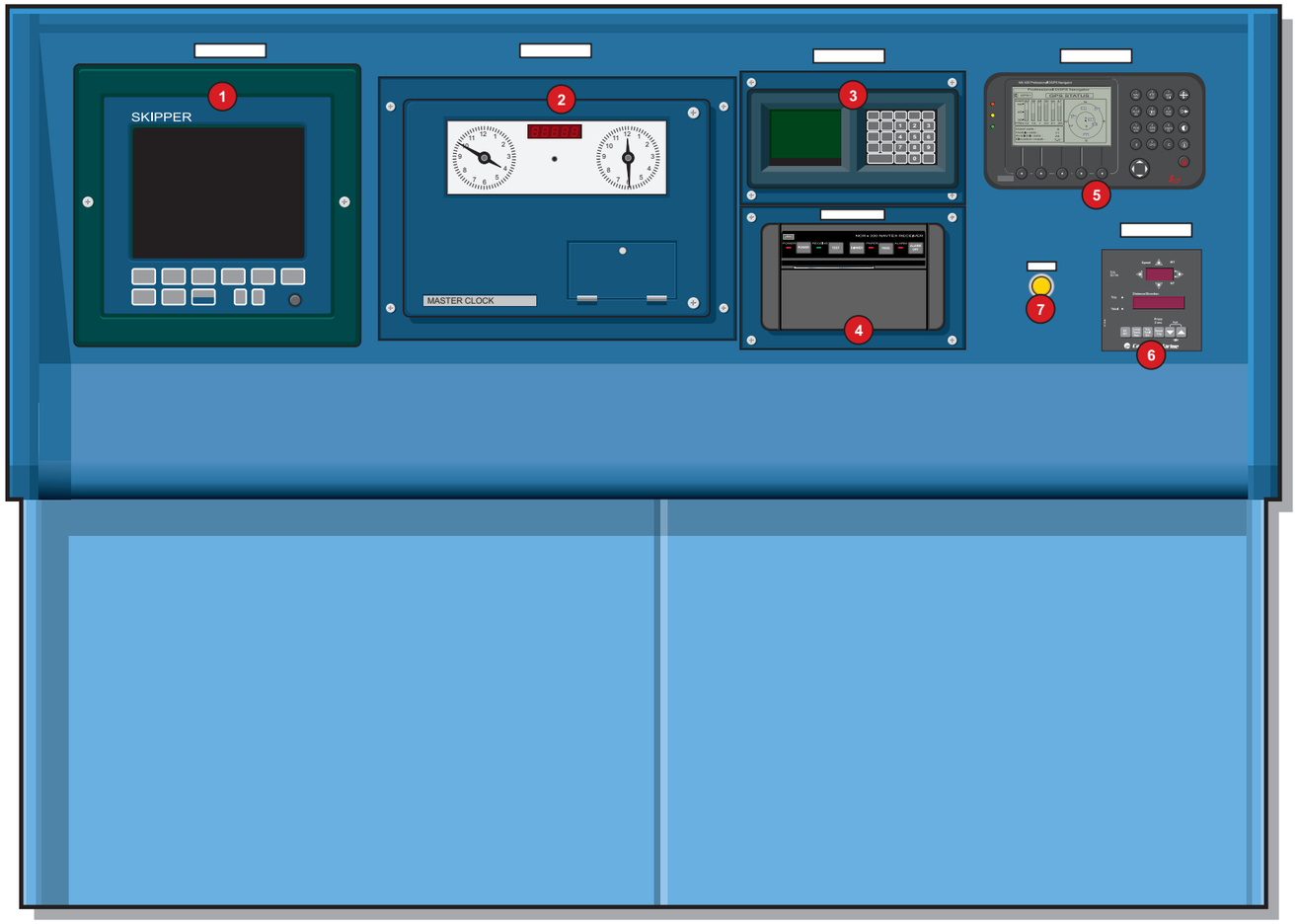
Computer Console

- Course recorder printer
- HICHAS monitor and keyboard
- Network computer with monitor and keyboard
- Stress computer with monitor and keyboard
- Printers for network and stress computers

Bridge Wing Console

- Doppler docking log
- Rudder angle indicator
- Dimmer for rudder angle indicator
- Main engine RPM indicator
- Dimmer for main engine RPM indicator
- Digital heading repeater
- Depth indicator
- VHF handset
- Gyro repeater
- Pushbutton for whistle
- NFU lever for steering control
- Manoeuvring table
- Lamp test
- Main engine manoeuvring control
- Main engine manoeuvring control
- Main engine manoeuvring control
- Morse key

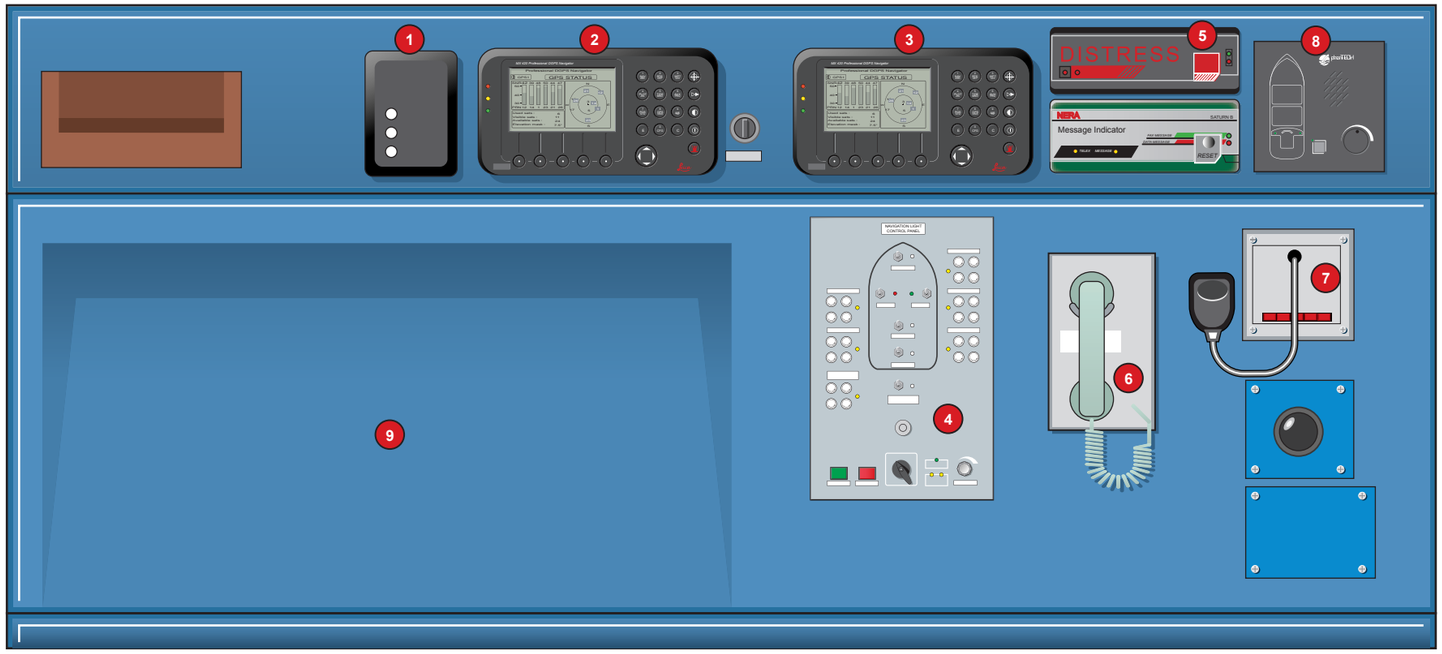
Illustration 2.1c Wheelhouse Navigation Console



Key

1. Echo Sounder
2. Master Clock
3. Loran C
4. Navtex Receiver
5. DGPS Navigator
6. Speed Log
7. Alarm Acknowledge Pushbutton

Illustration 2.1d Main Chart Table



Key

1. Voyage Recorder Alarm Panel
2. DGPS Navigator
3. DGPS Navigator
4. Navigation Lights
5. Sat B Distress Panel
6. Sat B telephone
7. PA Control Panel
8. Sound Reception Control Panel
9. Chart Table

2.2 Radars and ECDIS

2.2.1 Conning Display

2.2.2 Radars

2.2.3 Electronic Chart Display and Information System

Illustrations

2.2.2a Radar and ECDIS Equipment

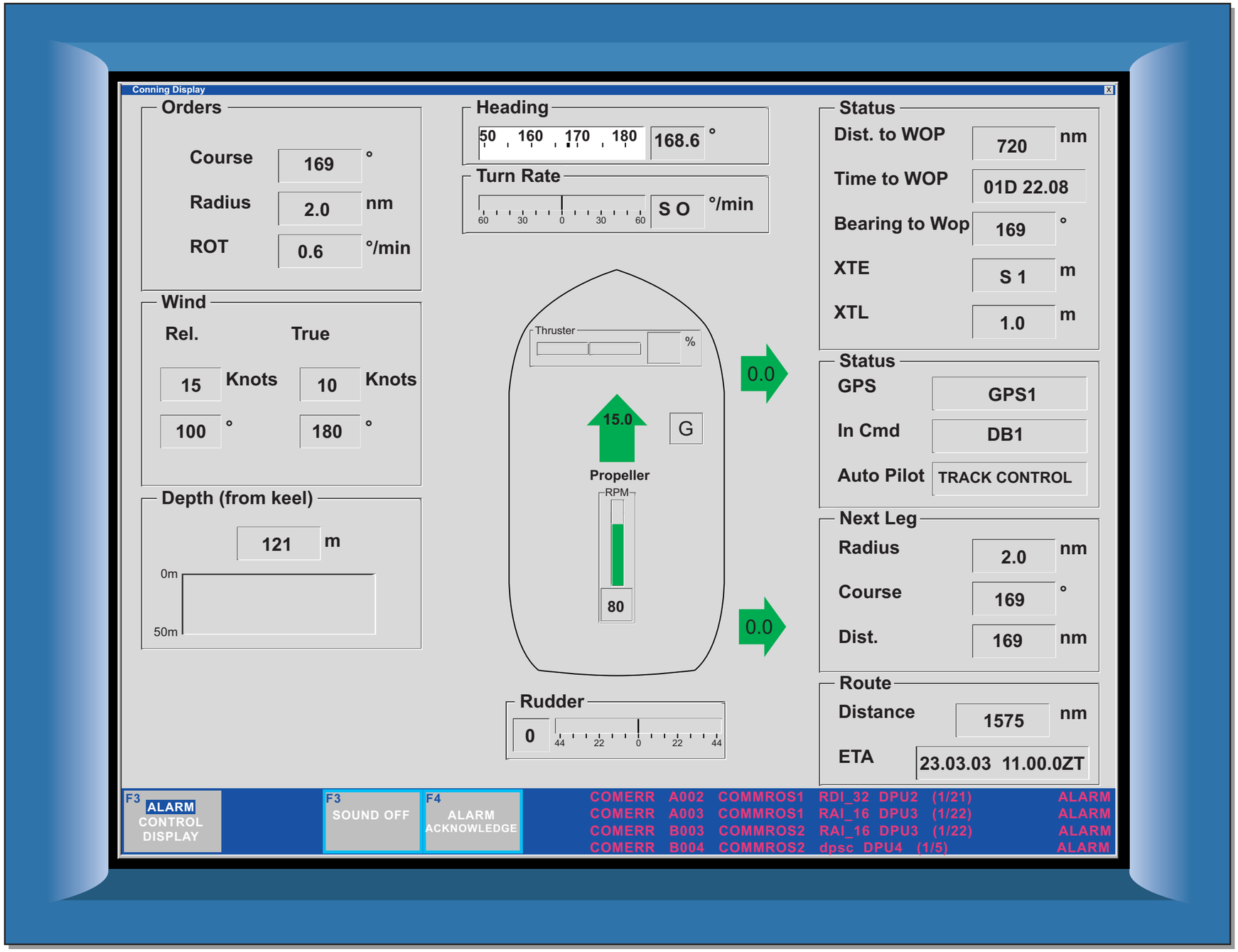
2.2.2b Radar Operating Console

2.2.1c Radar Display

2.2.3a ECDIS Operating Console

2.2.3b ECDIS Display

Illustration 2.2.1a Conning Display



2.2 RADARS AND ECDIS

2.2.1 CONNING DISPLAY

Overview

Located in the centre of the main console is the conning display which is interlinked to the ECDIS

The trackball and its associated buttons lets the user point, click and drag on screen data as required. The type of manipulation will vary from object to object but will in the main belong to one of the following categories:

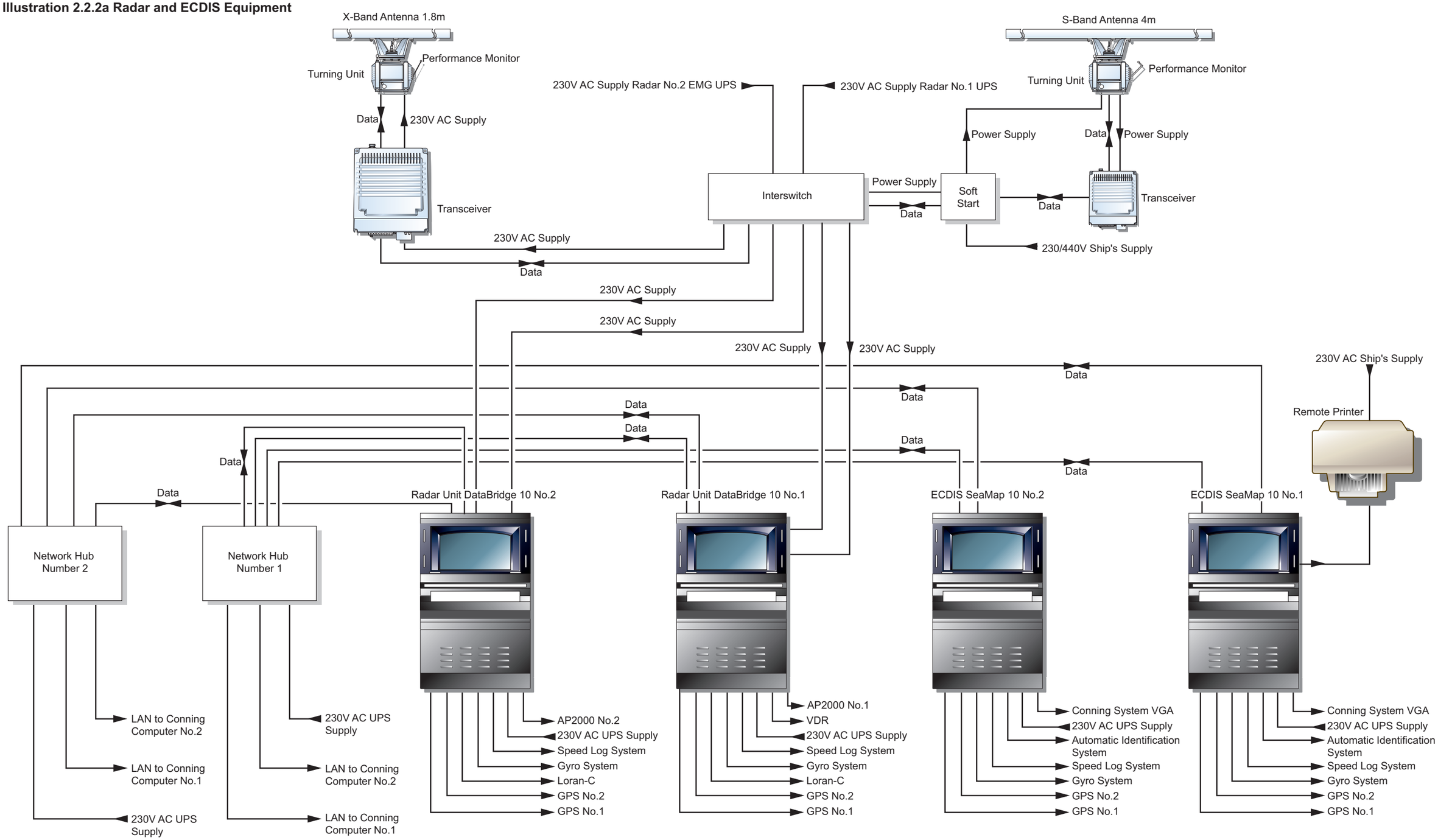
- Query info
- Parameter input/change
- Move
- Edit
- Delete
- Switch function or action on/off

The display shows the following information :

- Gyro heading
- Rate of turn
- Bow thruster position and power
- Forward and aft movement
- Sideways movement
- Speed - can be varied depending on which logs have been selected
- Engine revelutions
- Rudder angle
- ORDERS:
  - Course to steer
  - Radius of turn
  - Rate of turn
- Wind direction/speed - relative and true
- Depth of water below keel
- STATUS:
  - Distance / Time /Bearing to WOP
  - XTE (Cross track error in metres)
  - XTE (Cross track limit in metres)
- STATUS:
  - GPS
  - In Command
  - Autopilot
- NEXT LEG
  - Radius
  - Course
  - Distance:
- ROUTE
  - Distance
  - ETA

There is a changeover switch on the console that will allow the operator to change the ECDIS display to the central monitor and the conning display to the ECDIS screen.

Illustration 2.2.2a Radar and ECDIS Equipment



2.2.2 RADARS

Maker: Kongsberg Norcontrol A/S

Equipment Description

The vessel is fitted with two radars, one X band (3cm) and one S band (10cm). The equipment consists of a scanner, turning mechanism, transceiver and a display unit. An interswitch unit is installed which allows flexibility between scanner and display selection. A display unit can be connected, via the inter-switch to any one of the scanner units, and can be selected from that display as the master display for controlling that scanner, or as a slave display.

The Radar/ARPA control and display unit has a graphical interface, which allows the user to interact with the system by manipulating graphical objects such as buttons, text, entry fields symbols, etc on the display. The trackball and its associated buttons lets the user point, click and drag on screen data as required. The type of manipulation will vary from object to object but will in the main belong to one of the following categories:

- Query info
- Parameter input/change
- Move
- Edit
- Delete
- Switch function or action on/off

The operator panel provides direct access to some frequently used functions and in particular can be used for target tracking functions and for controlling the radar video presentation and signal processing. An alphanumeric keyboard is situated underneath the control panel and is used for text input if required.

In addition to displaying the radar picture and providing ARPA functions, the DataBridge 10 in the Automatic Navigation and Track-keeping System (ANTS) configuration displays electronic chart information, the planned route and the ship's geographical position and serves as the control unit of the automatic navigation and route keeping system.

Operation

It is advisable make a visual inspection of the radar scanners prior to switch on. Check for personnel or obstructions which may be struck by a rotating scanner. The radar may be switched on when the area around the scanner is confirmed to be clear. Whenever it is necessary for a technician to work on the scanner or turning unit it is good practice to display a warning sign on the radar displays stating:

MEN WORKING ALOFT DO NOT SWITCH THIS EQUIPMENT ON

Power On

Press the power button on the control panel. Start up takes approximately 3 minutes. The indicator light above the button flashes until the system is operational and remains steady as long as the system is operational. Should any problems occur during start up the Fail indicator will be illuminated and a warning buzzer will sound. As a safety feature the display will remain dark during start up to avoid the chance of destroying the night vision of the operator. Once operational the system will use a dark palette if the display is in Stand Alone mode or if no other DataBridge 10 or Seamap 10 system is operational on the bridge network. If other DataBridge 10 or Seamap 10 systems are operational on the radar and ECDIS local area network the palette in use is selected.

Power Off

On the control panel press and hold the POWER button down until the indicator light starts to flash. The indicator light will be extinguished when the system has stopped.

Entering Numeric Data

The alphanumeric keyboard can be used to enter numeric values, alternatively the trackball can be used. To use the trackball, press the SELECT button and then scroll through the legal value options until the desired value is highlighted. The operation of the trackball will increase or decrease the set value from the original setting. If a legal value is constrained within a defined interval it cannot be altered.

Procedure for Graphical Manipulation

To edit an object graphically it is necessary to select the object. Once selected the object will be displayed with a set of handles, and the most common edit-operations can be achieved by dragging a handle.

An object specific dialog is associated with each object. It will include all legal functions associated with that object.

The following objects are pre-selected and may be edited without explicit selection:

- Electronic Bearing Line (EBL)
- Variable Range Marker (VRM)
- Parallel Index Lines
- Sailing Routes
- Barrier Lines
- Mariners Notes

The Radar/ARPA offers the user a wide range of functions to assist in the navigation of the vessel. While not overriding the operator's function selections the system will provide on-screen advice when states deviate from the normal. In more serious situations the system will provide audible and visual warnings to alert the user to a possible problem.

Operation

The graphical interface is displayed on the screen as a dialog. They are organised in a hierarchy with the MAIN MENU as the top level. For each entry in the main menu there is a sub-menu listing all the dialogs for that entry. Clicking on the sub-menu will activate the dialogs. If a dialog cannot be activated it will be greyed out.

The MAIN MENU has the following entries leading to the dialogs:

Display

- Information
- Orientation and Mode

Intensity

- Intensity

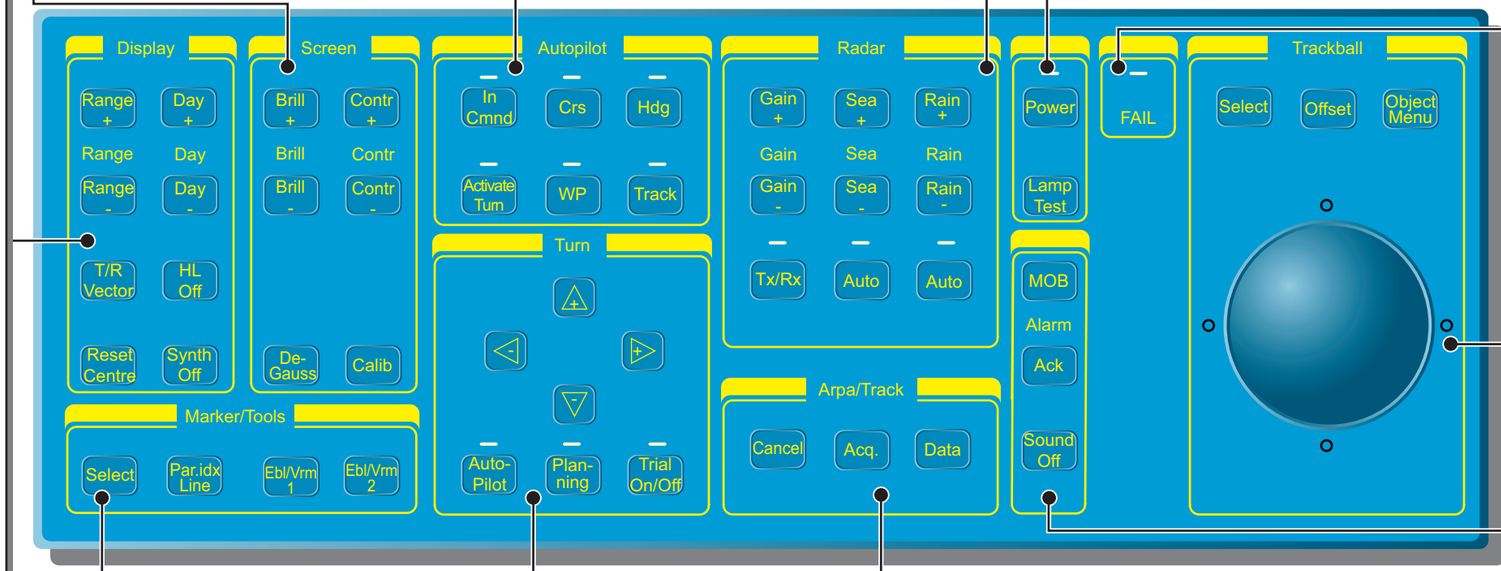
Own Ship

- Own Ship
- Position Offset
- Navigation Filters
- Position Sensors
- Heading Sensors
- Speed Sensors
- Own Ship Anchor Watch
- Position History
- ARPA Alarm Limits
- Grounding Check Area
- Autopilot
- Curved EBL (Trial Manoeuvre)

Radar

- Source

Illustration 2.2.2b Radar Operating Console



Track — Indicates that the autopilot operates in Track Mode. Pressing the button sets the mode.

WP — Indicates that the autopilot operates in Way Point Mode. Pressing the button sets the mode.

Activate Turn — Accepts the planned turn as input to the autopilot. The indicator is ON until the turn is completed, or either the Hdg or the Crs button is pressed. The indicator will be ON together with Track.

Hdg — Indicates that the autopilot operates in Heading Mode. Pressing the button sets the mode. When control is transferred from the autopilot, this will be the initial mode. Turn commands from the curved EBL are accepted.

Crs — Indicates that the autopilot operates in Course Mode. Pressing the button sets the mode. Turn commands from the curved EBL are accepted.

In Cmnd — Indication ON: Autopilot control from this console is enabled.
Indication OFF, but indication in some of the other lamps in the group: Autopilot Control from the integrated bridge system is enabled, but active from another console.
Indication OFF and no indication in the other lamps in the group: the Autopilot is in local control.
Pressing the button: takes control of the autopilot. Transfer of control between consoles in an integrated bridge system is without grant/acceptance sequence.
Flashing lamp: the autopilot has been switched to remote control transfer. When this occurs, the lamp will flash on all consoles. Press the button on the console where you want to control the autopilot to confirm.

De-Gauss — Press to perform a display de-gauss.

Calib — Brightness and contrast controls are returned to calibrated settings.

Range + / Range - — Increases/decreases range settings by one increment with immediate echo in the top bar.

T/R Vector — Toggles vector presentation mode. True motion vectors will change to relative vectors and vice versa, while the button is pressed.

Reset Centre — In True Motion: sweep centre is moved to maximum allowed offset with own ship heading line passing through the display centre.
In Relative Motion: sweep centre is moved to display centre.

Day - / Day + — Browses through the available day/night colour palettes

HL Off — Switches presentation of heading line off while pressed.

Synth Off — Removes all information in the situation plot area, except the radar.

Rain + / Rain - — Increases/decreases Rain Clutter Reduction in steps of 3%. Maximum reduction is obtained at 99% and minimum at 0%.

Auto — Switches Rain Clutter Reduction to automatic. Released by pressing either Auto once more or Rain Clutter Reduction Up or Down buttons. When the indicator lamp is lit, the function is ON.

Sea + / Sea - — Increases/decreases Sea Clutter Reduction in steps of 1%. Maximum reduction is obtained at 99% and minimum at 0%.

Auto — Switches Sea Clutter Reduction to automatic. Released by pressing either Auto once more or Sea Clutter Reduction Up or Down buttons. When the indicator lamp is lit, the function is ON.

Gain + / Gain - — Increases/decreases radar display gain in steps of 1%. Maximum gain is 99% and minimum gain is 0%.

Tx/Rx — Transceiver ON/OFF. The function is on when the lamp is lit. The function will work for the sensor currently selected as radar source, provided the display is in Master radar control mode.

Power — Switches the display power on and off.

Lamp Test — While pressed, all indicator lights on the panel will be lit and a buzzer will sound if successful.

FAIL — The lamp is lit by the system watchdog and indicates that the display computer is stopped or running out of resources.

Select — Places the system focus on the object or entry field pointed and clicked at. As a result, the object or entry field will display itself selected, exposing its handles for operator manipulation. Push the button or check the box.

Offset — Moves the display centre to the screen position of the trackball marker

Object Menu — Pointing at an object inside the situation plot will activate an object dialog at the marker position.

Select — Same as the Trackball select button. Intended for two-hand operation of the Drag Trackball Marker function.

Par.idx Line — Indicates a parallel index line, bearing parallel to own ship heading, distance 1nm.
If one or more parallel index lines are already presented, they are switched off.

Ebl/Vrm 1 / Ebl/Vrm 2 — Indicates EBL and VRM pair No.1/No.2 centred at own ship, following the sweep centre. If off centred, it will be fixed relative to ground.
Repeated click will delete the EBL and VRM pair.

Adjusts the curved EBL. Left/right adjusts the heading. Up/down adjusts the distance to turn. Will only work in Crs or Hdg modes and only when the console is IN CONTROL.

Auto-Pilot — Autopilot is not in command: this works as the planning button below.
Autopilot is in comand: the curved EBL is set with zero time to turn and the Left/Right buttons will set the new course set point on the autopilot.

Plan-ning — Activates a curved EBL in planning mode. The curved EBL is a graphical tool that can be used to indicate where the ship will sail if a manoeuvre with the given turning radius is initiated at the start of the curve. The plan will become active if Activate is clicked in the dialog or the Activate Turn button is pressed.

Trial On/Off — Activates/deactivates the trial manoeuvre. Activation will also activate the curved EBL in planning mode.

Cancel — Used together with the trackball marker. When pointing at a target, tracking off this target will be stopped without further notice to the operator.

Acq. — Used together with the trackball marker. The system will search for a radar echo by the marker and try to track it as a target. The target symbol will appear in accordance with the current track status.

Data — Used together with the trackball marker. Activates the target dialog for the target pointed at.

MOB — Inserts an Event symbol in own ship's current position. The event (navNote) dialog is available from the object menu.

Ack — Acknowledge any unacknowledged messages.
Pressing the button will provide a list of unacknowledged alarms. Pressing once more acknowledges the visible message in the list.

Sound Off — Mutes the audible alarm. When more than one control unit is integrated, pressing the button on any control unit will mute the audible alarm on every control unit.

Targets

- Target Data
- 2* Target Data
- Target Anchor Watch
- ARPA Alarm Limits
- Known Solution

Auto Acquire

- Edit Barriers

Tools

- Parallel Index Lines
- Curved EBL

Chart

- Chart Themes
- Chart Legend
- Object Info
- Safety Depth Setting

Routes

- Manage Routes
- List Waypoints
- Back-up/Restore Routes
- Monitor Route
- Autopilot
- Speedpilot

Notes

- Manage Notes
- Edit Note
- Save Notes
- Manage Note Folders
- Load Notes from Floppy
- Save Notes to Floppy

System

- Palette
- Date and Tie
- Ship and Route Parameters
- Passwords
- Maintenance
- Alarm Set-up
- Serial Communication
- Sensor Configuration
- Radar Configuration

The main menu display is shown below. To select a dialog use the trackball to move the cursor over the dialog and press the select button on the control panel. The list of available dialogs will be listed, then select the required dialog as above and proceed through the dialog using the trackball or alphanumeric keypad to complete information fields within the dialog.

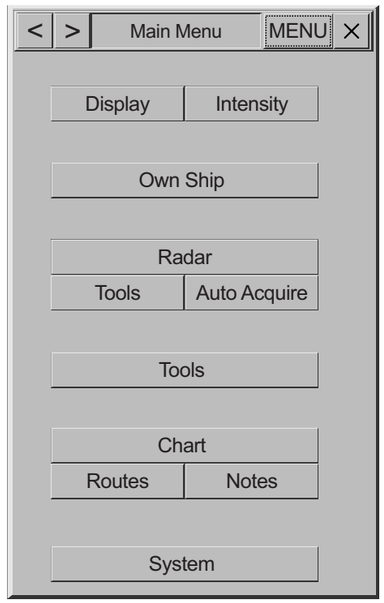
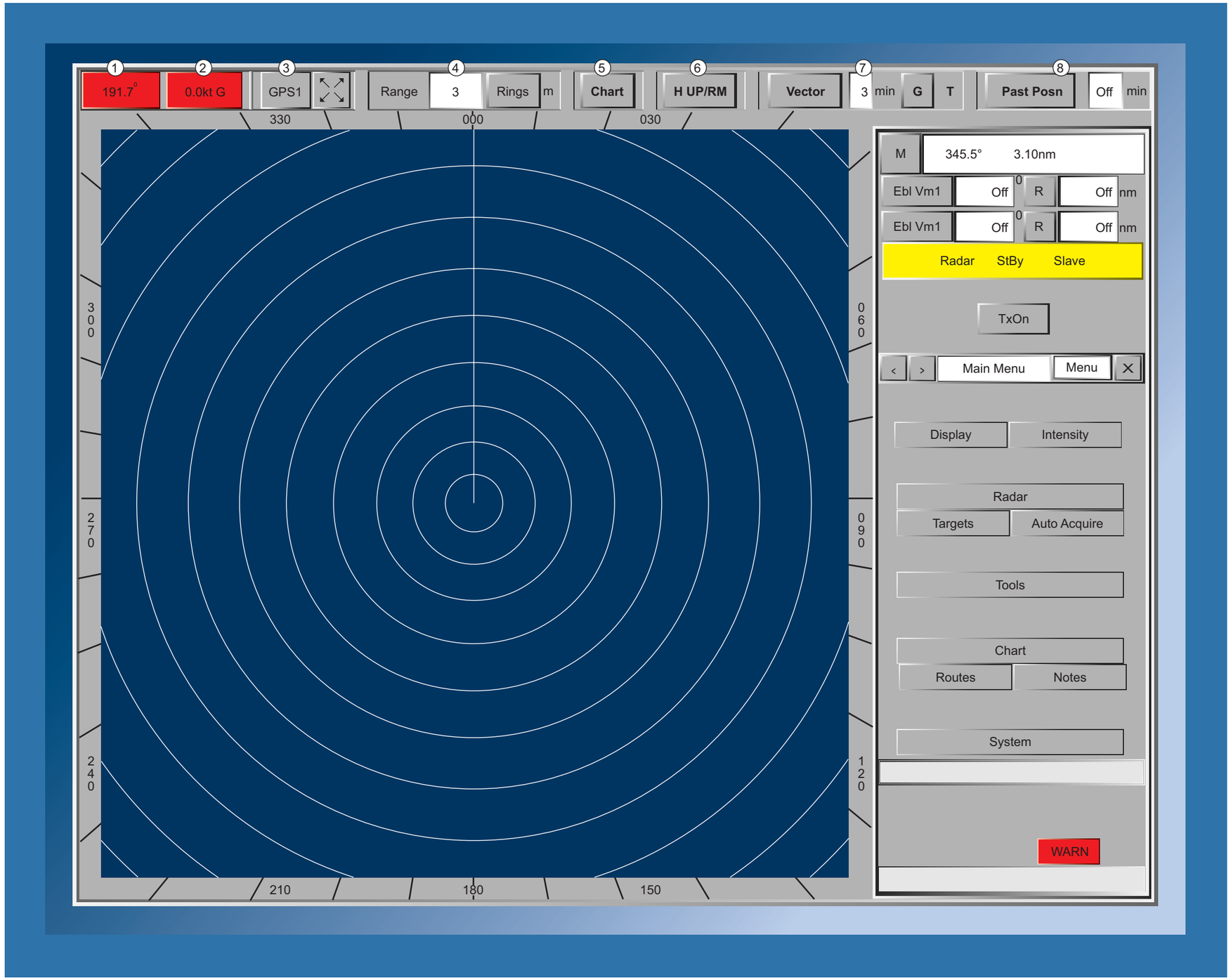


Illustration 2.2.2c Radar Display



Key

1	Own ship's heading
2	Own ship's speed
3	Current position fix system
4	Range and range rings
5	Chart status
6	Display orientation
7	Target and own ship vector
8	Target past positions

Automatic Navigation and Track-keeping System

When the DataBridge 10 is interfaced to the AP2000 TrackPilot autopilot system it makes the ship follow the planned route by providing the AP2000 with the present course, upcoming turn radius and next course information. The DataBridge 10 constantly passes off-track distance to the route to the AP2000 which adjusts the steering accordingly. The radius turn to the next course is initiated when the ship arrives at the wheel-over position.

Procedure to Operate the DataBridge 10 and AP2000 in Track Steering

a) From the MAIN MENU select the ROUTES dialog.

b) From the Routes dialog select MANAGE ROUTES dialog.

c) Select the desired route from the list and click the MONITOR button in the dialog. The route state is now listed as ‘ACTIVE’.

d) Confirm that the AP2000 is switched to AUTOPILOT and that AP-Mode in the dialog displays ‘LOCAL’.

e) Click on the IN COMMAND button in the dialog which allows the DataBridge 10 to control the autopilot. A tick appears in the box next to In Command.

f) Select track steering by selecting TRACK in the dialog or by pressing the TRACK button on the operator console.

g) After a few seconds the AP-Mode in the dialog displays ‘TRACK’ and the course/heading and cross track error are monitored.

h) Track steering is in operation.

Illustration 2.2.3a ECDIS Operating Console

In Cmnd
Indication ON: Autopilot control from this console is enabled.
Indication OFF, but indication in some of the other lamps in the group: Autopilot Control from the integrated bridge system is enabled, but active from another console.
Indication OFF and no indication in the other lamps in the group: the Autopilot is in local control.
Pressing the button: takes control of the autopilot. Transfer of control between consoles in an integrated bridge system is without grant/acceptance sequence.
Flashing lamp: the autopilot has been switched to remote control transfer. When this occurs, the lamp will flash on all consoles. Press the button on the console where you want to control the autopilot to confirm.

Crs
Indicates that the autopilot operates in Course Mode. Pressing the button sets the mode. Turn commands from the curved EBL are accepted.

Hdg
Indicates that the autopilot operates in Heading Mode. Pressing the button sets the mode. When control is transferred from the autopilot, this will be the initial mode. Turn commands from the curved EBL are accepted.

Activate Turn
Accepts the planned turn as input to the autopilot. The indicator is ON until the turn is completed, or either the Hdg or the Crs buttons are pressed. The indicator will be ON together with Track.

WP
Indicates that the autopilot operates in Way Point Mode. Pressing the button sets the mode.

Track
Indicates that the autopilot operates in Track Mode. Pressing the button sets the mode.

Power
Switches the display power on and off.

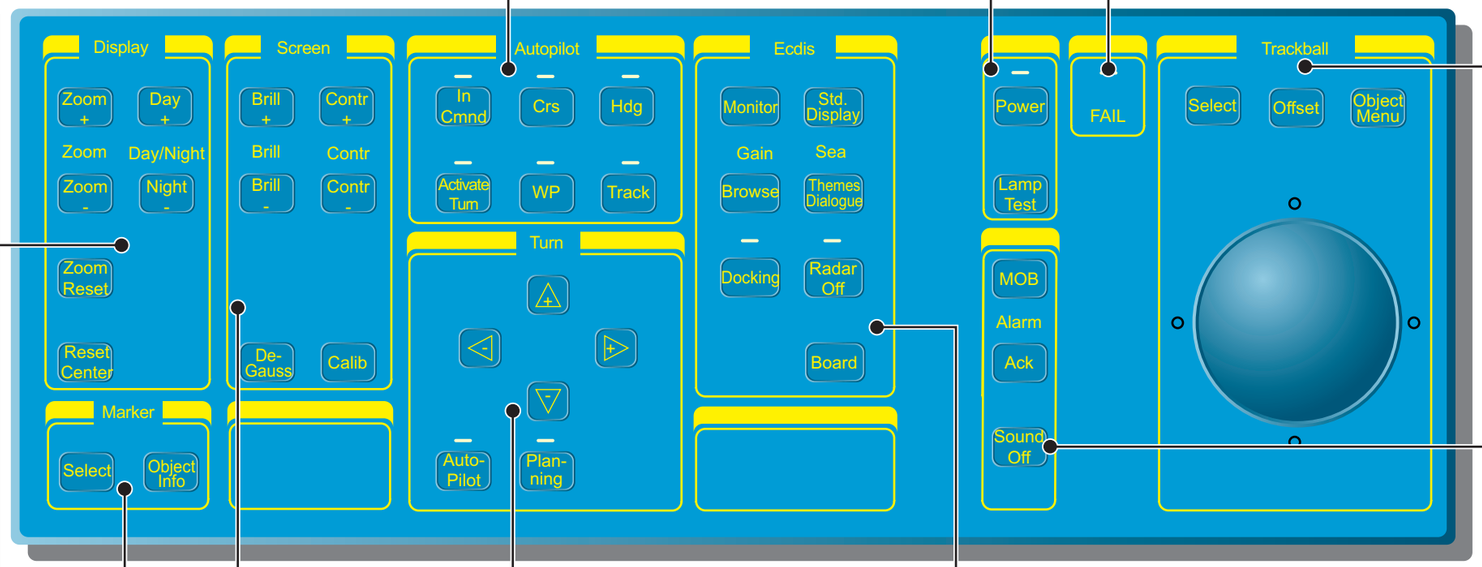
Lamp Test
While pressed, all indicator lights on the panel will be lit and a buzzer will sound if successful.

FAIL
The lamp is lit by the system watchdog and indicates that the display computer is stopped or running out of resources.

Select
Places the system focus on the object or entry field pointed and clicked at. As a result, the object or entry field will display itself selected, exposing its handles for operator manipulation. Push the button or check the box.

Offset
Moves the display centre to the screen position of the trackball marker

Object Menu
Pointing at an object inside the situation plot will activate an object dialog at the marker position.



Zoom -
Decreases the chart scale by a factor of two.

Zoom +
Increases the chart scale by a factor of two.

Zoom Reset
Resets the chart scale to the largest available.

Reset Center
Reset own ship's symbol on the screen to maximum allowed offset with the ship's course pointing through the display centre.

Day +
Browses through the available day/night colour palettes from current to brighter. Adjusts the operator panel background light level simultaneously.

Night -
Browses through the available day/night colour palettes from current to darker. Adjusts the operator panel background light level simultaneously.

Select
This is a copy of the select button on the trackball. Intended for two-hand operation of the drag trackball marker.

Object Info
Displays the Object Info dialog for the object the marker points to.

De-Gauss
Press to perform a display de-gauss.

Calib
Brightness and contrast controls are returned to calibrated settings.

Adjusts the curved EBL. Left/right adjusts the heading. Up/down adjusts the distance to turn. Will only work in Crs or Hdg modes and only when the console is IN CONTROL.

Auto-Pilot
Autopilot is not a command: this works as the planning button. Autopilot is in comand: the curved EBL is set with zero time to turn and the Left/Right buttons will set the new course set point on the autopilot.

Plan-ning
Activates a curved EBL in planning mode. The curved EBL is a graphical tool that can be used to indicate where the ship will sail if a manoeuvre with the given turning radius is initiated at the start of the curve. The plan will become active if Activate is clicked in the dialog or the Activate Turn button is pressed

Std. Display
Will modify the chart display to standard display.

Themes Dialogue
Displays the theme dialog.

Radar Off
Removes Radar video and targets from the display when the video or targets are visible, otherwise toggles visible/non visible.

Monitor
Own ship's position is always shown in the chart display. Will also reset to the best chart for the ship's position.

Browse
Chart display independent of own ship's position

Docking
Combines ECDIS with Conning information

MOB
Inserts an Event symbol in own ship's current position. The event (navNote) dialog is available from the object menu.

Ack
Acknowledge any unacknowledged messages.
Pressing the button will provide a list of unacknowledged alarms. Pressing once more acknowledges the visible message in the list.

Sound Off
Mutes the audible alarm. When more than one control unit is integrated, pressing the button on any control unit will mute the audible alarm on every control unit.

2.2.3 ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEM

Overview

The SeaMap 10 display units are interconnected with the radar system via two network hub computers. With a similar control panel to that of the radar and allows the operator to take control of other systems such as the AP2000 autopilot from the ECDIS control panel. As with the radar the display and control unit has a graphical interface, which allows the user to interact with the system by manipulating graphical objects such as buttons, text, entry fields symbols, etc on the display. The trackball and its associated buttons lets the user point, click and drag on screen data as required. The type of manipulation will vary from object to object but will in the main belong to one of the following categories:

- Query info
- Parameter input/change
- Move
- Edit
- Delete
- Switch function or action on/off

The operator panel supplements the trackball by providing direct access to some frequently used functions as well as maniplulation by graphics.

An alphanumeric keyboard is situated underneath the control panel and is used for text input if required.

Power On

Press the POWER button on the control panel. Start up takes approximately 3 minutes. The indicator light above the button flashes until the system is operational and remains steady as long as the system is operational. Should any problems occur during start up the Fail indicator will be illuminated and a warning buzzer will sound. As a safety feature the display will remain dark during start up to avoid the chance of destroying the night vision of the operator. Once operational the system will use a dark palette if the display is in stand alone mode or if no other DataBridge 10 or SeaMap 10 system is operational on the bridge network. If other DataBridge 10 or SeaMap 10 systems are operational on the bridge network the palette in use is selected.

Power Off

On the control panel press and hold the POWER button down until the indicator light starts to flash. The indicator light will be extinguished when the system has stopped.

Entering Numeric Data

The alphanumeric keyboard can be used to enter numeric values, alternatively an on-screen slider or the trackball can be used. If a legal value is constrained within a defined interval it cannot be altered.

Procedure for Graphical Manipulation

To edit an object graphically it is necessary to select the object. Once selected the object will be displayed with a set of handles, and the most common edit-operations can be achieved by dragging a handle.

An object specific dialog is associated with each object. It will include all legal functions associated with that object.

To speed up maniplulation of temporary tools such as an EBL or VRM these abjects are pre-selected by the system and may be edited without explicit selection. These principles apply to the graphical manipulation of the following objects:

- Electronic Bearing Line (EBL)
- Variable Range Marker (VRM)
- Route Plans
- Mariner's Notes

Chart Management

The SeaMap 10 system can install and use the following types of chart databases:

- S-57 Edition 3 Chart Management
- ARCS Chart Management

The ECDIS can be set up to automatically to select the best chart available for the ship's current location or the operator can select the desired chart from those available.

Operation

The menu button in the top bar toggles the top level menu area on and off. The menu area consists of eight menu buttons which represent the top level of the dialog hierarchy. Clicking on any of the buttons will display the associated submenu of dialogs. If the dialog cannot be activated it will be greyed out. The main menu followed by the available submenus are listed below:

Chart

- Display Mode
- Zoom
- Themes
- Object Info
- Legend
- Browse Position
- Safety Depth Setting
- Chart Types
- ARCS Chart Management
- CM-93 Edition 2 Chart Management
- CM-93 Edition 3 Chart Management
- S57 Chart Management

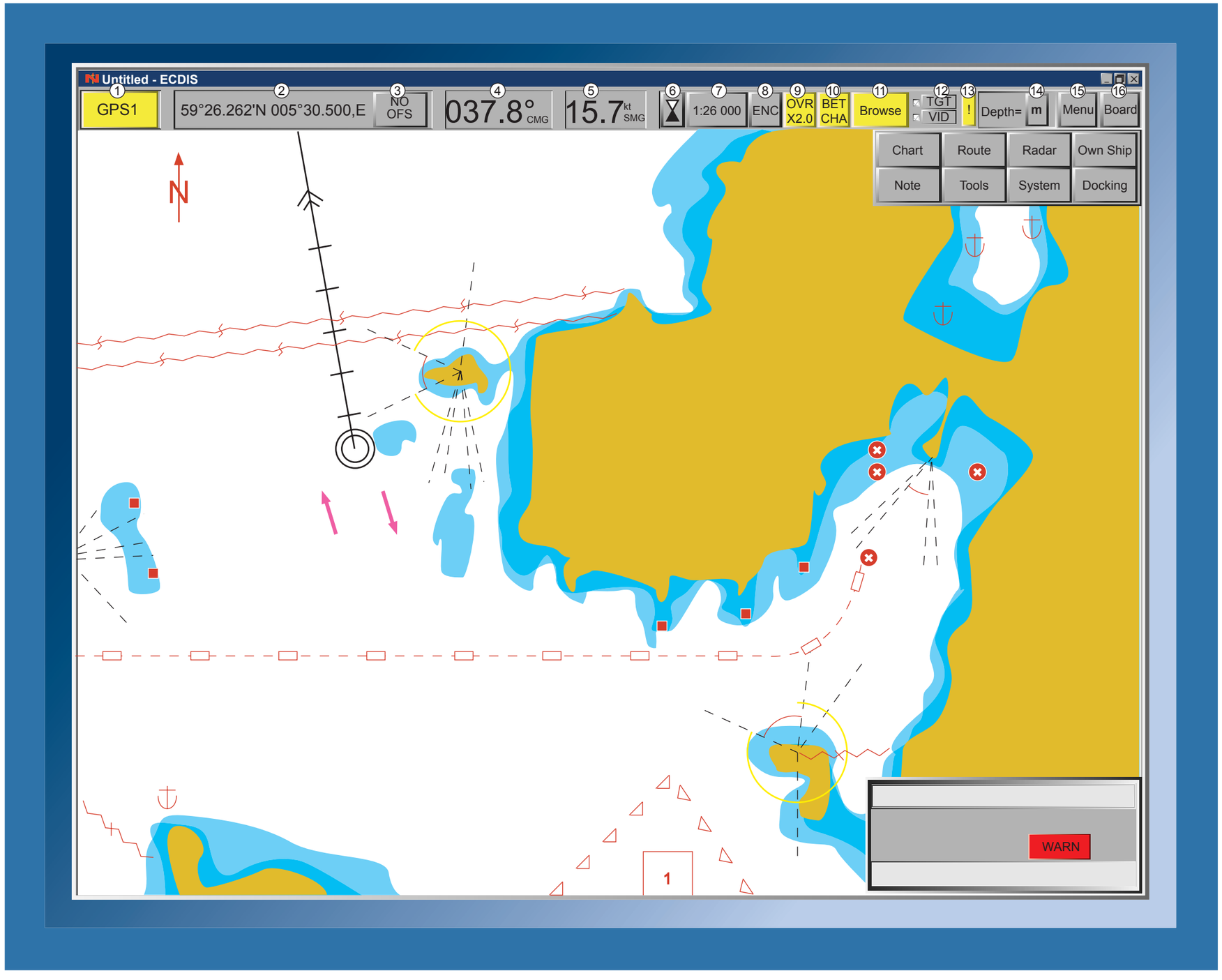
Route

- Manage Routes
- List Waypoints
- Validate Route
- Back-up/Restore Routes
- Weather Routing
- Set Route Parameters
- Monitor Route
- Autopilot
- Speedpilot

Radar

- ARPA Target Sources/Radar Video Sources

Illustration 2.2.3b ECDIS Display



Key

1	Position sensor
2	Own ship's position
3	Position offset indicator
4	Own ship's course
5	Own ship's speed
6	Chart display processing indicator
7	Displayed chart scale
8	ENC/NonENC indicator
9	Over Scale indicator
10	Chart availability
11	Chart orientation and mode
12	Radar toggles and indicators
13	System degradation warning
14	Unit of depth
15	Menu button
16	Board button

Own Ship

- Own Ship
- Position
- Heading
- Speed
- Position Offset
- Position Log Control
- Voyage Recording Control
- Voyage Recording List
- Ship Parameters
- Depth Data

Note

- Manage Notes
- Edit Notes
- Save All Notes
- Manage Note Folders
- Load Notes from Floppy
- Save Notes to Floppy
- ARCS Notes and Diagrams
- Arcs Temp. Notices to Mariners

Tools

- Marker Position
- Marker Range and Bearing
- EBL/VRM
- EBL/VRM (Advanced)
- Curved EBL
- Parallel Index Line
- Position Line
- Position Fix

System

- Palette
- Parameter Settings
- Grounding Alarm Set-up
- Date and Time
- Print Screen
- Printer
- Export to/Import from DB2000
- Passwords
- Maintenance
- Alarm Set-up
- Serial Communication
- Sensor Configuration
- ANTS Configuration
- Shutdown

Docking

From the menu bar toggle Docking to bring up the docking display. The display is very similar to the conning display and shows the following information on the ECDIS display screen.

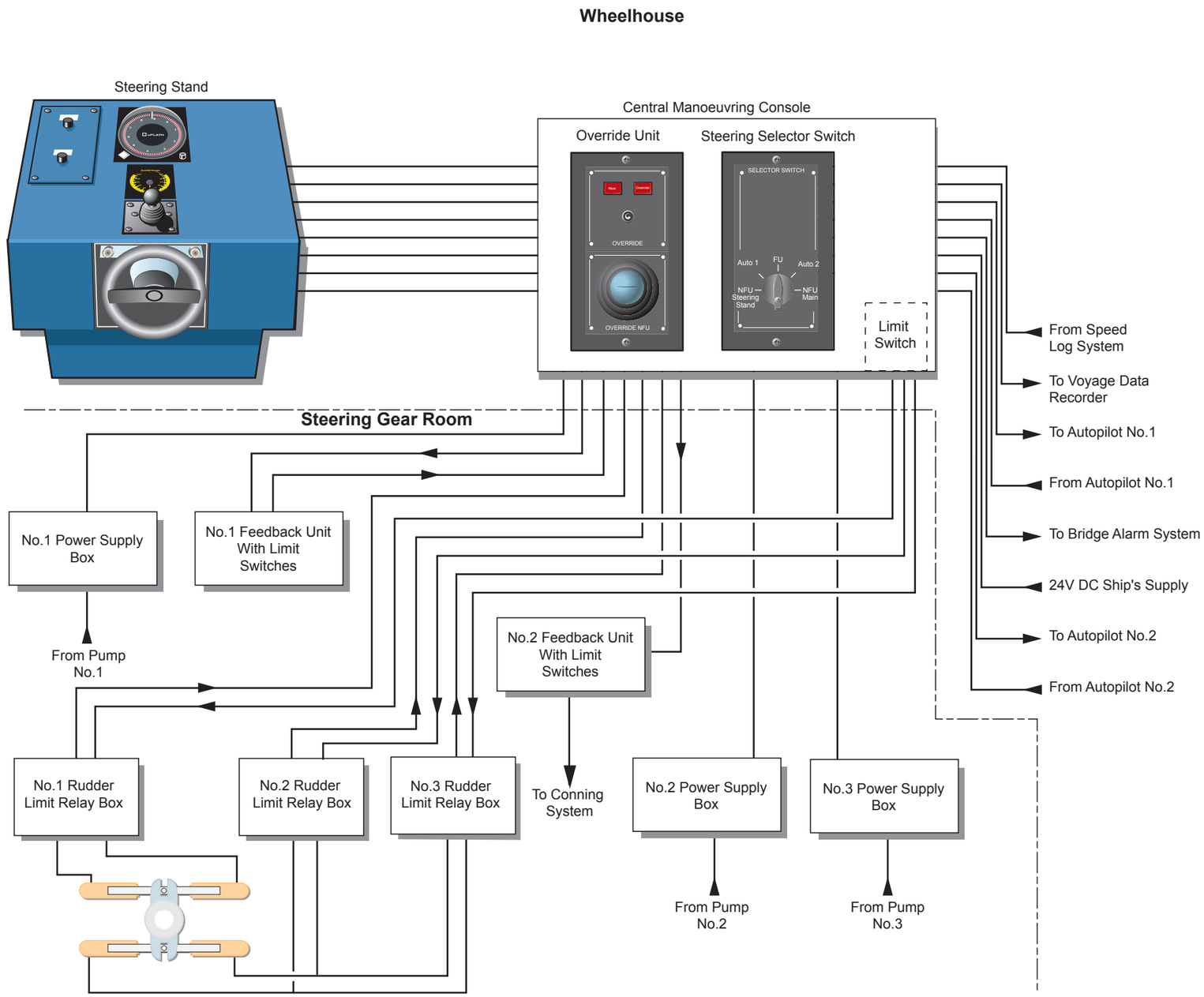
- Forward and aft movement
- Speed - can be varied depending on which logs have been selected
- Gyro heading
- Engine revolutions
- Bow thruster position and power
- Ruddrer angle
- Wind direction/speed - relative and true
- Depth of water below keel

There is a changeover switch on the console that will allow the operator to change the ECDIS display to the central monitor and the conning display to the ECDIS screen.

2.3 Autopilot System

Illustrations

Illustration 2.3.1a Steering Stand Peripherals



2.3 AUTOPILOT SYSTEM

2.3.1 STEERING STAND

Overview

The steering stand is located at the centre of the conning position in the wheelhouse. The steering stand itself comprises the following:

- A Follow Up (FU) steering wheel
- A Non Follow Up (NFU) tiller

In addition to the above the following controls are located on the central manoeuvring console:

- A Non Follow Up tiller and override switch
- The steering mode selection switch

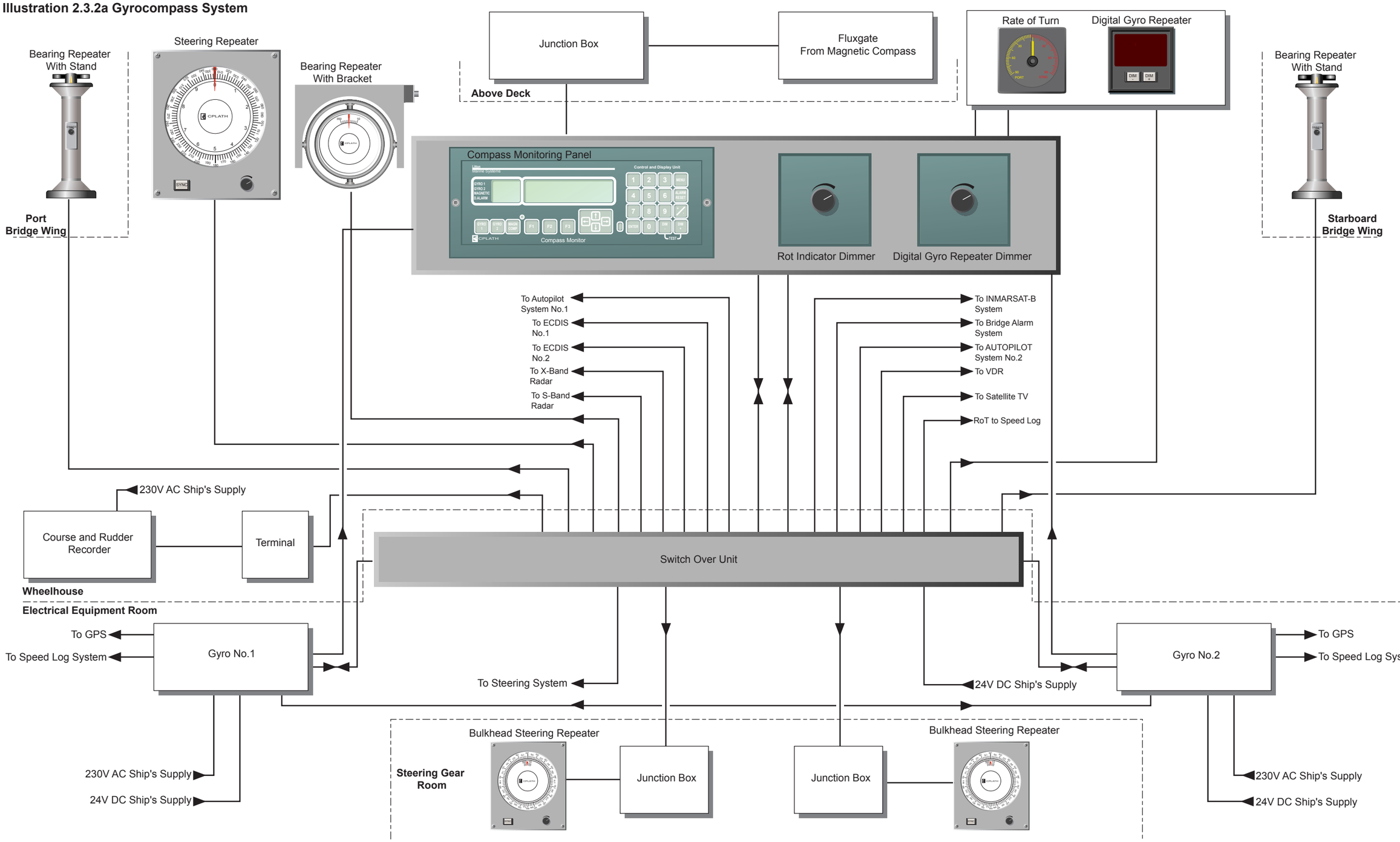
Operation

The mode of operation is selected at the steering mode selector switch situated on the central manoeuvring console. Listed below are the possible selections that can be made from the switch unit:

- Auto - This selects the automatic pilot and the steering motors respond to signals from the this system.
- NFU Steering Stand - This selects the non follow up tiller control situated on the steering stand.
- FU - This selects the follow up steering wheel control situated on the steering stand.
- NFU Main. - This selects the non follow up tiller on the central manouvering console.The overide tiller then can be operated as a steering tiller.

In addition to the above there is an override button and associated NFU tiller control situated on the central manoeuvring console. When the system is in autopilot mode the Reset button on the override panel is illuminated. With the mode control selector switch in the Auto position it is possible to press the Override button and the system will switch over to NFU mode. The system will then follow commands from the NFU tiller situated on the central manoeuvring console. The override button flashes for the duration that the NFU tiller is active. When the NFU mode is no longer required simply push the Reset button and the steering system will take up the set heading stored in the autopilot.

Illustration 2.3.2a Gyrocompass System



2.3.2 GYROCOMPASS

Maker: C.Plath
Model: NAVIGAT X Mk1

General Description

The vessel is fitted with a C Plath gyrocompass installation consisting of two NAVIGAT X Mk1 gyrocompasses, a compass monitoring panel, a switchover unit, course and rudder recorder and both digital and analogue repeaters.

NAVIGAT X Mk1 Gyrocompass

This is a microprocessor controlled gyrocompass system with integrated north speed error correction. In this system the gyrosphere is suspended in a supporting fluid and ensures north Starboardilisation during short power failures. For example if power is lost for three minutes no more than 2° of deviation would be expected. Once power has been restored the gyrocompass will return quickly to the correct heading without requiring the usual settling period. Latitude errors are more or less eliminated due to the combined effects of twin rotors and a liquid damping system.

Compass Monitor Control Unit

This control unit provides independent monitoring functions and allows operater control of the system via a keypad.

Switch Over Unit

This unit allows the user to select either gyro 1 or gyro 2 as the main unit.

Compass Monitor Control Unit

The control unit consists of two liquid crystal displays (LCDs) and a numerical keypad. The displays provide the following information:

- The heading display (left hand display) shows the heading data received from gyro 1, gyro 2 and the magnetic compass as well as indicating the difference alarm setting.
- The operating display (right hand display) shows the main menu screen.

Operating Procedures

Following the successful initalisation of the NAVIGAT X Mk1 gyrocompass system the following information can be expected to be displayed on the compass monitor control unit.

When switched on the unit will perform a self-test before entering normal operation mode. In normal operation mode the numerical keys have the following functions:

- GYRO 1 - Press key to select gyro 1
- GYRO 2 - Press key to select gyro 2
- MAGN COMP - Press key to select the magnetic compass

(**Note:** If steering is in autopilot mode the above selections are disabled.)

- DIM + - Press key to increase display illumination
- DIM - - Press key to decrease display illumination
- F1 - Press key to acknowledge an alarm, delete an alarm from the display panel and to mute buzzer.
- ALARM RESET - Press key to mute the alarm buzzer. An alarm message is displayed in the display until acknowledged by the operator.
- DIM+/DIM- - Press these keys simultaneously to initiate a test procedure. All the display elements and the alarm buzzer are actuated.

Sub-menus can be entered from the main menu display as follows:

- F1 - Press to enter the Display Data sub-menu.
- F2 - Press to enter the Manual Settings display.
- F3 - Press to enter the Setup Menu.

After pressing one of the above keys a sub-menu will be opened. Use the Up, Down, Right and Left arrow keys to navigate through to the desired location. The sub-menus are indicated on the following page.

Illustration 2.3.2b Gyrocompass Monitor

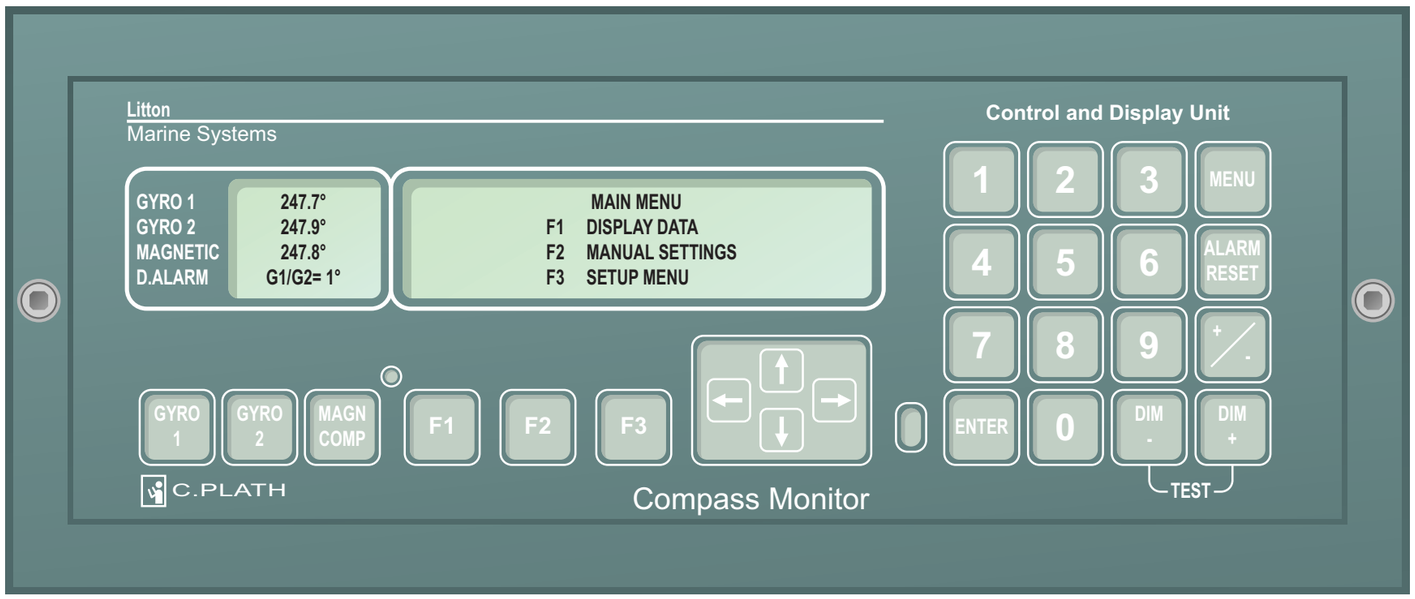
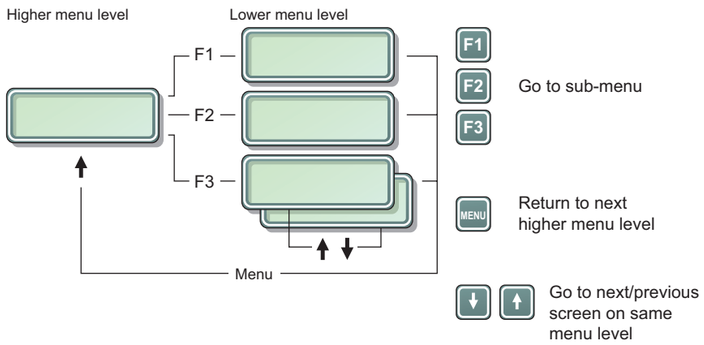
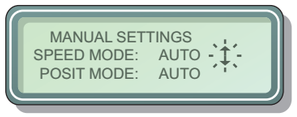


Illustration 2.3.2c Gyrocompass Sub-Menu

Navigating the Menu



Selecting Parameter Settings

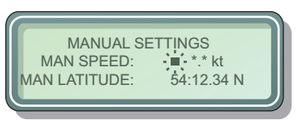


Flashing arrows: selection expected

Show next/previous option

ENTER
Select option and go to next line

Entering Data



Flashing cursor: data input expected

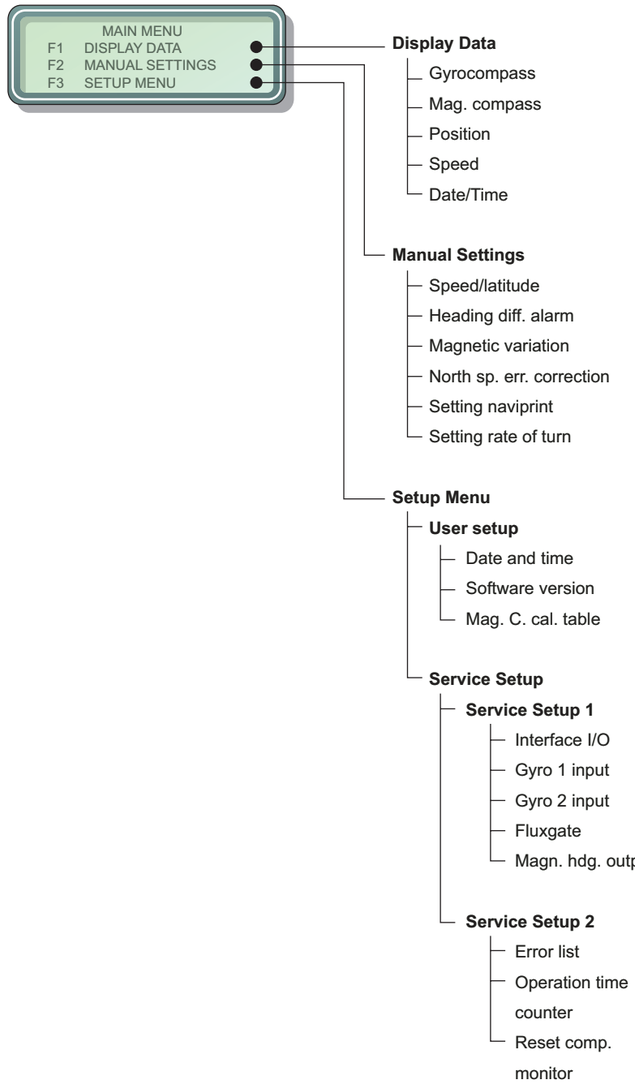
Use keypad to enter digits 0-9; "+/-" alters signs (+/-:E/W;N/S)

Move cursor forward/ back

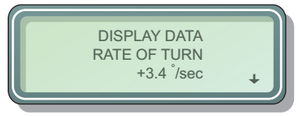
ENTER
Confirm input and go to next line

ALARM RESET
Clear input (value is set to zero)

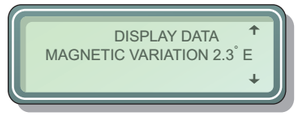
Main Menu



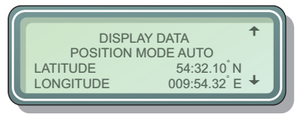
Display Data Screen



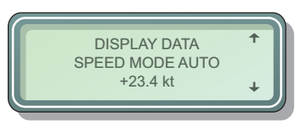
Rate of Turn
-Actual rate of turn



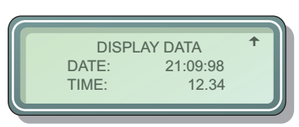
Magnetic Variation
-Magnetic variation



Position data
-Position mode (auto/man)
-Latitude
-Longitude

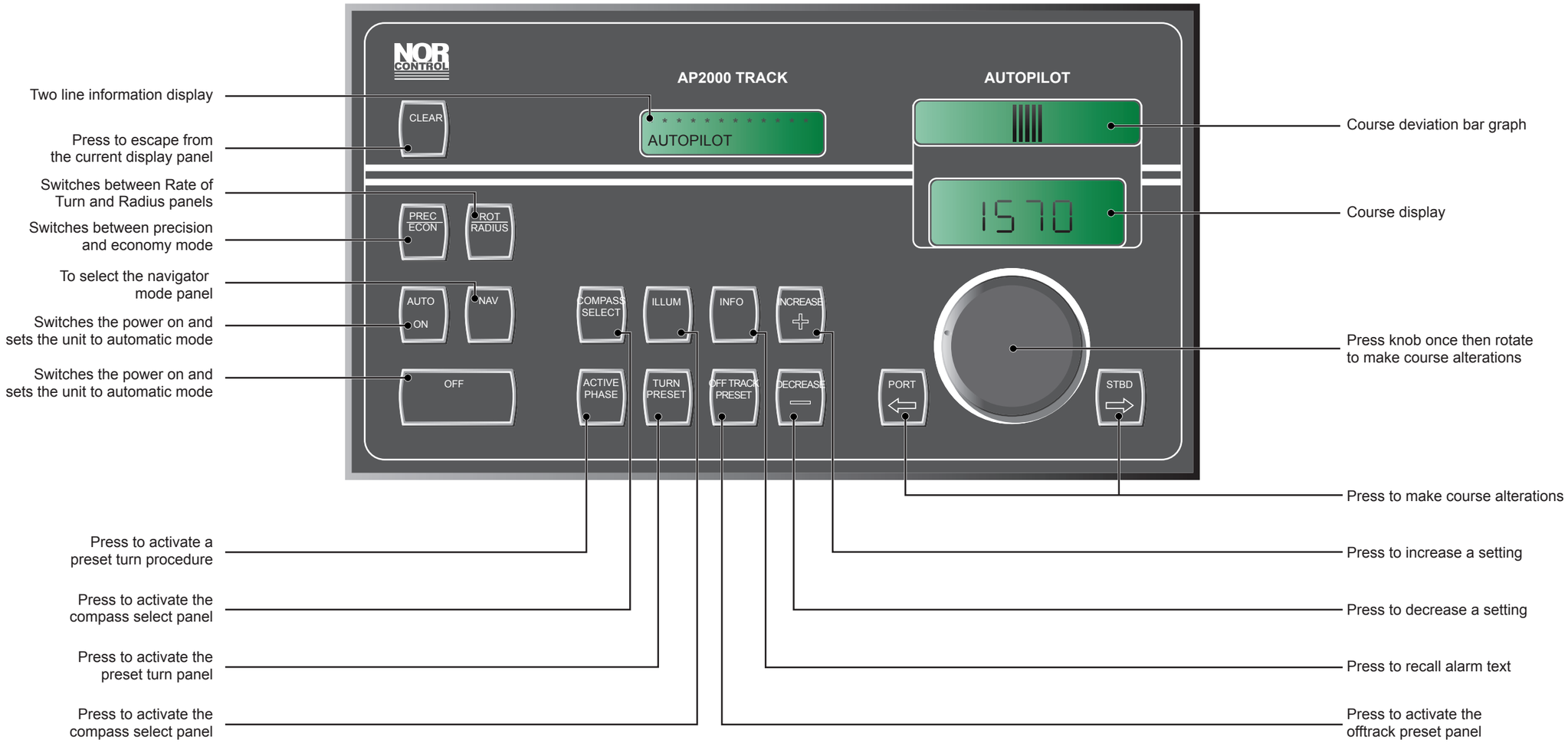


Speed
-Speed mode (auto/man)
-Actual speed



Date/Time
-Current date
-Current time

Illustration 2.3.3a Autopilot Control Panel



2.3.3 AUTOPILOT

Maker: Kongsberg Norcontrol
Model: AP2000 Track Pilot

Overview

The AP2000 Track Pilot adaptive autopilot has a computer at the centre of its system which provides accurate steering under autopilot control. The autopilot has been programmed to learn how the rudder responds to commands which in turn reduces rudder activity and ensures that the rudder is positioned as requested which helps to eliminate rudder overshoot. Precise course keeping is guaranteed by the ability to set all parameters individually with a high level of fine tuning. Any vessel, irrespective of its individual steering characteristics, can achieve smooth course changes due to the special rate of turn functions provide by the system.

The control unit is the user interface and has a number of pushbuttons, three Liquid Crystal Displays (LCDs), a rotary course selector knob as well as a port and starboard course selection buttons.

The gyro and magnetic compass NMEA inputs are applied directly to the control unit. The main computer runs the steering algorithms and interfaces with optional units such as the DGPS, speed log, Electronic Chart Display and Information System (ECDIS) and a serial input from the gyrocompass are all fed to the main computer.

In restricted waterways manual steering is recommended, and particularly so when navigating in restricted visibility. Switching from manual steering to autopilot steering is possible at all times, regardless of whether the autopilot is to hold the set heading or a change is to be made to the set heading.

The installation has two independent autopilot systems, Autopilot No.1 and Autopilot No.2. Each system comprises the following:

- Control unit with accessories
- Main computer
- Heading sensor
- Rudder feedback unit with transmission link
- Distribution unit

Operation

Under normal operating conditions command of the autopilot system will be carried out from the conning position through the ECDIS. However the system can be controlled from the local control panels located on the bridge control console. The mode selector switch is used to change control mode, for automatic steering autopilot is selected. The information display and keyboard will be in one of several different states. Each state is referred to as a panel and enables specific keyboard actions. The course display is mode dependent, in standby or manual mode it will display the main compass reading, in local or remote modes it will display the set course and under ECDIS track modes the current track bearing will be displayed. The course deviation bar graph always shows the difference between the main compass and the contents of the course display. Basic operation of the local control panel is described below.

Power On

Press and hold the AUTO ON key and wait for the lower line of the information display to show ‘AUTOPILOT’. Whenever the AUTO ON key is pressed the system returns to this starting point. The upper line of the display indicates the control mode set by the mode selector. If in the standby or manual mode ‘STANDBY’ or ‘MANUAL’ is displayed respectively otherwise the system is in the automatic steering mode.

Immediate Course Change

There are two ways to initiate an immediate course change.

a) Press the rotary course change knob once and turn it clockwise or anti-clockwise until the desired course is displayed.

b) Press the PORT or STARBOARD keys until the desired course is displayed in the course display.

In each of the above the turn will be executed immediately. In the information display the top line will show ‘IMMEDIATE TURN’ and the lower line will show ‘EXEC’ flashing with the rate or radius of turn indicated alongside it. ‘EXEC’ will flash until the turn is complete.

Increasing or Decreasing the Rate Of Turn Rate or Radius

Press the ROT/RADIUS key to toggle between the rate and radius submodes. The current selection is indicated in the lower line of the information display. Press the increase or decrease keys accordingly to alter the current selection.

Preset Turn Procedure

As the name suggests in this procedure the turn rate or radius is set before the turn starts.

a) Press the TURN PRESET key (when the vessel is not performing a turn) to activate the turn preset panel.

b) Preset the course by turning the rotary knob or pressing the PORT or STARBOARD keys until the desired course and turn direction appears on the top line of the display.

c) Press the ROT/RADIUS key to toggle between rate and radius submodes. The current selection is shown on the lower display. Preset the rate or radius using the increase or decrease keys.

d) While still in the turn preset panel press the ACTIVATE PRESET key to activate the turn. ‘EXEC’ will now flash in the lower line of the information display and will continue until the turn is completed.

(**Note:** It is possible to leave the TURN preset panel at any time by pressing the CLEAR key.)

Abort Turn Procedure

To stop an immediate turn procedure or a preset turn procedure press the AUTO ON key. The current heading will now be the set course.

Procedure to Return to the Main Panel

Press the CLEAR key at any time to leave a sub menu panel and return to the main panel.

Acknowledging Alarms

Press the CLEAR key to mute an alarm and to view the alarm indication. The upper line of the information display will flash FAILURE or WARNING until the failure is cleared.

INFO Key

Press the INFO key to recall alarm text. Press the INFO key repeatedly to scroll through failures if more than one is present.

Illumination Settings

To adjust the illumination of the keys and display press the ILLUMINATION key followed by the INCREASE or DECREASE key. The level of brightness is represented in the information display as ‘DAY, DUSK1, DUSK2, NIGHT’.

Remote Course Setting

The remote course setting is achieved through the ECDIS and is covered in section 2.2.2. The autopilot accepts remote set course when in ANTS (Automatic Navigation and Track-keeping System) COURSE mode.

Entering the Navigator Mode

It is very important to confirm that the navigator system to be selected has been properly initiated and that a route or waypoint list has been loaded. Follow the necessary procedures from the manufacturer's manuals for the navigator to load a route or waypoints. Proceed as follows:

a) Confirm that the autopilot is in the auto steering mode.

b) Press the NAV key on the control panel and one of the following messages will appear:

i) 'NAVIGATOR MODE
ACCEPTED'

The autopilot is connected to a traditional navigator and will change to the NAV mode. The course display will show the bearing of the current leg.

ii) 'NAVIGATOR MODE
NOT ACCEPTED'

The autopilot is connected to a traditional navigator but the NAV mode will not be engaged because of locking conditions or insufficient navigation data.

iii) ANTS TRACK MODE
NOT ACCEPTED'

The autopilot is connected to an ANTS navigator but the ANTS TRACK mode will not be engaged because of locking conditions or insufficient navigation data.

iv) 'ANTS TRACK MODE
REQUEST SENT'

The autopilot is connected to an ANTS navigator and a request to engage ANTS TRACK mode is sent to the navigator. The navigator decides whether to accept the request or not. The course display will show the bearing of the current leg.

2.3.4 STEERING PROCEDURES

Overview

All steering systems involve sending rudder command signals from the position where the vessel is navigated to the steering gear compartment where the machinery for controlling rudder movement is located. These rudder commands may be manually generated by a pilot/helmsman or electronically via an automatic pilot. Vessels usually have two parallel steering systems which duplicate the electrical and mechanical components, in order that the vessel can continue to be steered in the event of failure in one part of the system. These are normally called the 'port' and 'starboard' systems and a selector switch enables the operator to select either system to control rudder movement.

Manual Steering

Manual steering is normally carried out only when the vessel is manoeuvring. However, it may also be used in the event of autopilot failure. There are two main modes of manual steering; Follow Up (FU) and Non Follow Up (NFU).

Follow Up (FU) Mode

In follow up mode a steering helm has a midships position and movement in both port and starboard directions. When the helm is moved away from the midships position a rudder command voltage starts the steering gear causing the rudder to move. As it moves an electrical feedback signal from the rudder stops any further movement once the desired angle of rudder is reached. If the helm is left in this position the rudder will remain at that angle. If the helm is now moved to another position, the rudder will 'follow' this command and take up a new position. For example, if the helm were returned to midships, the rudder would return to midships. This system can only work when rudder feedback signals are available.

Non Follow Up (NFU) Mode

In NFU mode there are usually additional controls called 'Local NFU' perhaps located in a control panel away from the steering stand. When moved in one direction the rudder will continue to move until the command is removed (or the rudder limit is reached). If the control is returned to midships the rudder will remain at this angle. An opposite command has to be applied to bring the rudder back.

Illustration 2.3.4a Steering Procedures

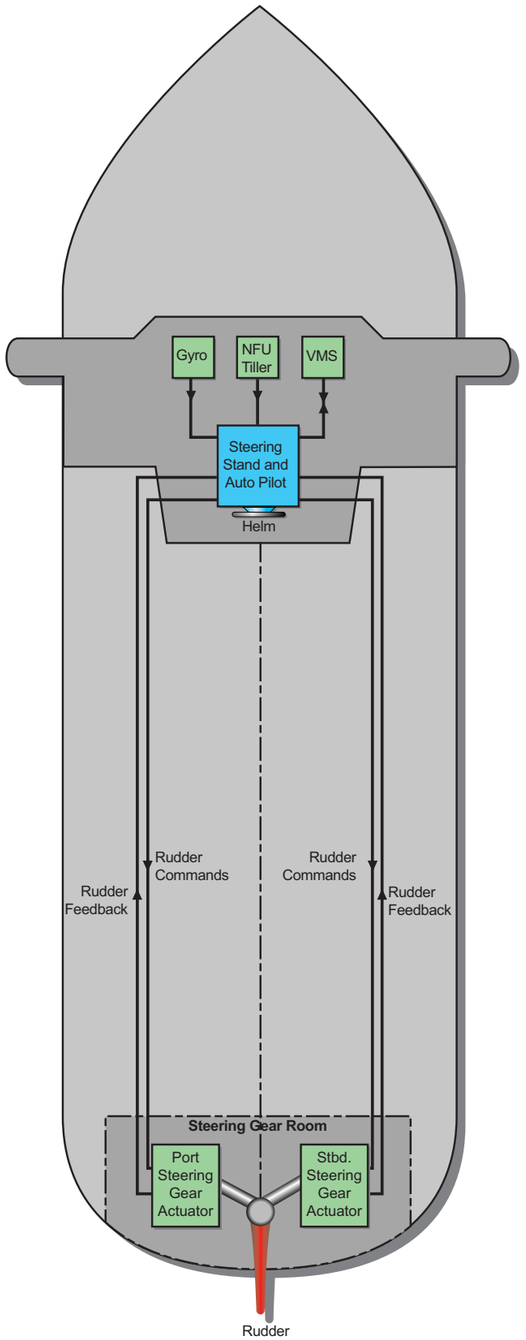


Fig.1 Typical Steering System with Duplication.

Automatic Mode

Here an electronic device produces the rudder command signals to steer the ship. The navigator sets the desired course on the autopilot controls and the system compares the 'set course' with 'actual course' information from a gyrocompass or occassionally a transmitting magnetic compass. If there is a difference between set and actual courses a rudder command signal causes the rudder to move in the correct direction and by an appropriate amount to bring the vessel back on course. Modern autopilots are 'adaptive' in that they can modify the steering to changing external forces such as sea conditions or wind as well as the individual characteristics of the ship's hull.

Steering Controls

A 'MODE' switch (figure 2) allows the navigator to select the type of steering control.

Illustration 2.3.4b Steering Procedures

Fig.2 Mode Switch

2.3.5 MAGNETIC COMPASS

Maker: C.Plath
Model: Jupiter

Overview

The Jupiter class A flat glass compass is housed in a navipol magnetic compass binnacle. The binnacle is located on top of the bridge deck with a reflector tube to the steering stand. It has a fluxgate output to the gyrocompass system which allows a magnetic compass heading to be used in the event of gyrocompass failure.

Magnetic Compass Maintenance

- The compass bowl should be inspected regularly for signs of leaks or bubbles.
- The upper glass surface should be cleaned.
- Compass gimbals should be checked.
- A few times a year a check should be made on the cap and sapphire bearing arrangement. This should be done with the vessel alongside. Use a magnetic object to cause the heading to deviate by 2°. Hold it in this position for 10 seconds, and then remove the magnet. The compass card should settle within 15’ of arc of the original heading. If it does not, the compass should be overhauled by an authorised technician.

2.3.6 RUDDER ANGLE INDICATORS

Maker: C.Plath
Model: Feedback Unit Type 4900

Overview

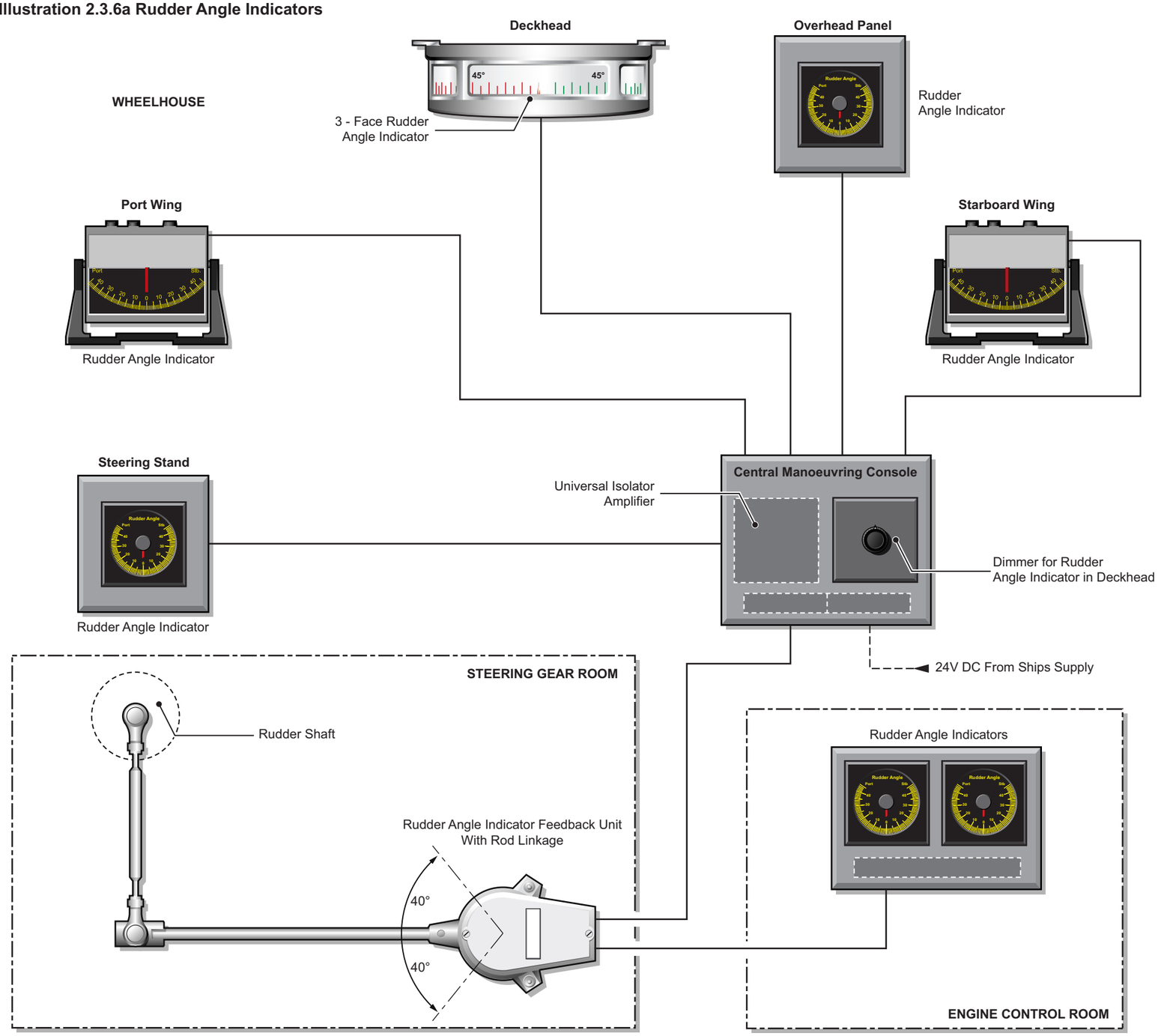
The rudder angle indicator system comprises a transmitter unit (type 4900) which is connected by a linkage rod to the rudder shaft lever in the steering gear room. As the shaft moves an electrical signal is produced in the feedback unit which is fed to the rudder angle indicators. The indicators provide a ± 45° range.

Rudder angle information can be easily viewed by both the Master (or OOW) and the helmsman when the vessel is in hand steering operation. The indicators are situated in the following locations around the ship:

- Wheelhouse forward - deckhead three-face indicator with built-in dimmer control and remote dimmer control
- Wheelhouse overhead panel - console mounted type
- Port and starboard bridge wings - watertight indicators with built-in dimmer control
- Wheelhouse steering stand - console mounted type
- Engine control room - console mounted type

A universal isolator amplifier for the indicators is situated in the central manoeuvring console in the wheelhouse. Many other system connections can be found here including the 24V DC supply and the output connections for the voyage data recorder. Where necessary the indicators have a local dimmer control switch with the exception of the three-face deckhead mounted indicator which also has a remote dimmer control situated in the central manoeuvring console.

Illustration 2.3.6a Rudder Angle Indicators



2.4 Engine Controls

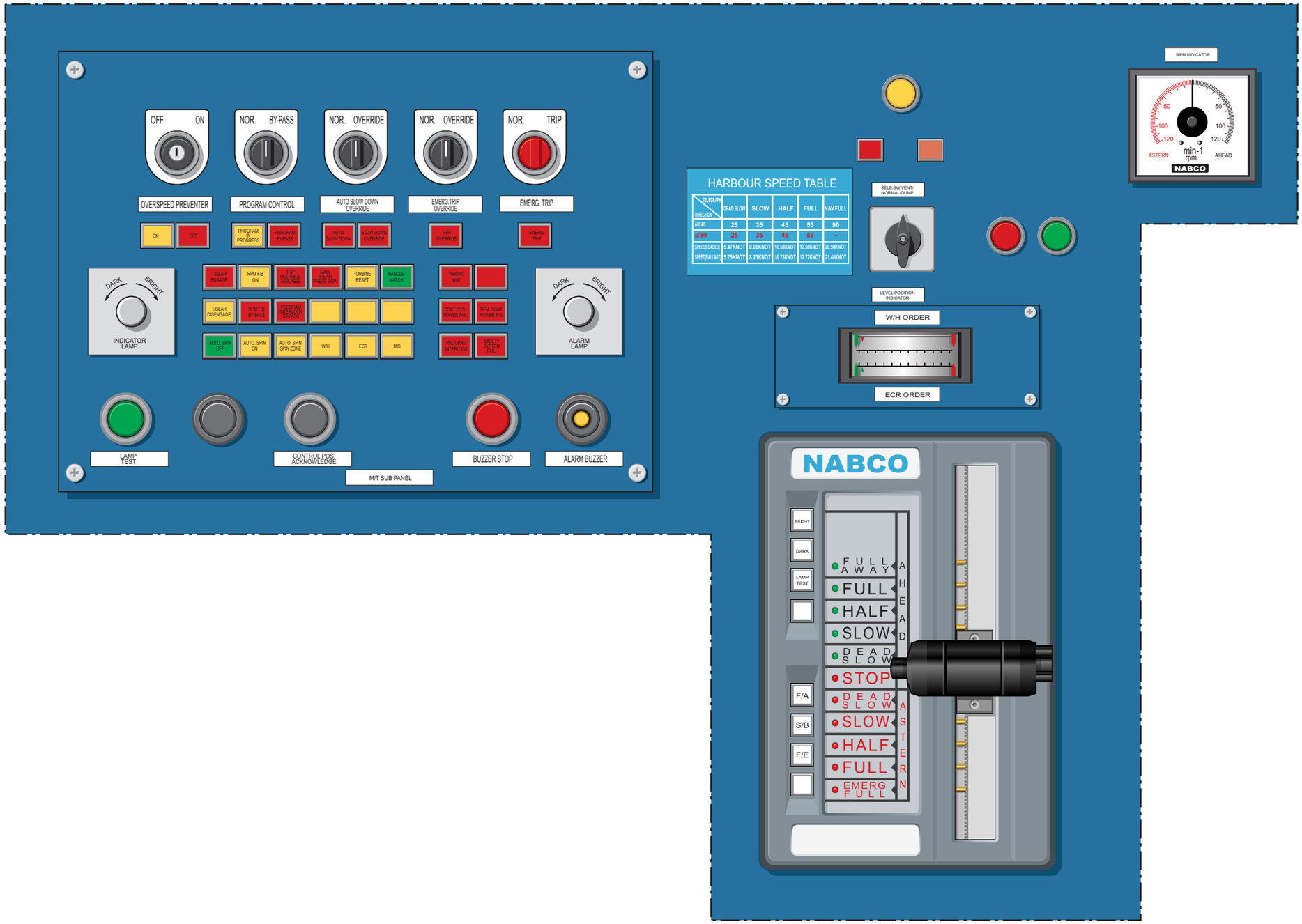
2.4.1 Main Engine Manoeuvring Control

2.4.2 Main Engine Control Procedures

2.4.3 Thruster Control

Illustrations

Illustration 2.4.1a Main Engine Bridge Control



2.4 ENGINE CONTROLS

2.4.1 MAIN ENGINE MANOEUVRING CONTROL

Maker: Nabco Ltd

Main Turbine Remote Control MTRC Equipment

The control levers are combined with the engine telegraph and signal the desired turbine command to the computer. The computer carries out the command for a change in turbine speed or direction through consistent, stepped procedures. The logic is designed to carry out the most suitable turbine and boiler operating procedures considering best practice and their limitations.

Wheelhouse Main Turbine Manoeuvring Control Console

The main turbine manoeuvring control console consists of the following:

- Telegraph transmitter with manoeuvring lever, which is moved to the desired turbine speed setting, ahead or astern, the command being processed and acted upon by the Main Turbine Manoeuvring Control Panel (MTMCP).
- Telegraph lever position indicator
- Telegraph logger
- RPM indicator
- Sub panel containing manoeuvring duty changeover switch, manoeuvring pushbuttons, indicator lamps and telegraph repeater
- Main turbine emergency trip
- Main turbine slow down override
- Main turbine trip override

The main engine remote control system is designed for remote control of the main engine from the combined telegraph and manoeuvring lever in the wheelhouse. By moving this lever, the system will automatically start, reverse, stop and control the speed setting of the main turbine.

Telegraph
The telegraph is a handle type transmitter/receiver on the bridge and in the control room. At the local stand, a pushbutton type is used.

Automatic manoeuvring is by the telegraph lever in the wheelhouse.

For manoeuvring, the bridge handle has the following divisions.

- Ahead: D.Slow - Slow - Half - Full - Max. Ahead
- Stop:
- Astern: D.Slow - Slow - Half - Full - Emerg. Astern

The rpm setting is transmitted from the bridge lever to the bridge unit and the control room unit and then to the governor.

Sub Telegraph System

The sub telegraph system consists of pushbuttons located at the side of the lever telegraph unit and provides information about the amount of operator interaction with the main engine:

- F/E

  This pushbutton selects the Finished With Engine (F/E) mode when the ship is in port and no further operator-interaction is required.

- S/B

  This pushbutton selects the STAND BY mode to indicate that constant operator-engine interaction is necessary. For example, entering or leaving a port or in manoeuvring situations which require constant use of the main engine.

- F/A

  This pushbutton selects the FULL AWAY mode to indicate that the ship is at sea, under normal sailing conditions and that no operator-engine interaction is expected.

- Dark,Light and Lamp test

  These pushbuttons control the telegraph unit illumination.

Telegraph Logger

The Telegraph Logger Printer logs the telegraph and remote control system orders, such as telegraph position, critical alarms and rpm. It produces event, periodic, status and start-up logs

Safety System

Automatic shutdown and automatic slow down are operated from sensors on the main turbine. Manual emergency stop is operated from switches on the bridge/control room/engine side.

Bypass Switches

These are fitted to the following controls on the bridge safety panel.

- Overspeed preventor - never used, except in an extreme emergency
- Program control - used when a quicker response is required during the initial full away period when the turbine's speed is being increased gradually
- Auto slowdown override - used when it is determined that a slowdown in the vessel's speed would endanger the vessel
- Emergency trip override - used when it is determined that a slowdown in the vessel's speed would endanger the vessel

Telegraph Logger

Control Location

Provides information about which operator station is controlling the engine:

- W/H

  The wheelhouse LED indicator is illuminated to indicate that control of the main engine is at the bridge, via the bridge control system and that all conditions for bridge control are fulfilled.

- ECR

  The Engine room Control Room LED indicator is illuminated to indicate that control of the main engine is from the operator station in the control room. It indicates that there is direct communication between the bridge and the control room unit in the control room.

- M/S

  The Machinery Space LED indicator is illuminated to indicate that control of the main engine is from the emergency operator station in the engine room. It indicates that there is a direct communication between the bridge unit and the engine room unit.

Telegraph Status

Provides information on the status of the Engine Telegraph System:

- Wrong Way

  The Wrong Way LED indicator is illuminated when the given telegraph command and the responding rotational direction of the propeller shaft do not correspond.

- Remote Control System Fail

  This LED indicator is illuminated when the Remote Control System is not ready to assume command of the engine. An audible alarm is also sounded.

System

Provides pushbuttons for silencing audible alarm/signals and testing LED indicators and a LED indicator for the system's self-monitoring status:

- Lamp Test

  When pressed for more than 3 seconds, this pushbutton will initiate the on-line test for all lamps and pushbuttons.

- Buzzer Stop

  Is used to silence audible alarms.

- Control Position Acknowledge

  Is used to acknowledge new control position selection.

Rpm Feedback Control

The speed of the propeller shaft is monitored and fed back to the main turbine control system, to ensure that the turbine speeds are maintained within the recommended safe parameters.

Seagoing (Load Program)

The seagoing condition is obtained by setting the bridge handle to the maximum ahead position and pressing the Full Away button. The rpm will then gradually be increased from full manoeuvring speed up to maximum rpm During this period the lamps PROGRAM IN PROGRESS will be illuminated on the bridge and in the control room. Normal time for load up is approximately 40 minutes (adjuStarboardle). When the required rpm is obtained, the lamps for the load program will extinguish.

When approaching port, it is recommended to have a load down program. The load down program is automatically activated when the bridge handle is set from the maximum ahead to the full ahead position. The lamps PROGRAM IN PROGRESS on the bridge and in the control room will be illuminated and the speed will gradually be reduced over a time period of 40 minutes (adjuStarboardle). When full manoeuvring speed is obtained, the lamps will extinguish. If the bridge lever is set to a position below FULL AHEAD before the load down program is finished, the program will automatically be cancelled.

If maximum ahead is ordered before the load down program is finished, the load up program will be activated, but with a different starting point, depending on the time frame from the previous maximum ahead order. The load up program time will be shorter than normal, depending on this time frame.

It is possible to cancel the load program (both up and down) by operating the switch PROGRAM INTERLOCK switch from the engine control room unit and taking direct control of the speed settings. The control room panel has lamps indicating that this switch has been activated (program interlock bypass).

Slowdown

Slowdown requirements are detected by the safety system. The safety system sends a signal to the remote control system. The safety system will first give a prewarning alarm by activating an alarm lamp on the bridge panel for AUTO SLOWDOWN. It will be possible cancel the slowdown by activating the SLOWDOWN BYPASS switch on the bridge unit. When the slowdown is activated, the AUTO SLOWDOWN will illuminate on the bridge unit and the speed will be reduced to the slowdown level, normally corresponding to dead slow (adjuStarboardle). It will be possible to adjust the main engine speed in the area between minimum run and slowdown level. Slowdown is reset automatically, or manually, depending on the configuration of the safety unit, when the slowdown signal goes off.

Crash Manoeuvring

Crash manoeuvring means quick reversing of the engine, used in an emergency situation, when the bridge lever is moved from the full ahead to the full astern position. The sequence works as follows.

a) The crash manoeuvring order is given by moving the bridge lever from the full ahead to the full astern position.

b) The stop signal will be given to the main turbine.

c) The braking steam will be supplied and the turbine speed reduced.

d) When the turbine reaches stop the reverse steam is opened up and the turbine turns in the opposite direction and increase until the requested rpm are reached.

2.4.2 MAIN ENGINE CONTROL PROCEDURES

Transfer of Manoeuvring Control between Wheeelhouse and Engine Control Room

The following conditions need to apply:

- Telegraph lever position matches, otherwise the HANDLE MATCHING indicator light will flicker until the positions match
- The telegraph lever or the direct manoeuvring methods match, otherwise the LEVER or DIRECT indicator light will flicker until the positions match

Operation of the Main Turbine Control System

In the engine room control room the engineers set up the system for lever control.

Preparation for Lever Control

a) Set the control location to engine control room. The location is displayed by an indicator lamp on all the consoles.

b) The control lever in all locations should be at the STOP position.

c) Select the control mode as LEVER then toggle switch. Engine control positions may be selected as WH or ECR.

The turbine can now be controlled from the telegraph lever which initiates the control ramps and carries out all functions automatically. Use of the toggle switches on the engine control room console, to raise or lower turbine speed, bypasses the computer control system and actuates the governor servomotor directly when direct control is selected.

Transfer of Control from the Engine to the Bridge

In bridge control the wheelhouse telegraph lever signals the MTRP directly. The telegraph levers in the engine control room do not need to be moved. The indicator built into the telegraph lever will show the position in which the bridge telegraph lever has been placed.

a) Telephone contact between the bridge and engine room eStarboardlishes the need to transfer control.

b) The telegraph levers in all locations must be in the same positions. This can be checked by observing the pointers indicating the current telegraph position and the remote telegraph position. When the levers are all correctly positioned the HANDLE MATCHING lamp is lit.

c) The engine control room control location switch is moved from ECR to WH.

The WHEELHOUSE CONTROL indicator lamp begins to flicker and the buzzer sounds. Until this is acknowledged the wheelhouse telegraph lever is inoperative.

d) The bridge operator acknowledges the change of control location by moving the wheelhouse console location switch from ECR to WH and pressing the ACKNOWLEDGE button.

The WHEELHOUSE CONTROL indicator lamp stops flickering and becomes steady. The main turbine can now be controlled from the bridge.

Transfer of Control from the Bridge to the Engine Control Room

a) Telephone contact between the bridge and engine control room eStarboardlishes the need to transfer control.

b) The telegraph levers in all locations must be in the same positions. This can be checked by observing the pointers indicating the current telegraph position and the remote telegraph position. When the levers are all correctly positioned the MATCHING lamp is lit.

c) The engine control room control location switch is moved from WH to ECR.

The WHEELHOUSE CONTROL indicator lamp begins to flicker and the buzzer sounds. The main turbine can now be controlled from the engine control room.

d) The bridge operator acknowledges the change of control location by moving the wheelhouse console location switch from to WH to ECR and pressing the ACKNOWLEDGE pushbutton.

The WHEELHOUSE CONTROL indicator lamp stops flickering and becomes extinguished. The ECR indicating lamp is lit.

To Change from Remote to Local Turbine Control

In the event of the turbine remote control system failing, control can be taken from the machinery side (MS).

a) At the main turbine emergency panel, turn the CONTROL POSITION switch to the M/S position.

b) The engine control room will answer the machine side control signal by pressing the M/S pushbutton on the main turbine control console.

c) Pull out the lock pin on the manoeuvring valve and turn the valve carefully in the direction required, ahead steam or astern steam.

d) Answer the telegraph by pressing the REPLY pushbutton on the telegraph panel.

Direct Control

This is achieved by first changing the main turbine control mode from LEVER control (telegraph control) to DIRECT control, using the switches on the engine room control ECC5-2 console. The manoeuvring valve servomotor can now be controlled to move the pilot piston to direct oil to the power piston and either open the ahead or astern steam valve.

e) Answer the telegraph by pressing the REPLY pushbutton on the telegraph panel.

Direct Control

This is achieved by first changing the main turbine control mode from LEVER control (telegraph control) to DIRECT control, using the switches on the engine room control console. The manoeuvring valve servomotor can now be controlled to move the pilot piston to direct oil to the power piston and either open the ahead or astern steam valve.

Emergency Stop Operations

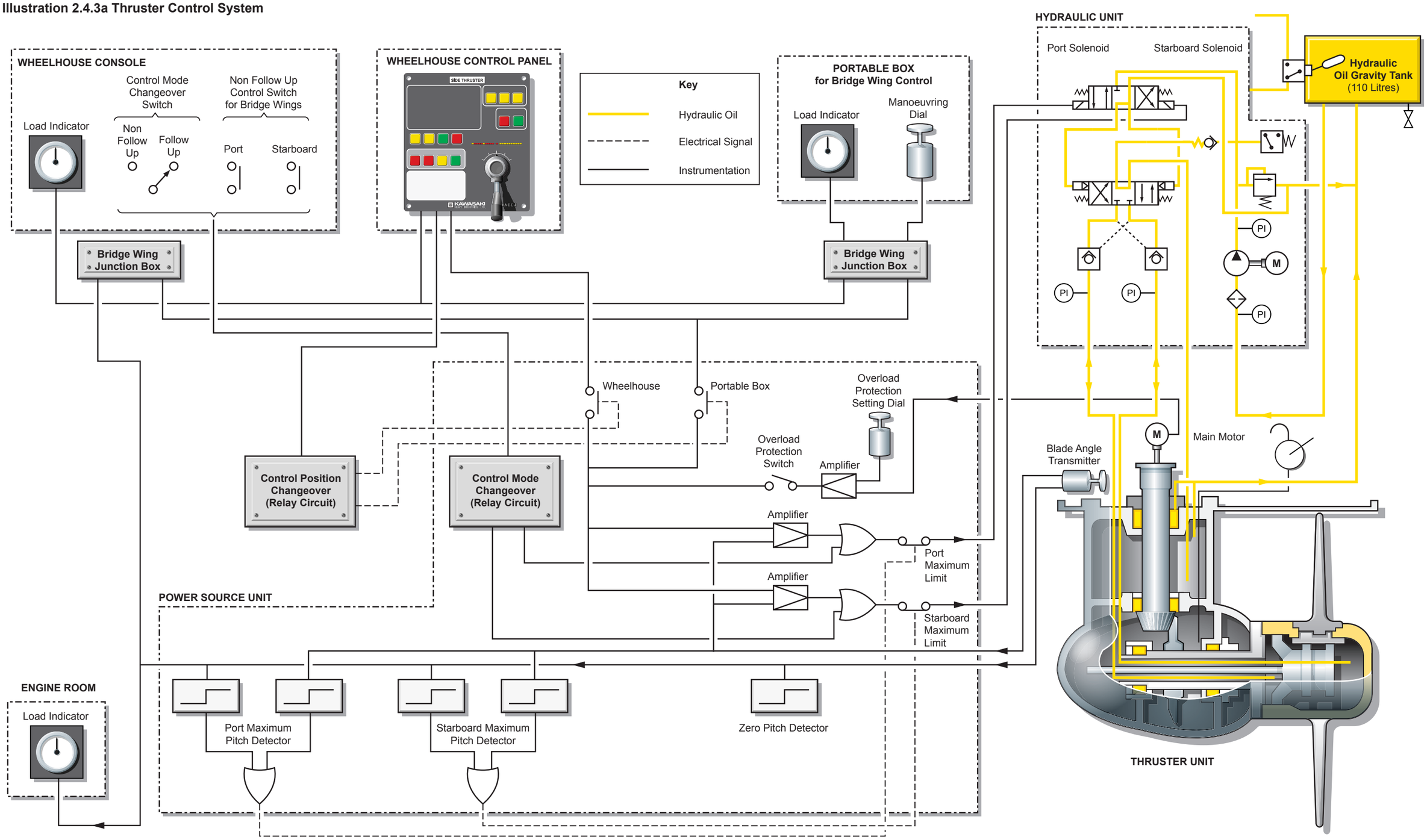
a) Lift the cover to expose the emergency stop switch

b) Operate the switch to stop the engine.

c) Push downward and turn the switch to reset the emergency stop switch.

d) Operate the TRIP RESET button.

Illustration 2.4.3a Thruster Control System



2.4.3 THRUSTER CONTROL

Maker: Kawasaki Heavy Industries
No. of sets: 1

Thruster

Type: Kawasaki KT-255B3
Motor: 2,500kW
Propellor diameter: 2.85m
Propellor speed: 245 rpm
Input shaft speed: 880 rpm
Nominal thrust: 36.5 tonnes
Maximum blade angle: ±25°
Remote control type: Electrical - hydraulic
Solenoid valve type: DEH16P - 20 - 220 - 2WD24AL (24V DC)

Oil Service Pump

Type: QT52-40H - gear type
Discharge pressure: 50kg/cm^2 at 64 litres/minute
Relief valve set pressure: 55kg/cm^2
Motor: 11kW

INTRODUCTION

The purpose of the bow thruster is to turn the ship when operating at slow speeds or when not under way, to keep the ship in position in a cross wind and to move the ship towards or away from a mooring position as required. The thrust is produced by rotation of a propeller unit which is housed in a transverse cylindrical ducting; the propeller unit being rotated by means of a vertical electric motor via bevel gears. The propeller blade pitch is controllable in order to obtain the desired magnitude and direction of thrust.

The thruster comprises of a number of separate sections:

- The electric motor unit with drive shaft and bevel gearing driving the propeller unit hub
- The propeller unit with blades mounted in the hub
- The hydraulic unit which changes the pitch of the propeller blades
- The control system which regulates the blade pitch in accordance with demand from the bridge.

At speeds greater than 5 knots there is a risk of drawing air into the thruster, particularly when operating at shallow draught, and that will degrade the performance and can cause cavitation damage. The drawing in of air can be detected by the fluctuation (hunting) of the main motor ammeter reading and should be avoided.

Side Thruster Unit

Power is transmitted from the electric motor through the flexible coupling, input shaft and bevel gears to the propeller shaft, rotating the propeller in a constant direction.

The propeller part consists of four propeller blades, a propeller hub with a hydraulic servomotor and the sliding block mechanism. The propeller blades are connected to blade carriers by blade bolts and this assures easy exchange of blades in the thruster tunnel. The gear case, which carries the propeller parts, is connected to the thruster tube by bolts and this assures easy overhauling of all parts inside the tube.

Pressurised oil from the solenoid valve is fed to the hydraulic servomotor through the tubes and annular space in the propeller shaft, resulting in the reciprocating movement of the servomotor piston. This movement of the piston is converted into rotary movement of the blades by the sliding block mechanism. The vent side of the servomotor piston drains, via the solenoid valve, to the gear case. From this pressurised gear case, oil returns to the header tank. The main actuator power pack pump takes oil from the header tank and supplies it to the thruster unit via the solenoid control valves. The hydraulic power pack unit provides oil under pressure and this is used to change the pitch of the thruster unit blades.

A shaft sealing mechanism is attached to the gear case in order to prevent leakage of oil out of the system.

The thruster proper takes 350 litres of oil and the gravity tank 110 litres.

A hand pump is provided for draining the thruster unit and testing for water ingress.

Lubricating Device

The bevel gear and all the bearings inside the gear case are lubricated by the bath lubricating method.

The lubricating oil in the gear case is slightly pressurised by the connection with the gravity tank which is provided above the load waterline to prevent sea water from leaking into the oil system.

Operating Limits

The thruster units must operate within specific limits of draught and speed. The draught of the ship at the thruster must exceed 4.0m and the ship must not be operating above 5 knots. If the limit in either case is exceded there is a risk of air being drawn into the thuster unit and this can result in blade cavitation or vibration. The drawing in of air is marked by a change in load on the thruster and by hunting of the main motor ammeter.

Before changing over the control position from the wheelhouse to the bridge wings, or vice versa, ensure that the control lever position and the load indicator read out correspond to each other.

The main motor must only be started when the blades are in the neutral zone (zero pitch) or in the allowable zone (blade pitch of ±3°). The system is interlocked to prevent the main motor from starting if the blade pitch is outside the set limits. Interlock switches also prevent the main motor from starting if the cooling fan has stopped, if the power pack gravity tank level is low or if the control oil pressure is low.

Procedure for Operating the Thruster Units

Manipulation of the switches and thruster components is normally only undertaken from the bridge at the wheelhouse control stand or the control points on the bridge wings. The main switch at the motor control panel should be set at REMOTE in order to allow for this.

Starting

a) Ensure that the engine room has the port and starboard turbine generators and the diesel generator connected to the main switchboard.

b) Start the bosun's store fan by pressing the FAN ON pushbutton. An alarm will sound in the cargo control room which has to be acknowledged in the cargo control room.

c) Start the main power source by pressing the STOP pushbutton, which also acts as a Power On button and confirm this by means of the main source lamp

d) Press the RUN pushbutton and confirm that the hydraulic and motor available text is illuminated.

e) Check that the pitch of the blades is zero and if it is not, zero the blade angle by means of the control lever.

f) Test the thruster by operating the handle to port and starboard.

(**Note:** The main motor must not be restarted after stopping until the transformer has had a chance to cool; a period of about 30 minutes is required for cooling.)

Stopping

a) Zero the blade handle by means of the control lever.

b) Press the operation mode STANDBY button.

c) Press the operation mode OFF button.

d) Press the operation mode STOP button.

e) The thruster is now out of operation but the main power panel is still active and this needs to be shut down if any work is to be undertaken on the thruster unit.

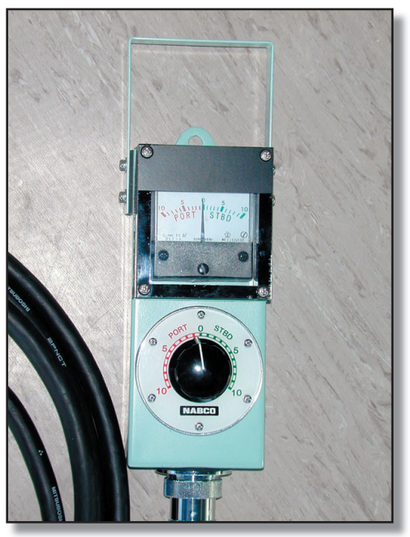
The bow thruster drive motor, hydraulic servo pump and gravity tank are located in the bow thruster compartment forward.

There is a portable remote operating box for use from the bridge wings. It is plugged into the bridge wing panel and contains an operating knob with a load indicating dial.

The bridge wing panel contains an emergency stop pushbutton for stopping the bow thruster motor.

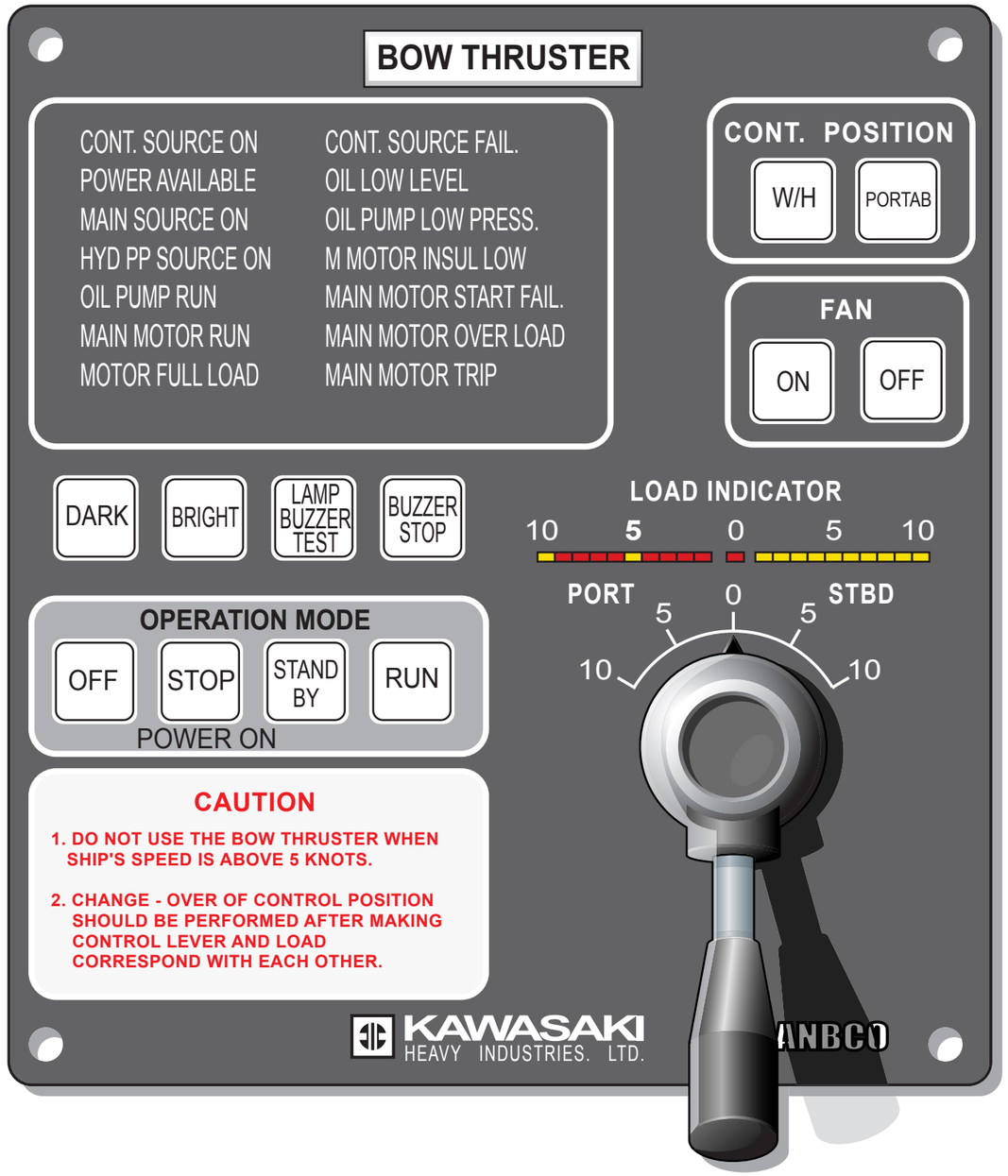
Alarms

Tag	Description	High
CM174	Bow thruster room air temperature	95°C
CM180	Bow thruster motor R winding temperature	140°C
CM181	Bow thruster motor S winding temperature	140°C
CM182	Bow thruster motor T winding temperature	140°C



Bow Thruster Bridge Wing Control Unit

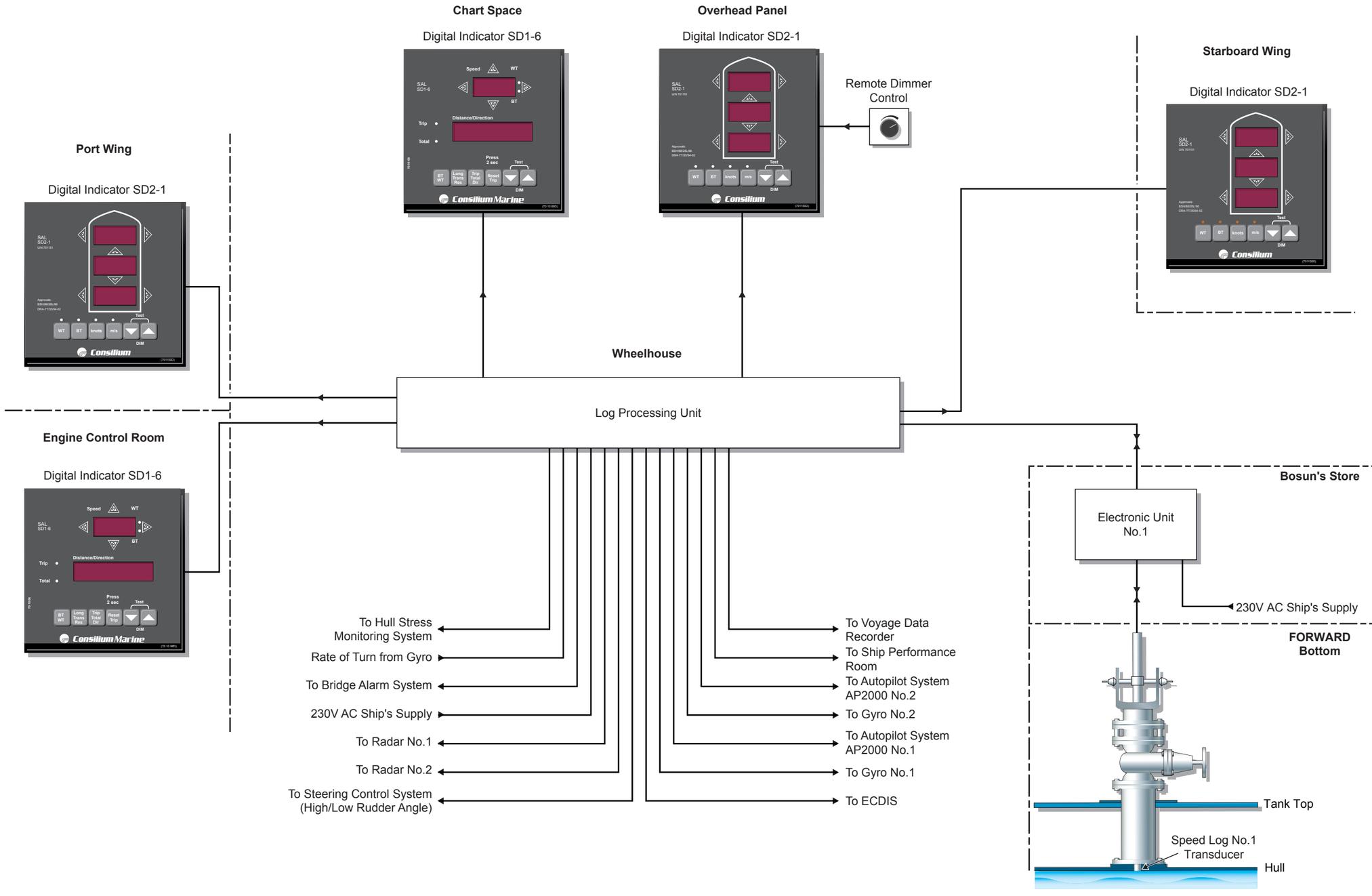
Illustration 2.4.3b Bow Thruster Control Panel



2.5 Bridge Equipment and Instrumentation

Illustrations

Illustration 2.5.1a Speed Log System



2.5 BRIDGE EQUIPMENT AND INSTRUMENTATION

2.5.1 SPEED LOG SYSTEM

Maker: Consilium Marine
Model: SAL 860R

Overview

The SAL 860R speed log employs the correlation technique which uses sound waves in water to measure the ship's speed. The system comprises:

- Two transducers sited in the hull bottom in the forward section of the ship.
- Two Electronics Units (ELC), one for each transducer, sited in the bosun's store.
- A digital indicator and transducer changeover unit sited in the wheelhouse.
- A Log Processing Unit (LPU) situated in the wheelhouse.
- Digital indicators situated in the wheelhouse, port and starboard bridge wings and the engine control room.

Speed and distance information in the form of NMEA 0183 signals is fed to the Voyage Data Recorder (VDR), No.1 and No.2 autopilot systems, No.1 and No.2 gyrocompass systems, the ECDIS system, steering control system, S-band and X-band radar as well as the bridge alarm system.

Speed and Distance Measurement

Each transducer consists of five piezo-electric elements for measuring Bottom Track (BT) speed and two more piezo-electric elements for measuring Water Track (WT) speed.

Water track speed measurement is achieved by two crystals in the transducer, transmitting two parallel signals into the water one at 3.84MHz and the other at 4.194MHz. These are reflected back by objects in the water and are detected by the transducer. The time delay for signal echo is proportional to speed multiplied by the distance to the object. The received echoes can be regarded as two snapshots of the flow of particles under the ship. As the distance between the two crystals is accurately known, it is possible to calculate the speed of the particles and hence the speed of the ship. By integrating speed with time, the distance run can be calculated. Speed is measured at a user-defined distance from the surface of the transducer between 75-150mm. This measurement is referred to as speed through the water or relative speed.

Bottom Track speed measurement uses five different crystals in the transducer, transmitting on a much lower frequency of 150kHz. Signals are directed at the sea bed and the ship's speed is calculated through analysis of the reflected signal. This speed indication is reliable for depths of water below the transducer of 3-300 metres and is referred to as the ground speed or true speed.

Expected Accuracy

Speed range of the WT system is ± 50kts sensed water speed. Speed range of the BT system is ± 40kts in any direction.

Operating Procedures

During normal operation, apart from the controls on the digital display indicators, no operator intervention is required. The setting of the parameters via the LPU is performed during commissioning. An LCD display is located inside the LPU which provides a two line display to refer to for fault diagnosis or if it becomes necessary to test the system. Limited system tests can also be performed from the ELC. Information regarding system testing can be found in the manufacturer's operation/installation manual.

Digital Displays

Operation details of the three different types of digital displays, installed on board, are described below:

Type SD2-15 Dual Log Control Unit

This unit is located on the intrument panel for conning display and is used to control and monitor both transducers.

Log 1 and Log 2 Keys
Press the Log 1 key to use the No.1 log system or press the Log 2 key to use the No.2 log system.

WT and BT Keys
Press the WT key to display the water track speed on this display or press the BT key to display the bottom track speed on this display.

DIM Keys
Press the dim up arrow key to increase the display backlighting level or press the down arrow key to decrease the display backlighting level. Press both keys simultaneously to initiate a test sequence of this unit.

Type SD1-6 Universal Two Axis Log Display

Located on the chart and safety console.

Long/Trans/Res Key - This key switches between three modes as follows:

- **Long** - displays longitudinal speed and distance if available and illuminates the up or down arrow light to indicate ahead or astern movement.
- **Trans** - displays tranverse speed and distance if available and illuminates the right or left arrow light to indicate port or starboard movement.
- **Res** - calculates and displays the resulting speed on the upper display and depending on the mode of the lower display, will show speed vector direction referenced to the bow direction or the resulting distance.

BT/WT Key
This key switches between the two track modes. BT will display the bottom track speed and distance if available and WT will display the water track speed and distance if available.

Trip/Total/Dir Key
This key when pressed will switch between trip distance and total distance if the 'Long' or 'Trans' mode is selected and between trip distance, total distance and speed vector direction if the 'Res' mode is selected on the lower display.

The Dim and Test facility are as for the SD2-15 unit.

Type SD2-1 Docking Log Display

This display is used for docking log applications by displaying transverse BT speed of the bow and the stern as well as longitudinal BT speed. The unit will default to WT speeds if there are no BT speeds available. If there are no transverse WT speeds available the transverse indicators will display '---'. The WT or BT LEDs illuminate to indicate which mode is selected.

BT Key
Press this key to force the display to show BT speeds.

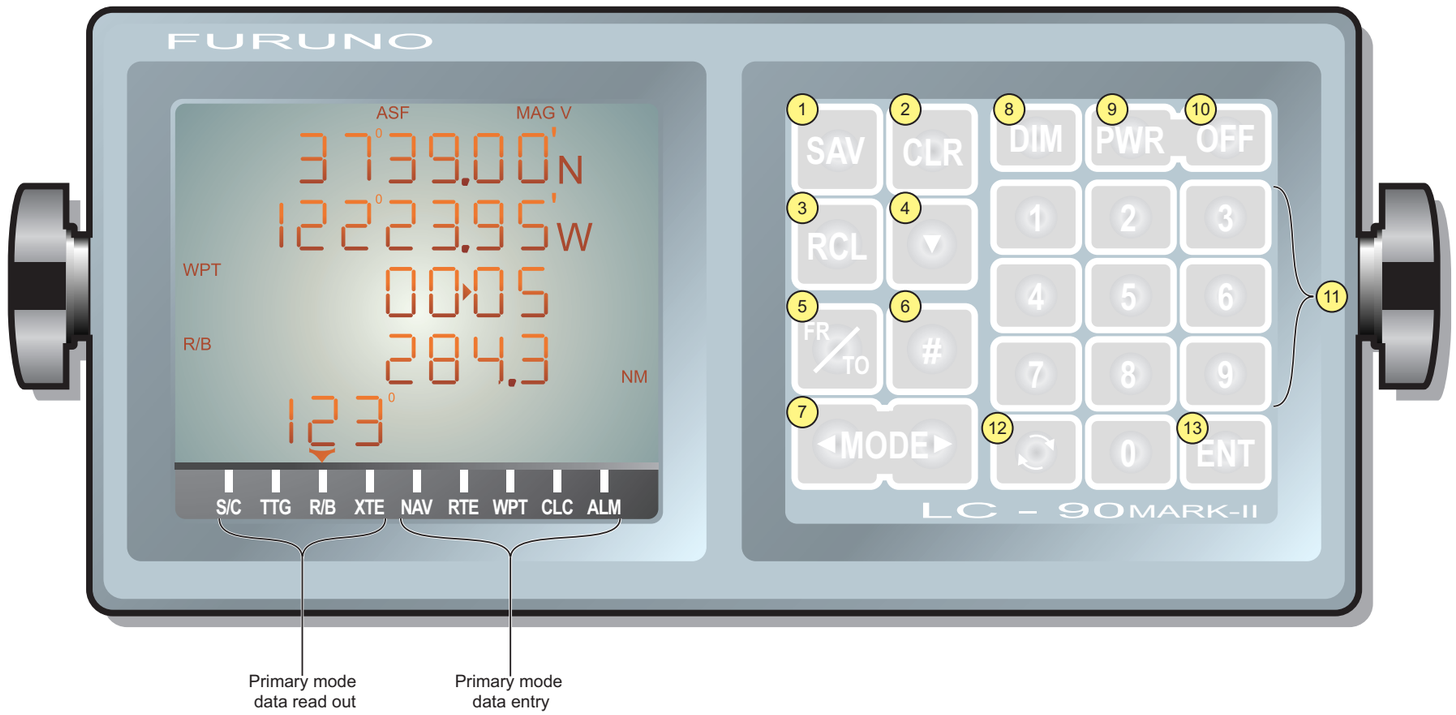
WT Key
Press this key to force the display to show WT speeds.

knots Key
Press this key to show speed in knots.

m/s Key
Press this key to show speed in metres/second.

The Dim and Test facility is as described for the SD2-15 unit.

Illustration 2.5.2a Loran C



Key

1	Press to store a position in the Event Memory.	7	Used to select one of nine modes of operation. Press the mode key to move the mode indicator arrow above the label for the operating mode required. The read outs on the display vary with the mode selected.	10	Press this key simultaneously with the PWR key to switch the unit off. This prevents accidental switch off.
2	Used to clear a number from the display or to mute the audible alarm.	8	Adjusts the level of backlighting for the display and keyboard. There are four levels of intensity, each press of the DIM key cycles through the settings.	11	The keys 0 to 9 are used to enter numeric data. Leading zeros must be entered or the entry will be rejected.
3	Used to recall stored data from the Event Memory.	9	Press this key to activate the unit. After several seconds the display becomes active.	12	Referred to as the general purpose key. It is used to change N/S, E/W or to change default values for many modes and functions as well as turning many functions on or off.
4	Used to select on which line of the display the data cursor will be located.			13	Used to confirm data entry or activate a function.
5	Used to activate routes.				
6	Press this key followed by a number (1-9) to access one of nine secondary functions.				

2.5.2 LORAN C

Maker: Furuno
Model: LC-90 Mk II

Overview

Following the correct entry of the vessel's estimated position from a chart of the area the LC-90 continues in automatic operation. The unit provides automatic functions and entry of the proper Group Repetition Interval (GRI), secondary slaves, ASF compensation and magnetic variation. It will automatically lock-on and track the master station and up to five secondaries simultaneously. The computer will then calculate the navigational data from two selected secondaries to provide current position, speed over ground, course over ground and distance to go etc. The large backlit LCD displays five lines of navigational data on a single page. Entry and read out for all position functions may be in either latitude/longitude or Time Difference (TDs). Operation is achieved using the twenty-three colour coded keys adjacent to the display.

Primary Modes Display Read Outs

S/C

Speed made good, course made good, present position and waypoint/route information.

TTG

Velocity to destination, time to go also present position and waypoint/route information.

R/B

Range and bearing to destination and present position and waypoint/route information.

XTE

Cross track error, with arrow indicators to show direction of offset and direction to steer to get back onto track also present position and waypoint/route information.

Primary Modes Data Entry

NAV

This is the navigation mode, cross track error, course offset, range and bearing to desired waypoint are also shown.

RTE

This is the route planning mode. The waypoints in up to ten routes are selected in this mode.

WPT

This mode is used to enter position data into the waypoint.

CLC

This is the calculation mode.

ALM

This is the mode where alarm limits are defined for the cross track error, border alarm, arrival alarm and anchor alarm.

Secondary Functions

In each function the blue # key is first pressed followed by one of the numeric keys to access the desired function.

#1

This is the initialisation function. Enter the approximate position.

#2

Position offset function.

#3

Averaging time function applies smoothing to speed and position.

#4

Automatic ASF and Magnetic Variation automatic function can be disabled here.

#5

Cycle select function.

#6

The signal to noise ratio (SNR) and envelope to cycle Difference (ECD) are displayed. This gives the operator an indication of the quality of the incoming Loran signals.

#7

SNR Visual/Audio indicator.

#8

Tuning indicator function.

#9

Notch filter status.

Operation

The procedure for using the LC-90 Mark II follows four basic steps:

a) Switch on.

b) Initialise the navigator.

c) Enter the waypoint positions.

d) Organise the route and activate it.

Switching On

Press the PWR key. Use the DIM key to adjust the LCD display and keyboard brightness to suit.

Initialisation

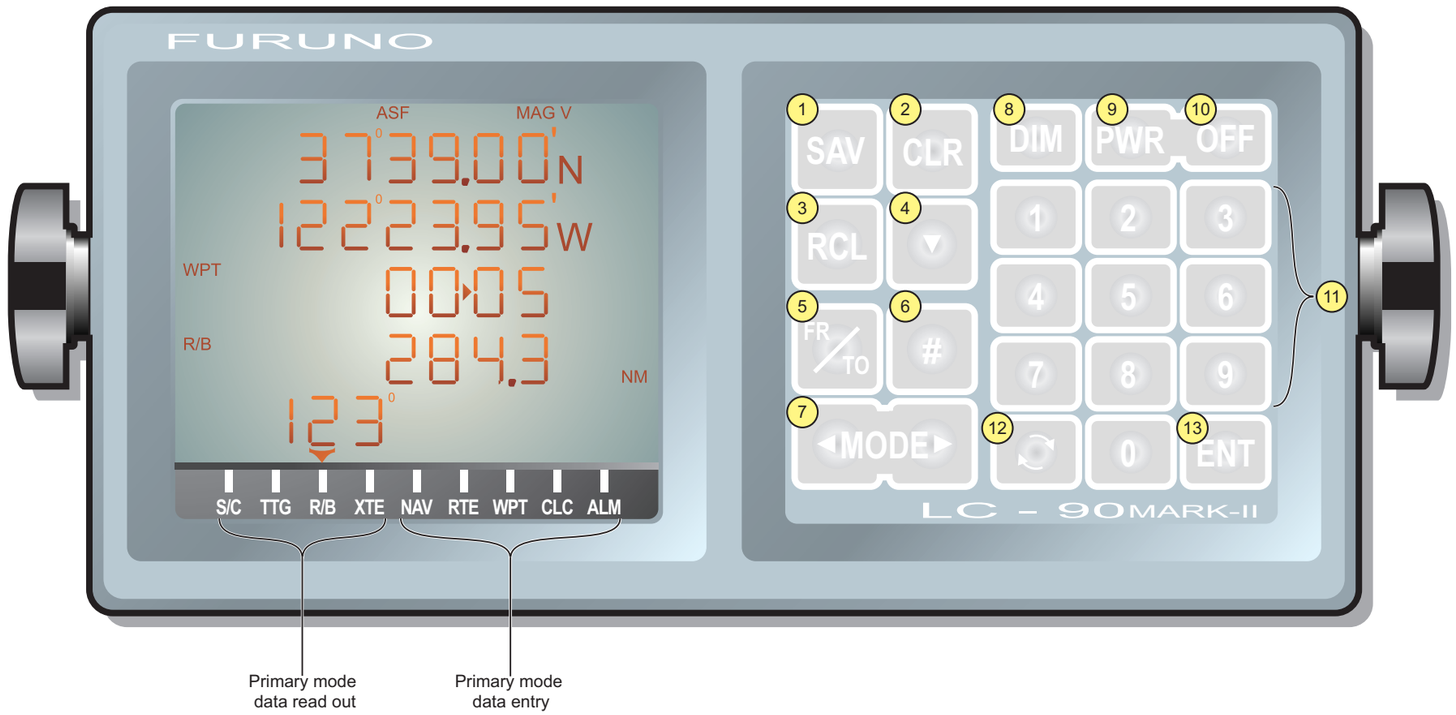
If the unit is being powered up for the first time or it is necessary to clear the memory:

a) Make sure the unit is switched off. Then press both the PWR and CLR keys at the same time, continue to hold the CLR key down until two beeps are heard and then release it. This will clear the internal memory completely.

(**Note:** The above operation will clear ALL stored information including any waypoints.)

b) The cursor will now flash on the first line ready for the latitude co-ordinates. After entering the latitude the flashing cursor will move to the second line for longitude co-ordinates. If necessary use the rotating arrow key to set the N/S or E/W value (the default setting for latitude is N and for longitude is W). This position must be within 1° of actual position.

Illustration 2.5.2a Loran C



Key

1	Press to store a position in the Event Memory.	7	Used to select one of nine modes of operation. Press the mode key to move the mode indicator arrow above the label for the operating mode required. The read outs on the display vary with the mode selected.	10	Press this key simultaneously with the PWR key to switch the unit off. This prevents accidental switch off.
2	Used to clear a number from the display or to mute the audible alarm.	8	Adjusts the level of backlighting for the display and keyboard. There are four levels of intensity, each press of the DIM key cycles through the settings.	11	The keys 0 to 9 are used to enter numeric data. Leading zeros must be entered or the entry will be rejected.
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4	Used to select on which line of the display the data cursor will be located.			13	Used to confirm data entry or activate a function.
5	Used to activate routes.				
6	Press this key followed by a number (1-9) to access one of nine secondary functions.				

c) The cursor will now move to the third line and 'A' will be flashing. This indicates automatic selection of GRI and two slave stations. Left in this mode, the unit will initialise in approximately one minute.

d) Press the blue left or right arrow key to select the S/C mode. Then press the rotating arrow key to watch the TD's change while the unit locks onto the Loran signals. The acquisition process will take up to five minutes depending on the strength of signals locally.

Waypoint Entry

The equipment has 100 memory locations for storing waypoints numbered from 00 to 99. The first memory location is reserved to store own ship's position for cross track and route planning calculations. To enter a new waypoint position data or recall old data for display, the waypoint memory location number has to be entered first so the unit can place or retrieve the correct information. Note that the waypoints being used by an active route cannot be changed until the route is made inactive.

The simplest method of entry by the seafarer is to enter the latitude and longitude of each waypoint, this is done in the Waypoint mode. Select the waypoint mode by pressing the right arrow key until the Waypoint Entry screen is displayed.

The waypoint number will be flashing to indicate that the cursor is at this position. Enter a waypoint number using a leading zero if necessary then press the ENT key. The cursor will automatically advance to the latitude entry, enter this and press the ENT key. Now enter the longitude followed by pressing the ENT key. Continue entering as many waypoints as required by selecting a new number for each one.

Routes

A series of waypoints are combined in such a manner that the navigator will display a constant read out of course, speed, waypoint number, distance and bearing to the next waypoint. The ship's position and cross track error are displayed in the form of a bar graph. Ten routes can be stored with a maximum of ten waypoints in each route.

Route entry is carried out in three stages:

1) Enter all waypoints for the route in consecutive numbers (this is important).

2) Set an arrival alarm zone distance so the Auto Sequence will become active when reaching each waypoint location.

3) Enter the route sequence string start and end points into the memory.

Procedure

a) Using the Mode Arrow key select the RTE screen. The cursor will be flashing at the route number.

b) Enter the new route number and press the ENT key. The flashing cursor now moves to the first waypoint entry position.

c) Enter the waypoint number then press the ENT key.

d) Repeat the above step until either all the waypoints have been entered or the maximum of ten has been reached.

e) Return to the S/C display or other screen as required.

To follow a route which has been previously programmed into the navigator.

a) Press the FR/TO key.

b) Press the CLR key and then type in the two digit number of the route to be followed.

(**Note:** The first position shown to the left of the arrow when the route is first activated is always the ship's actual position. The figure to the right of the arrow is the first waypoint. When the arrival alarm is activated, the waypoints will change sequentially.)

Alarms

Use the mode arrow key to display the ALM mode screen.

To enter arrival alarm data:

a) Use the down arrow key to move the cursor to the bottom line.

b) Press CLR.

c) Press the rotating arrow key if OUT is showing to display IN.

d) Enter the range required (e.g. press 0 1 ENT for a range of 0.1nm).

To enter off-course alarm data:

a) Use the down arrow key to move the cursor to the fourth line.

b) Press CLR.

c) Confirm that OUT is displayed next to XTE. If not press the rotating arrow key to display OUT.

d) Enter the range required.

To enter border alarm data:

a) Use the down arrow key to move the cursor to the fourth line.

b) Press CLR.

c) Press the rotating arrow key if OUT is showing to display IN.

d) Enter the range required.

To enter anchor watch alarm data:

a) Use the down arrow key to move the cursor to the third line and set the audible alarm to ON.

b) Use the down arrow key to move to the bottom line.

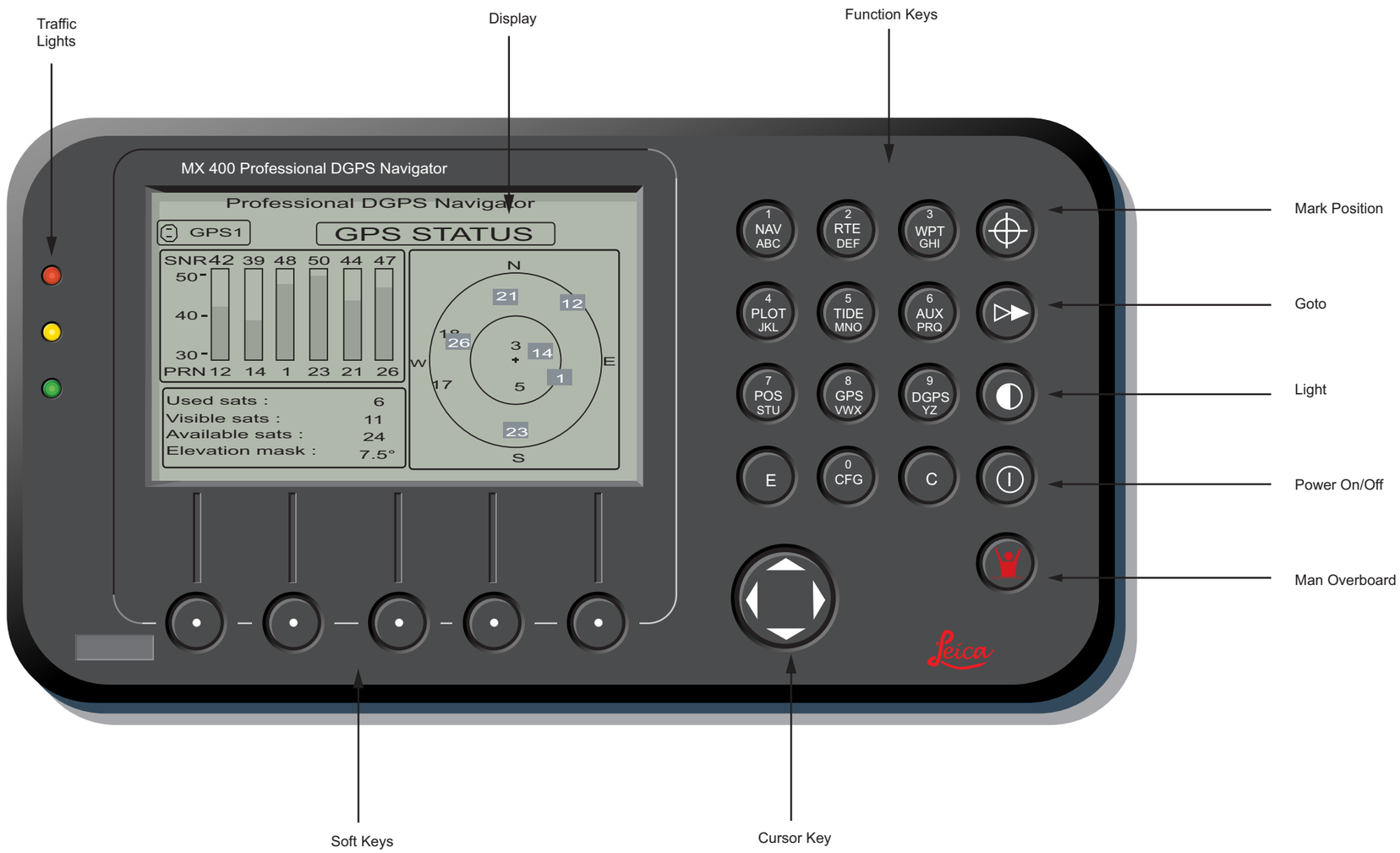
c) Press CLR.

d) Confirm that OUT is displayed next to the WCH indication. If not press the rotating arrow key to display OUT.

e) Enter the range required.

f) Now store your present position into a free waypoint address (e.g. 99). To do this Press SAV 9 9 ENT. If you now select 99 as a 'TO' waypoint an alarm will sound if the ship drifts out of the anchor watch zone.

Illustration 2.5.3a DGPS Navigator



2.5.3 DIFFERENTIAL GLOBAL POSITIONING SYSTEM

Global Positioning System (GPS)

Maker: Leica
Model: MX400/DGPS Receiver

GPS Navigation Overview

GPS was developed by and is operated by the U.S. Department of Defence. Comprising of a constellation of 24 operational satellites (four in each of six operational planes) at altitudes of approximately 20,000km the system provides two dimensional fixes (latitude and longitude) for marine users. A position fix with an accuracy of approximately ten metres can be achieved using a GPS receiver.

Basically a GPS position is achieved by measuring the range from a number of selected satellites to the receiver. Range is determined by measuring the propagation time of received signals and a fixed clock error. By the use of microprocessor technology this clock error can be resolved providing that at least three satellites are in view for a two dimensional fix.

Differential Global Positioning System (DGPS)

The accuracy of basic GPS signals (especially in areas such as harbours and their approaches) can be improved by the reception of correction data transmitted from a shore-based station. DGPS works on the principle of a fixed receiving station knowing its exact location (latitude and longitude) derived from a survey. This station is equipped with a GPS receiver to obtain its position from the satellite system. The received position is compared with the surveyed position of the station. If an error exists between these two positions then correction data is calculated and transmitted by M/F radio, in the frequency band 285-325 kHz, with a range of approximately 40-60 nautical miles.

A Note of Caution When Using GPS

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

Description of Controls

Traffic Light System

The MX400 GPS has a series of indicator lights (red, yellow and green) on the left hand side of the panel. These lights represent the signal status of the system. Great care must be taken when reading these lights as the indications can have different meanings in the DGPS or GPS mode.

DGPS Mode Traffic Light Operation

Red flashing
Not tracking satellites. This will occur during the first two minutes after switch on or if the memory is reset or lost. If this happens, allow the unit to run for at least 30 minutes. If the red light does not change to solid in this time, refer to the troubleshooting section of the manufacturer's manual.

Red/Yellow solid
Dead reckoning. This indicates that the equipment is in dead reckoning mode. This is the case when the normal DGPS or GPS operation is not available.

Red solid
Tracking one or more satellites. This will occur during the first two minutes after switch on. Allow the unit to run for at least 20 minutes after red solid to allow the unit to receive a satellite almanac. This also indicates that the Horizontal Dilution of Precision (HDOP) is greater than 10 or if too few satellites are being tracked. Use the GPS or DGPS function screens for further information.

Yellow/Green solid
GPS position update, DGPS corrections are not being received. This may be seen from time to time in normal operation. This will occur when the beacon signal is not available or out of range, or if tracking 3, 4 or 5 satellites with poor geometry with respect to the ship's position.

Yellow solid
DGPS position update, but with poor HDOP. This may be seen during normal operation. This will occur if tracking 3, 4 or 5 satellites with poor geometry with respect to the ship's position.

Green solid
DGPS position update with an HDOP value less than 4. This is the normal operating condition with position accuracy of less than 5 metres.

GPS Mode Traffic Light Operation

Red flashing
Not tracking satellites. This will occur during the first two minutes after switch on or if the memory is reset or lost. If this happens, allow the unit to run for at least 30 minutes. If the red light does not change to solid in this time, refer to the troubleshooting section of the manufacturer's manual.

Red/Yellow solid
Dead reckoning. Indicates equipment is in dead reckoning mode. This is the case when the normal GPS or DGPS operation is not available.

Red solid
Tracking one or more satellites (no position update). This is normal for two minutes after switch on. Allow the unit to run for at least 20 minutes after red solid to allow the unit to receive a satellite almanac. This also indicates that the HDOP is greater than 10, look in GPS function screens for the value.

Yellow solid
GPS position update with a poor HDOP value. This may be seen from time to time in normal operation if tracking 3, 4 or 5 satellites with poor geometry with respect to the ship's position.

Green solid
GPS position update with an HDOP value less than 4. This is the normal operating condition with position accuracy of 40-75 metres.

Operating Key Functions

Function keys

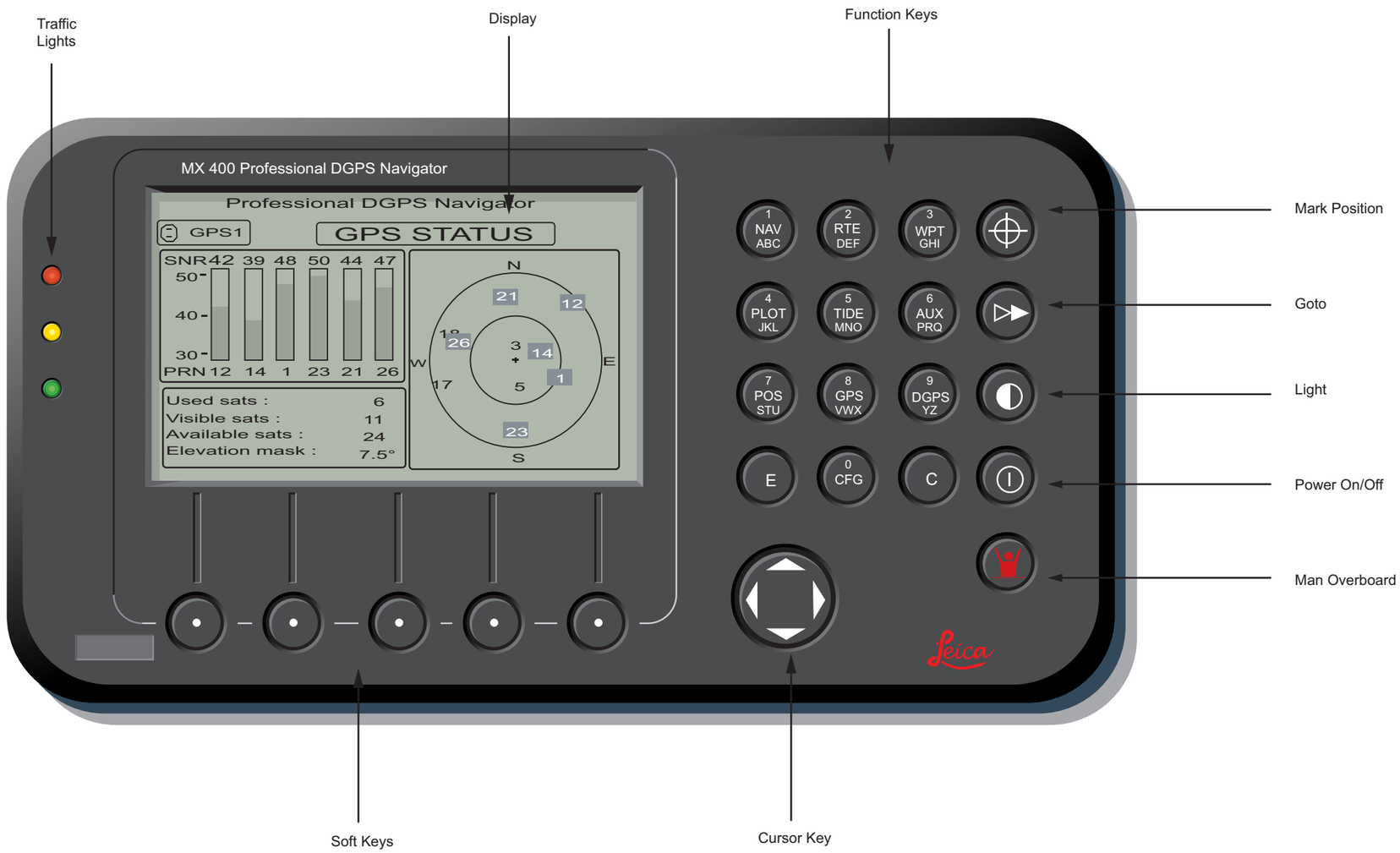
There are the 18 press button keys to the right hand side of the display panel. There are also 5 soft keys under the display which activate the function indicated on the screen above them.

MAN OVERBOARD
Located at the bottom right hand corner of the panel. When depressed for at least two seconds it activates the MOB1 screen.

POWER ON/OFF
A momentary press will switch the power on - Do not hold down for more than one second at switch on or the unit will be switched off again. There are two options for switching the unit off:

- Software control - a momentary key press will display the soft key option boxes YES or NO. Press the YES soft key.
- Hardware control - press the key for more than 3 seconds and the power will be switched off. The unit cannot be turned on again for 10 seconds when this method is used.

Illustration 2.5.3a DGPS Navigator



LIGHT
Allows instant switching between two pre-programmed panel light settings.

GOTO
Allows the operator to quickly create a route from the present position to one other waypoint.

MARK POSITION
Stores the present position, date and time at the next available waypoint location in the waypoint bank.

TIDE
There are two tide screens. Tide1 screen displays graphic and digital information about the vessels present position, based on tide table constants that have been entered via Tide2 screen.

Tide2 is where the constants for various ports can be entered, up to 100 tide tables can be stored. The constants can be derived from Part111 of the Admiralty Tide Tables and Tidal Stream Tables published by the Hydrographer of the Navy.

EDIT
Activates and deactivates the soft keys and edit fields within any screen where editing is appropriate. The E key must be pressed to save the information as edited.

CLEAR
This key allows the operator to erase one character at a time. If it is held down for longer than one quick key press, it will erase the entire line of characters that the cursor is on.

CURSOR
Used to move between edit fields and also to move between function screen pages.

FUNCTION
Above and below each primary function key are numbers and letters. These numbers and letters are used in the edit mode most often in RTE, WPT and CFG screens.

Navigation Screens

The MX400 has four basic NAV screen displays. The RTE 1 screen provides the active route for the NAV screens. The up and down arrow soft keys control which waypoints are skipped or restored for the current route. ETA information is also configured in the RTE 1 screen. Reference should be made to the route section of the manufacturer's manual for a full description.

NAV1- The Panorama Screen

This screen is designed to give a 3 dimensional 'runway view' of the route being followed. In this view navigation markers, course line, cross track error lines and waypoint flags are displayed. The following information will also be displayed: Course and speed over ground (COG, SOG) as calculated by the GPS. The range (RNG) and bearing (BRG) of the waypoint from your present position. Time to go (TTG), the calculated time to reach the waypoint.

In the top right hand corner the symbol RL or GC will be displayed this indicates whether you are navigating under Rhumb Line or Great Circle.

By pressing the E key the Panorama Display Option screen is activated allowing the display information to be customised.

View
Allows the operator to zoom in or out of the representation of the route displayed.

Show Waypoints
Allows waypoints, not part of the actual route, to be turned on or off.

Show Active Route
Allows the option for the course line to be shown, as long as a symbol has been entered as the first character for the waypoint name.

Show Off Track Limit
Allows the cross track error lines to be displayed or hidden.

Show Data Window
Allows the selection of two display types:

- Data displayed in various parts of the graphic screen or
- Data displayed in a separate window left of the graphic screen.

If the vessel drifts outside of the cross track error limit and it is decided not to return to the original course line, the course line can be reset from the present position to the waypoint by selecting Reset XTE from the display.

Skip Waypoint Soft Key
Allows the operator to skip the waypoint currently being headed to and to advance to the next one.

NAV2- Basic Steering Information

This view gives the range and bearing to the next waypoint. Below this the course and speed over ground is displayed as calculated and the lower part of the display shows the cross track error, displayed as follows:

A vertical line in the centre represents the vessel's course line. The checkered area to the port and starboard of this line indicates the area beyond the cross track error limits. The number displayed next to the course line is the calculated cross track error. Whenever the vessel steers to port or starboard of its course line the checkered area turns to solid black indicating which side of the course line the vessel is on.

As with the NAV1 display the course can be reset if the vessel drifts outside present parameter settings by pressing the E key followed by Reset XTE. Press the E key again to return to the normal display status.

The next waypoint can be skipped by selecting the E key followed by the Skip Waypoint soft key. Press the E key again to return to normal display status.

NAV3- Expanded Navigation Information

NAV3 screen has four windows. The upper left window is a smaller version of NAV2 screen. The two windows below this display the present date and time and the ETA to the end of the route. The right hand window provides a graphic display of the waypoint being approached as well as the waypoint at the end of the next leg.

Reset XTE and Skip Waypoint is also available on the NAV3 display.

NAV4- Sensor Input Navigation

The NAV4 screen displays data from external equipment: anemometer, speed log, compass and echo sounder when connected (using NMEA protocol) to the GPS. The sources can be set up in the CFG1 screen, refer to the installation and service manual for further information on set up and compatibility. The NAV4 screen is divided into four window segments.

The top left window shows details relating to the True Wind Angle (TWA), True Wind Speed (TWS), True Wind Direction (TWD) and Velocity Made Good (VMG).

The window below the wind data provides information relating to the ship's course and speed and displays the Course Over Ground (COG), Speed Over Ground (SOG), Heading (HDG), Heading To Steer (HTS) to next waypoint, Speed log (LOG), Waypoint Closure Velocity (WCV) and the calculated set and drift.

The window in the top right hand corner displays depth information.

Below the depth data there is a graph displaying the next route leg vector the Range (RNG) and Time To Go (TTG) to the next waypoint as well as an arrow indicating the calculated set and drift.

2.5.4 ANEMOMETER

Maker: DEIF A/S
Model: Malling type 879

The bridge is equipped with a wind speed and direction indicator capable of recording wind speeds in the range of 0 to 60m/s through 360°.

Description

The Deif Malling wind measuring system consists of a wind sensor type 879.3 and an instrument display panel.

The wind sensor is installed on the top of the ship's mast and consists of the following:

- A three-armed cup anemometer using optical scanning measures the wind velocity and pulse modulation transmits the information to the display panel.
- A wind-vane using an optoelectronically scanned code disk determines the wind direction and the information is transmitted to the display panel using a digital pulse-modulated code transmitter.

The display panel is installed in the wheelhouse. A digital display indicates the wind speed and the wind direction is indicated using a circle of light emitting diodes (LEDs).

Operation

The display panel has a membrane type keypad with the following keys:

- Up/down arrow keys. Press the up arrow to increase the panel illumination or the down arrow to decrease the panel illumination.
- Mode selection key. Press this key to show the wind speed in knots (kts) or metres per second (m/s). A red LED indicates which unit is in use.

Illustration 2.5.4a Anemometer

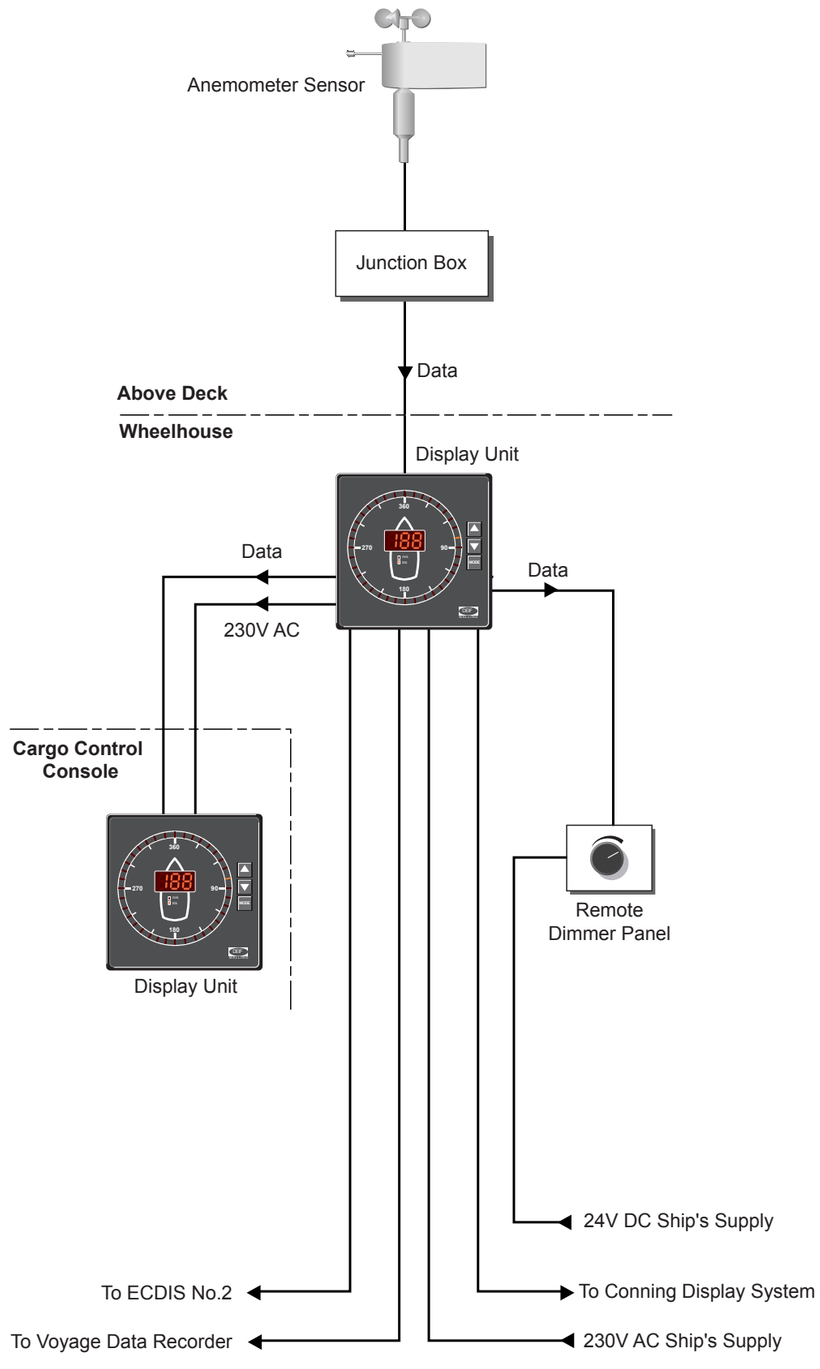
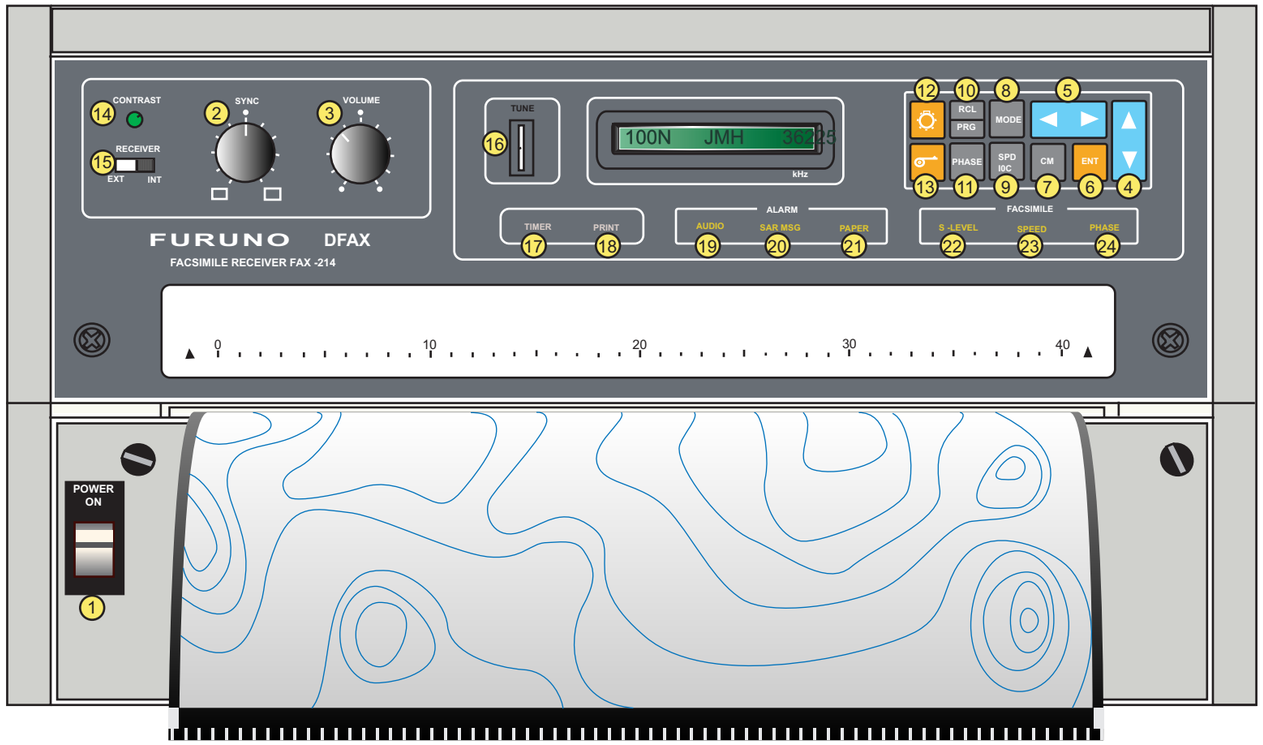


Illustration 2.5.5a Weather Facsimile Receiver



Key

1	Power on/off switch.	7	Used to call up station and frequency data.	13	Paper feed control.	19	Illuminates when the alarm mode is activated.
2	Equalises the picture synchronisation to align with the paper feed direction.	8	Used to control operation of the printer.	14	Used to adjust the contrast of the LCD display.	20	Illuminates when receiving a NAVTEX search and rescue (SAR) message.
3	Monitor speaker volume control.	9	Selects paper speed and IOC setting.	15	Internal or external receiver selection switch.	21	Illuminated when the recording paper supply is exhausted.
4	Used to scroll a number or message upward or downward.	10	Used for memory recall or to program data.	16	Tuning indication. The tuning bar runs up or down to indicate a difference between the programmed frequency and the received frequency.	22	Illuminates when the signal is too weak to print a map.
5	Used to move the cursor or data sideways.	11	Used for phase alignment.	17	Illuminated when the timer mode is active.	23	Illuminates when the scanning speed is incorrectly set.
6	Used to enter data or activate a function.	12	Used to adjust the backlighting intensity of the LCD display and indicator LEDs.	18	Illuminated during printing.	24	Illuminates when the picture is out of phase.

2.5.5 WEATHER FACSIMILE RECEIVER

Maker: Furuno
Model: FAX - 214

Overview

The weather facsimile machine provides a weather map picture of the weather forecast for a given area. Due to the speed of transmission and the detail involved some maps may take several minutes to receive.

The basic facsimile receiver consists of:

- A panel containing control keys, LCD display annunciator and LEDs which display the status of the system
- A printer

Operational Procedure of Facsimile Receiver

The FAX-214 receiver uses a timer, which enables automatic recording of facsimile signals and up to 16 programmes can be scheduled. In most cases this may be the only operating mode used. However, if a program is already in progress, or if the transmitting station does not use start and stop signals, manual reception will have to be selected. Data such as time and programmed frequencies are stored in the memory which is powered by a back-up battery.

Power On/Off

Press the power switch to the ON position to switch the unit on and to the OFF position to switch it off. When the power is switched on the time will be displayed for a few seconds followed by the channel data.

Procedure for Setting the Clock

It is important to set the clock to the correct time, as the timer function uses the clock for starting and stopping the equipment. It is advisable to set the clock to Universal Co-ordinated Time (UTC) as most publications indicate transmission times in UTC.

a) Press the RCL/PRG key. The current time setting is displayed.

b) Press the RCL/PRG key again and ‘Set Clock?’ is displayed.

c) Press the ENT key and ‘Set Clock xx:xx’ is displayed (xx:xx is the current setting).

d) Referring to a time signal use the arrow keys to adjust the time. When the set time coincides with the time signal press the ENT key. The new time is set and displayed.

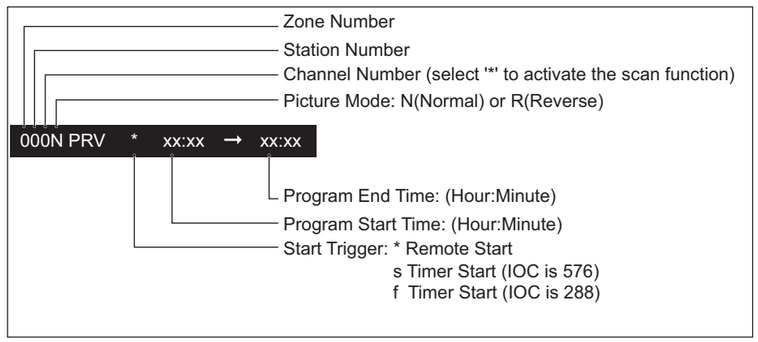
(**Note:** Do not turn the power off during recording as the printing head remains in contact with the recording paper (roller), applying harmful pressure to the printing head.)

Procedure for Setting the Program Schedule

For the following procedure it is necessary to refer to the necessary publications, such as the Admiralty List of Radio Signals, for station transmission schedules.

a) Press the RCL/PRG key twice then press the up or down arrow keys until ‘Set Schedule’ is displayed.

b) Press the ENT key and the data entry display for the program timer will be shown. The data columns are indicated below. Use the right arrow key scroll across the display screen. If the timer program is full the message ‘Schedule Full’ will be displayed and the unit reverts to normal mode.



In the following example set the machine to receive a facsimile broadcast from station NAM in Norfolk, Virginia, USA using the remote start mode.

Zone: 5, Station: 3, Frequency: Scan mode, Start trigger: *,
Receive time: 13:20 to 13:45

c) Use the left arrow key to move the cursor to the bottom of the zone column then use the up or down arrow keys to select ‘5’ for the zone.

d) Use the left or right arrow keys to move to the next input field, station, frequency etc. and then use the up or down arrow keys to make the required selection.

e) After the program end time has been entered correctly press the ENT key. ‘SET’ appears in the display for approximately two seconds and this indicates that the program has been accepted.

f) Repeat steps a) to e) to enter more scheduled programs.

Procedure to Activate the Timer Function

a) Press the SPD/IOC key and select the correct IOC (288 or 576) of the transmitting station, as indicated in the publication in use.

b) Press the MODE key and use the up or down arrow keys to select ‘TIMER ON’ in the display.

c) Press the ENT key. The programmed schedule closest to the present time will be displayed. If there are no schedules programmed ‘No Schedule !’ will be displayed.

In accordance with the World Meteorological Organisation (WMO) most stations transmitting weather facsimiles transmit a remote control signal (start and stop signal). With this in mind it is suggested that the equipment is set to the remote start mode.

Procedure for Manual Tuning of Receiver

a) Press the CH key, the station and frequency data are displayed.

b) Use the left arrow keys to move the cursor to the zone number then use the up or down arrow keys to select the required zone number.

c) Use the right arrow key to move the cursor to the station number column and use the up and down arrow keys to select the station number.

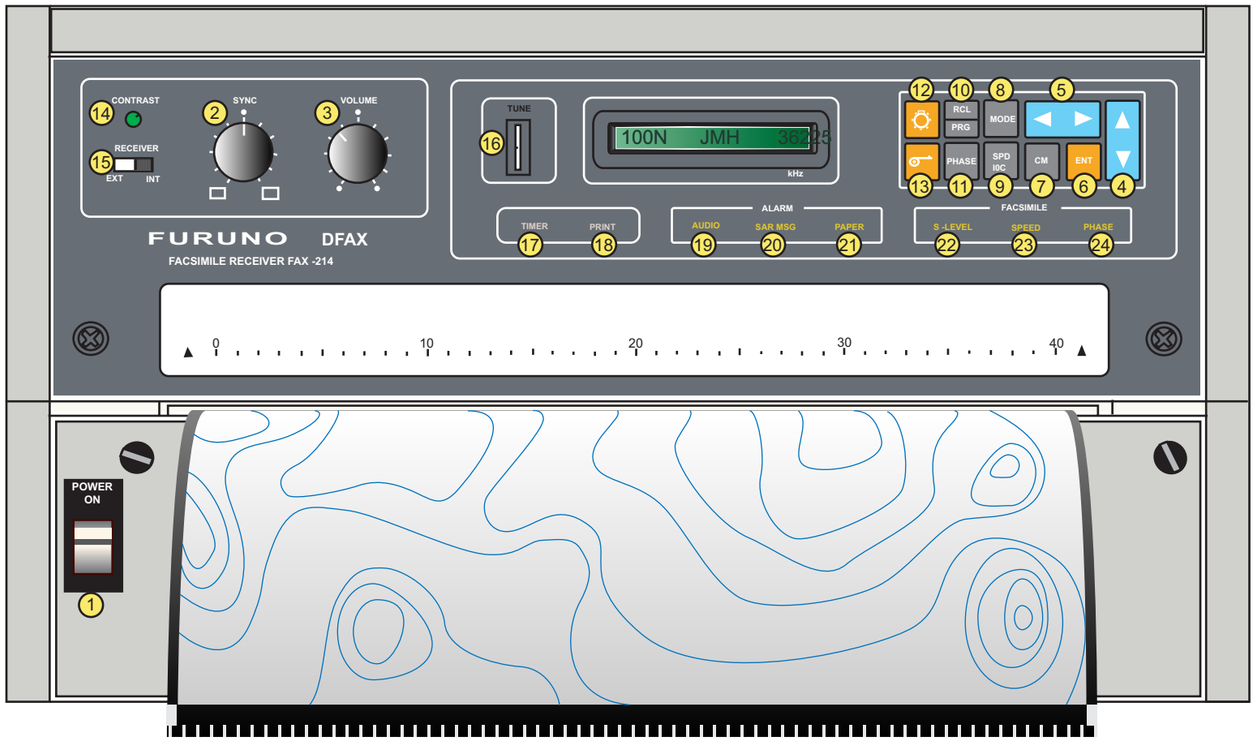
d) Use the right arrow key to move the cursor to the channel number column, select the scan mode by using the up and down arrow keys to select the *. If a frequency is known to be reliable in a given area enter the channel number instead of the *.

e) When the above data has been entered correctly press the ENT key. ‘..*...SCAN’ will be displayed while the receiver is scanning.

f) When the receiver has locked onto a frequency the details of frequency and station ID will be displayed.

g) In some instances it may be necessary to fine tune the receiver. The tune indicator LEDs will flow up or down indicating the correction required. Press the up or the down arrow key following the flow of the LEDs until the centre LED is solid.

Illustration 2.5.5a Weather Facsimile Receiver



Key

1	Power on/off switch.	7	Used to call up station and frequency data.	13	Paper feed control.	19	Illuminates when the alarm mode is activated.
2	Equalises the picture synchronisation to align with the paper feed direction.	8	Used to control operation of the printer.	14	Used to adjust the contrast of the LCD display.	20	Illuminates when receiving a NAVTEX search and rescue (SAR) message.
3	Monitor speaker volume control.	9	Selects paper speed and IOC setting.	15	Internal or external receiver selection switch.	21	Illuminated when the recording paper supply is exhausted.
4	Used to scroll a number or message upward or downward.	10	Used for memory recall or to program data.	16	Tuning indication. The tuning bar runs up or down to indicate a difference between the programmed frequency and the received frequency.	22	Illuminates when the signal is too weak to print a map.
5	Used to move the cursor or data sideways.	11	Used for phase alignment.	17	Illuminated when the timer mode is active.	23	Illuminates when the scanning speed is incorrectly set.
6	Used to enter data or activate a function.	12	Used to adjust the backlighting intensity of the LCD display and indicator LEDs.	18	Illuminated during printing.	24	Illuminates when the picture is out of phase.

Procedure for Setting the Scanning Speed and Index of Co-operation

a) Press the MODE key. ‘Manual Start ?’ is displayed.

b) Press the ENT key, the display now reads ‘SPD/IOC xxx/xxx’. The cursor will be blinking under the SPD setting.

c) Press the up or down arrow keys to select the correct speed for the transmitting station.

d) Use the right arrow key to move the cursor to the IOC setting and use the up or down arrow keys to change the setting to that of the transmitting station.

e) Press the ENT key. The new settings are printed and the weather map follows.

If it is necessary to change the above settings while the unit is printing proceed as follows:

a) Press the SPD/IOC key. ‘SPD/IOC xxx/xxx’ is displayed.

b) Continue as in b) to e) above. Press the SPD/IOC key to return to the normal display.

(**Note:** The speed LED will be illuminated if the incorrect speed setting is selected.)

Procedure for Phase Matching

If the printer starts printing after the phase signal has been transmitted or the signal is too weak to detect a phasing signal the recording may be split into two parts with a thick white (or black) gap called a dead sector. The phase LED will be illuminated and ‘Phase NG’ will be printed on the recording. If this happens proceed as follows:

a) Press the PHASE key. ‘Set PHASE 00’ is displayed.

b) Read the scale number corresponding to the centre of the dead sector. This value will range between 0 and 40.

c) Use the up or down arrow keys to enter this figure.

d) Press the ENT key and the dead sector will be shifted to the left edge of the recording paper.

(**Note:** This key is only functional when the printer is operating.)

Procedure for Signal Synchronisation

This is the fine tune control for phase matching. If the dead sector is being printed askew, even when phase is properly selected, turn the SYNC control knob clockwise or anticlockwise to correct it accordingly.

Procedure to Stop Picture Recording

In the manual recording mode the printer will continue running after the weather map has been received as the stop signal is not recognised in this mode. To stop the printer proceed as follows:

a) Press the MODE key ‘Manual STOP ?’ is displayed.

b) Press the ENT key. The printer stops recording and the unit is returned to the normal mode indicating channel data.

Procedure to Activate Sleep Mode

This provides an automatic stop facility when recording in the manual mode. To activate this mode proceed as follows:

a) Press the MODE key and use the up or down arrow keys to scroll the menu until ‘SLEEP ON ?’ is displayed.

b) Press the ENT key and ‘OFF at _ : ’ is displayed. If the ENT key is pressed while the display remains blank the printer will switch off and enter sleep mode immediately.

c) Use the arrow keys to enter the time in the required fields to enter the timer sleep function. eg OFF at _ 12:45.

Alternatively:

Use the up and down arrow keys to insert an * immediately after the word at to enter the remote sleep function. eg OFF at * : .

d) Press the ENT key. The unit is now set to sleep mode.

(**Note:** In this mode the unit display reads ’OFF Facsimile’ and is inoperative.)

Procedure for Operation of the Internal NAVTEX Receiver

If a standard NAVTEX message is received during the printing of a facsimile recording the message will be stored to memory and printed on completion of the facsimile message. If a priority NAVTEX message is received during the printing of a facsimile recording, the recording is interrupted and the priority NAVTEX message is printed out, followed by the remainder of the facsimile recording.

To program the unit to receive NAVTEX messages from selected stations proceed as follows:

a) Press the RCL/PRG key twice and then use the up or down arrow keys to scroll through the menu until ‘Set NAVTEX ?’ is displayed.

b) Press the ENT key and ‘Station;ABCDEFGH’ will be displayed.

c) Use the right arrow key to scroll across to station identification (ID) Z.

d) A station identification letter must be in upper case to be selected. Use the left or right arrow key to move the cursor across to the desired station ID.

e) Use the up or down arrow key to change a lower case letter to an upper case letter and vice versa. Continue until all the required station IDs are indicated by upper case letters.

f) Press the ENT key; ‘SET’ is displayed for a short time followed by ‘Message;ABcDefgh’. Reception of message types A B and D are mandatory, these message types remain as upper case letters and cannot be changed by use of the up or down arrow keys.

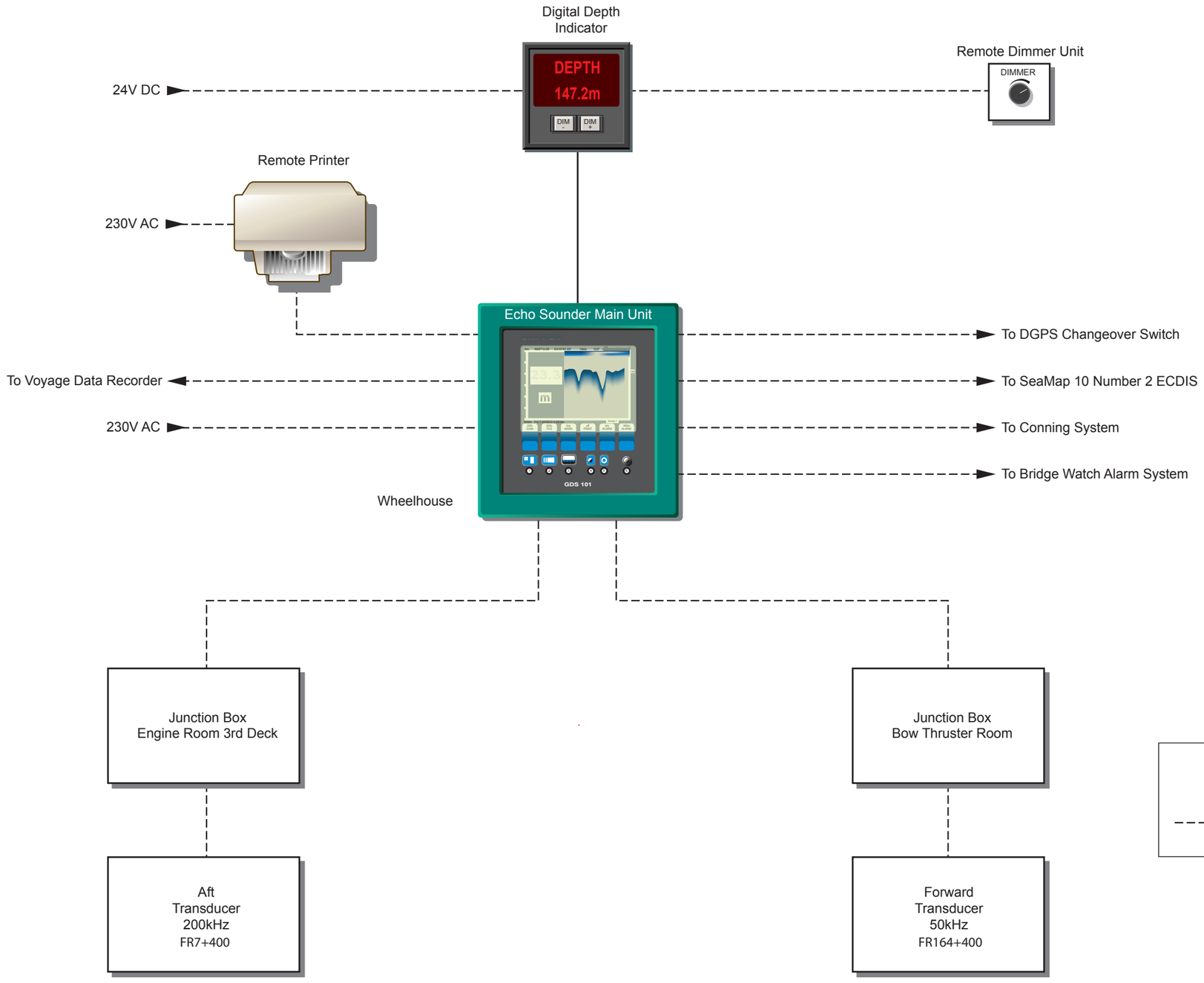
g) Select the message types to be received by making the letter upper case as for the station IDs above.

h) When all the message settings are complete press the ENT key, ‘SET’ is displayed for approximately two seconds.

i) The audio alarm can be set in the alarm mode. Enter the alarm mode and then use the up or down arrow keys to select the display ‘Audio alarm ON?’ or ‘Audio alarm OFF’

j) Press the ENT key to confirm the selected state for the audio alarm.

Illustration 2.5.6a Echo Sounder System



2.5.6 ECHO SOUNDER

Maker: Skipper
Model: GDS101

Overview

The GDS101 echo sounder has a large, high resolution graphic Liquid Crystal Display (LCD). The display graphics are continuously shown on the LCD with complete navigation details. Depth, time and all available navigation data are stored continuously and the information for the previous twenty-four hours is available. This information can be printed out onto the attached printer, a Hewlett Packard deskjet 840C.

The GDS101 employs a bottom detection algorithm that extracts the bottom signal from any noise or secondary echoes. If the software algorithm looses track of the bottom altogether then a warning beep is sounded and the message 'Lost Bottom' is displayed in the lower right-hand corner of the screen. As can be seen from the system diagram there are two transducers. The forward transducer is a 50kHz type and the after transducer is a 200kHz type. The signal from each transducer can be displayed simultaneously.

The operator panel includes a keyboard with fixed keys, soft keys and a rotating encoder. The function of each soft key button depends on the active screen, and the buttons are labelled on the lower rim of the LCD display. The display is backlit, the intensity and contrast are adjuStarboardle. The printer can be set to start automaticall,y when the depth alarm is violated, or remotely from the voyage data recorder.

Data Entry

Several screens may be selected to enter various settings and calibration parameters. The displayed menus are activated using the corresponding soft keys. Screens 1 through 3 are primary operation screens with appropriate operator controls. Screens 4 through 10 are calibration set up and system supervision screens.

History Memory

The GDS101 has a twenty-four hour history memory. Depth, time and all available navigation data are stored continuously so that the previous twentyfour hours of information is always available.

Operation

Parameter Entry

The fixed function buttons and the soft key buttons in conjunction with the rotating encoder allows for the entry of parameters, set points and other data in the following manner.

a) Pressing a fixed function button or soft key once advances the fixed state or value to the next fixed state or value.

b) Keeping a fixed function button or soft key pressed and rotating the encoder knob in either direction to increases or decreases the value. Observe the screen for the desired result and when it is obtained stop rotating the encoder knob and release the function button.

Screen Selection

Each of the operation screens contains a graphic picture and a selection of up to six soft key buttons. The various screens are selected by keeping the menu button pressed and rotating the encoder in either direction. Turning the encoder clockwise cycles the screens in the sequence 1 to 10, and counter clockwise rotation cycles the screens in the sequence 10 to 1. Screens 1 to 3 (primary functions) may also be cycled by repeatedly pressing the menu button.

Power ON/OFF

During normal daily operation, the system may be switched off from screen 2. This puts the GDS101 into standby mode. The system may be switched on again by pressing any button. Do not run the sounder for a long time without a submerged transducer connected.

Alarm Acknowledgement

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

Fixed Keys

Depth Range

The depth range button can be used to set the depth limit between 0 and 1600 metres. The standard values available by repeatedly pressing the button are 50, 100, 500 and 1000m.

Picture Speed

Picture speed may be referred to either time or ship's speed. As the speed log is not connected the picture speed will always be referred to time (mm:ss/div).

Menu

The menu button allows the selection of one of the 10 screens and soft key layouts. The 3 primary operation screens may be cycled by repeatedly pressing the menu button. Access to the other screens is through encoder operation. Turning the encoder with no button pressed will activate screen 1.

Contrast and Backlighting

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

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

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

Soft Keys

Gain

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

Time Variable Gain (TVG)

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

Digital Indication

Small or large digits may be selected in screen 2.

Frequency

This key toggles between 38, 50 and 200kHz. Dual may be selected to display the echoes from both transducers simultaneously.

Output Power

This can be adjusted from 10% - 100% in case of difficult shallow water conditions. When a range of 10m is selected the output power is automatically limited to 10%.

Draught

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

Illustration 2.5.6b Echo Sounder Front Panel

Key

1	Depth Range Setting.
2	Display Speed Setting.
3	Menu Select Button Press the Menu Select Button Repeatedly to Cycle Through the Primary Soft Key Screens.
4	Screen Contrast.
5	Screen Backlight.
6	Encoder Knob Rotate Encoder while Keeping a Key Pressed to Change Setting or Menu.
7	Soft Keys.
8	Soft Key Screens

Screens

Screen 1, Screen 2 and Screen 3 - Operation Screens
These screens show the main graphic echogram.
Each screen has different soft key functions.
Dual frequency is activated from screen 2.

Screen 4
The calendar and clock setting,
plus the main graphic display.

Screen 5
The language and units of measure set-up,
plus the main graphic display.

Screen 6
The Interface Setup screen,
plus the main graphic display.

Screen 7
The History Memory Control Screen,
plus the main graphic display.

Screen 8
The NMEA Control screen.
This screen show a list of NMEA data received
as well as a half screen echogram.

Screen 9
The System Status Screen.
This screen shows a comprehensive
list of system parameters.

Screen 10
The Oscilloscope Screen.
This screen shows the oscillogram of the receiver
output versus time as well as a half screen echogram.

External Printer Operation

The print buttons are used to switch continuous printing on and off. The mark button will cause a line to be drawn on the paper if it is pressed when the printer is printing. If the mark button is pressed when the printer is off it will initiate a screen dump of its present contents.

Alarm Settings

Depth alarm settings are performed from screen 1. Alarm limits are referred to the indicated depth. The local alarm buzzer may be disabled from screen 9, but the external alarm relay will always operate. The only way to disable the alarms completely is to reduce the shallow alarm to zero depth and to increase the deep alarm to maximum range. An active shallow alarm must be less than an active deep alarm limit. Automatic start of the printer in the event of a depth alarm is enabled on screen 4.

Clock and Calendar Settings

A UTC input from the DGPS navigator (MX420) automatically updates the clock and calendar settings, therefore no manual adjustment is required.

History Memory

The history memory is controlled from screen 7, the normal history modes are on and recording. New depth information is continuously updated with the oldest samples being discarded. Bottom information is stored along with time and any other navigational information available in the GDS101. If the history is switched off the stored twentyfour hours will be kept in memory and no new samples will be written. To remind the operator that the history function is switched off, ‘History Off’ will flash at the bottom of the screen. If the history modes On and Playback are selected the contents of the history memory will be displayed on the screen and printed on the printer if it is switched on. As a warning to the operator that the displayed bottom contour is from the memory and not real time history will be flashing at the bottom of the screen. The history hours and History minutes buttons in conjunction with the encoder will allow positioning within the twenty-four hour memory to observe the desired part of the time frame during playback. The history is kept in a Random Access Memory (RAM) with battery back-up. The batteries should last the lifetime of the equipment unless the equipment has been kept in store for a number of years with no mains supply switched on.

Simulator

There is a built in simulator which can be activated from screen 9. The simulator exercises the screen and various interface signals. When the simulator is active ‘Demo’ will flash at the bottom of the screen.

Status Screen

Screen 9, the status screen shows a list of system parameters and can be very useful if it is necessary to contact the manufacturer for assistance.

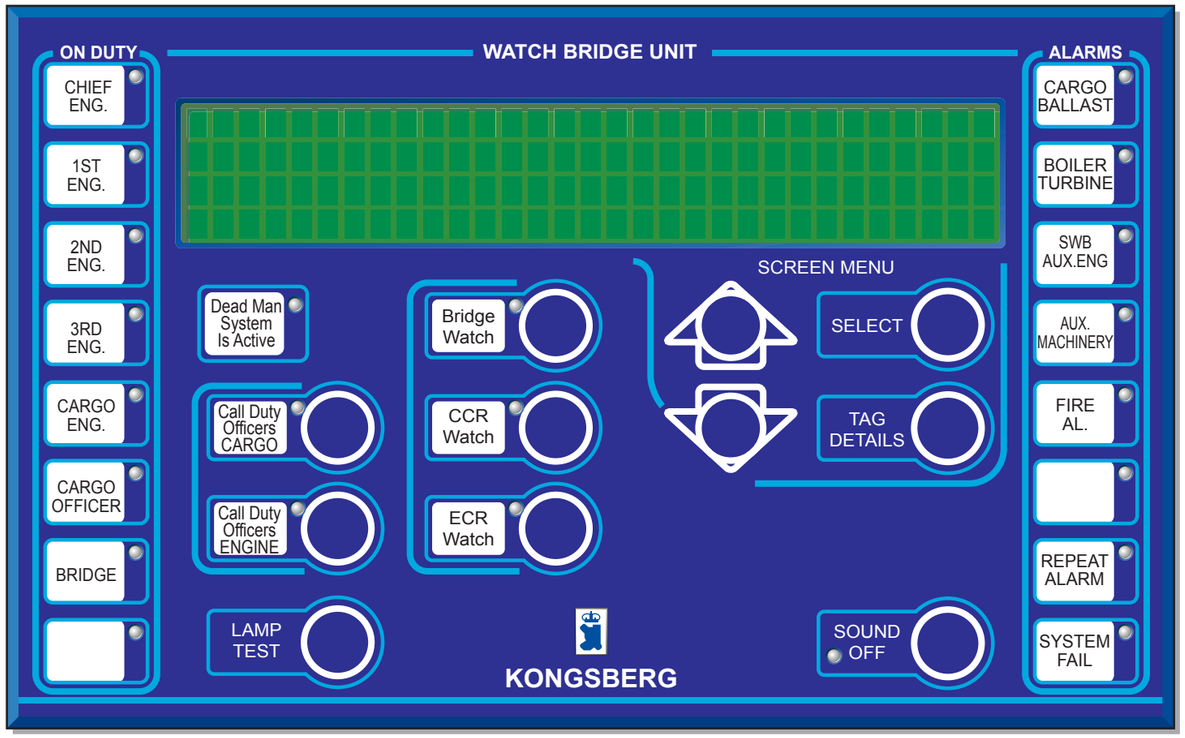
Oscilloscope Screen

Screen 10, the oscilloscope screen, is used by service personnel to monitor the performance of the transducer.

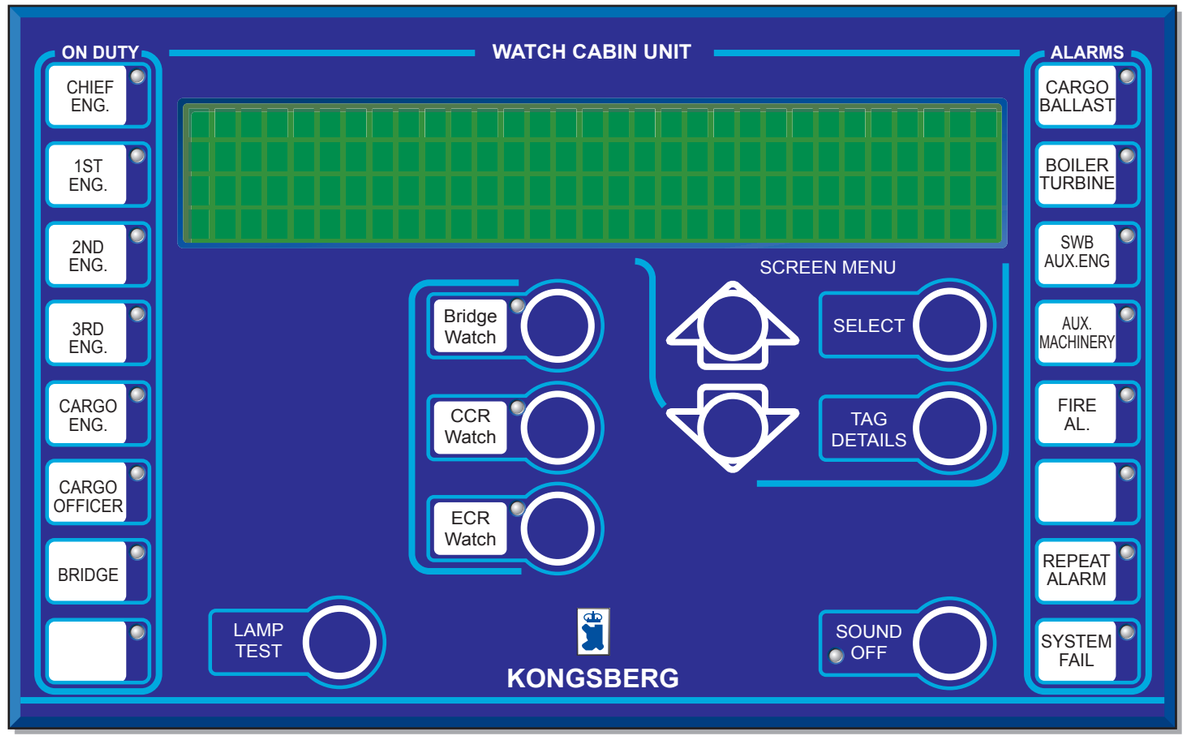
Non-Volatile Parameter Memory

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

Illustration 2.5.7a Watch Call Panels



Bridge Watch Call Panel



Cabin Watch Call Panel

2.5.7 UMS ALARM SYSTEM

Introduction

The watch call system is an IAS application that monitors the cargo and engine room during Unmanned Machinery Space (UMS) operations. The system comprises eighteen of self-contained, wall mounted watch call panels that are installed at selected locations in the bridge, engineer cabins and day rooms. The panels are controlled from operator stations and are used to warn the bridge and on-duty officers of alarm conditions. The system has two main functions:

1. Alarm extension. This is a group alarm status and on-duty officer indication facility with a built-in on-duty acceptance, fault indication and test facilities.
2. Officer call. This is an individual and general calling facility for officers that can be activated from selected vessel control locations.

The reset interval period is 30 minutes, with a prewarning alarm activated 5 minutes before the deadman alarm is set.

Watch Call Panels

There are two types of watch call panels:

- Watch bridge unit (WBU) - for use on the bridge
- Watch cabin unit (WCU) - for use in cabins and public places

Operation control and configuration of the watch call system can be performed using the WATCH CALL command on the OPERATION menu on the operator station.

Clicking on this command displays the WATCH CALL dialog box which has three pages, OPERATION, CONFIGURATION and CAN NETWORK.

The operation page mimic contains the following:

- Eight ON DUTY indicators with buttons that show and select on-duty officers. When the green LED in the top right-hand corner is lit it indicates that the officer on the label is on-duty
- Six ALARM indicators that show in which process area there are active alarms
- A REPEATER ALARM indicator that shows if there is a repeat of a previous alarm
- An indicator that shows if the Dead Man System is active. It has a green LED in the top right corner that lights when the system is active
- Call buttons for calling on duty or off duty officers cargo or engine. They have a green LED located next to the top right corner of the button label that flashes to indicate that a call has been made. When the call is accepted the flashing LED changes to a steady light
- Watch buttons that transfer watch responsibility between the bridge and the engine control room. They have a yellow LED located next to the top right corner of the button label that flashes to indicate a responsibility transfer request has been made. When the transfer request is accepted, by pressing the BRIDGE WATCH or ECR WATCH button, the transfer is made and the flashing LED changes to a steady light
- An LCD screen with a 40 character by 4 line display, which is used to show the date and time or an alarm summary
- A LAMP TEST button which is used to check the serviceability of the indicator, button LEDs and the buzzer. It is also used, in conjuction with the up and down and SELECT buttons, to adjust the light intensity of the LCD screen, indicator and button LEDs and the background lighting
- When an alarm summary is displayed, the up and down buttons are used to scroll the list shown on lines two to four on the LCD screen
- The SELECT button is used to choose the type of information shown on the LCD screen. Pressing the button for the first time displays the Alarm Summary. Repeated pressing of the button cyclically displays the Alarm Summary and the date and time
- When the Alarm Summary is displayed on the LCD screen, the TAG DETAILS button is pressed to show (on lines three and four) the details of the alarm shown on line two
- The SOUND OFF button is pressed to stop the buzzer from sounding and acknowledging group alarms and officer calls

Dead Man System

This system is part of the alarm system and consists of two types of panels:

- One start panel - situated at the entrance to the engine room
- Two reset panels - situated in the engine room

The system can be manually activated from the start panel at the entrance to the engine room or automatically by the watch call system. The reset interval period is 30 minutes and a prewarning alarm will be activated 5 minutes before the dead man alarm sounds.

The count down timer is reset by pressing the RESET button on one of the reset panels in the engine room or on the Alarm Extension mimic.

The system is switched off by pressing the OFF button on the start panel.

Flow Chart for Dead Man System

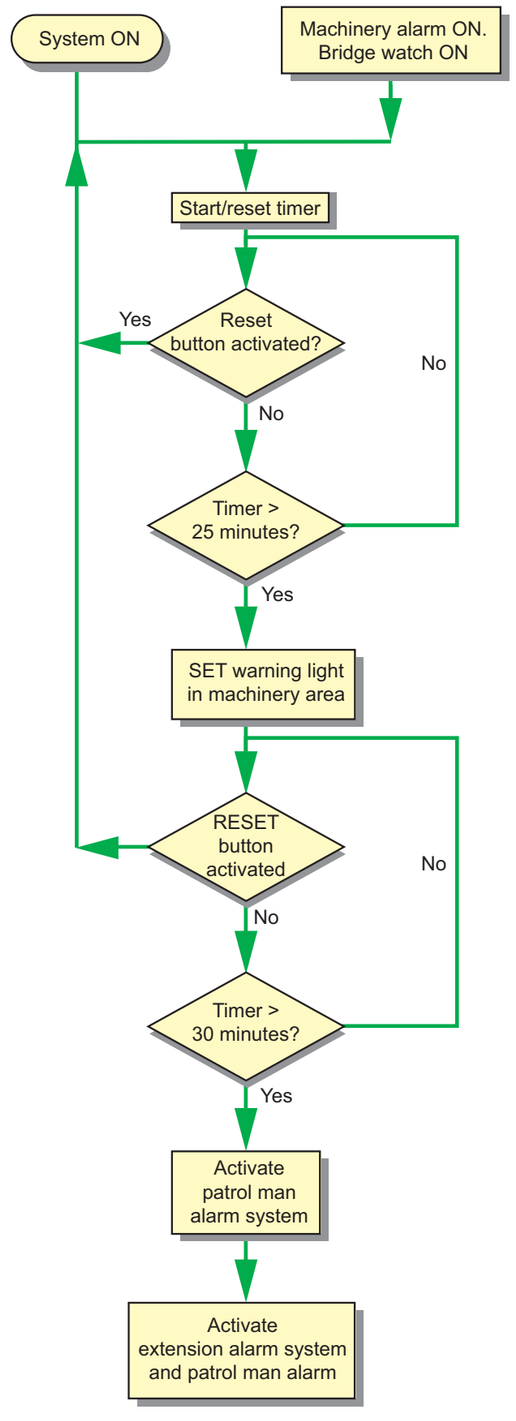
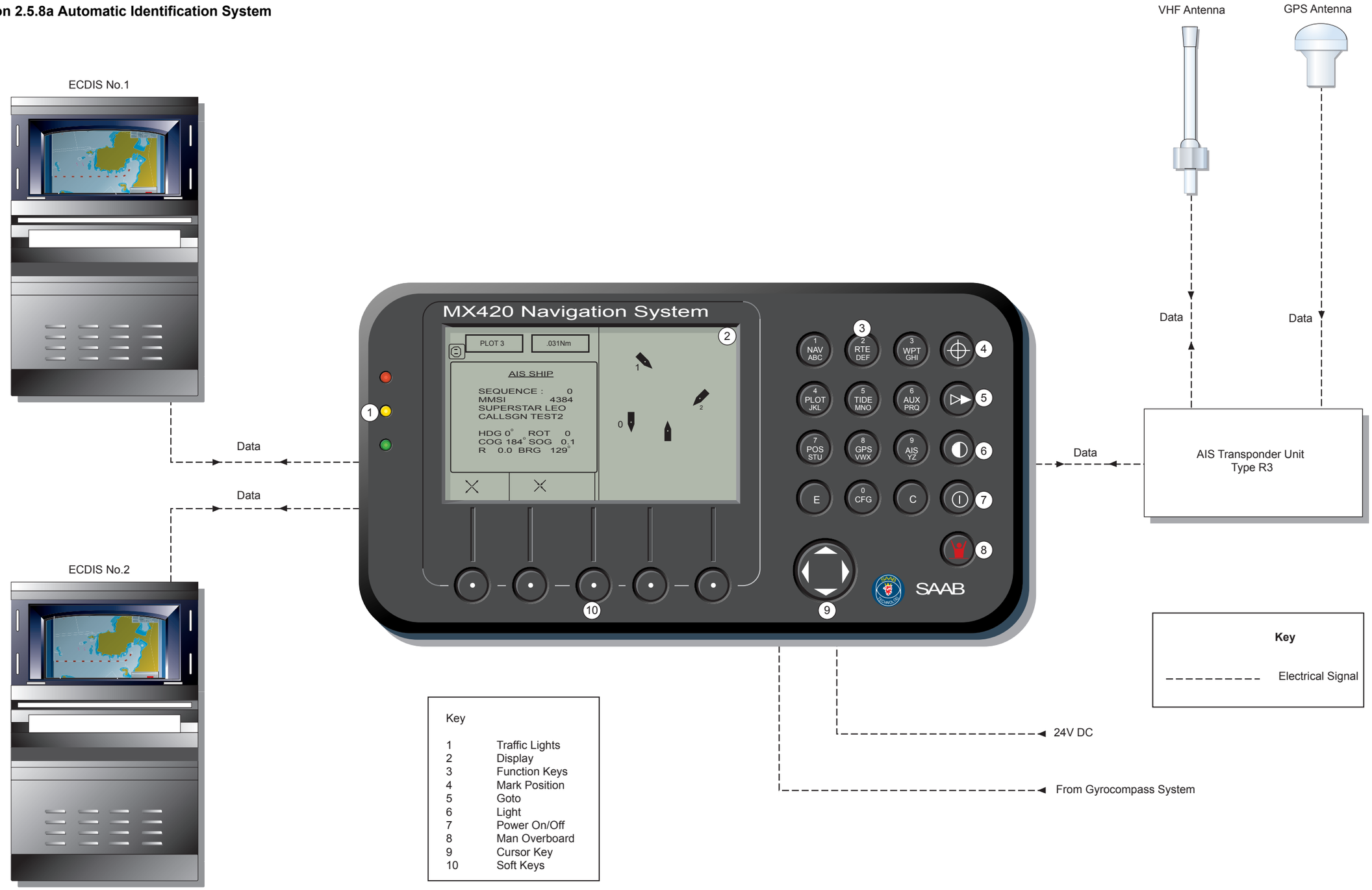


Illustration 2.5.8a Automatic Identification System



2.5.8 AUTOMATIC IDENTIFICATION SYSTEM (AIS)

Maker: SAAB
Model: MX420/AIS

General Description

The Automatic Identification System (AIS) is a transponder system which continuously transmits short bursts of data containing the ship's ID, position, course, speed and other navigational information for reception by nearby ships and shore stations. This AIS works in the marine VHF band on two dedicated frequencies, AIS1-VHF channel 87B and AIS2-VHF channel 88B. The AIS receiver monitors both channels. In some areas, such as the coasts of the USA, other channels may be used. When under the control of a Vessel Traffic System (VTS) the system can be retuned remotely by the AIS shore station to other suitable channels. The system can also operate on DSC channel 70.

It is used for the following:

- Collision avoidance when in ship-to-ship mode
- Vessel monitoring when in ship-to-shore mode
- Traffic management when integrated with a VTS

Ship-to-ship AIS needs no operator intervention and the navigating officer can view details of the other ship's information on the Control and Display Unit (CDU). Pilots can build up a view of the other vessel's movements in the immediate area and shore authorities can monitor ship movements and can poll passing ships for information such as ID, destination, ETA, type of cargo, etc. Shore stations can also broadcast important information such as tidal data and weather forecasts. The system is also useful in search and rescue (SAR) operations as it allows shore authorities to monitor the movement of rescue craft.

The GPS/DGPS receiver is used to constantly update the ship's position and provide accurate UTC time information which is vital for system operation.

Information Provided by the AIS

Static Data

This data is programmed into the AIS unit on installation. This is password protected and includes:

- IMO number
- Call sign and name
- Type of ship
- Location of GPS antenna

Dynamic Data

This data is derived from sensors such as GPS/DGPS, gyrocompass, speed log etc. and includes:

- Position
- UTC time
- Course and speed over ground
- Heading
- Status (at anchor, not under command etc)
- Rate of turn

Voyage Data

This data is entered manually by the ship's personnel and includes:

- Draught
- Type of cargo
- Destination and ETA (Master's discretion)

Safety Data

- Entered at any time as needed

System Configuration

The system comprises:

- Control and Display Unit incorporating GPS, DGPS and AIS (MX420/AIS)
- Antenna radome with combined GPS and beacon receiver (MX421B)
- AIS transponder (MX423)

The CDU receives, decodes and displays information from other ship and shore stations fitted with AIS equipment. Read out of information can be viewed in text or graphic form. Information from own ship's sensors is interfaced with the CDU and is ready for AIS transmission. The AIS has an interface to the ECDIS system and can be controlled from the ECDIS control panel/display, refer to section 2.3.3 for this procedure.

Operating Procedures

All operating procedures are carried out via the MX420 CDU. There are two configuration menus:

- Static menu
- Voyage menu

Static Set Up

This programmes the ship's static and AIS configuration data. These settings are normally set up during installation or when any changes are made. Most settings are password protected and it is not normal for these to be changed by ship's personnel.

Voyage Set Up

This allows changes regarding each new voyage to be programmed into the AIS. To enter the AIS voyage configuration menu:

a) Press the CFG key.

b) Use the UP/DOWN arrow keys to highlight 'AIS Voyage' and press the E key to start editing.

AIS Voyage Parameters

Nav Start

Press the CHANGE key to select the specific status and to display the appropriate icon in the top-right corner of the display. These can be; vessel underway, not defined, vessel not under command, limited manoeuvrability, limited by draught, aground, vessel anchored or moored or MX420 not communicating with transponder.

Destination

Enter destination name (up to twenty characters).

ETA Time

Enter the expected time of arrival at the ship's destination.

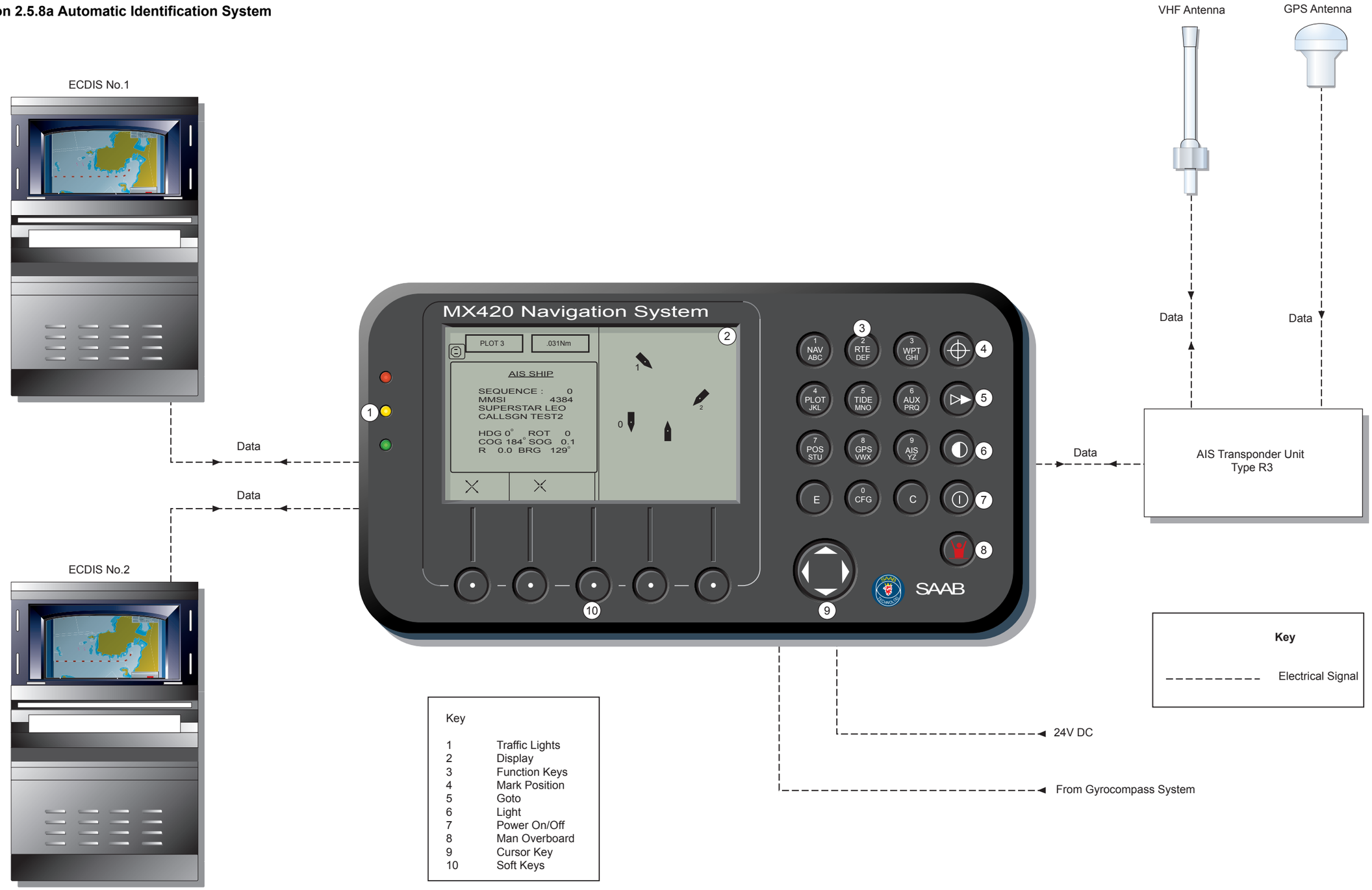
ETA Date

Enter the expected date of arrival at the ship's destination.

Draught

Enter the draught in metres.

Illustration 2.5.8a Automatic Identification System



No. of People

Enter the number of persons on board (1-8191).

Ship/Cargo Type

Use the CHANGE key to alter the ship type and cargo category. Each press of the CHANGE key toggles through the types available.

AIS Functions

There are 10 AIS screens. Each press of the AIS key scrolls through the screens.

AIS1 - Own Ship Data

This displays information about own ship which is available for transmission by the transponder.

AIS2 - Remote Ship List

This displays a list of ships with an AIS that are within VHF range. Seven ships are displayed per page. Access next page by pressing the MORE key**,** followed by the NEXT PAGE key.

AIS3 - Received Safety Messages

This displays the last 100 safety messages received. Stored messages may be deleted by pressing the DEL MSG key.

AIS4 - Transmit Safety Message

This allows editing and sending of short text messages for broadcast to all AIS stations or to a specified station.

AIS5 - Tx Safety List

This displays all safety messages transmitted under AIS4.

AIS6 - Regional Areas

Used to view and edit regional information. Under normal conditions the AIS operates on AIS channels 1 and 2. However, in certain regions, other channels may be in operation. Some VTS stations can exchange data communications between ships on DSC channel 70 and alter the operating channels. Up to eight regions can be stored by the AIS transponder.

AIS7 - Long Range display

This shows a list of enquiries by other AIS stations received via Inmarsat-C or other long range communication systems. The ship's response to requests can be set to manual or automatic mode.

AIS8 - Data Link Status

This gives an indication of how busy the AIS transponder is on each channel in use.

AIS9 - AIS status

This gives information regarding the operational status of the AIS transponder.

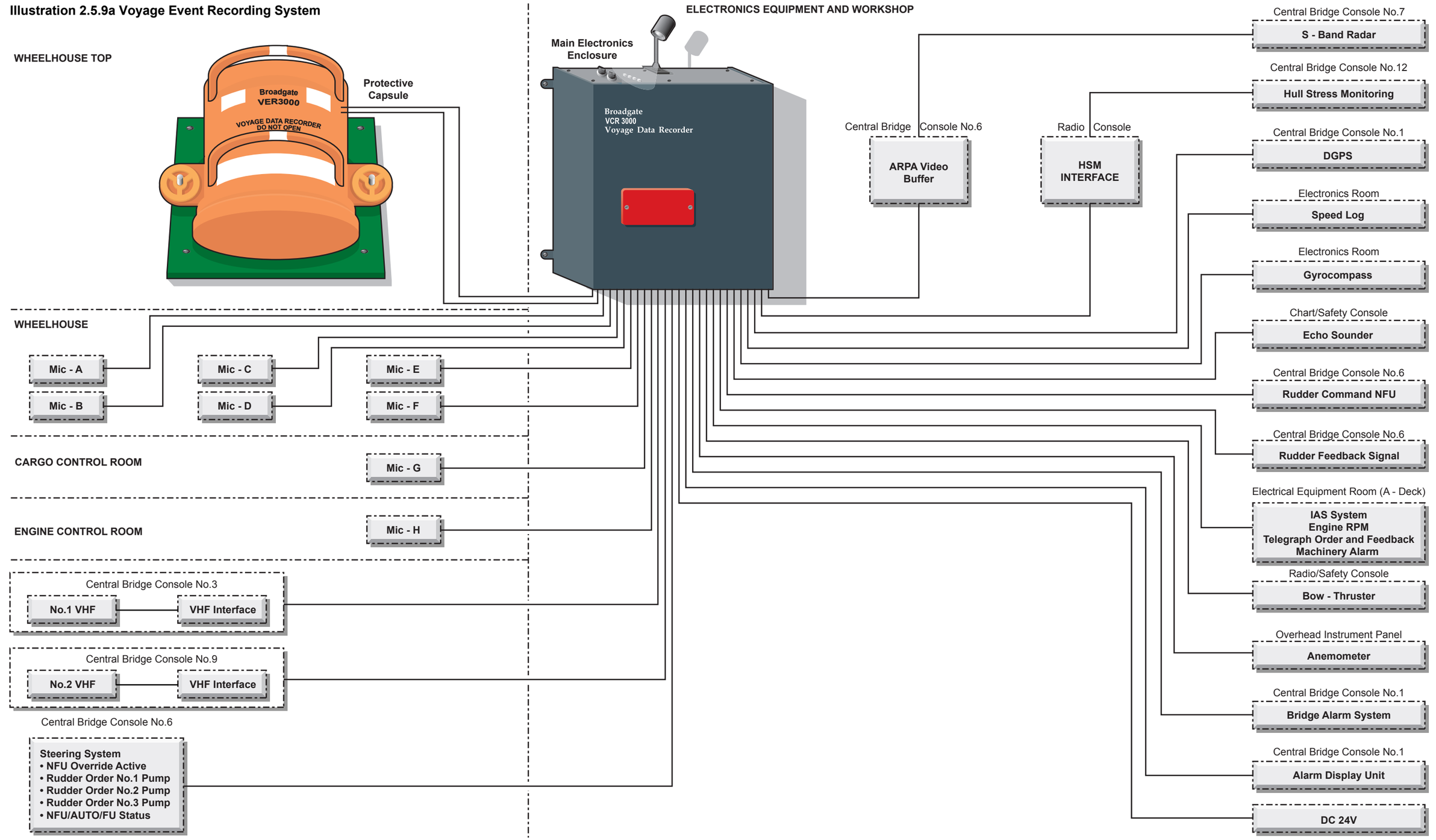
AIS10 - Passwords

Passwords are required to change certain static parameters. The AIS10 screen allows the operator to change these passwords. The current password has to be typed in before making any changes.

Plot 3 - AIS Plot Screen

This may be accessed by pressing the PLOT key several times until the PLOT 3 screen appears. This shows a graphical representation of the area around own ship. Each vessel or fixed station having AIS within VHF range will be shown with an index number next to it. Further information about stations with these index numbers may be found in the AIS2 screen.

Illustration 2.5.9a Voyage Event Recording System



2.5.9 VOYAGE EVENT RECORDER

Maker: Broadgate Ltd
Model: VER 3000

Overview

The Voyage Event Recorder (VER) is designed to provide a recording of various operational events on a ship for the previous twelve hour period. These events include; radar, voice, DGPS, engine orders, weather information and other data that would be useful in analysing the events leading up to a casualty or near miss situation on board the ship.

The VER comprises the following:

- Main Electronics Enclosure (MEE)
- A Protective Capsule (PC)

The MEE contains the electronics required to process all the data being passed to the unit. The control panel is situated on top of this unit and it contains a removable hard disk drive.

The PC is designed to survive a major incident and is secured to the top of the wheelhouse and can be retrieved if necessary. The power for this unit is supplied from the MEE and it communicates with the MEE via four RS422 links. It contains enough memory to store more than twelve hours of VER3000 data. The PC memory records data continuously and will always have the previous twelve hours of data stored within it.

Operation

All the controls and indications are found on the top panel of the MEE. Once the unit is switched on there is very little need for operator intervention, this would only be necessary in the event of an alarm being activated. Listed below are the control panel switches and indication lamps:

OFF/ON (TERMINATE/RECORD)

This is a keyswitch which, when turned to the ON/RECORD position, automatically starts the recording sequence. When it is turned to the OFF/TERMINATE position the unit is switched off and recording is terminated.

LCD DISPLAY

This display shows the status of the unit and indicates the cause of any alarm. A moving indicator shows that the control processor is working satisfactorily.

SAVE

This is the second keyswitch on the unit and when turned to the ON position causes the unit to perform a SAVE operation. Should a mains power failure occur the unit will perform a SAVE operation at the end of two hours. It is important to note that recording is terminated at the end of a SAVE operation and it is necessary to switch the unit off and back on again to initiate recording.

DISPLAY LIGHT

This switch switches the LCD display backlight on and off.

DIM CONTROL

This control adjusts the level of LED illumination, however it is not possible to dim the Alarm LED in case an alarm condition should arise.

BUZZER

This sounds when an alarm condition exists.

ALARM ACCEPT BUTTON

This button has two functions:

1) If pressed when an alarm condition exists it will mute the alarm buzzer and the ALARM LED changes state from flashing to steady.

2) If this button is pressed when an alarm condition does not exist the buzzer and each LED will be tested sequentially.

ALARM LED (Red)

- Off: No alarm condition exists
- Flashing: There are one or more alarms that have not been accepted
- On: One or more alarms have been accepted and no further alarms have occurred since the accept button was last pressed

SAVING LED (Green)

This LED is normally off, however two other conditions may exist:

- Flashing: Data is being downloaded from the buffer to the removable hard disk drive.
- On: The SAVE operation is complete. The unit is not recording at this point and needs to be reset.

SAVING FAILURE LED (Red)

- Off: No errors detected in the recorded data to the Protective Capsule
- Flashing: If more than one bit in 10^8 is in error in the last twelve hours of recording
- On: If an error occurs twice or more in a twelve hour period

Switching On

a) On the control panel insert the key into the ON/RECORD-OFF/TERMINATE keyswitch and turn it to the ON/RECORD position.

b) The unit will perform a self-test and the LCD will scroll through a series of displays.

c) Finally the display reads ‘Status: OK’ and a ∗ symbol is displayed stepping six places from the left to the right. This indicates that the VER3000 is operational and recording. Remove the key from the keyswitch.

d) If either of two alarm indications continue to flash, switch the unit off and then on again to re-initialise it. If the unit fails a second time refer to the manufacturer’s manual for an explanation of the failure message and contact Broadgate Ltd for further information.

e) If the ∗ symbol fails to step left to right although the status is OK it indicates that the unit is not recording it is necessary to reset it by switching off and on again. If this fails to rectify the problem proceed as in d) above.

Action to be Taken in the Event of an Alarm

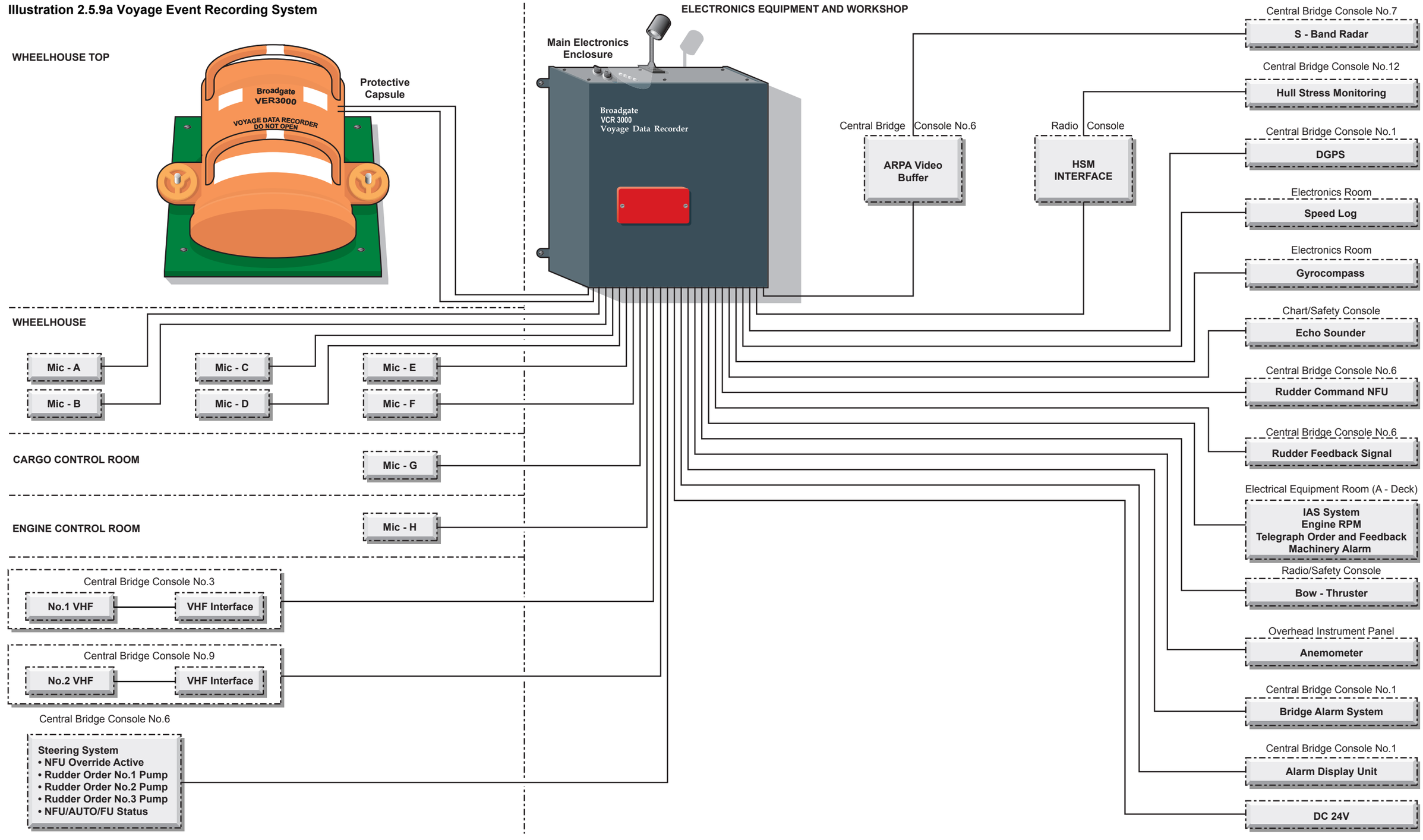
a) Press the ALARM ACCEPT button on the control panel of the MEE.

b) Read the fault code from the LCD.

c) Refer to paragraph 3.3.2 of the manufacturer’s operation and maintenance manual. Carry out any remedial action as indicated in this section.

d) If it is not possible to rectify the cause of the alarm report the problem to Broadgate Ltd or as per company policy.

Illustration 2.5.9a Voyage Event Recording System



Saving Data

As previously mentioned the protective capsule records data continuously and stores the previous twelve hours of data. The Removable Hard Disk Drive (RHDD) in the MEE has the same data written to it via a buffer. The buffer holds two minutes of data and only downloads this data to the RHDD when it is full. If the RHDD has to be removed it is possible that the hard disk would be missing the last two minutes of data. A SAVE facility is provided to overcome this possible problem, when activated it will download the last two minutes of data from the buffer to the RHDD.

(**Note:** Whenever the SAVE switch is operated the VER 3000 terminates recording until it is reset, by switching the unit off and then on again.)

Procedure to Download Data to the Hard Disk

Before commencing this operation be sure to have a spare hard disk drive to hand to replace the one which is being removed.

a) Insert the key (as supplied) into the SAVE keyswitch and turn it to the ON position and release. The LCD will display ‘Status: Saving’.

b) The SAVING LED will flash until the data has been downloaded and will then be steady. The LCD will display ‘Status: Stopped’.

c) Remove the orange cover from the hard disk bay.

d) Insert the key into the ON/RECORD-OFF/TERMINATE keyswitch and turn to OFF/TERMINATE.

e) Put the key into the hard disk drive caddy and turn it a quarter of a turn anti-clockwise to unlock it.

f) Pull the disk drive unit out.

g) Insert a replacement hard disk drive into the caddy and lock into place.

h) Return the ON/RECORD-OFF/TERMINATE keyswitch to the ON/RECORD position and remove the key.

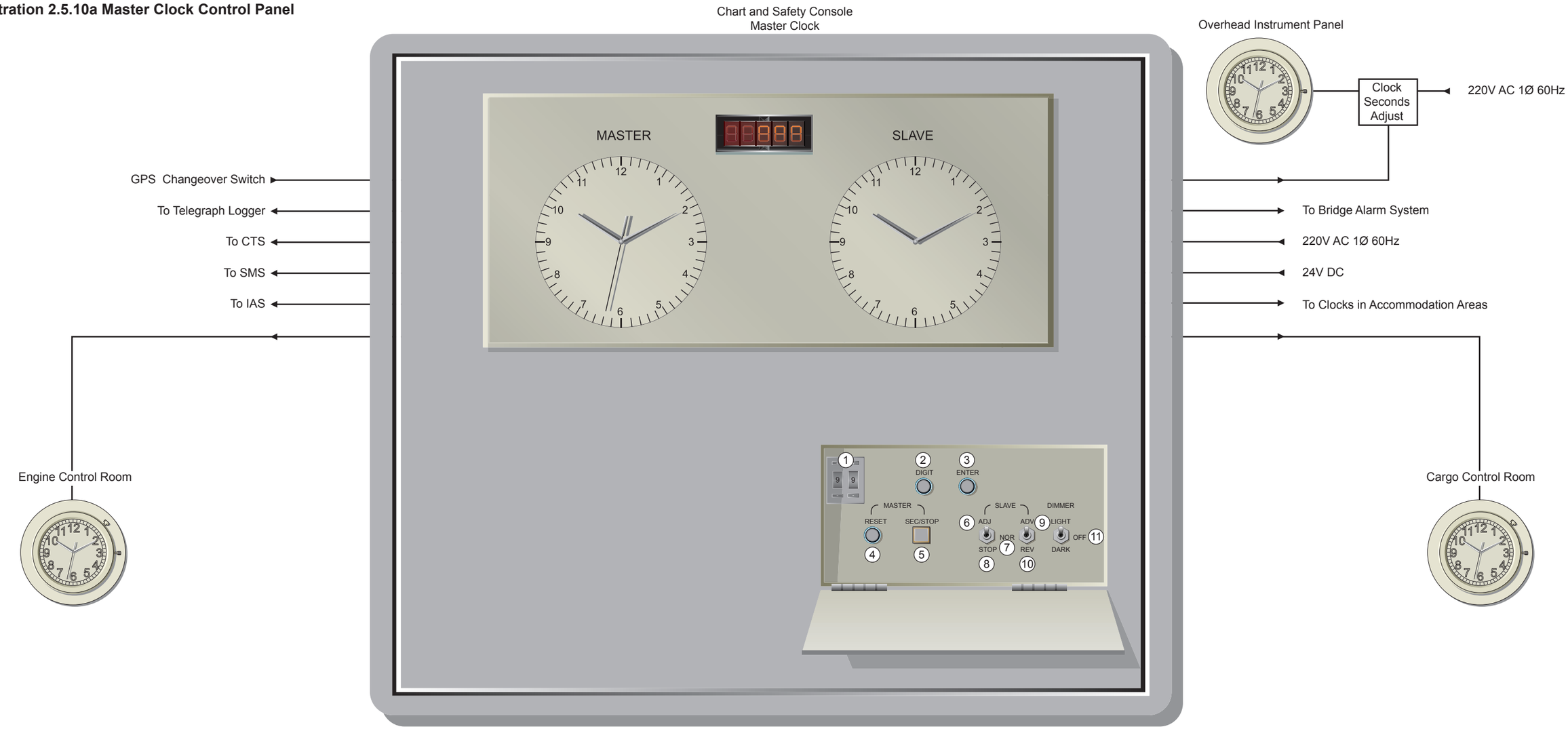
i) The system should now initialise as described above.

j) Remove all keys and secure the orange cover over the hard disk drive bay.

(**Note:** The RHDD can be removed with the system power on and recording but this will cause a failure in the system due to a loss of two way communication between the memory in the protective capsule and the hard disk drive. The only way to reset this fault is by switching the unit off and back on again.)

Voyage Event Recorder Protective Capsule

Illustration 2.5.10a Master Clock Control Panel



Key

1	Digital push selection switches to input values between 00 and 99.	3	Press to accept a parameter and move to the next parameter.	8	Stops output to the slave clocks.
2	Used in conjunction with the LED display on the master clock panel. A flickering dot on the display indicates which parameter will be adjusted. Each push of the switch scrolls through the range as follows: UTC Hour > UTC Minute > UTC Year > UTC Month > UTC Day > Local Zone Mark (+/-) > Local Zone Hour > Local Zone Minute > Exit adjustment mode.	4	Press to reset the seconds hand to 00. This resets the master clock and any slave clock with a seconds hand.	9	Use with SLAVE ADJ position to advance the time on all the slave clocks.
		5	Press to stop the seconds hand of the master clock	10	Use with SLAVE ADJ position to reverse the time on all the slave clocks.
		6	Allows forward or reverse adjustment of the slave clocks.	11	Front panel LEDs to maximum illumination, off or minimum illumination.
		7	Normal operating position.		

2.5.10 MASTER CLOCK SYSTEM

Maker: Han II Display Company Limited
Model: Marine Master Clock MQ4

Overview

The quartz master clock system comprises:

- A master clock panel incorporating the master clock, a slave clock, an LED display and the control switches is situated on the chart/safety console in the wheelhouse
- An input from the DGPS provides automatic time adjustment
- Twenty three slave clocks sited around the ship in carefully selected locations

The system provides time signal outputs for time stamps etc to the following pieces of equipment:

- The engine telegraph logger - UTC time signal
- The custody transfer system (CTS) - local time signal
- The shipboard management system (SMS) - local time signal
- The integrated automation system (IAS) - local time signal

The master clock will normally display Co-ordinated Universal Time (UTC) while the pilot clock and slave clocks display local time. The pilot clock controls the slave clocks with the transmission of DC voltages between ± 24V. There are two types of slave clocks on board, one model has a seconds hand and the other model doesn't.

Operation

The main control panel is situated on the chart/safety console and is supplied with 220V AC from the wheelhouse distribution board 6ED with a back-up 24V DC supply fed from the wheelhouse DC 24V distribution board. In the event of a power failure the system automatically switches over to the DC battery supply. Once the system has been set up the master clock is adjusted automatically from the DGPS using the NMEA 0183 (National Marine Electronics Association) protocol.

Procedure for Automatic Operation

a) Before switching the power on open the control panel and adjust the master and slave clock to 12:00 hours using the adjustment lever of each clock.

b) Open the control panel and confirm that the SLAVE switches are set to the NOR position.

c) Confirm that the input from the DGPS is connected.

d) Switch the power on. The clock will now be adjusted automatically from the DGPS. This process takes some time before the clocks are correctly adjusted, it takes approximately 24 minutes to adjust the clock time by 12 hours.

e) The master clock seconds hand is adjusted manually and can be stopped by pressing the MASTER SEC/STOP switch.

Procedure for Manual Operation

a) Before switching the power on open the control panel and adjust the master and slave clock to 12:00 hours using the adjustment lever of each clock.

b) Press the DIGIT button and the LED UTC hour unit dot will flicker. Use the digital SELECT buttons to select the hour between 00 and 23.

c) Press the ENTER button to accept the hour and now the LED UTC minute unit dot will start to flash.

d) Use the digital SELECT buttons to select the minutes between 00 and 59. Press the ENTER button to accept the minutes and the LED UTC year unit will start to flash.

e) Use the digital SELECT buttons to select the year between 00 and 99. Press the ENTER button to accept the year and the LED UTC month unit will start to flash.

f) Use the digital SELECT buttons to select the month between 01 and 12. Press the ENTER button to accept the month and the LED UTC day unit will start to flash.

g) Use the digital SELECT buttons to select the day between 01 and 31. Press the ENTER button to accept the day and the LED Local Zone Mark (+/-) unit will start to flash.

h) Use the digital SELECT buttons to select (+ or -) 00 represents - and 99 represents +. Press the ENTER button to accept the mark and the Local Zone hour unit will start to flash.

i) Use the digital SELECT buttons to select the hour between 00 and 23. Press the ENTER button to accept the hour and the LED Local Zone minute unit will start to flash.

j) Use the digital SELECT buttons to select the minutes between 00 and 59. Press the ENTER button to accept the minutes the system exits the adjustment mode and the slave time display clock hands move quickly to match the digital time display.

k) If it is necessary to adjust the exact seconds press the MASTER RESET button.

(**Note:** Local zone = time difference from UTC eg Korea is - 09:00.)

For a difference in the slave clock displayed time and the digital time during normal operations use the SLAVE ADJ, ADV and REV buttons to correct.

2.5.11 HULL STRESS MONITORING SYSTEM

The vessel is fitted with a Strainstall StressAlert Mark II hull monitoring system in order to obtain advance warning of structural deterioration in service and to load the ship accurately for maximum safe efficiency, according to expected conditions.

The system monitors the stress at four locations using deck mounted long-base strain gauges. These gauges, together with a bow slam accelerometer and bow pressure sensor, are monitored by a PC computer system whose outputs are displayed graphically on a colour screen and are logged on disc. Output is continuously relayed to the VDR, with 12 hour rolling data storage.

Alarm output relay contacts are provided to the Norcontrol alarm monitoring system. The alarm thresholds represent pre-defined stress limits, according to the operational mode of the ship, a separate user configurable alarm is also provided. The alarm indicator is combined with an acknowledgement button.

System Description

The layout of the StressAlert system is shown above.

- Strain gauge
- Bow accelerometer
- Bow pressure transducer

The four strain gauge transducers are interfaced via signal conditioning unit amplifiers and Zener barriers in the hydraulic power unit room. The amplifiers convert the signals from the transducers to voltage levels that can be read by the analogue to digital converter (ADC) in the computer.

The bow accelerometer output and supply are also fed via Zener barriers, but it is interfaced locally by a Strainstall 1506A intrinsically safe (IS) amplifier which is built into the accelerometer enclosure. The bow pressure transducer is also intrinsically safe and has an internal amplifier.

The system displays these outputs as both bar and line graphs. Numerical values are shown on a separate screen and the statistical values of each transducer output are recorded on floppy disc.

Transducers

STRAIN: The four strain gauges are extensometers measuring over a 2m baseline. The electrical transducer is a marine grade LVDT (linear variable differential transformer), IS classified with a full scale range of ± 4mm. This is fed with a low frequency alternating supply and returns a modified amplitude signal, according to its displacement, that is fed via Zener barriers to its respective amplifier.

ACCELERATION: The bow slamming accelerometer is a strain gauged beam type, which meets the IS safety regulations as simple apparatus. It is mounted in an Ex 'e' approved box with an approved IS line amplifier that supplies a 4-20mA signal to a buffer amplifier in the safe area whose output is ±5 volts to the computer ADC (scaled for ±2g with an offset of 1g).

BOW PRESSURE: The bow pressure transducer and amplifier form an intrinsically safe unit that also supplies a 4-20mA signal to a buffer amplifier in the safe area. The unit has a range of 15 bar, zero representing atmospheric pressure (i.e. out of the water).

Computer

The computer is a Hewlett-Packard (HP) Vectra 'Mariner' ruggedized desktop PC with a SVGA colour display monitor mounted on the starboard side of the bridge main control console. Control is via the standard keyboard and trackball. The 3½″ diskette is used for archiving logged data and must be changed monthly using a 1.44Mb pre-formatted disk.

The analogue inputs from the transducers are digitised by an ADC card in the computer. The programs and results are stored on the computer's hard disk and may be archived via the floppy disk (diskette) drive. The computer is designed to start and load the StressAlert software automatically when power is applied.

Mains power is fed to the system via UPS supply that allows continuous operation if power is temporarily removed (up to 3 hours). It also protects against the effects of voltage drops and electrical noise. A relay output is also provided - this operates when the software detects an alarm condition.

Operation

Day-to-day operation of the system will mostly involve checking that it is set to the correct mode and that the variable alarm level is set appropriately. At least one of the displays should be checked regularly to ensure that the inputs are present and as expected, and the Shiplog data should be entered on each watch. Local preferences will dictate which display is normally used - the mimic diagram is the system default.

The stress levels displayed in both the seagoing modes represent the maximum and minimum levels experienced during the preceding 5 minutes. If either of these exceeds the fixed alarm limits, an audible alarm (and relay closure) will be triggered to indicate that the safe operating limit for that mode has been exceeded. The seriousness of such an event will depend on its frequency - the overall pattern will be clearer from the Engineering and Trend displays.

The software operates under Windows NT4 and performs the following tasks:

- Controls the ADC, setting the sampling rate and accepting the signals for all channels
- Calculates the mean, maximum peak, maximum trough, maximum peak-to-peak, standard deviation and average mean up-crossing period for all channels
- Compares the strain signal levels over the set calculation period, and passes the highest level to the Trend display routine
- Counts the number of acceleration peaks exceeding the set level in each hour
- Records the statistical values on disk
- Updates the graphical displays
- Operates the alarm facilities
- Operates the Shiplog facility

All screens and alarms are scaled in bending moments. In addition to the help item on the menu bar, a 'help balloon' will appear describing the choices or limits affecting the entry. This disappears as soon as the cursor moves

Strain: Positive = extension (hog) Negative = compression (sag)

Acceleration: Positive = bow going down Negative = bow coming up

When the program first runs, the following display appears (shown above in Harbour mode):

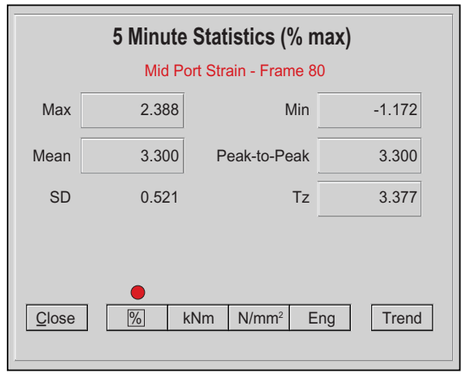
The bar graphs show the current mean sensor values, expressed as % of maximum, with horizontal lines to indicate the alarm limits for each input, according to the intended mode of operation,

- Harbour — Used only when berthed
- Short Sea — Permissible for sheltered water/harbour movement
- Sea — Normal

In other modes, the graphs are shown as two bars, representing maximum and minimum values over the preceding 5 minutes, as % of maximum allowable stress.

Statistics for each input are displayed simply by moving the cursor to a bar graph and clicking the trackball button. These appear in the following format.

(**Note:** The Tz (zero up-crossing period) is always displayed in seconds, irrespective of other settings.)



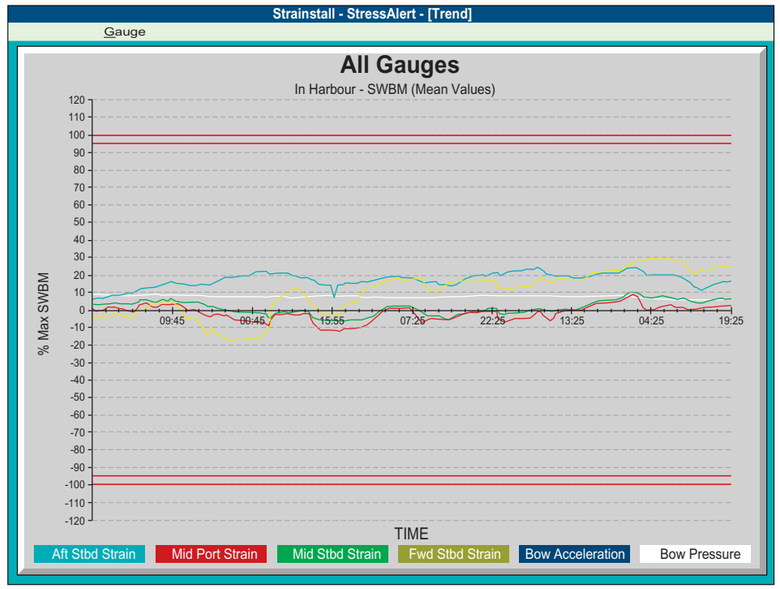
Alarm Levels

The fixed alarm levels, when exceeded, trigger 'high alarm' relay contacts and sound an audible alarm. A separate variable alarm level can also be set by choosing a % value from a menu list, as shown below. This triggers 'low alarm' relay contacts only. The variable alarm setting is shown as a red line in all the graphical data displays and is independent of mode.

The fixed alarms are set via bending moment values entered in the Setup display and are not normally adjusted. The accelerometer has a % threshold used to generate a 'slamming' alarm.

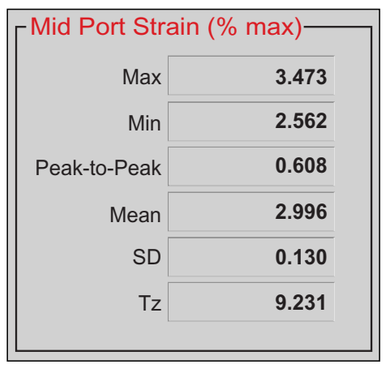
Trending of Data

The Engineering display allows trending of sensor values against time for the most recent 5 minute data. The Trend display allows trending of sensor values against time for the most recent 5 hour data. Individual channels can be selected via the Gauge menu.



Statistics

The statistics from the last 5 minutes' data are displayed in the following format:

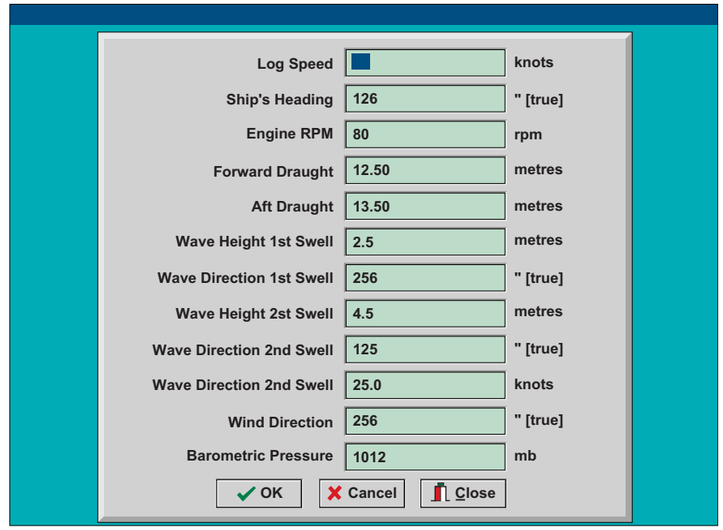


Profile

This shows the strain gauge data (only) in the same format as in the main (mimic) display, but against a cross-section and side elevation of the ship. This indicates the stress distribution across and along the vessel.

Shiplog

The Shiplog screen provides for manual entry of details from the ship's log, as follows:

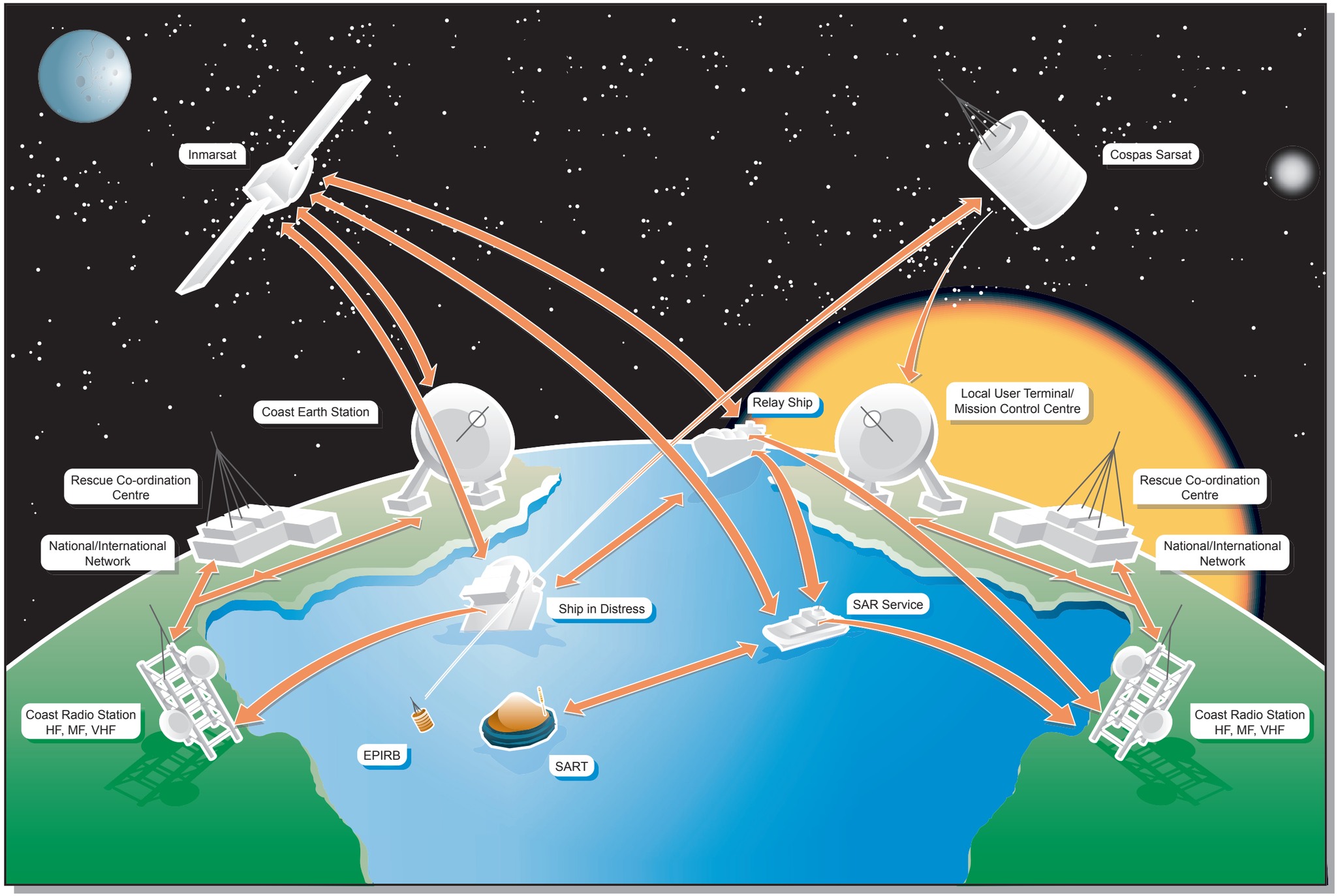


When ENTER is pressed, or OK selected, the revised data are written both to the hard disk and to a floppy disk. The new data will not be accepted if a formatted floppy disk is not present. The log should be updated during each watch.

2.6 Communications Systems

Illustrations

Illustration 2.6.1a GMDSS



2.6.1 GMDSS

Overview

The Global Maritime Distress and Safety System (GMDSS) is an international system relating to all vessels over 300 gross tonnes and all passenger vessels engaged on international voyages, irrespective of tonnage. It provides comprehensive communications for distress, urgency and safety operations in the terrestrial and satellite services. It specifies methods to be used to enable vessels requiring assistance to transmit specific alerting signals to indicate they require help.

There are nine vital communication functions which all vessels complying with SOLAS regulations must be able to fulfil, namely:

- Transmitting ship-to-shore distress alerts by at least two separate and independent means, each using a different radio communication service
- Transmitting and receiving ship-to-ship distress alerts
- Receiving shore-to-ship distress alerts
- Transmitting and receiving search and rescue co-ordinating communications
- Transmitting and receiving on-scene communications
- Transmission and reception of location signals
- Reception of maritime safety information
- Transmitting and receiving general radio communications to and from shore-based radio systems or networks
- Transmitting and receiving bridge-to-bridge communications

One of the features of GMDSS enables watchkeeping duties to be performed by automatic means both ashore and on ships. It is unlikely that a manual radio watch will be carried out on the RT distress frequencies in any particular band, therefore it is important to precede any communications with an appropriate alert. There are four levels of priority given to such alerts:

- Distress: When the vessel or person(s) on board are in grave and imminent danger and require immediate assistance
- Urgency: When the safety of the vessel or person(s) is threatened and they require assistance. Examples include; not under command and require a tow; vessel overdue; person(s) require medical assistance
- Safety: These are reserved for meteorological and navigational warnings
- Routine: Normal alerts to attract the attention of coast stations or other ship stations

It is in the interest of safety that the watchkeepers are aware of which sea area the ship is in at any time. There are four sea areas within GMDSS. The Admiralty List of Radio Signals Volume 5 provides comprehensive details.

A1 Area

This is an area within radiotelephone range of at least one VHF coast station at which continuous DSC alerting is available, as defined by a contracting government.

A2 Area

This area excludes area A1 and is within radiotelephone range of at least one MF coast station at which continuous DSC alerting is available, as defined by a contracting government.

A3 Area

This area excludes areas A1 and A2, but is within the coverage range of the Inmarsat satellite system, between latitudes 70º North and 70º South.

A4 Area

This area covers any sea areas not covered by areas A1, A2 and A3, ie, the polar regions.

Distress Alerting

The primary function of a distress alert is to inform a coast station and/or a Marine Rescue and Co-ordination Centre (MRCC) of the ship's situation. On receipt of a distress alert, an MRCC will co-ordinate the rescue and will relay details to other ships in the area. If the ship is in distress, the main objective should always be to send the distress alert ashore by any appropriate means. However, personnel may also consider alerting vessels in the vicinity by sending a distress alert using Digital Selective Calling (DSC) equipment on VHF Channel 70 (for vessels within approximately 20 miles) or MF on 2187.5kHz (for vessels within approximately 150 to 200 miles).

The distress communication procedure should always be as follows:

a) Send a distress alert on an appropriate band according to the sea area as listed below. This is a very important action as it attracts the attention of radio personnel enabling them to listen to your distress message.

b) Expect an acknowledgement from a shore station either by DSC or telephony.

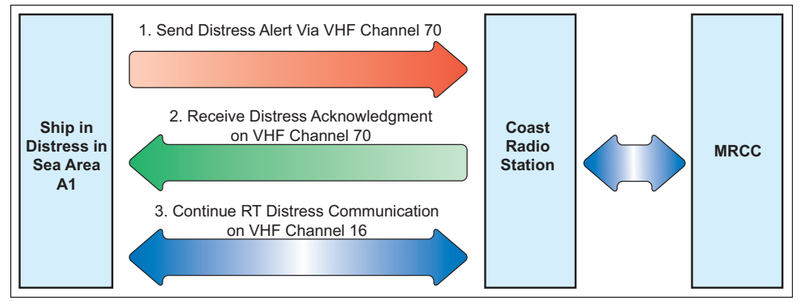
c) Send a distress call and message on the Radio Telephony (RT) distress frequency in the same band as the distress alert and follow the instructions given by the MRCC/controlling station.

GMDSS Distress, Urgency and Safety Frequencies in Terrestrial Radio Bands

Sea Area	Band	DSC Alerting Frequency	RT Communications
A1	VHF	Channel 70	Channel 16
A2	MF	2,187.5	2182
A3/A4	HF*	4,207.5	4,125
A3/A4	HF*	6,312	6,215
A3/A4	HF*	8,414.5	8,291
A3/A4	HF*	12,577	12,290
A3/A4	HF*	16,804.5	16,420

(Frequencies are quoted in kHz)

* Select an HF frequency band according to the distance from the nearest HF shore station and the time of day. Generally speaking, the higher the band the greater the range. At night, a lower band will achieve greater distances. If unsure, use 8MHz. (Inmarsat distress procedures are described later.)



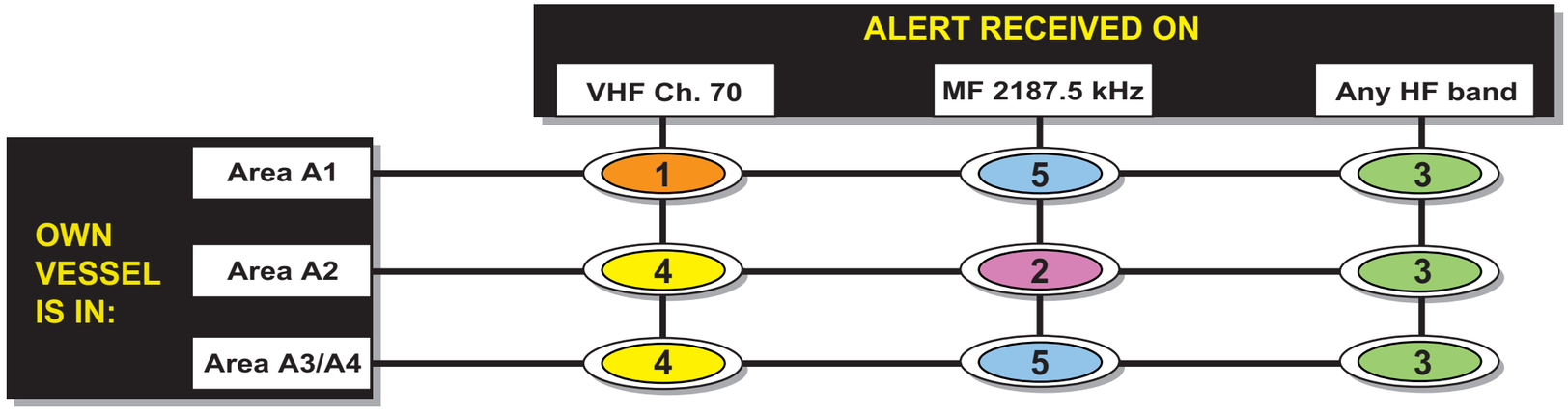
Example of Distress Transmission Procedure in Area A1

Sea Area	VHF DSC Ch.70	MF DSC 2187.5kHz	HF DSC 4/6/8/12/16MHz	Inmarsat-C	Inmarsat-B
A1	Yes	No	No	Yes	Yes
A2	No	Yes	No	Yes	Yes
A3	No	No	Yes	Yes	Yes
A4	No	No	Yes	No	No

Systems To Use For Distress Alerting

Illustration 2.6.1b GMDSS Distress Reactions

Procedure on Receiving a DSC Distress Alert



1

a) Tune to RT Channel 16 and listen for distress communications.

b) Acknowledge receipt of the alert using RT on Channel 16 and carry out distress communications.

c) If the alert is not responded to by a shore station, acknowledge by DSC on Channel 70 and relay the alert ashore by any appropriate means.

2

a) Tune to 2182 kHz and listen for distress communications.

b) Acknowledge receipt of the alert using RT on 2182 kHz and carry out distress communications.

c) If the alert is not responded to by a shore station, acknowledge by DSC on 2187.5 kHz and relay the alert ashore by any appropriate means.

3

a) Tune to the RT distress frequency in the band on which the distress alert was received.

b) Do NOT acknowledge eithr by RT or DSC.

c) Wait at least 3 minutes for a shore station to send DSC acknowledgement.

d) If no shore station acknowledgement or RT distress communications is heard, relay the alert ashore using any appropriate means.

e) If within VHF or MF range of the distress position try to establish RT contact on Channel 16 or on 2182 kHz.

4

a) Tune to RT VHF Channel 16 and listen for distress communications.

b) Acknowledge receipt of the alert using RT on Channel 16 and carry out distress communications.

c) If the alert continues, relay ashore using any appropriate means.

d) Acknowledge the alert by DSC on Channel 70.

5

a) Tune to RT 2182 kHz and listen for distress communications.

b) Acknowledge receipt of the alert using RT on 2182 kHz and carry out distress communications.

c) If the alert continues, relay ashore using any appropriate means.

d) Acknowledge the alert by DSC on 2187.5 kHz.

Example of distress call and message by RT:

MAYDAY, MAYDAY, MAYDAY,
This is British Innovator, British Innovator, British Innovator,
MAYDAY,
British Innovator/MMSI No.*xxxxxxxx*
21 degrees 34 minutes North, 68 degrees 15 minutes West
On Fire
Require immediate assistance
Over

Urgency Alerts

For messages concerning the safety of the vessel or person(s) on the vessel, use the following procedure on any appropriate radio band according to the sea area:

a) Send a DSC urgency alert.

b) Send an urgency call and message.

Example procedure of how to request medical assistance from Area A3:

a) Send a DSC urgency alert on 8414.5kHz, indicating intended RT transmission frequency (8291kHz) in the call. Do NOT expect to receive an acknowledgement.

b) Transmit an urgency call and message on 8291kHz as follows:

PAN PAN, PAN PAN, PAN PAN,
All stations, all stations, all stations,
This is British Innovator, British Innovator, British Innovator,
I have crew with severe injuries and require medical assistance,
My position is 22 degrees 30 minutes North, 79 degrees 27 minutes West,
OVER.

Safety Alerts

If it is necessary to send a meteorological or navigational warning use the following procedure on any appropriate radio band according to the circumstances:

a) Send a DSC safety alert.

b) Send safety call and message.

Example procedure of how to advise vessels in the vicinity of a danger to navigation and at the same time inform shore stations in Area A1:

a) DSC safety alert on VHF channel 70, indicating intended RT transmission channel in the call. Do NOT expect to receive an acknowledgement.

b) Transmit safety call and message on VHF channel 16 (or 13).

SECURITAY, SECURITAY, SECURITAY,
All stations, all stations, all stations,
This is British Innovator, British Innovator, British Innovator,
Large floating container sighted in position 30 degrees 20 minutes North, 64 degrees 55 minutes West,
Danger to navigation keep sharp lookout,
OVER.

Procedure on the Receipt of a DSC Distress Alert

See illustration 2.6.1b.

Procedure on the Receipt of a DSC Urgency or Safety Alert

On receipt of a DSC urgency or safety alert, tune the RT to the frequency indicated in the received alert and await reception of the call and message. Do NOT attempt to acknowledge the urgency or safety alert.

Procedures for Sending Alerts via Inmarsat

Inmarsat-C Distress Alerts

Inmarsat-C is an ideal system for distress alerting and messaging. It can be used from sea areas A1/A2 and A3, but NOT area A4. Inmarsat-C does NOT support voice communications, so all messages appear as text. Inmarsat-C is a store and forward system. There are no live links between the ship and shore authorities, therefore expect a short delay before any response from ashore.

Inmarsat-C Distress Transmission Procedure:

a) Send a distress alert (either designated or undesignated).

b) Expect a response from an MRCC within 2/3 minutes.

c) Compose a distress message on the Inmarsat-C editor using the following format:

MAYDAY (or SOS)
British Innovator/Inmarsat-C number *xxxxxxxx*
18.35 North 77.58 West
On fire
Require immediate assistance
xx persons on board

d) Using distress priority and ideally selecting the nearest land earth station (LES) to the ship's position, send the distress message. If an LES is not selected here it will default to the last used LES. Stand by for further communications from the MRCC.

Urgency or Safety Alerts via Inmarsat-C

If required to send urgency or safety priority messages via Inmarsat-C, compose the message using the edit facilities. Leave the message on the screen as text, then:

a) Go to 'TRANSMIT' mode.

b) Select routine priority.

c) Select the appropriate LES.

d) Select the special code from the following:

32 to request medical advice

38 to request medical assistance

39 to request maritime assistance

42 to provide weather danger and navigational warnings

e) Send the message as text.

Sending Alerts via Inmarsat-B

Inmarsat-B supports voice and text messaging. The operator must decide which to use. Text helps overcome language difficulties and provides a hard copy of both sides of the distress communications.

Inmarsat-B Distress Transmission Procedure

Refer to the manufacturer's operating manual and follow the telephone or telex distress transmission procedures. When the connection with the MRCC is eStarboardlished, send the following:

MAYDAY
British Innovator/Inmarsat-B number *xxxxxxxx*
18.35 North 77.58 West
On fire
Require immediate assistance
OVER

Be prepared to indicate the ocean region satellite being used. Follow the instructions given by the MRCC operator and if instructed to disconnect the line, keep the Inmarsat-B clear so that the MRCC can call back when necessary.

GMDSS Radio Watchkeeping

At sea, the vessel shall maintain a continuous radio watch on the following:

Frequency/Ch	Purpose of Watch
VHF Ch. 16 *	RT distress/urgency/safety and route call/reply
VHF Ch. 13	International bridge-to-bridge safety of navigation
VHF Ch. 70	Short range DSC distress/urgency/safety and routine alerts
MF 2187.5 kHz	Medium range DSC distress/urgency and safety alerts
HF 8414.5 kHz **	Long range DSC distress/urgency and safety alerts
518 kz	Reception of NAVTEX MSI
Inmarsat-C	Reception of EGC MSI including shore-to-ship distress alerts
Inmarsat-B	Reception of shore-to-ship distress alerts

* Vessels are required to monitor VHF channel 16 until 1st February 2005.
** Plus at least one other HF frequency from 4,207.5, 6,312, 12,577 and 16,804kHz.

As the vessel has Inmarsat-C, there is no requirement to monitor HF DSC frequencies for A3 distress alerts. MF/HF DSC equipment can be configured to watch the 2187.5kHz frequency only.

General Rules for Communications

1. All Stations are Forbidden to Carry Out

- Unnecessary communications
- The transmission of profane language
- The transmission of signals without identification

2. Avoid Interference

All stations are forbidden to carry out the following:

- The transmission of superfluous signals and correspondence
- The transmission of false or misleading signals

All stations shall radiate the minimum power necessary to ensure satisfactory service.

3. Secrecy of Communications

All administrations bind themselves to take the necessary measures to prohibit and prevent the following:

- The unauthorised interception of radio communications not intended for the general use of the public
- The divulgence of the contents, simple disclosure of the existence, publication or any use whatsoever, without authorisation, of information of any nature obtained by the interception of radio communications

4. Radio Log Keeping

All vessels are required to keep a radio log on the navigating bridge convenient to the radio installation. It should be available for inspection by any authorised representative of any administration.

The log contains details of the ship's name, call sign, MMSI number, etc, details of persons qualified to operate the radio equipment and the daily diary of operation of the radio equipment. Entries in this latter part should contain the following:

- Details of communications relating to distress, urgency and safety including times and details of ships involved and their positions
- A record of important incidents such as breakdown or malfunction of equipment, adverse propagation and interference
- Serious breaches of radio procedures by other stations
- The position of the ship at least once per day
- Details of the tests carried out on radio equipment as in paragraph 5 below

(Note: Any messages received as hard copies, such as NAVTEX, EGC, etc, can be appended in date order at the rear of the logbook and an indication of the time and frequency received can be noted in the log.)

5. Testing of GMDSS Radio Equipment

Daily tests:

- The proper function of the DSC facilities shall be tested at least once per day without radiation of signals, by use of the means provided by the equipment
- Battery voltage should be checked once per day and where necessary brought up to fully charged condition

Weekly tests:

- Proper operation of the MF DSC facilities shall be tested weekly by means of a test call with a coast station. When out of range of an MF coast station for longer than one week the ship should make a test call on the first opportunity when the ship comes into range of such a coast station

(Note: Live tests should NOT be made on VHF DSC equipment.)

Monthly tests:

- Each EPIRB shall be examined monthly by operating its test facility and ensuring that it is able to float free. It should be inspected for security and any signs of damage
- Each SART should be tested by means provided and by observing rings on nearby 3cm radar
- Each survival craft VHF shall be tested on a channel other than channel 16
- The radio battery compartment should be inspected and the security and condition of all batteries providing a source of energy for any part of the radio installation should be checked
- Printers should be checked daily to ensure an adequate supply of paper
- The condition of all aerials and insulators should be checked monthly

Brief Description of GMDSS Equipment

Search and Rescue Transponder (SART)

The purpose of a SART is to indicate the position of survival craft or survivors during search and rescue operations. It operates in the 3cm radar band only. When activated, a SART sweeps the 3cm radar band and on receipt of radar pulses from a search and rescue craft it transmits coded signals. This results in a series of dashes appearing on the rescue craft radar display; similar to those of a RACON. The echo nearest to the rescue craft's own position represents the position of the SART. The minimum range of a SART is 5 nautical miles. In order to achieve this, the SART should be mounted at least 1 metre above sea level in a vertical aspect. If lying in the sea, the range may be limited to approximately 1 mile.

Emergency Position Indicating Radio Beacon (EPIRB)

An EPIRB is a secondary means of transmitting a distress alert ashore – usually from a survival craft. It can be activated manually, but may also be released automatically by a hydrostatic release mechanism if the vessel sinks. Three types of EPIRB can be used within GMDSS:

- COSPAS/SARSAT satellite EPIRB giving coverage of all sea areas
- Inmarsat-E EPIRB giving coverage in sea areas A1/A2 and A3
- VHF DSC EPIRB giving coverage in sea area A1 only

All EPIRBs must be capable of indicating the vessel's ID and position. Vessel ID information is encoded into the EPIRB by the equipment manufacturer. Positional information can be determined automatically by the COSPAS/SARSAT satellites from measuring the Doppler effect; by having an in-built GPS receiver or by manually inserting the position via a keypad on the EPIRB. For COSPAS/SARSAT EPIRBs, there may be a maximum of 90 minutes before the alert is received ashore.

Inmarsat-E EPIRBs provide almost instantaneous alerting.

VHF EPIRBs work on VHF channel 70 and send a designated DSC alert to coast stations and vessels within an A1 area. They have an in-built SART for determining position.

Digital Selective Calling (DSC)

DSC is an automated watchkeeping and alerting system operating in the VHF, MF and HF bands. It permits unmanned watchkeeping for distress/urgency/safety and routine calls in the terrestrial radio service by having dedicated watchkeeping receivers listening out continuously.

Band	Frequency/Channel	Use
VHF	Channel 70	Distress/urgency/safety and routine alerts
MF	2187.5kHz	Distress/urgency/safety alerts
MF	2177.0kHz	Routine shore-to-ship alerts
MF	2177.0 Hz	Routine ship-to-ship alerts
MF	2189.5kHz	Routine ship-to-shore alerts
HF	4207.5; 6312; 8414.5; 12577; 16804.5kHz	Distress/urgency and safety alerts
HF	4, 6, 8, 12, 16, 18, 22 and 25MHz bands	Paired DSC frequencies are available for routine alerts. Details in ALRS Volume 1

(**Note:** Frequencies shown in red should be monitored continuously by DSC watchkeeping receivers whilst at sea. To receive routine DSC alerts in MF and HF bands an additional scanning receiver must be fitted.)

Maritime Mobile Station Identity (MMSI) System

Each mobile station (ship) and shore station having DSC equipment is issued with a unique MMSI number. This number is programmed into all DSC equipment on installation. Self-identification is always automatically included in any DSC transmission. The MMSI system also permits individual stations or groups of stations to be called. The allocation of MMSI numbers is as follows:

Ships Stations

9 digits, the first three being the country MID: eg, 232123456.

Shore Stations

9 digits, the frst two being 00, then country MID: eg, 002321234.

Group of Stations

9 digits, the first being a single 0, then country MID: eg, 023212345.

Reception of Maritime Safety Information (MSI)

GMDSS provides facilities for the reception of meteorological warnings, navigational warnings and shore-to-ship distress alerts. SOLAS regulations require ships to monitor the appropriate frequencies in order to receive MSI in their area.

Short Range MSI

NAVTEX – operating on;

- 518kHz for English language broadcasts
- 490kHz for second language (or supplementary broadcasts)
- 4209.5kHz in tropical zones to overcome the effects of MF static

518kHz has to be included in a NAVTEX receiver. The other frequencies may or may not be fitted according to vessel requirements.

Long Range MSI

- Enhanced Group Call (EGC): Operating via Inmarsat-C
- HF NAVTEX: Operating in areas where MF NAVTEX and EGC are not available

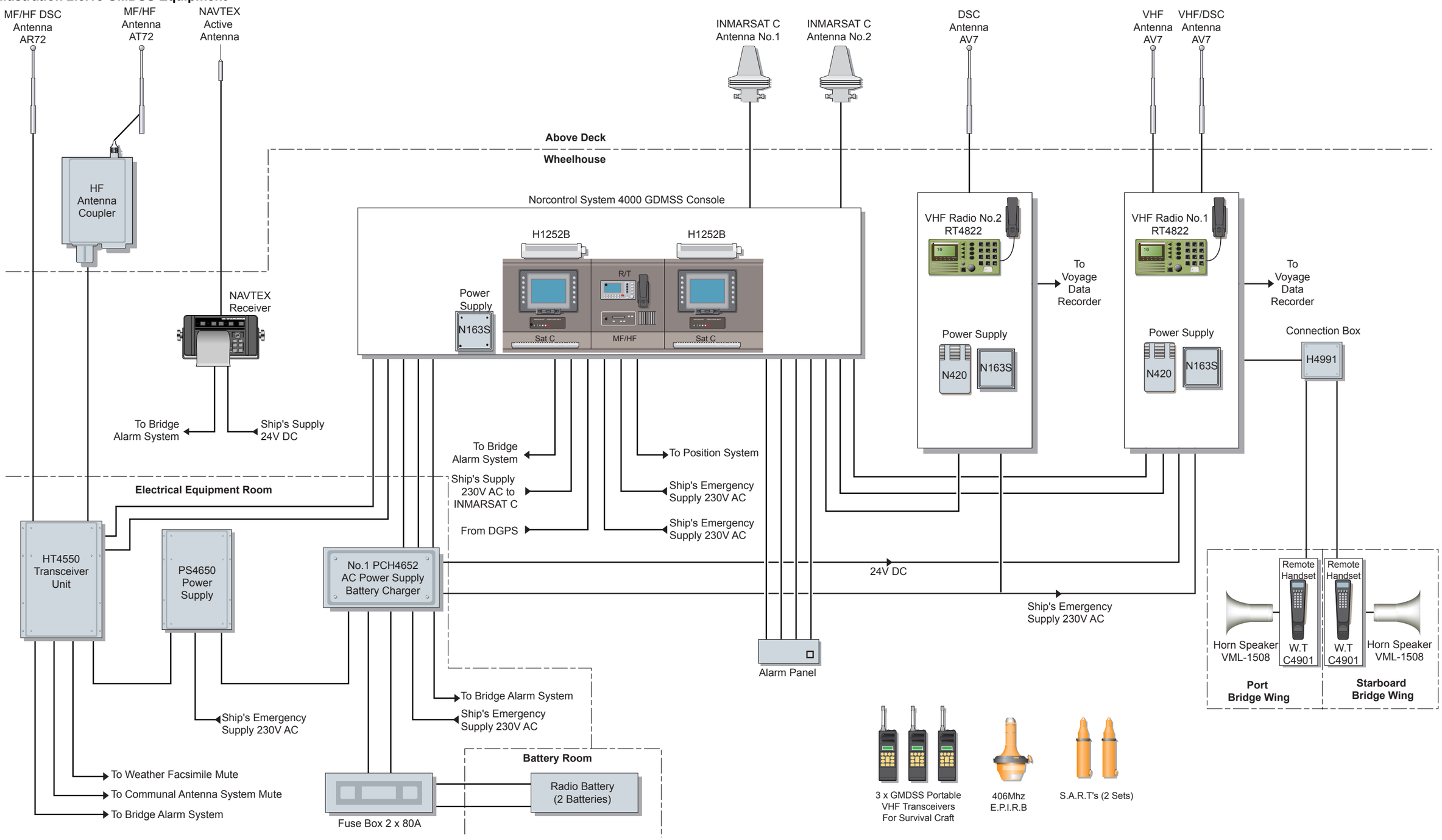
Details of these systems providing worldwide coverage are to be found in Admiralty List of Radio Signals Volumes 3 and 5.

Facilities on NAVTEX and EGC receivers allow operators to programme reception of messages from different areas. EGC receivers automatically restrict the reception of messages to the NAVAREA that the vessel is in by awareness of the vessel's position via GPS input. The world is divided up into 16 'NAVAREAS', each having its own provision. Additionally, choice can be made over the type of warning available for reception. In order not to receive unwanted information, navigators should programme MSI equipment accordingly.

Types of message which can be programmed:

A: Navigational warning*
B: Meteorological warning*
C: Ice report
D: SAR information (distress alerts relays etc)*
E: Meteorological forecasts
F: Pilotage messages
G: Decca warnings
H: Loran-C warnings
I: Omega warnings

Illustration 2.6.1c GMDSS Equipment



J: Satnav warnings

K: Other navaid warnings

L: Navigational warnings additional to letter A*

V, W, X, Y: Special services - trial allocation

Z: No messages on hand

(**Note:** Messages marked * cannot be disabled.)

Satcom Systems

Inmarsat; the International Mobile Satellite organisation provides high quality voice, telex, data and facsimile circuits to suitably equipped vessels. The system comprises of four geostationary satellites in orbit approximately 36,000kms above the equator. Each satellite provides coverage for a particular ocean region, as below. Communication, via these satellites, at latitudes greater than approximately 70° are unreliable due to the satellites being out of line-of-sight when so far north or south.

The four satellites cover the main ocean regions and are named accordingly: -

- AOR-W Atlantic Ocean Region West
- POR Pacific Ocean Region
- IOR Indian Ocean Region
- AOR-E Atlantic Ocean Region East

There are five marine Inmarsat systems in operation:

Inmarsat A

Using mainly analogue techniques, this system provides telephone, telex, facsimile and data communications between suitably equipped MESs and subscribers ashore via their national and international telephone and data networks.

Inmarsat B

Using digital techniques exclusively, this system features all of the facilities available in Inmarsat-A. However it makes better use of the satellite power and bandwidth thus increasing the number of available channels and is more cost efficient. Inmarsat-B will eventually replace Inmarsat-A.

Inmarsat C

A digital satellite communications messaging system. This system does not support voice communications. Enhanced group call (EGC) equipment, based on this system, is used for receiving maritime safety information (MSI) and is an integral part of all marine Inmarsat-C equipment.

Inmarsat E

Utilising the L-band (1.6GHz) EPIRB system offering almost instantaneous distress alerting via Inmarsat satellites. It can be used instead of a COSPAS/ SARSAT EPIRB for vessels trading in sea areas A1, A2 or A3 only.

Inmarsat M and Mini M

A digital communications system for voice, low-speed data and facsimile services. These systems do not conform to GMDSS.

Network Co-ordination Station (NCS)

Each ocean region has its own Network Co-ordination Station (NCS) which controls the allocation of channels to MESs and LESs within its region. When a call is initiated, the NCS connects the MES to the LES.

Land Earth Station (LES)

Within each of the satellite ocean regions there are a number of Land Earth Stations (LES). The function of the LES is to provide a connection between the Inmarsat system and national and international telecommunications systems worldwide. An LES may also be referred to as a Coast Earth Station (CES).

Mobile Earth Stations (MES)

Each vessel equipped with suitable Inmarsat equipment is known as a Mobile Earth Station (MES). Each MES is issued with a unique Inmarsat Mobile Number (IMN). If a user has more than one MES, each will have its own Inmarsat Mobile Number (IMN).

Each system can be recognised by its IMN as follows:

Inmarsat A

A seven digit code beginning with the number 1 followed by a further six digits, eg, 1238763.

Inmarsat B

A nine digit code beginning with the number 3 followed by the country MID and a further five digits, eg, 342200162.

Inmarsat C

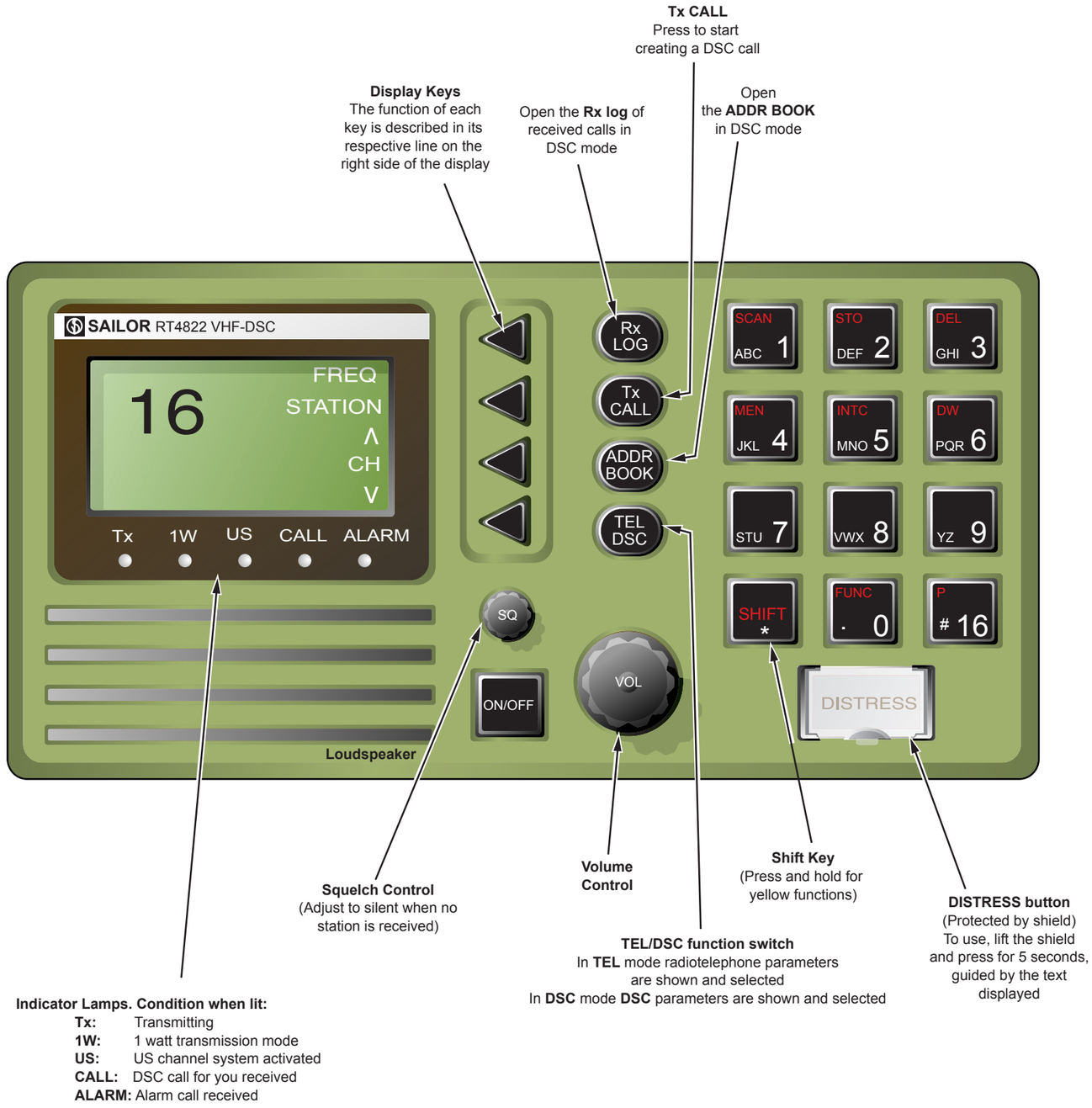
A nine digit code beginning with the number 4 followed by the country MID and a further five digits, eg, 442200262.

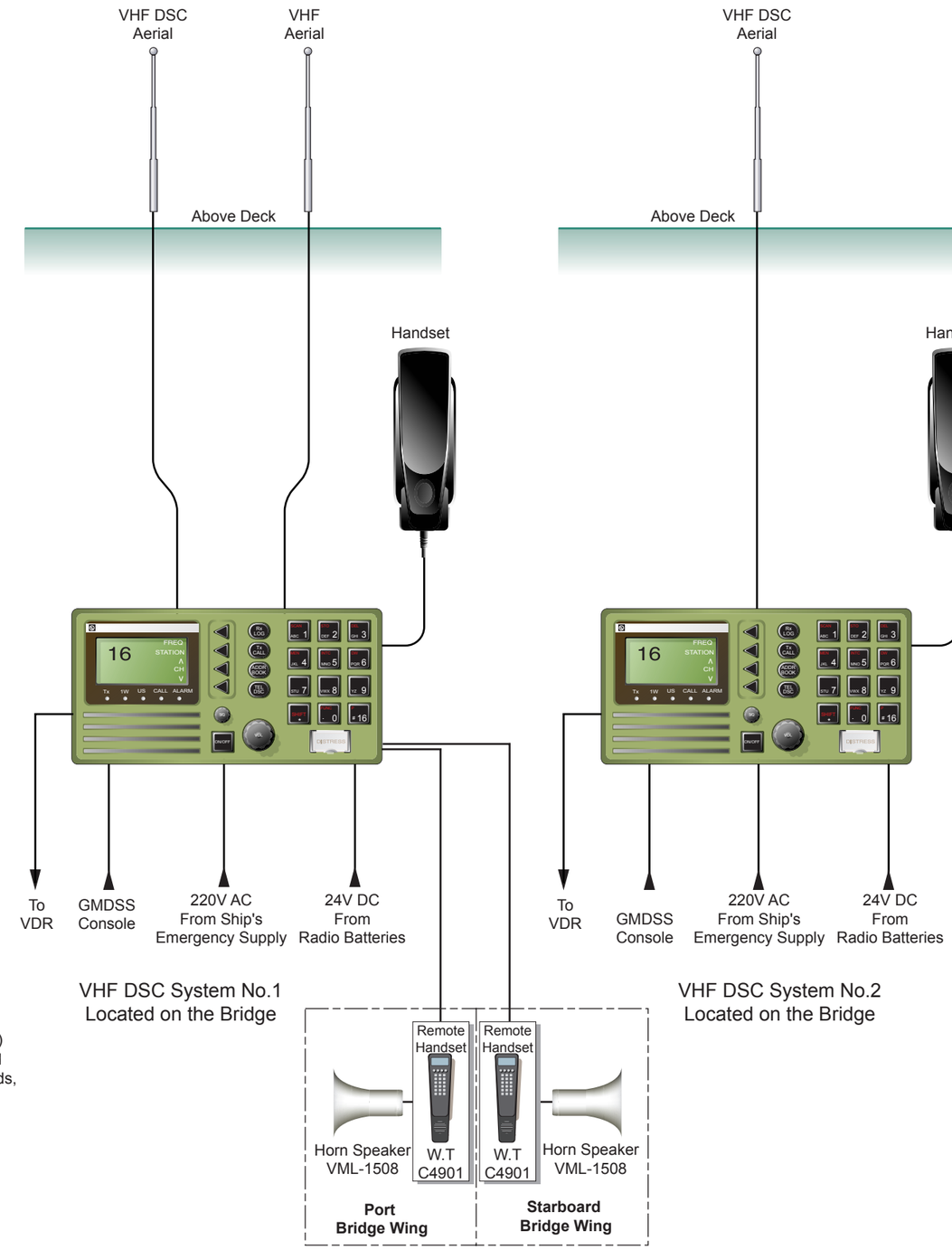
Inmarsat M

A nine digit code beginning with the number 6 followed by the country MID and a further five digits, eg, 642200362.

(**Note:** An MES may also be referred to as a Ship Earth Station - SES.)

Illustration 2.6.2a VHF DSC Systems





2.6.2 VHF TRANSCEIVER SYSTEMS

VHF DSC RADIOTELEPHONE

Maker: SAILOR
Model: RT4822

Description

The Sailor RT4822 system consists of a main transceiver unit and two antennae. The transceiver unit contains a VHF transmitter, receiver, and channel 70 watch receiver module. The performance and operation are controlled from the front panel. The first antenna is utilised for transmitting and receiving and the second antenna for DSC watch keeping.

Basic Functions

ON/OFF

The unit can be switched on or off by pressing the ON/OFF key.

TEL/DSC

Use this key to switch between Telephony and DSC modes.

(**Note:** DSC mode is automatically selected when the DISTRESS button is pressed.)

Switching Loudspeaker ON/OFF

Press the soft key to switch the loudspeaker on or off. The display indicates condition of speaker. The speaker is automatically muted when the PTT (press-to-talk) key, on the handset, is pressed.

Volume Control

Turn VOL knob clockwise to increase and anticlockwise to decrease volume.

Dimmer Control

Use the soft key to select the backlight level (between 0-3).

Setting the Transmitter Power Level

Each press of the soft key next to the 1W/25W display selects the power output. Some channels are programmed to operate on 1W level only. Low power is indicated by the 1W indicator lamp on the display.

Address Book

Press ADDR BOOK to open the address book menu in the DSC mode.

DSC TERMINAL

Quick Distress Call (Undesignated)

a) If the equipment is switched off or in standby mode press the ON/OFF key.

b) Lift the plastic lid covering the DISTRESS button.

c) Press the DISTRESS button until RELEASE is displayed (approximately 5 seconds).

d) Wait for acknowledgement.

e) When a distress acknowledgement has been received transfer to Ch 16 VHF to the transmit the distress message.

Sending a Distress Alert

To make a distress call:

a) Press the TEL/DSC key to select DSC mode.

b) Press the soft key to select DISTRESS.

c) Press the soft key to scroll up or down to select type of distress (e.g. Flooding, Abandoning etc.).

d) Check that the position/time is correct if there is a GPS input, otherwise manually input position/time information.

e) Lift the DISTRESS button cover and press the DISTRESS button until RELEASE is indicated on the display (approximately 5 seconds).

f) On receipt of a distress acknowledgement an audible alarm will sound and 'Distress Acknowledgement Received' will be displayed. Press the 16 key and lift the handset. Press the PTT (press-to-talk) switch and transmit distress message by RT.

(**Note:** The distress alert will be repeated every 3.5 - 4.5 minutes until a distress acknowledge message has been received.)

Procedure for Cancelling a False Distress Alert

a) Stop the transmission immediately.

b) Switch to channel 16.

c) Make an 'all stations' broadcast giving the vessel's name, call-sign and DSC number and then cancel the false distress alert transmitted at (quote) date and time (UTC).

Example:

ALL STATIONS ALL STATIONS ALL STATIONS

THIS IS

BRITISH INNOVATOR/call sign *xxxx* MMSI No.*xxxxxxxx*

MY POSITION 56 DEGREES 20 MINUTES NORTH, 010 DEGREES WEST CANCEL MY DISTRESS ALERT OF 271225UTC TRANSMITTED ON CHANNEL 70 VHF

MASTER BRITISH INNOVATOR/call sign *xxxx* MMSI No.*xxxxxxxx*

Calling a Ship or Shore Station

a) Press the TX CALL key.

b) Press the SHIP (or SHORE) soft key.

c) Key in the nine digit MMSI number, or select ship information from MEMORY, of desired ship. Press the ACCEPT soft key.

d) Key in the desired RT working channel. Press the ACCEPT soft key.

e) Press the SEND soft key. The following message will then flash on the display 'Call in Progress' and 'Waiting for Acknowledgement'.

f) When the message 'Individual Acknowledgment Received' is displayed, lift the handset to work on the desired telephony channel or press the VIEW soft key. Then press the MORE soft key followed by the CONNECT soft key to change to the telephony mode on the desired channel.

Radiotelephone Operation

Setting the Transmitter Power Level

Each press of the soft key next to the 1W/25W display selects the power output. Some channels are programmed to operate on 1W level only. Low power is indicated by the 1W indicator lamp on the display.

Setting the Squelch Level

Select a free channel (no station transmitting). Turn the rotary squelch knob until background noise just disappears.

Making a Telephony Call

a) Turn the power on by pressing the ON/OFF key.

b) Activate the VHF functions by pressing the TEL/DSC key or the 16 key.

c) Select the VHF channel required by pressing the channel number on the keyboard.

d) Adjust volume as required.

e) To transmit lift the handset and press the PTT (press-to-talk) switch and speak into the microphone. Release the PTT switch to listen for a response.

(**Note:** Before transmitting, think about the subject which has to be communicated and, if necessary, prepare written notes to read from, to ensure that no valuable time is wasted on a busy channel. Listen to confirm that the channel is free before starting your transmission. This will avoid interrupting the transmission of others.)

Channel 16

To select channel 16 press the quick select key 16 (bottom right hand corner of keypad). If necessary now proceed with a distress message on this channel.

(**Note:** Avoid calling on channel 16 for purposes other than distress, urgency and very brief safety messages when another calling channel is available. So that distress calls and distress traffic have priority all transmissions on channel 16 VHF should be kept to a minimum and should not exceed 1 minute.)

Private Channels

How to select private channels if the equipment is programmed with any:

a) Press the SHIFT key.

b) Press the 16 key followed by channel number (e.g. 23).

c) Press the 2 key.

d) Press the 3 key.

P23 will now be displayed on the screen.

Dual Watch

This function allows a priority watch to be kept on channel 16 while monitoring a second selected channel.

To start dual watch, select the channel number required then press the SHIFT key and the DW (No.6) key. The DW channel number will be displayed on screen with the priority channel in the lower right corner of the display.

To stop the dual watch either:

1) Press the SHIFT key and the DW (No.6) key.

or

2) Press the PTT (press-to-talk) switch on the handset.

or

3) Press channel 16 key.

Channel Mode

To select International or United States channel mode use the soft key. If the US mode is selected this will be indicated by the illumination of the US indication lamp on the display.

VHF RADIOTELEPHONE REMOTE CONTROLLER

Maker: SAILOR
Type: C4901

Overview

Two VHF radiotelephone remote handsets fitted with water resistant horn speakers are supplied and one is installed on each bridge wing. They allow remote control of the Sailor RT4822.

Handset Basic Functions

ON/OFF: Turns the power on and off.

TEL/DSC: Toggles handset between Telephony and DSC modes.

RX LOG: Enters DSC menu to read received DSC messages.

TX CALL: Enters DSC menu to set up DSC calls for transmission.

SEND CALL: Starts transmission of set up DSC call.

CANCEL: If a DSC call is in progress, it cancels transmission of the call. If the handset is in the DISTRESS REPEAT mode, it cancels the distress call.

16: Selects TELEPHONY mode and channel 16.

PTT: Press key to transmit a message and release to hear reply.

SHIFT+FUNC: Enters the function menu to set up the handset and system. If the function menu is active it enters VHF telephony mode.

DSC Operation

Quick DISTRESS Call

a) If the unit is switched off or in standby mode press the ON/OFF key.

b) Lift the handset from cradle.

c) On the handset cradle lift the lid covering the DISTRESS button, press the DISTRESS button until RELEASE is displayed (approximately 5 seconds). Wait for an acknowledgement.

Sending a Distress Alert

a) Press the TX CALL key.

b) Press the down arrow key 4 times until DSC DISTRESS is displayed.

c) Press the right arrow SELECT key to enter the distress menu.

d) Use the UP/DOWN arrows keys to select the nature of distress. When the nature of distress is highlighted, press the right arrow SELECT key.

e) If there is a GPS input confirm that the position given is correct; if not connected input the information manually and press the right arrow SELECT key.

f) Lift the handset from the cradle, lift plastic cover covering the distress button and press the DISTRESS button until RELEASE is displayed (approximately 5 seconds).

g) Wait for an acknowledgement.

h) When a distress acknowledgement is received press the 16 key for telephony Ch 16 and transmit the distress message.

Calling a Ship Station

a) Press the TX CALL key.

b) Press the right arrow SELECT key.

c) Key in the nine digit MMSI number and press the right arrow SELECT key.

d) Press the SEND CALL key.

e) When the call has been transmitted the display will show ‘DSC WAIT ACKN’.

Telephone Operational Sequence

a) Turn the power on by pressing the ON/OFF key for one second.

b) To activate the telephony functions press the TEL/DSC or the 16 key.

c) Set the squelch level until the background noise just disappears using the SQ and the UP/DOWN arrow.

d) Select the VHF channel required by pressing the channel number on the keyboard.

e) Adjust the volume as required.

f) Lift the handset and press the PTT key to transmit a message. Release the PTT key and wait for a reply.

Output Power

Each press of the SHIFT and PWR key selects the power output 1W/25W.

(**Note:** The transmitter power is automatically set for 1W on some channels.)

Turning the Loudspeaker On/Off

To turn the loudspeaker on/off, press the SHIFT and SPK key on the pad. A display indication shows that the loudspeaker is off.

Dual Watch

To start dual watch, select the required channel number then press the SHIFT and DW keys. DW will then appear on the display screen.

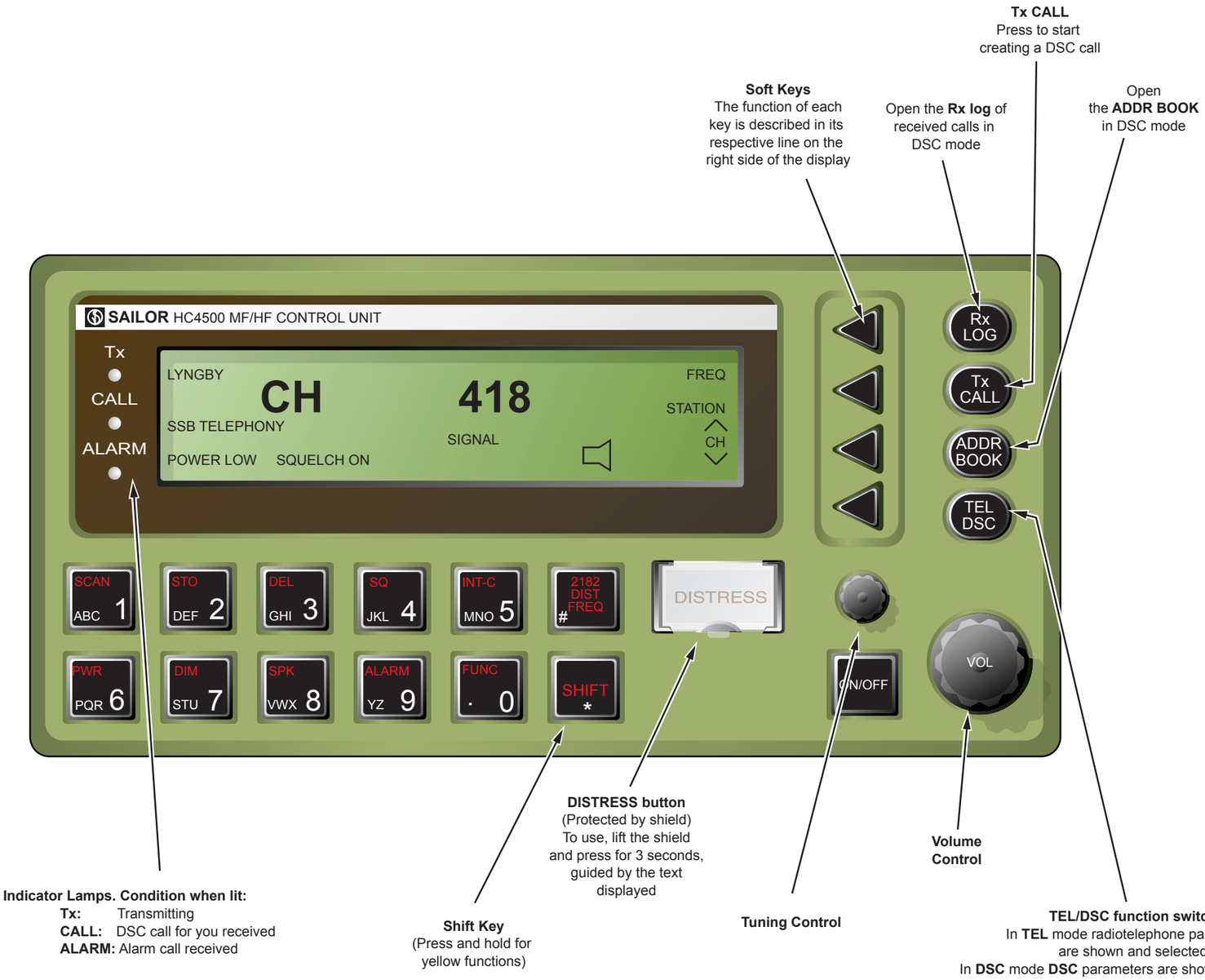
For example - channel 13 is selected with channel 16 priority

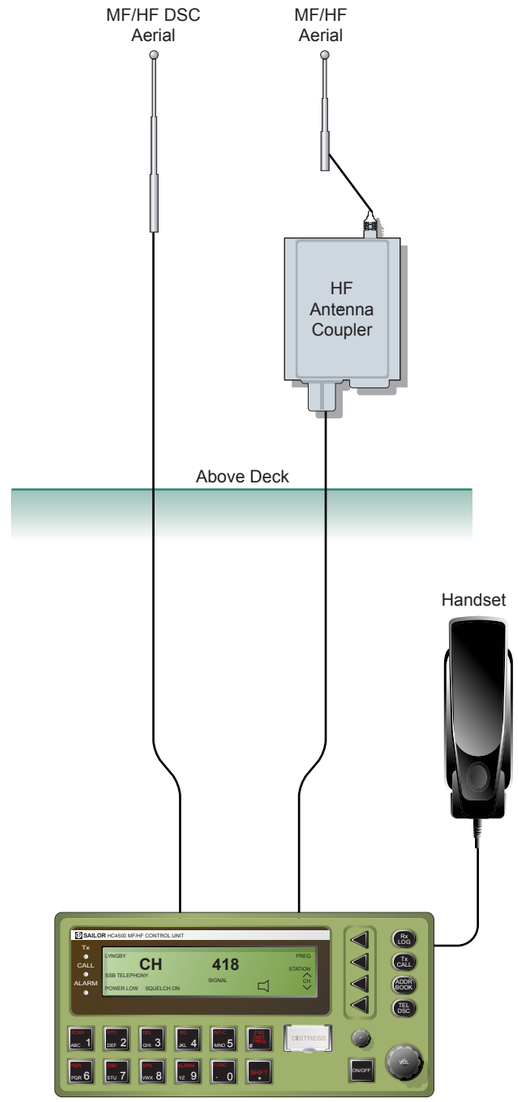
a) Press keys 1 and 3 or use the UP/DOWN arrows to select channel 13.

b) Press the SHIFT and DW keys simultaneously. The display will now indicate DW 13 with priority channel 16.

To stop the dual watch press the SHIFT and DW keys, or press 16 on the panel.

Illustration 2.6.3a MF/HF Control Unit System





MF/HF Control System
Located on the GMDSS Console

2.6.3 MF/HF TRANSCEIVER SYSTEMS

MF/HF GMDSS TERMINAL

Maker: SAILOR
Model: HC4500

Designed for the maritime environment the equipment is a 500W MF/HF transceiver capable of DSC, voice and telex operation. The equipment offers simplex and semi-duplex SSB telephony in the frequency range 1.6 to 30MHz as well as DSC capabilities.

Basic Functions

ON/OFF

The unit can be switched on or off by pressing the ON/OFF key. To switch off, hold the key down and release it when instructed to from the screen (approximately 5 seconds).

TEL/DSC

Use this button to switch between Telephony and DSC modes.

(**Note:** DSC mode is automatically selected when the DISTRESS button is pressed.)

Setting Backlighting

The backlight level can be adjusted, in four steps, by pressing the SHIFT key followed by the DIM key on the keyboard until the desired setting is reached.

Switching the **Loudspeaker ON/OFF**

Press the SHIFT key followed by the SPK key to switch the speaker on or off.

Volume Control

Turn the VOL knob clockwise to increase and anticlockwise to decrease volume.

Squelch Control

Press the SHIFT key followed by the SQ key to turn the squelch on or off.

Setting the Transmitter Power Level

Three power setting levels are available; HIGH, MED or LOW. The power levels can be adjusted by pressing the SHIFT key followed by the PWR key until the desired power level is reached.

(**Note:** An on-screen indication is displayed when an action is selected.)

Mode of Emission

Three modes of emission can be selected on the unit: SSB TELEPHONY, AM TELEPHONY and TELEX (See note). To select MODE function press the SHIFT key followed by the FUNC key until MODE is highlighted next to a soft key.

DSC TERMINAL

Sending an Undesignated Distress Call

a) Use the ON/OFF key to switch the equipment on.

b) Remove the cover from the DISTRESS key and press the DISTRESS key until RELEASE is displayed (approximately 3 seconds).

c) Wait for an acknowledgement to the distress call. When an acknowledgement is received, 'Distress acknowledgement received' is displayed.

d) Press the 2182 key to select the distress voice channel.

e) Lift the handset from its housing and press the PTT (press-to-talk) button to transmit the distress message.

(**Note:** The undesignated distress will be transmitted on 2187.5kHz. The distress call is automatically repeated every five minutes. When a DSC DISTRESS acknowledge is received the DSC DISTRESS alert transmission will be terminated automatically.)

Receiving a Distress Call

When a distress call is received 'Distress Call Received' is displayed on the display screen.

a) Press VIEW to read the contents of the call.

b) Press MORE to continue reading the call.

c) Press the 2182kHz key and stand by for transmission of the DISTRESS message which should follow. Acknowledge the message by RT on 2182kHz.

Types of Call (Can be selected by pressing the appropriate softkey)

Shore

Select to transmit a routine or test call to an individual coast station.

Ship

Select to transmit a routine message to another ship.

Extended

Distress: select to send Alert, Relay or Acknowledge.

All Ships: normally used for coast station all ships call.

Individual: select for individual routine call.

Operation

Procedure for Sending a Distress Message

a) Press the CALL button. There menu is displayed to the left of the soft keys.

b) Select EXTENDED.

c) Select DISTRESS.

d) Select ALERT.

e) Confirm that the position information is correct then press OK.

f) Select FREQUENCY, then press OK.

g) Select the nature of the distress by scrolling up/down until the particular nature of distress is highlighted.

h) Lift the cover and press the red DISTRESS button for 3 seconds. 'Distress Transmission in Progress' and the transmission frequency will be indicated on the screen.

SSB Radiotelephone

Maker: SAILOR
Model: HC4500

2182kHz

Press the 2182 key to select the distress channel for distress traffic and safety message announcements only.

MF/HF Channel Selection

Press the TEL/DSC key to select telephony mode then use the menu and soft keys to select a pre-programmed coast station channel or select an ITU channel number. Alternatively by pressing the RX or TX key it is possible to select your own RX (receive) or TX (transmit) frequency by using the number keys on the keyboard.

DISTRESS MESSAGE TRANSMISSION

Press the 2182 button and the TUNE button.

Using the attached handset press and hold the PTT (press to talk) switch and broadcast the following message in a calm clear voice:

For example:

MAYDAY

THIS IS

MMSI No.*xxxxxxxx* BRITISH INNOVATOR

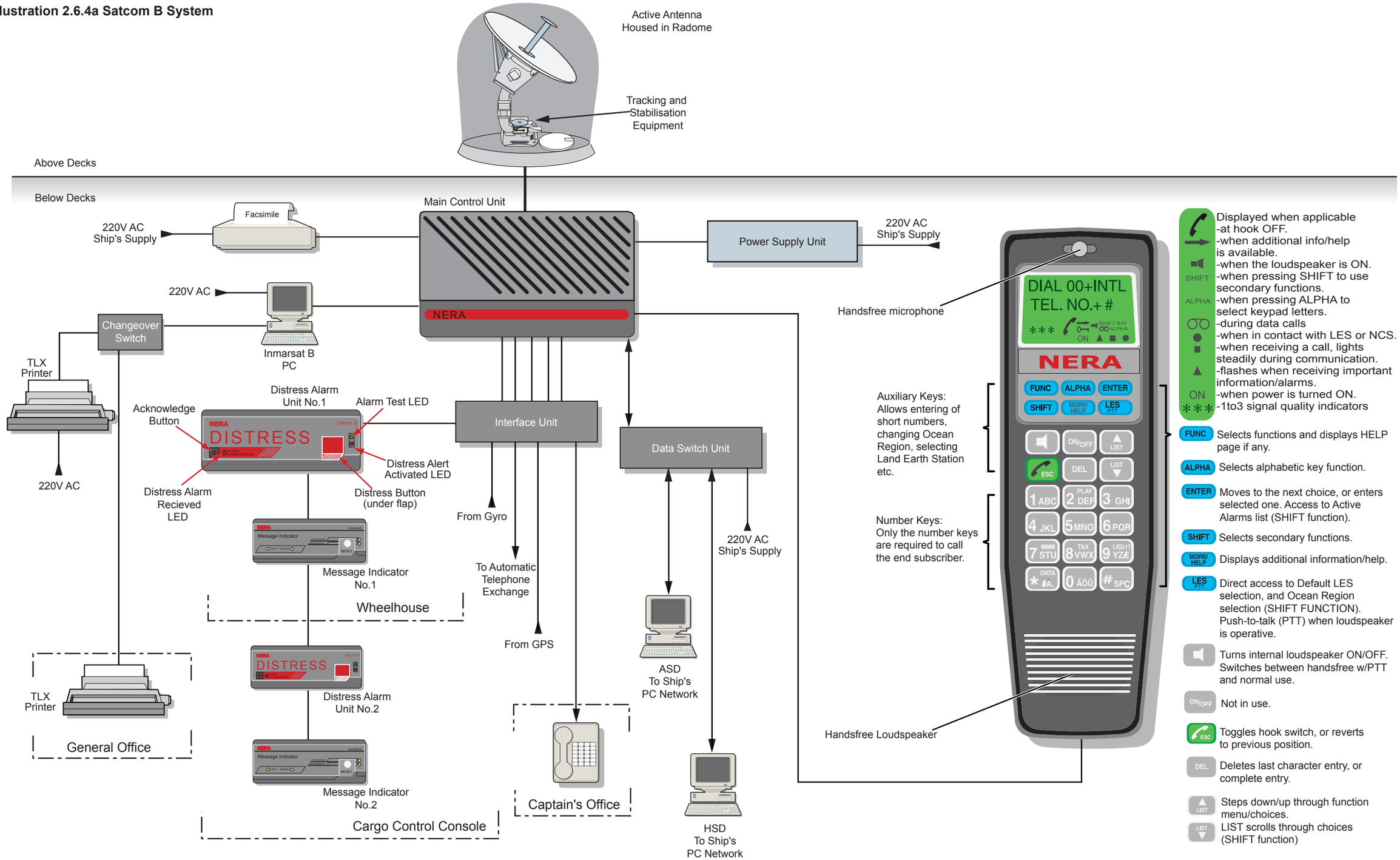
56 DEGREES 20 MINUTES NORTH 009 DEGREES 40 MINUTES WEST

TAKING ON WATER AND SINKING

REQUIRE IMMEDIATE ASSISTANCE

NO SHIP POWER WIND NNW FORCE 8

Illustration 2.6.4a Satcom B System



2.6.4 INMARSAT B SYSTEM

Maker: Nera
Type: Saturn Bm Marine MKII

Overview

The installation comprises the following:

- Above Decks Equipment (ADE) - Starboardilised antenna with RF-units and pedestal control unit (PCU) radome.
- Below Decks Equipment (BDE) - main control unit (MCU), display handset, 2 x distress alarm units, 2 x message indicator units, power supply, telex computer, telex changeover switch, 2 x telex printers, fax machine and data switching unit providing both asynchronous and high speed data connections to the ship's PC network.

Main Control Unit

This unit is the major part of the terminal performing all the signal processing and message handling functions.

Telex

The GMDSS version of the telex terminal runs on a dedicated PC.

Display Handset

A handset keypad with a built-in display allows control of communications and system functions.

Distress Alarm Unit

The distress alarm unit provides activation and indication of an alert transmission and reception, situated in the wheelhouse and the administration office.

Message Indicator Unit

The message indicator is activated on reception of telex, telefax and data calls. It provides a visual and audible indication that a particular type of message is being received, situated in the wheelhouse and the cargo control room.

Facsimile

A facsimile machine is linked to the system to allow for automatic transmission and reception of telefax messages sent at up to 9600 bits per second (bps).

Telephone

A dedicated telephone handset is provided in the Master's cabin and the radio console in the wheelhouse.

Asynchronous Data (ASD) and High Speed Data Function (HSD)

The Data Switch Unit (DSU) provides for both ASD and HSD data transfer between the ship's computer network and the Saturn-Bm terminal.

Initial Switch On

If the power to the unit is interrupted, the equipment will initiate a self-test and an automatic satellite search when power is restored. The following will appear on the handset display when the unit is available for operation: '00+INTL TEL.NO.+#' and the signal strength will be indicated by the number of * signs, *** indicates the best quality signal and * indicates the worst quality signal.

Distress Calling

a) Lift the telephone handset from its base.

b) Lift the flap covering the DISTRESS button and press and hold the DISTRESS button for 6 seconds.

c) When the dial tone is heard press the # key to initiate call.

d) When the call is answered by the Rescue Coordination Centre (RCC). Transmit the distress message using the format below:

- MAYDAY
- THIS IS (ship's name/callsign) CALLING VIA INMARSAT-B FROM POSITION (latitude/longitude, or relative to a named point of land).
- MY INMARSAT MOBILE NUMBER IS (IMN for this channel of your MES - e.g. 310200162) USING THE (Ocean Region) SATELLITE.
- MY COURSE AND SPEED ARE (course and speed).
- State the NATURE OF DISTRESS eg: fire/explosion, sinking, flooding, disabled and adrift, collision, abandoning ship, grounding, attack by pirates or listing.
- ANY ASSISTANCE REQUIRED.
- ANY OTHER INFORMATION (to assist SAR units).

e) DO NOT clear the call until instructed to do so by the RCC. Keep the MES clear of traffic so that the RCC can contact the vessel as required.

Making a Standard Call

Calls can be made through the default LES or through a selected LES see below:

Making a Call Through the Default LES

00441244535787# (routes the call via the default LES for the Ocean Region in which the ship is operating)

Making a Call Through a Selected LES

2*00441244535787# (routes the call via the LES Goonhilly (2) in the United Kingdom)

To end a call press the ESC key on the handset.

Making a Standard Call via the Automatic Telephone System

To access the Inmarsat B system from an authorised ship's telephone the user must first dial the access code (available from the Master), then the required subscriber's number.

2.6.5 INMARSAT C SYSTEM

Maker:	Kongsberg Norcontrol/ Thrane & Thrane
Type:	SA1605M Maritime antenna
	H2095C Capsat transceiver
	DT4646E Message terminal
	TT-10202 Message handling software
No. of sets	2 of each

A remote alarm is fitted on the navigation console

Overview

INMARSAT C is a digital satellite communications messaging system which does not support voice communications. The system operates on a store and forward basis. A message sent from an MES is transmitted in data packages, via satellite, to an LES where it is then reassembled and forwarded to its ultimate destination by national and international telecommunications networks. From shore based equipment messages may be sent, via an LES, to a single MES or to a group of MESs.

Enhanced Group Call (EGC)

There are two main types of EGC as follows:

Safety-NET

Authorities can send Maritime Safety Information (MSI) messages to vessels within selected geographical areas.

Fleet-NET

Commercial organisations can send information to a virtually unlimited number of predesignated mobile terminals simultaneously. Useful for subscription services distributing information such as news, weather, stock exchange reports and road/port information.

As well as providing the above facilities INMARSAT-C terminals can also generate and send a priority distress message. It can also allow data reporting and polling, position reporting and some LESs now offer internet e-mail via this service.

Equipment Description

The communication unit consists of a PC installed with the Capsat Message Handling program and a Capsat transceiver with built in GPS receiver unit.

Capsat Transceiver

The front panel of the transceiver houses the following indicator lamps and control buttons:

Power Indicator

Illuminates when power is present.

Stop Button

Used to set the serial port to the default values (if pressed at power-on). The stop button can also be used for switching off the alarm indicator. Pressed simultaneously with the alarm button for five seconds it will transmit a distress alert.

Log In Indicator

Illuminates when the transceiver is logged into an ocean area. If the transceiver is in synchronisation, but has not been logged into an ocean area the indicator will flash. If the transceiver is unable to obtain synchronisation the indicator will be off.

Send Indicator

Flashes when the transceiver enters the transmit protocol. When the transceiver is transmitting the indicator will be on. When the transmission is complete the indicator will flash until an acknowledgement is received from the LES.

Mail Indicator

Flashes when the transceiver is receiving a non-EGC message. When the message is received the indicator will be on. The indicator will remain on until the message has been read. If the Capsat program is used the message will be read immediately. Because of this the user will see the mail indicator flash when a message is being received and then turns off when fully received.

Alarm Button

Pressed simultaneously with the stop button for five seconds it will transmit a distress alert.

Alarm Indicator

When a distress alert has been sent, the alarm LED will flash until an acknowledgement is received from the LES and then it will remain on. The alarm indicator can now be switched off by pressing the STOP button.

Sending a Distress Alert

Press the STOP button and the ALARM buttons simultaneously for at least 5 seconds until the alarm LED starts flashing. The distress alert, with current position of the ship, will normally be sent to the land station used for the last transmission.

Sending a Distress Message

After transmitting a distress alert a detailed distress message can be sent using the message terminal as follows:

a) Type the distress message in the text field of the editor.

b) Select TRANSMIT (Alt T).

c) Press the tab key to move the cursor to the priority field '(*) Routine'.

(**Note:** The address book may pop up when doing this. If the address field is empty just select the first destination as the address is not used in this instance.)

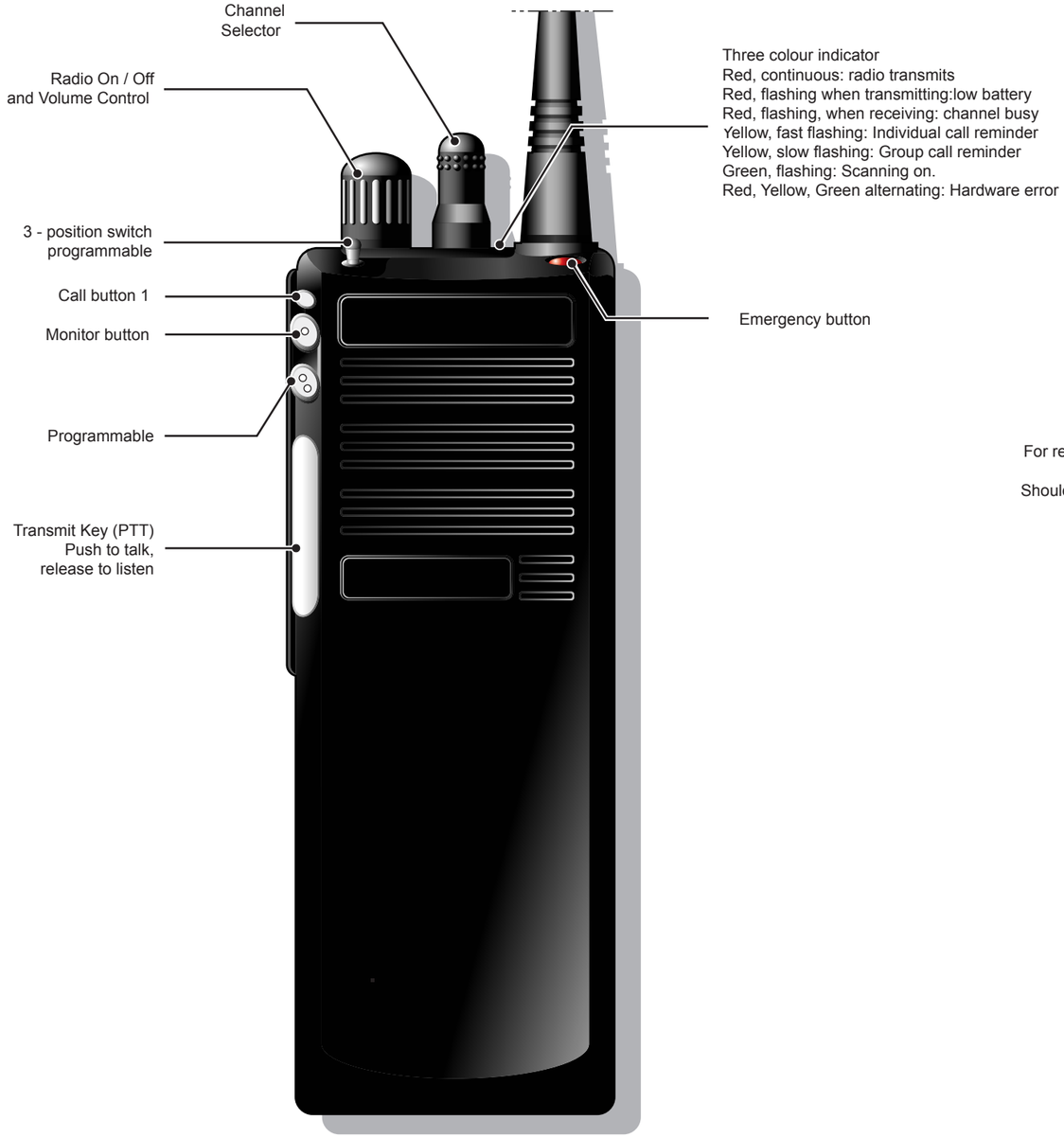
d) Press the arrow key down twice to move to '( ) Distress' and press the space bar to select. This causes the address field to show 'SEARCH & RESCUE'.

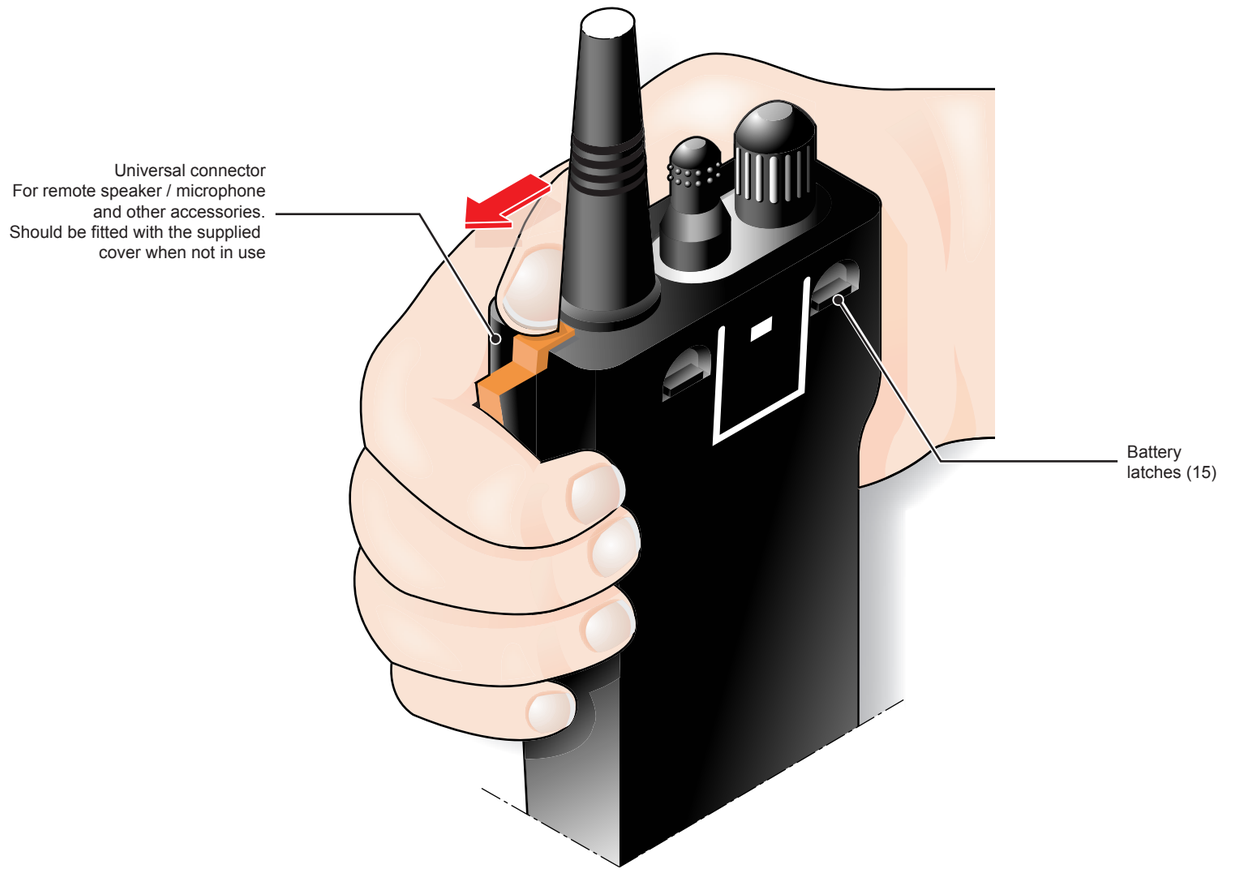
e) Press the ENTER key to move the cursor to SEND and press the ENTER key again to transmit.

(**Note:** If the LES field is empty, the cursor will be positioned there instead. Press the space bar to view the LES list and select a station. Press ENTER to move to SEND.)

f) Press the ENTER key to confirm the distress priority transmission.

Illustration 2.6.6a UHF Hand Held Radiotelephone





2.6.6 UHF RADIO TELEPHONE

Maker: Motorola
Type: GP900

The vessel is supplied with 20 UHF walkie talkie radios facilitating communication on board during both routine and critical operations.

Operation

Radio ON/OFF

Turn the radio on by turning the on/off switch clockwise. The radio operates a self-test terminating with an audible beep if successful.

The volume can be adjusted by turning the on/off switch to a suitable setting, clockwise for maximum volume and counter clockwise for minimum volume.

The radio can be turned off by turning the on/off switch counter clockwise until the switch reaches its stop.

Channel Selection

The channel selector switch located next to the on/off switch is used to select the desired channel by turning the switch clockwise or counter clockwise as required.

Prior to transmission always ensure that the channel selected is free. If the channel is in use the indicator lamp flashes red on the top of the radio unit.

Channel 2 is duplex and works via repeater stations, not directly between UHF transceivers ans channels 1, 3, 4 and 5 are Simplex.

Making a Call

In order to make a call select the desired channel, ensure the channel is free of traffic and pressing the Press To Talk (PTT) key located at the side of the handset speak into the handset microphone slowly and clearly.

Release the PTT key when the message has been sent and wait for a response.

Receiving a Call

When a call is received the alert tone for individual or group call is heard and the yellow indicator flashes. The call is answered using the procedure described above for making a call.

Address Selection

The radio number is the address and consists of up to seven digits. The address may be selected manually via the key pad.

To select an address press the address selection key followed by the number of the address to call.

Keypad Lock

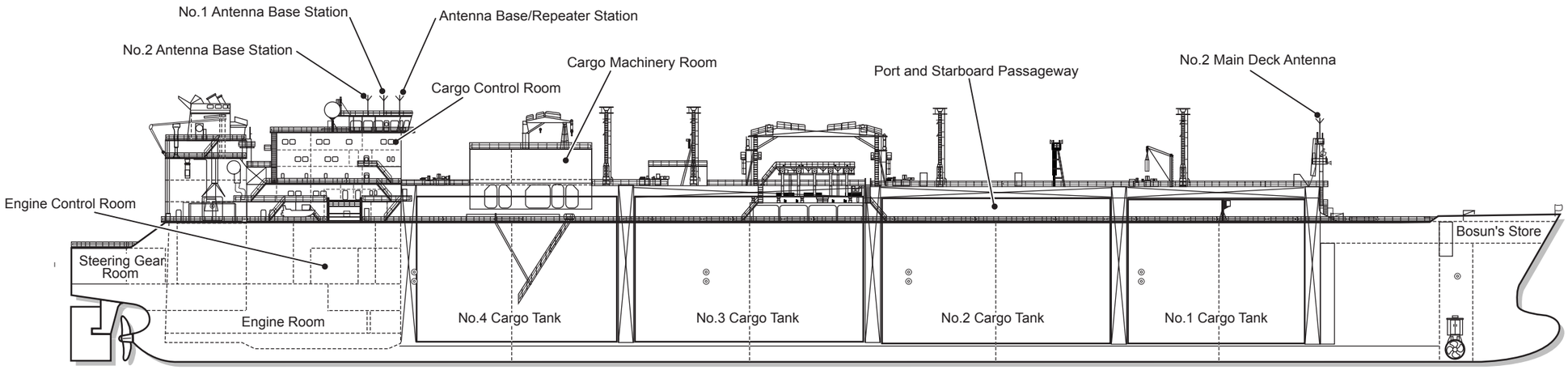
The keypad may be locked by pressing the keypad lock key and unlocked by pressing the address selection key or DTMF key.

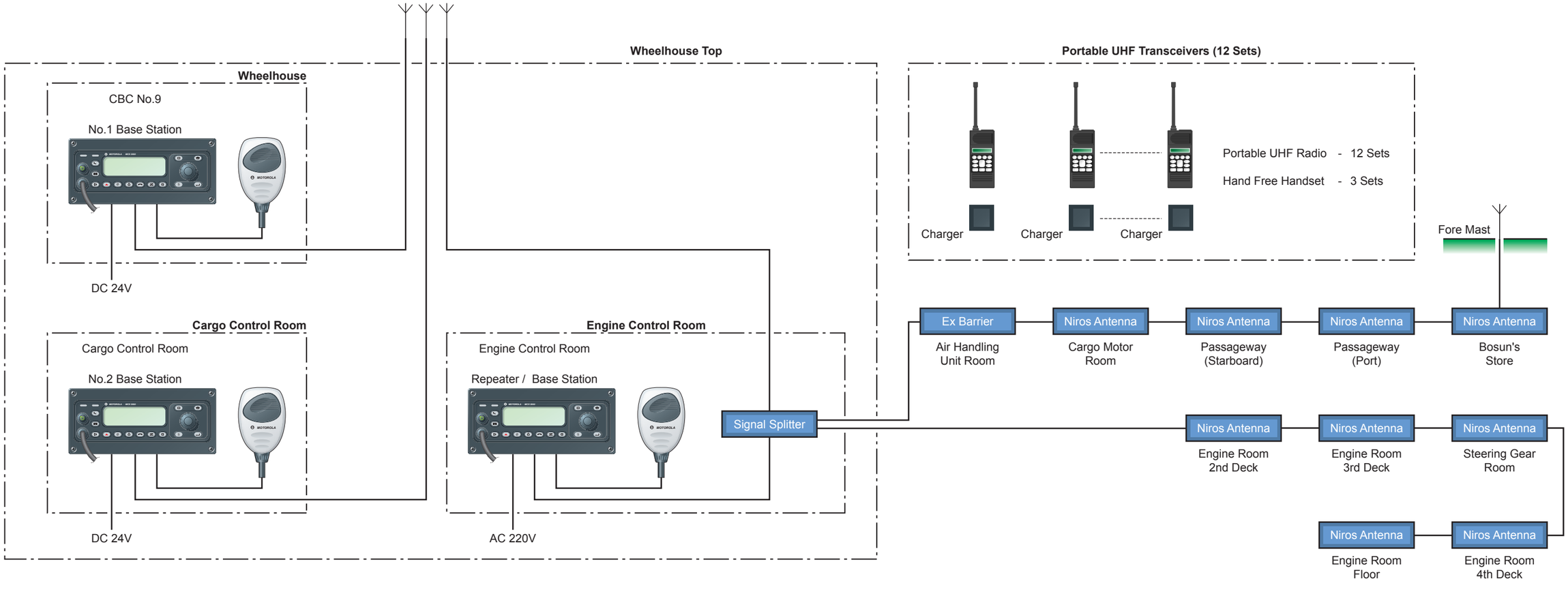
Changing the Battery

The battery may be changed (in a safe gas free environment) by pressing down on the two battery latches on the top of the battery pack and pulling the battery away from the radio handset.

A replacement battery can be inserted by placing the two tabs at the bottom of the replacement battery into the corresponding holes of the radio and pressing the battery into place against the radio handset.

Illustration 2.6.6b UHF Radio Base Stations





Base Stations

The vessel is fitted with two MCS200 base stations and a repeater base station. The base stations are located in the wheelhouse and cargo control room whilst the repeater station in the engine room control room.

Each base station has its own receiving aerial located on the wheelhouse top and acts as a relay stations to the signals from hand held UHF radios. Each unit also has a microphone and can be used as a UHF radio.

Transmissions from the hand held units are received by one of the base units then retransmitted, relaying the signal round the vessel.

The engine room repeater unit is linked to a series of aerials located round the engine room, air handling unit, cargo motor room, bosun's store and the deck passage where signal reception in not normally very good due to background noise and structural interference.

Transmissions are picked up from one or more of the aerials, sent to the repeater unit, retransmitted and received on the handsets.

For normal operations the two deck base units are on channel 1 and the engine room unit on channel 2. Similarly the hand held units are set to the corresponding channel, depending on where they are being operated.

Illustration 2.6.7a VHF Hand Held Emergency Radios

Key Switches

1. Monitor
2. Lamp
3. PTT
4. Call

2.6.7 VHF HAND HELD EMERGENCY RADIOS

Maker: SAILOR
Type: SP3110

The Sailor SP3110 is a multifunction hand held VHF, which conforms to the international GMDSS requirements, to provide portable VHF communications in the event of an emergency situation arising on board the vessel.

The vessel is equipped with three such units located in the wheelhouse. Each unit consists of a transceiver, rechargeable battery (NiCd type) and a mains operated battery charger. An emergency battery (lithium type) is supplied for each unit and is only to be used in an emergency situation.

The radio has all the maritime simplex channels with a quick selection of ch 16 as well as two user programmable channels (A and B). Set up controls are on the front of the main unit. Battery warning, transmission power and channel selection indicators are provided on the display.

Housed in a watertight case the radio is designed for use in lifesaving craft. The primary function is to provide voice communications in a distress situation, but can also be used for routine shipboard communications.

Description of Controls

ON/OFF Switch

Press this key for at least one second to turn the transceiver on or off. A read out, of channel number etc., on the LCD display indicates that the transceiver is on.

Keyboard Lock Key

To prevent any unintentional change of channel the keyboard can be locked (or unlocked) by pressing this key for more than one second. The key-sign will show up in the display when the numeric keyboard is locked.

(**Note:** When the keyboard is locked quick selection of channel 16 is still possible by a long push on the 16 key.)

Speaker Mode Selection

The AF output level range may be selected for the intended mode of operation. When the speaker sign is shown in the display, the audio output level is in the high range fitted for traditional use, with the transceiver held in front of the user.

When there is no speaker sign shown, the audio output level will be in the low range setting the transceiver for convenient use as a normal radio telephone handset.

Keyboard Beep Tone Function Control

When pressed for more than one second, the audible keyboard feedback can be switched on or off.

UP/DOWN Keys

These keys allow the user to select any one of four functions by stepping up or down. The UP/DOWN keys default to the audio volume control, indicated by the VOL sign.

1. Power Level Function

When the PWR key has been activated, the actual RF power level sign will blink for 2.5 seconds, in which time the arrow keys may be used to change the power level setting (2W high/0.25W low).

2. Channel Selection Function

If the CH key is activated, the CH sign will blink for 2.5 seconds, in which time the arrow keys may be used to change the channel number, either step by step or by continuous activation.

If the CH key is pressed for more than one second, the receiving frequency for the actual selected channel will be shown in the display as long as the key is activated.

3. Squelch Level Function

If the SQ key is activated, the squelch level will be displayed above the blinking SQ sign for 2.5 seconds, during which time the setting may be changed by means of the arrow keys.

If the SQ key is pressed for more than one second, the automatic squelch facility will be activated, where the lowest level on which the receiver will be muted is selected.

4. Volume Level Function

If the VOL key is activated, the selected volume level will be shown below the blinking VOL sign for 2.5 seconds.

The setting of the volume level can be changed by means of the UP/DOWN arrow keys whenever no other signs are blinking in the display.

Other Keyboard Functions

Quick selection of call and distress channel 16 is carried out by pressing 16.

Quick selection of user programmable channel is carried out by pressing A.

Quick selection of user programmable channel is carried out by pressing B.

Programming of the Channel Soft Keys A and B

The user may change the channels, which can be selected by means of the quick channel keys A and B.

a) Select the channel required to have as a quick selection by means of the CH key and the UP/DOWN arrow keys.

b) When the required channel is displayed press the lock key followed by a long-push (more than 1 second) on the soft key A or B.

Battery Charger

The 14 hours NiCd battery charger is used to charge the 7.2V secondary rechargeable battery which is intended for the daily use of the VHF.

The charger has two charger positions. A VHF transceiver assembled with a rechargeable (NiCd) battery can be charged in the front position. The rear charging position is not normally connected and is employed as storage for the primary emergency (lithium) battery.

Operation

a) Connect the charger to a 230V AC source. Press the ON/OFF switch down to switch the charger on.

b) Switch the VHF off and place it (including NiCd battery) in the front charging position.

c) Press the CHAR switch down to start the 14 hour charging cycle. The left-hand charging indicator will indicate charging with a solid red light. The charger automatically checks the battery type, which can be either 700mAh or 1200mAh.

d) After 14 hours, the battery charger changes to trickle charge mode and the indicator light flashes green. The charge cycle is complete and the transceiver is ready for use.

(**Note:** It is important that the battery is fully discharged before being recharged. If the battery is repeatedly recharged, when not fully discharged it will develop a memory effect. This prevents a full charge being made and the battery will not give optimum performance.)

By pressing the DIM switch, the charging indicator can dimmed for night time operation in a bridge location.

2.6.8 EPIRB AND SART

Electronic Position Indicating Radio Beacon - EPIRB

Make: Jotron
Model: Tron 40S MkII

Overview

The function of the EPIRB is to help locate survivors in the event of a search and rescue operation. The EPIRB will also act as an automatic means of distress transmission if no other means is available. The EPIRB is housed in a casing with a hydrostatic release. The EPIRB is positioned on the starboard bridge wing.

Monthly Testing Procedure

The internal test of the battery and transmitter should be carried out once a month, as follows:

a) Remove the EPIRB from its bracket, holding the unit upright.

b) Wipe clean the EPIRB and check that the two earthing screws for the mercury tilt switch are clean. The screws are close to the join of the two EPIRB sections. If the unit is inverted after removal and the screws earthed, the EPIRB will activate and set off a false alert.

c) Push the test switch to the test position. Within 15 seconds the strobe and red light will flash several times. After one minute the EPIRB will automatically reset.

d) Check the expiry date of the battery unit.

e) Carefully replace the EPIRB in the correct position within its bracket.

(**Note:** The unit's normal stowage position is inverted i.e. the battery unit is uppermost.)

f) Enter the results of the test in the GMDSS logbook.

Regular Tests

Every three months a visual inspection of the holding bracket should be carried out. Every two years the unit should be serviced, as per the manufacturer's instructions, by an authorised JOTRON agent. Every four years the battery should also be changed during the service.

Illustration 2.6.8a EPIRB

Tron 40S Float Free Satellite EPIRB
Emergency Position Indicating Radio Beacon

Search and Rescue Transponder - SART

Maker: Jotron
Model: Tron SART

Overview

Within GMDSS The purpose of a SART is to locate the vessel in distress or people in a survival craft from the vessel in distress. An easily portable device which should be taken to the survival craft if it is necessary to abandon ship. The unit is a passive device, it will only transmit when interrogated by a transmission from an X-band (9GHz) radar. Once triggered it produces a distinctive dotted line on the radar screen representing approximately 10 nautical miles. Once activated the beacon itself provides confidence to survivors by giving an audible and visual indication that a rescue vessel is in the vicinity.

A SART is installed near each bridge wing door.

Monthly Testing Procedure

The SARTs should be checked once a month by activation and subsequent checking of the ship's 3cm (X Band) radar display for the correct signal indication. The procedure is as follows:

a) Remove the SARTs from their cabinets.

b) When in open waters with no other ships nearby, take the SARTs to one of the ship's bridge wings and activate it using the self-test button. The red LED will illuminate to show the unit has activated.

c) The radar beam will interrogate the SART and the internal loudspeaker will produce an audible signal. The signal is continuous when close to the radar source but will become intermittent at a distance.

d) Check the 3cm radar display. The display should show 12 to 20 dots radiating out from the position of the SART in concentric circles, similar to a racon indication.

e) Check the battery expiry date.

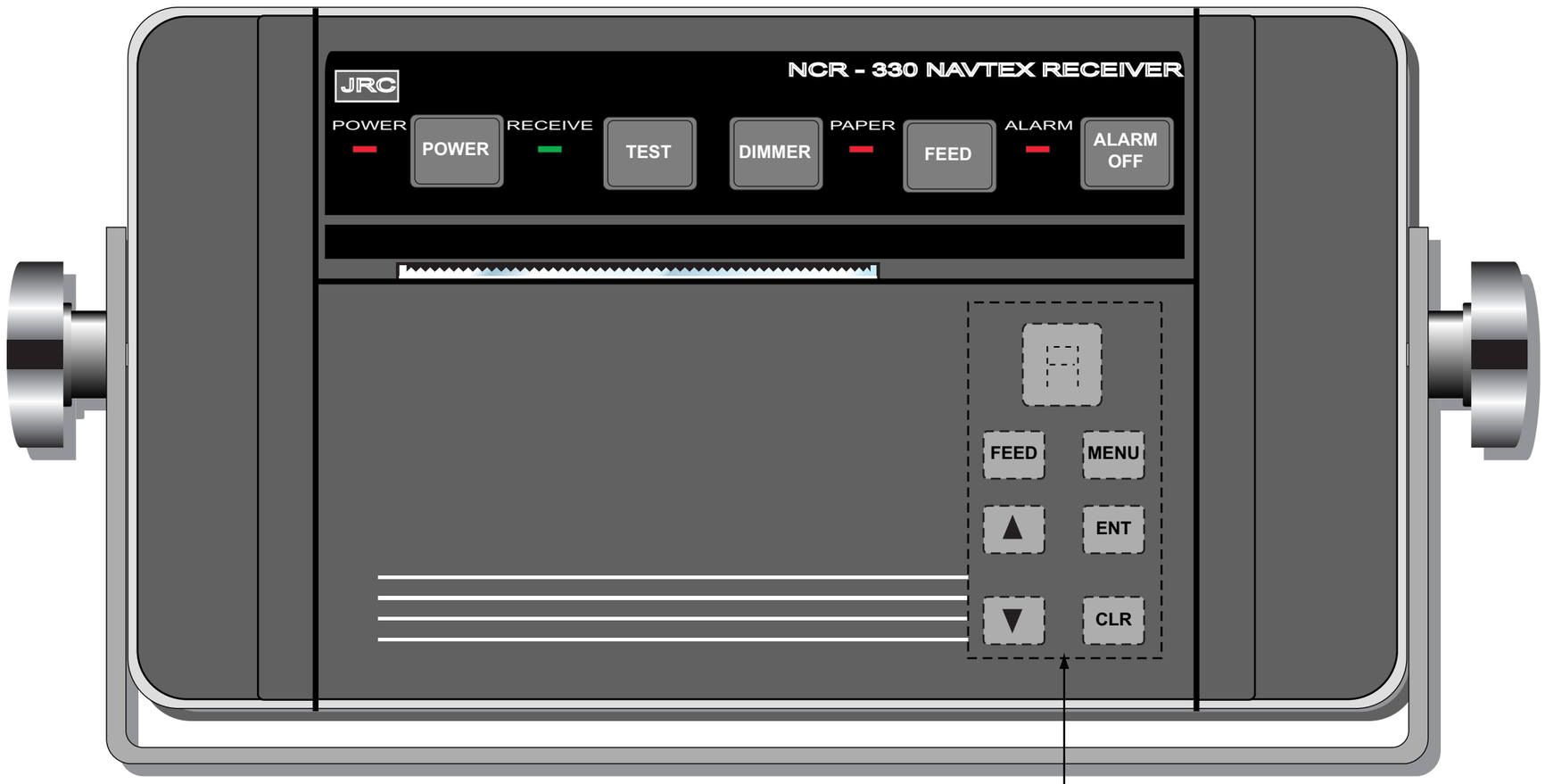
f) Enter the results of the test in the GMDSS logbook.

Every four years the SART battery should be renewed.

Illustration 2.6.8b SART

Tron SART
Search And Rescue Transponder

Illustration 2.6.9a Navtex Receiver



2.6.9 NAVTEX RECEIVER

Maker: JRC
Model: NCR-330

Overview

The NAVTEX receiver is located on the left-hand side of the chart table. The receiving whip antenna and associated coupler NAW-330 are located on the port side of the compass deck. The receiver is fix-tuned to 518kHz thereby receiving English language NAVTEX broadcasts typically at a range of up to 400 miles as required by the GMDSS. 12V DC is supplied to the receiver from a separate power supply unit type, which is fed by 220V AC supply. In the event of a mains failure the system is automatically fed from the 24V DC emergency battery supply.

Main Operating Controls and Indicators

POWER Control
Turns the receiver on or off.

POWER Indicator
The green lamp indicates power is on.

RECEIVER Indicator
Blinks when receiving a message.

DIMMER Control
Each time the dimmer control is pressed it selects another level of brightness of the status lamps. It does not affect the brightness of paper and alarm indicators.

PAPER Indicator
The orange lamp flashes to indicate that the paper is running low.

ALARM Indicator
The red lamp flashes to indicate the reception of an important alert.

ALARM OFF Control
Mutes the alarm.

FEED Control
Feeds the paper through each time the control is pressed.

TEST Control
Starts the self-test function.

MENU Control
Starts the receiver status setting mode

ENT (Enter) Control
Accepts any changes to the receiver status.

CLR (Clear) Control
Deselects any settings.

STATE Control
Prints out the current receiver settings.

Operating Procedures

Turning the Power On/Off

a) Press and hold the power control for at least 2 seconds.

b) The green power indicator lamp will illuminate.

c) Use the same power control to turn the receiver off.

Message Reception

Messages are automatically received and printed out. Messages retransmitted with the same identification code will be withheld automatically for up to 72 hours to avoid duplication. The receive indicator flashes during reception.

Receiver Programming

This allows the operator to select the required NAVTEX station(s), and the type of received message.

Programming NAVTEX Station, Type of Message and Receiver Status

a) Lift the paper roll cover.

b) Press the MENU key. The printer will print ‘SET COAST STATION?’.

c) Press the ENT key and the unit indicates 26 coast stations (A to Z). Use the up/down controls to select the station to programme.

d) Use the ENT key to enable a station. Press the CLR key to disable a station.

e) Press the MENU key to end the programming of stations. The printer will give a list of disabled areas followed by ‘SET MESSAGE TYPE’.

f) Press the ENT key to programme the message types. Press the CLR key if this is not required.

g) The display indicates 22 different types of message category. Certain types of important message category cannot be disabled and are listed below:

- A & L - Navigational warnings
- B - Meteorological warnings
- D - Search and Rescue warnings

h) Press the up/down arrow keys to select the type of message to be programmed.

i) Press the ENT key to enable a type of message. Press the CLR key to disable a type of message.

j) Press the MENU key to end programming.

k) The printer will give a print out of the type of messages which have been disabled.

l) Press the MENU key and the printer will print ‘SET STATE?’

m) Press the ENT key to select the receiver status and a print out of the current settings. If changes to the receiver status are not required press the CLR key.

n) ‘ALARM BUZZER ON/OFF’ is printed.

o) Press the ENT key to enable the alarm. Press the CLR key to disable the alarm. Alarms for type D (SAR) messages cannot be disabled.

p) ‘CHARACTER SIZE CHANGE’ is printed. Press the ENT key to select large print. Press the CLR key to select normal print.

q) Press the MENU key to quit the settings programme.

r) ‘STATE END’ will be printed.

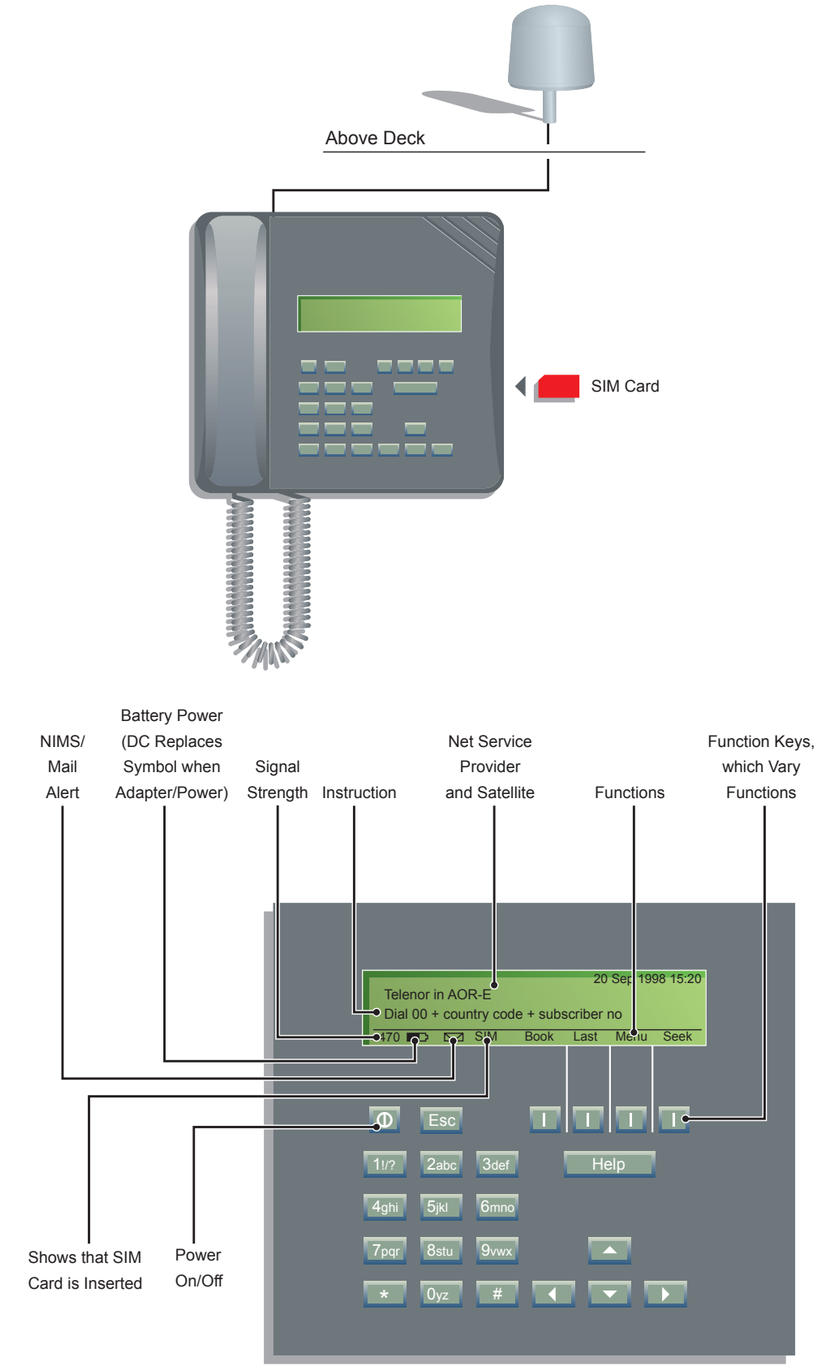
Status Printing

To receive a print out of the receiver settings at any time press the STATE key.

Self-Diagnosis Test

Press the TEST key to receive a print out including a ‘Quick brown fox’ printer check, main processor check and receiver check. During this time the alarm buzzer will sound. Press the ALARM OFF key to silence the buzzer.

Illustration 2.6.10a World Phone Telephone Unit



2.6.10 INMARSAT M SYSTEM

Maker: Nera
Type: Worldphone Marine

Overview

The installation comprises the following:

- Above Decks Equipment (ADE) - Starboardilised antenna with RF-transceiver.
- Below Decks Equipment (BDE) - main control unit (MCU) consisting of a keypad, display panel, handset and a power supply. located on the navigation bridge. One pay phone handset located in the C deck telephone booth which requires a pin number to activate.

Main Control Unit

This unit is the major part of the terminal performing all the signal processing functions. The keypad with a built-in display allows control of communications and system functions.

The main Worldphone is assigned a separate incoming call number.

Initial Switch On

a) Switch on the power supply.

b) Press and hold the telephone ON/OFF key for 2 seconds.

c) Enter the phone PIN at the prompt and press OK.

d) A shaded signal strength bar will appear in the display. The longer the signal bar or the higher the signal strength indicator value, the better the signal quality. The bar will become solid when the signal strength value reaches 400.

e) Press OK to accept the displayed satellite.

The operator can seek a different satellite by pressing the SEEK function key and scrolling down the displayed list. Pressing the SELECT key will initiate a search for the chosen satellite. This operation is usually only carried out in special circumstances.

Normal operational mode is for the unit to search for any satellite (default).

f) The equipment is ready for use when the main window display appears.

Making a Standard Call from the Main Unit

a) Dial 00 then the country code, area code followed by the subscriber's number, maximum of 22 digits.

00441244535787

b) Press DEL key to delete the digit on the left of the cursor if a mistake is made.

c) Once the number has been correctly entered, press the CALL key to send the dialled number. Pressing the # key will achieve the same function.

d) The duration of the call is displayed when connected.

e) To end a call replace the handset.

In addition to the normal operation there are the following facilities available:

- Hands free mode - select to use the builtin loudspeaker or the handset.
- Phone Book. The phone book function allows the operator to enter frequently used numbers into the phone book memory. Once the numbers are entered, the operator can press the BOOK function key which displays the listings on the screen, then scroll down the list, select the number and press the CALL key to connect.

Making a Call to another Worldphone

a) Dial 00 then the 87 plus the access code for the ocean area followed by the subscriber's IMN number.

00871762420510

a) The codes for the different areas is as follows:

- 871 AOR-E (Atlantic Ocean Area East)
- 872 POR (Pacific Ocean Area)
- 873 IOR (Indian Ocean Area)
- 874 AOR-W (Atlantic Ocean Area West)

(**Note:** Some Net service providers support the common Ocean Region access number 870 which connects the call to the Worldphone regardless of the Ocean region the user is currently communicating through.)

Making a Call from the Public Worldphone

The Worldphone located in the phone booth on deck C is for the use of the ship's staff and crew for calls though the Stratos Prepaid Calling Service. The required prepaid pin numbers are purchased from the Master.

a) Lift the handset.

b) When the dial tone is heard dial 75# to access the Stratos Prepaid Calling Service.

c) Enter the 9 digit pin number followed by #.

d) Dial the country code, area code followed by the subscriber's number.

44 -124-4535787#

e) The call should then be connected.

(**Note:** If the number dialled is engaged or not answered the call will not be charged for.)

The public Worldphone is assigned a separate incoming call number.

Facsimile

A facsimile machine can be linked to the system. The telefax facility supports Group 3 fax transmissions at a rate of 2.4Kbps.

The telefax is assigned a separate incoming call number.

Data Service

The builtin data transmission service is capable of transferring data at 2.4Kbps. It allows the worldphone to interface with a PC without the aid of a modem or data card.

The Asynchronous Data (ASD) system provides data transfer between two Worldphones, or between a Worldphone and the fixed international networks.

The data facility is assigned a separate incoming call number.

Full operating and maintenance instructions are to be found in the Nera Worldphone Users Manual supplied with the unit.

2.7 Internal Communications

2.7.1 Automatic Telephone System

2.7.2 Intrinsically Safe Sound Powered Telephone System

2.7.3 Public Address System

2.7.4 Talkback System

Illustrations

2.7.1 AUTOMATIC TELEPHONE SYSTEM

Maker: CMR Korea Co. Ltd
Type: SDX-Compact

Overview

The SDX Compact automatic telephone system allows internal ship telecommunications. The exchange is powered from the ship's mains and has a back-up battery supply in the case of a power failure. The system offers the following features:

- Automatic dialling to other extensions
- Paging facility (PA system and group paging)
- External calls via Inmarsat or a shore telephone connection
- Conference call facility
- Automatic ring back
- Priority call

Automatic Dialling

a) Lift the handset and check for a dial tone.

b) Dial the extension number required.

c) When the ringing tone is heard wait for the called party to answer.

d) On completion of the call replace the handset.

Paging Call

a) Lift the handset and check for a dial tone.

b) Press the '0' button.

c) Listen for the chime sound in the ear piece and on the public address system.

d) Make the required announcement via the telephone handset.

e) When the announcement is complete replace the handset.

Conference Call

a) Make an internal call as described earlier. When contact has been made with the called party (party No.1) ask them to hold the line.

b) Press the HOOK FLASH button and listen for a dial tone. Party No.1 will hear music while on hold.

c) Dial the extension number required (party No.2).

d) When party No.2 answers a three party conference is eStarboardlished and the music is cancelled from the phone of party No.1.

e) To add extra parties (up to a maximum of five) follow the above procedure.

f) When the conference call is completed replace the handsets.

Priority Interruption

(A higher priority extension can interrupt the call of a lower priority extension)

a) If the called extension is busy press the HOOK FLASH button and listen for the dial tone.

b) Press the HOOK FLASH button. The called party hears an interruption tone for 2 seconds and then the parties are connected.

c) Speak to the called party.

d) Replace the handset when the call is complete.

There is a system programming telephone unit on the Radio and Safety console in the wheelhouse. Refer to the manufacturer's manual for operation of this unit.

Illustration 2.7.1a Accommodation Handset

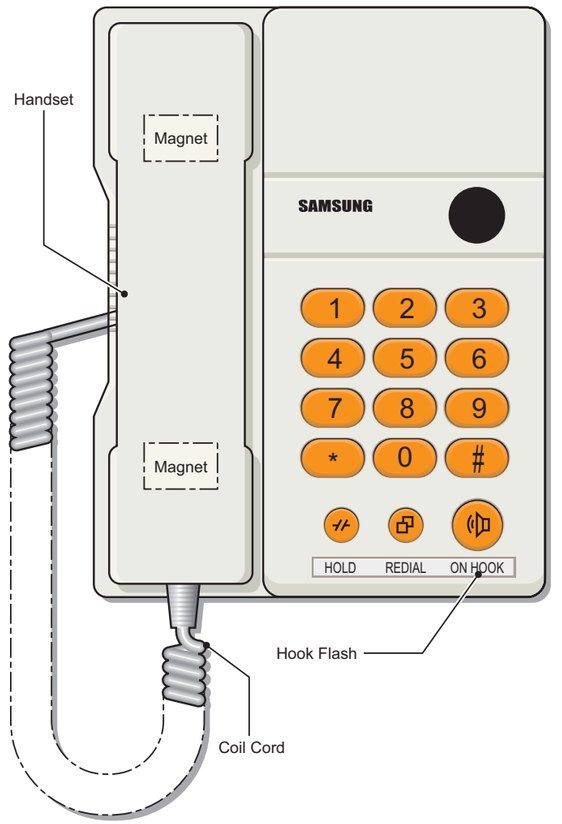
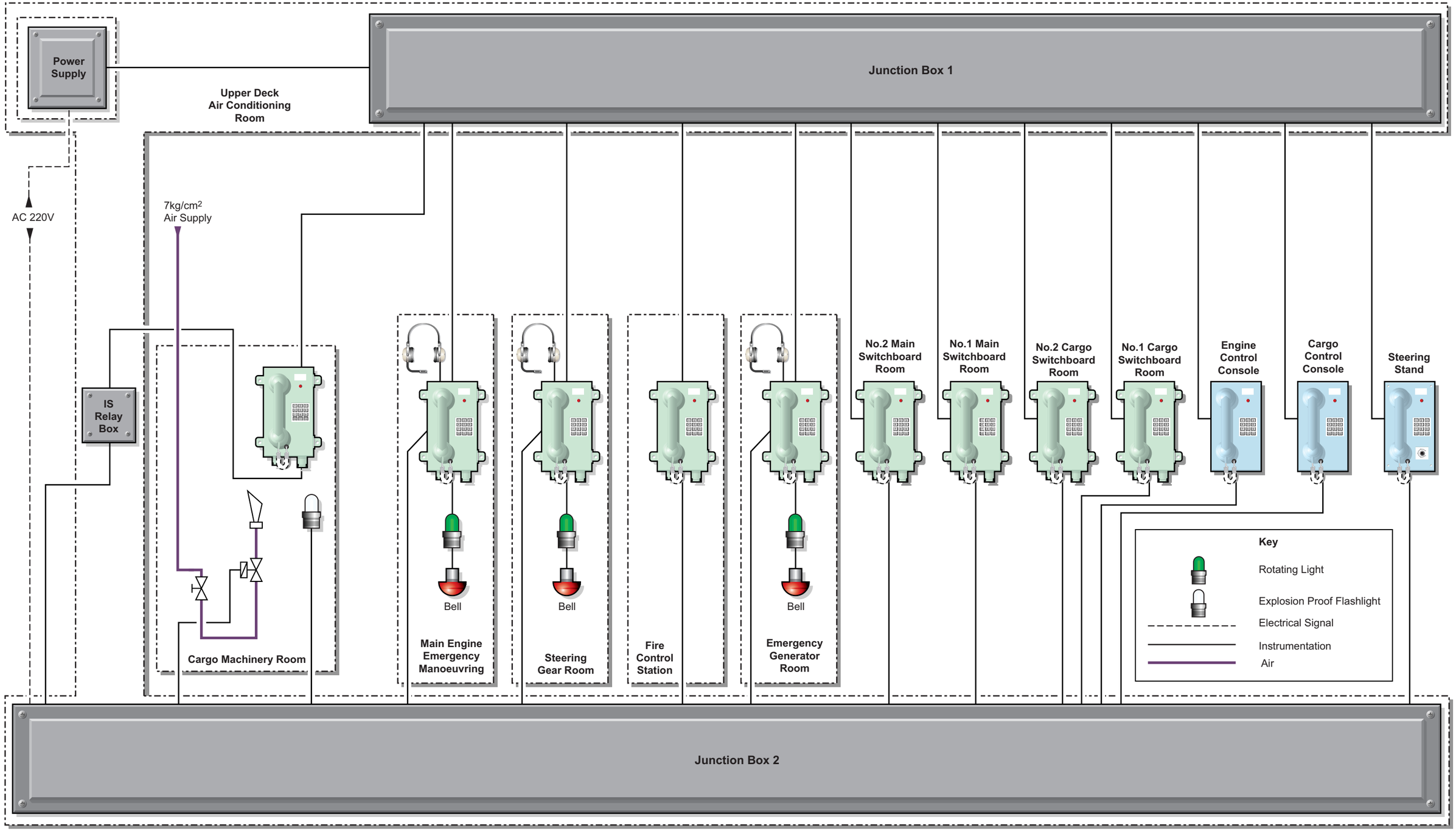


Illustration 2.7.2a Intrinsically Safe Sound Powered Telephone System



2.7.2 INTRINSICALLY SAFE SOUND POWERED TELEPHONE SYSTEM

Maker: CMR Korea Co Ltd

Overview

The intrinsically safe sound powered telephone system is installed on board to fulfil the demands of emergency communication between vital positions on the vessel during times of power failure or failure of the primary telecommunication system.

The system has units at the following positions:

- Steering stand
- Cargo control console
- Engine control room console
- No.1 cargo switchboard room
- No.2 cargo switchboard room
- No.1 main switchboard room
- No.2 main switchboard room
- Emergency generator room
- Fire control station
- Steering gear room
- Main engine emergency manoeuvring
- Cargo machinery room

Headsets with a noise cancelling microphone can be connected to the phones at the following locations:

- Emergency generator room
- Steering gear room
- Main engine emergency manoeuvring

Operating Procedure

Calling

a) Lift the handset of the telephone and use the keypad to dial the required extension.

b) Wait for the call to be answered and proceed with communications.

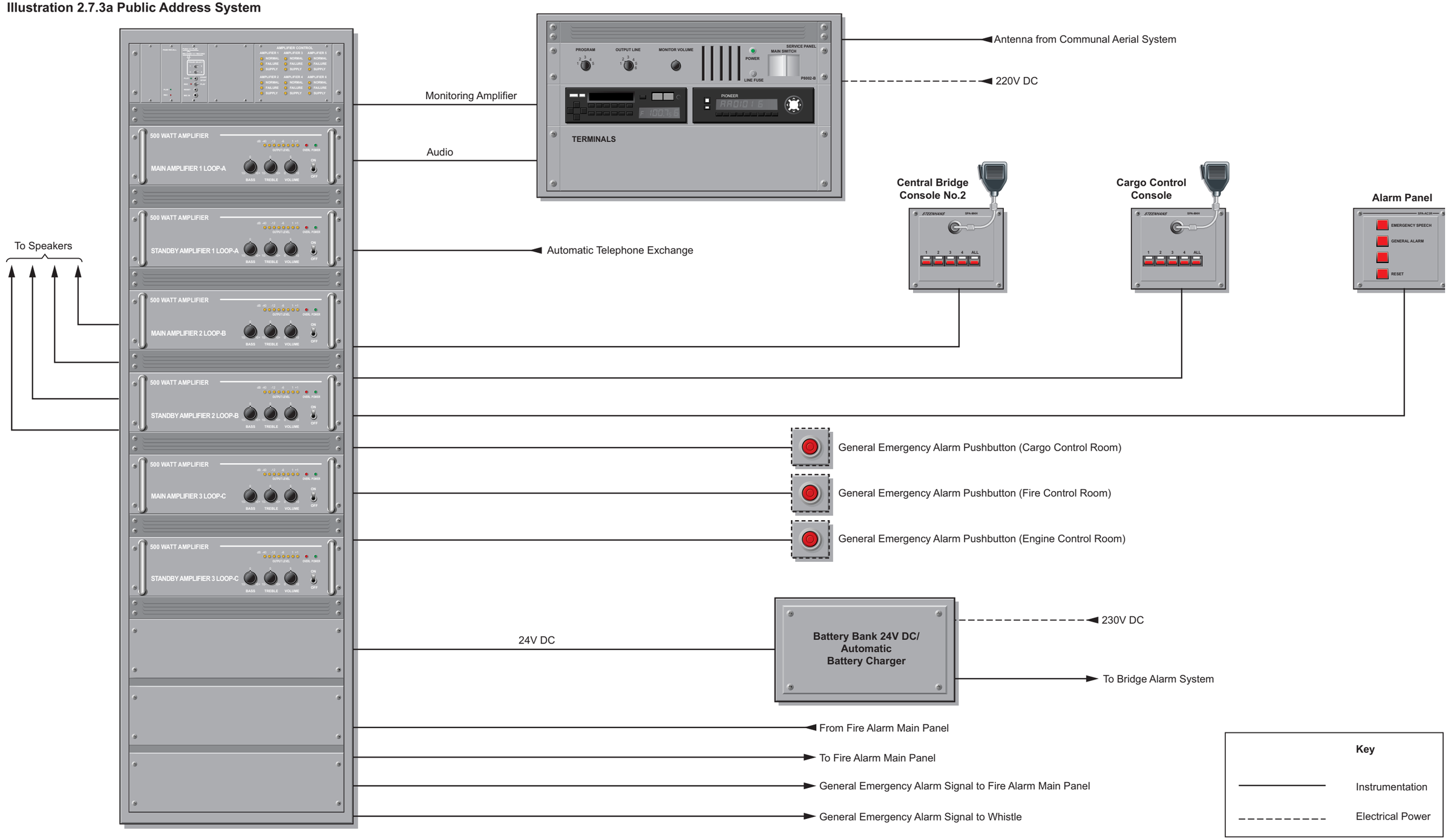
c) On completion of communications replace the handset.

Receiving a Call

a) When the telephone bell rings and the lamp lights lift the telephone handset. Proceed with communications.

b) On completion of communications replace the handset.

Illustration 2.7.3a Public Address System



2.7.3 PUBLIC ADDRESS SYSTEM

Maker: Stento ASA
Type: SPA-500

Overview

The SPA-500 Public Address (PA) system has been produced for the marine industry. The main amplifier rack and entertainment rack are situated in the electrical equipment room on A deck. The system allows for the broadcast of emergency as well as general announcements, and has inputs from the fire alarm repeater panel and automatic telephone exchange and an output to the ship's whistle system. The system is supplied with 220V AC and in the event of a power failure will be powered by 24V DC from a dedicated battery supply.

Main System

The main amplifier entertainment racks are situated in the electrical equipment room on A deck and comprise the following:

- 6 x power amplifiers (500W each)
- Amplifier monitor panel
- Alarm generator module
- PABX interface module
- Output service/monitor panel
- Radio/cassette unit and radio/CD unit

In addition to the above there are two microphone panels, one on the central bridge console No.2 and one in the cargo control room. One alarm panel situated on the central bridge console No.3 and three general emergency pushbuttons situated in the following locations:

- Cargo control console
- Fire control station
- Engine control console

Power Amplifier

Six of these units are situated in the main rack and provide amplification for different groups of speakers. Three amplifiers are classed as main amplifiers with three standby (back-up) units in case of failure. Each unit has its own individual power switch.

Radio/Cassette and Radio/CD Units

These units allow the operator to play pre-recorded audio tapes, CDs or live radio over the PA system for entertainment purposes.

Microphone Panel

This unit has a dynamic hand microphone with an integrated pressel switch. Its simple design offers four buttons for zone selection and an ALL AREAS button. After selecting an area to make a broadcast to, the operator uses the microphone to make an announcement. A general emergency alarm signal will take priority over any other broadcast in progress.

Alarm Panel

The alarm panel situated on the bridge allows the operator to make a priority emergency broadcast by selecting the EMERGENCY SPEECH button. The general alarm signal can also be activated from this panel by pressing the GENERAL ALARM button. Pressing the RESET button cancels a General Alarm signal request.

General Emergency Pushbutton

There are three of these button located as follows:

- Cargo control console
- Fire control station
- Engine control console

If it is necessary to sound the general emergency alarm signal it can be done by pressing the General Emergency pushbutton at one of the above locations.

Monitor Speaker Unit

This panel allows the operator to monitor an output signal, such as music, from the entertainment equipment rack. A monitor volume control knob is situated next to the speaker.

Paging

Announcements can be made from designated automatic phones on the ship. Refer to section 2.7.1 for further details.

Operation

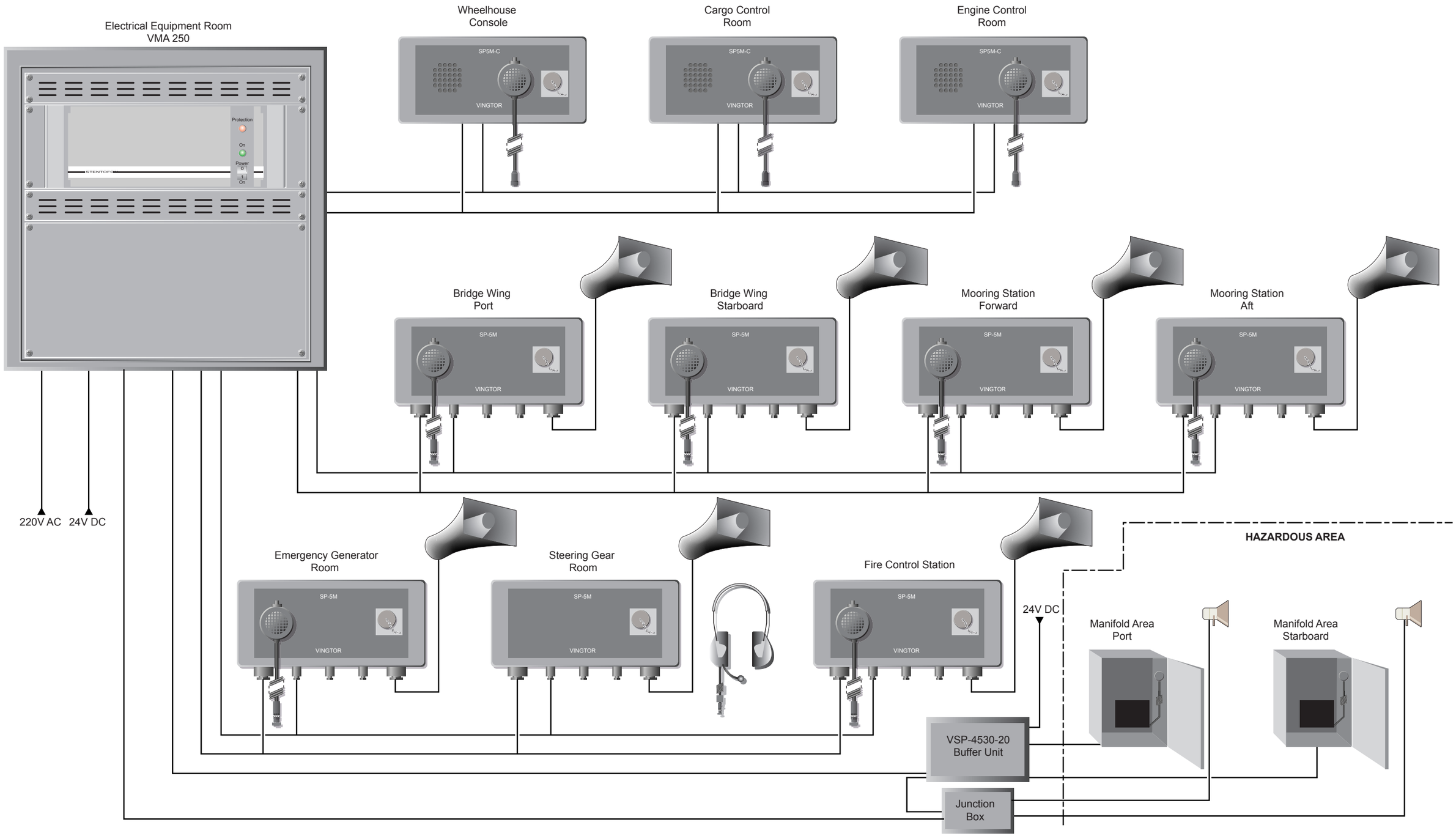
Before making an announcement check that the system is not already in use.

a) Press the speaker selection buttons to select the broadcast areas.

b) Press the switch on the microphone and proceed with the announcement.

c) When the announcement is complete release the microphone switch and deselect the speaker selection buttons.

Illustration 2.7.4a Deck Talkback System



2.7.4 TALKBACK SYSTEMS

Maker: Stento ASA
Type: SP-5-DC and SP-5-MC

Overview

There are two separate talkback/talk-through systems on board, independent of the PA system, one for the deck working spaces and one for the machinery spaces. Each is serviced by its own amplifier situated in the electrical equipment room. The deck system is serviced by the VMA 250 amplifier providing 250W of power while the machinery system is serviced by the VMA 120 amplifier providing 120W of power. Each unit is supplied with 220V AC and by 24V DC if the main supply fails. The volume adjustment control is situated at the back of the amplifier and under normal circumstances should not need to be adjusted after installation by the service engineer. The power switch is situated on the front of the amplifier and should always be left in the ON position.

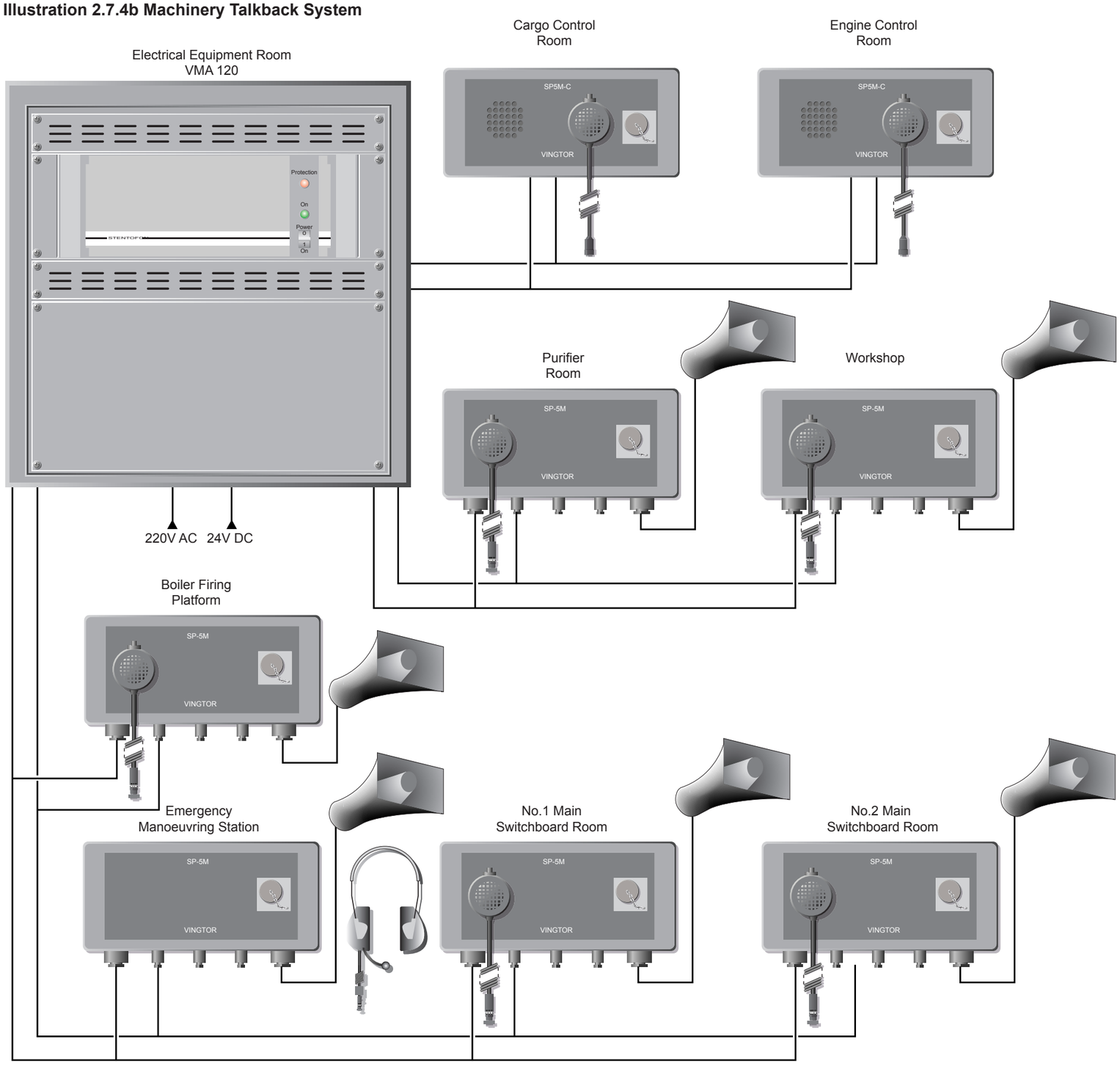
Operation

a) Press the hand held microphone switch or the press to talk switch on the headset switch unit.

b) Speak into the microphone. The message will be heard through every speaker or headset on the system. The speaker local to the microphone will be muted.

c) On completion of the message release the switch and listen for a response through the speaker or headset accordingly.

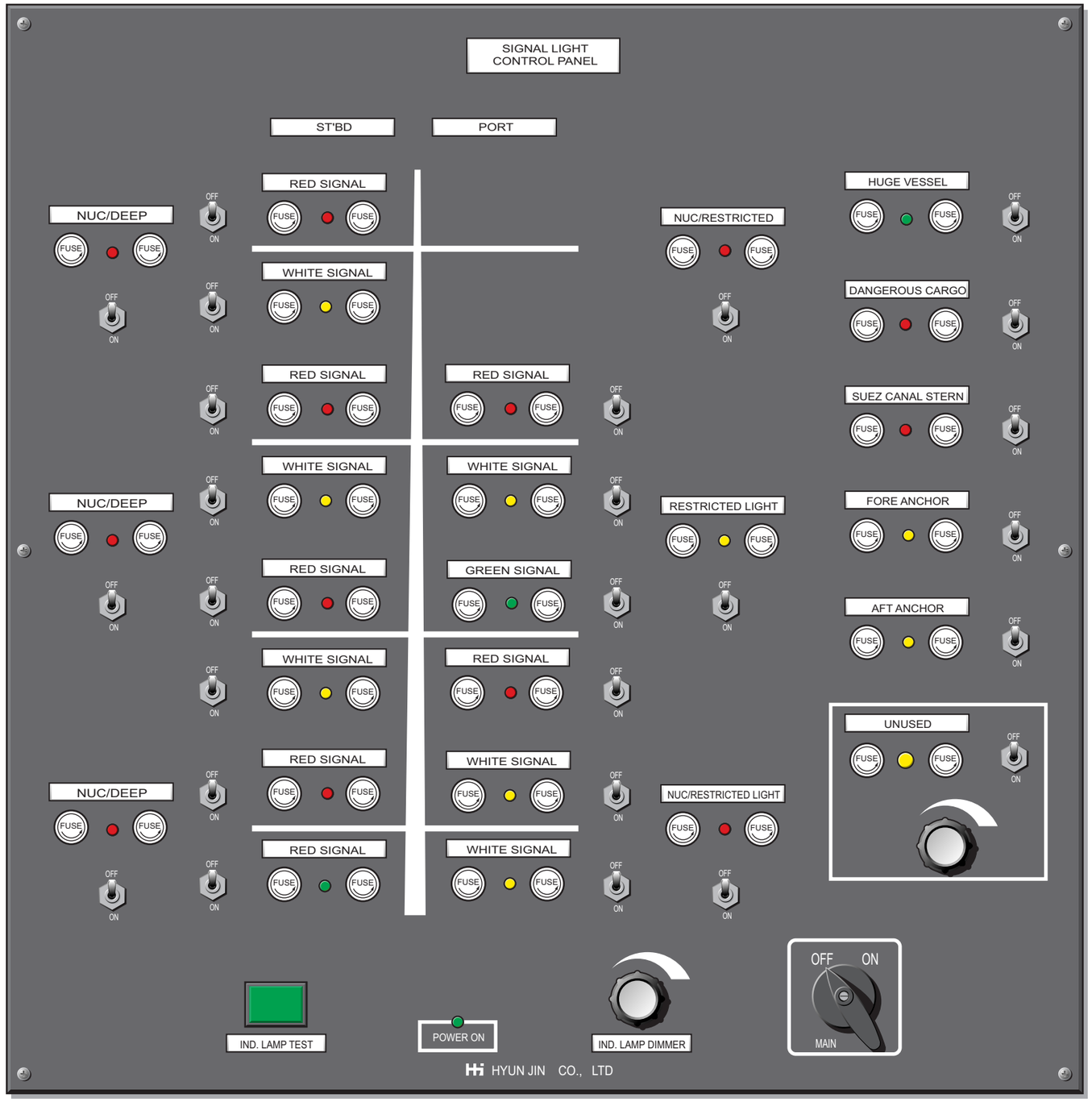
Illustration 2.7.4b Machinery Talkback System

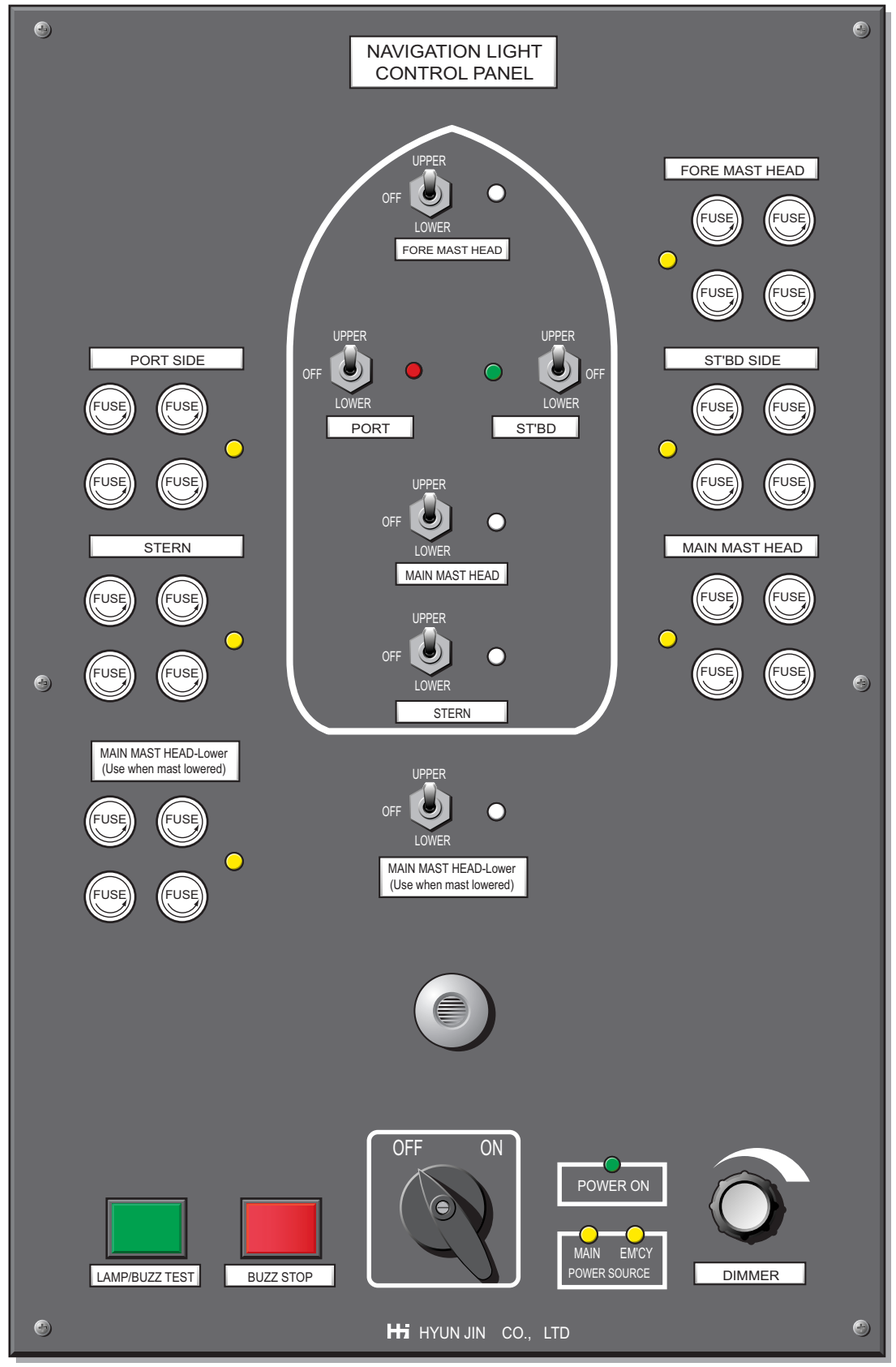


2.8 Lighting and Warning Systems

Illustrations

Illustration 2.8.1a Navigation and Signal Light Control Panels





2.8 LIGHTING AND WARNING SYSTEMS

2.8.1 NAVIGATION LIGHTS

Maker: Hyun Jin Co. Ltd

The control panel for the navigation lights is situated on the bridge console.

The officer of the watch must ensure that navigation lights are properly shown during his watch, in accordance with the applicable COLREGS.

Spare light bulbs must be kept accessible and ready for use. The navigation light system must be tested periodically.

The navigation light control panel is supplied from the main 220V AC switchboard and has a back-up supply from the emergency 220V AC switchboard.

Operation Procedure for Navigation Lights

a) Operate the MAINS switch to the ON position. If the power supply is abnormal, the buzzer will sound and a flashing LED will indicate if the main or emergency power supply has failed. If both the main and emergency supply have failed the panel buzzer will not sound and both indicator LEDs will be extinguished. In any of the above cases the central bridge system will indicate a failure.

b) Turn the appropriate navigation lights on by pushing the toggle switch to the upper position. The outside light and corresponding LEDs are illuminated.

The outside lights are constantly monitored. If a light failure occurs the buzzer will sound and the indicator LEDs for the failed light will flash. The bridge alarm system will also indicate the failure.

c) Press the BUZZER STOP pushbutton to mute the buzzer.

d) Push the toggle switch of the faulty light to the lower position. The indicator LEDs should stop flashing and be illuminated steadily. The buzzer output and the output to the bridge alarm system is cancelled.

The defective navigation light should be changed at the earliest possible opportunity.

Test Procedure for Navigation Lights

a) Operate the toggle switch for each navigation light, first in the upper position and then in the lower position. In each position confirm that the indicator LEDs are illuminated steadily and that the buzzer does not sound. The outside lights should be visually checked.

Other functions are available on the panel:

- Press the LAMP/BUZZ TEST pushbutton to perform a test of the indicator LEDs and alarm buzzer
- Use the rotary control knob DIMMER switch to adjust the illumination of the indicator LEDs

Signalling Lights

Morse/Manoeuvring Light

A morse/manoeuvring light is fitted on the radar mast. The light is controlled from the whistle system.

The signal light panel is supplied from the 220V emergency switchboard.

Signal Mast Lighting

In addition to the main navigation light panel there is a control panel for the signal mast lights situated on the chart console.

The coloured signal lights are arranged on the control panel in the same formation as they are fitted on the signal mast. Each light and its respective colour is identified by a small name plate, a toggle switch located beneath the name plate is used to operate the light.

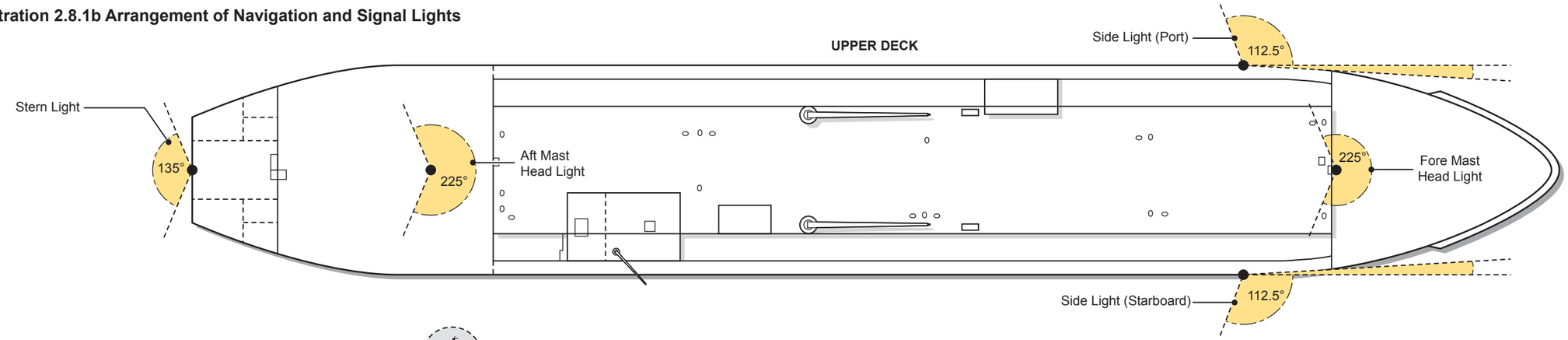
The purpose of the signal mast lights are to show that the vessel is carrying out specific operational tasks as defined in the IMO International Regulations for Preventing Collisions at Sea (COLREGS). During these operations a combination of these lights are displayed in addition to the required navigation lights.

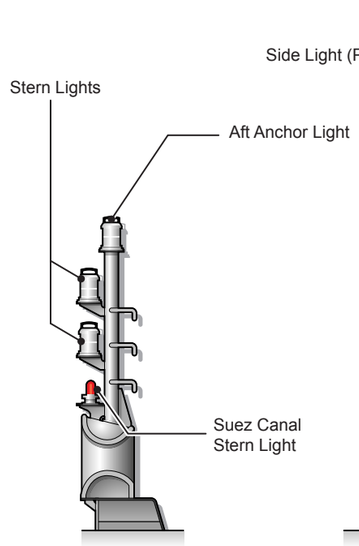
Certain countries have local regulations that require vessels to show additional lights signals to those required by the COLREGS and three of the more common are incorporated on the signal mast panel.

In Japanese waters the signal for a huge vessel is a flashing green light and for a vessel carrying dangerous cargo, a flashing red light. These lights are to be displayed as high as possible and to be visible through 360°.

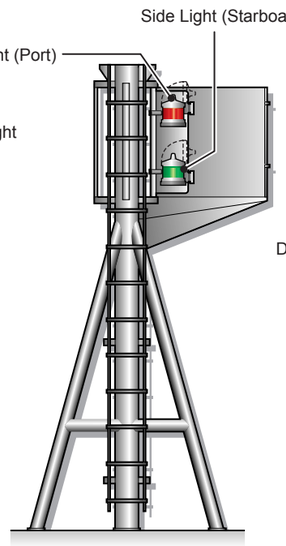
Vessels transiting the Suez Canal are required to display a red light at the stern.

Illustration 2.8.1b Arrangement of Navigation and Signal Lights

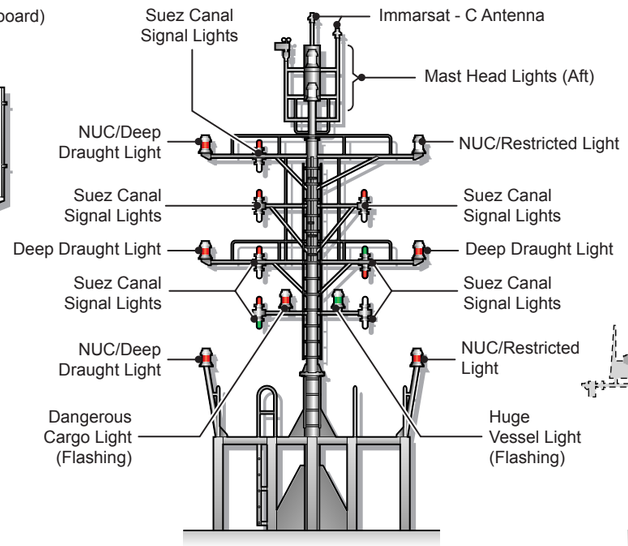




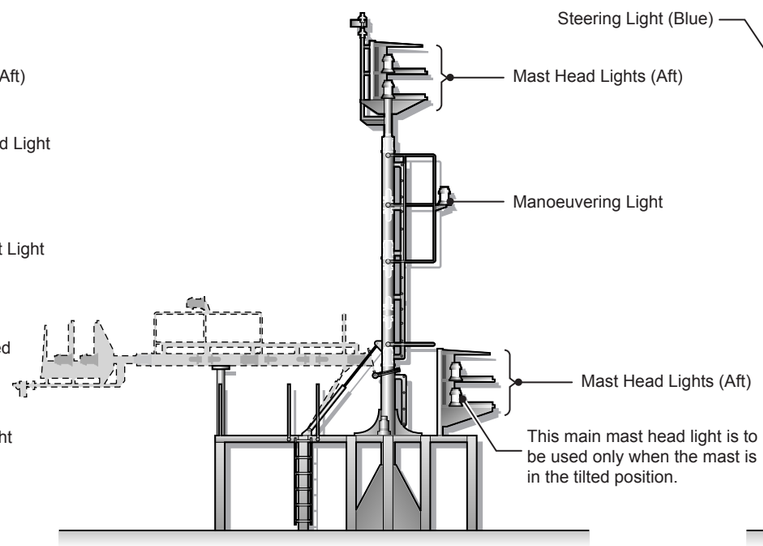
Stern Mast (Looking Port)



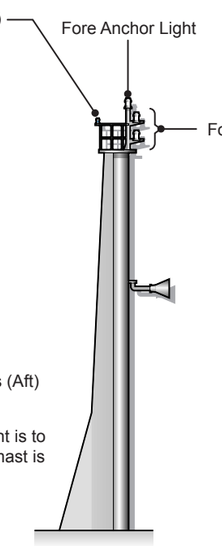
Side Light (Looking Centre)



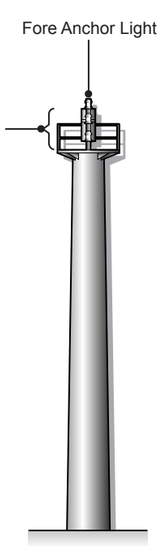
Main Mast (Looking Aft)



Main Mast (Looking Port)



Fore Mast (Looking Port)



Fore Mast (Looking Aft)

2.8.2 DECK LIGHTING

A deck and accommodation outdoor lighting control panel is situated next to the signal light panel on the port forward side of the chart and safety console on the bridge.

Bridge Wing Searchlights

A 1kW swivelling searchlight is situated on each bridge wing. Switches are adjacent to the lights and these lights can be directed to give additional illumination of the accommodation ladders.

Light	Distribution Board-Breaker
Port bridge wing	LD2-003
Starboard bridge wing	LD2-004

Boat Preparation Lights and Launching Lights

Each lifeboat station is provided with a single 500W metal halide lamp. The lamps are located at B deck level, whilst their respective switches are on A deck, located outside the watertight doors to the cross alleyway. These lamps are supplied from the emergency AC 220V system.

Port lifeboat	LE3-8A1
Starboard lifeboat	LE3-8B1

Lifeboat Embarkation Lights

Each lifeboat station has a single 500W metal halide lamp, the respective switches being adjacent to each lamp. These lights are fed from the AC 220V emergency supply system.

Starboard lifeboat embarkation	LE4-2A1
Port lifeboat embarkation	LE4-2B1

Forward Liferaft Preparation and Launching Lights

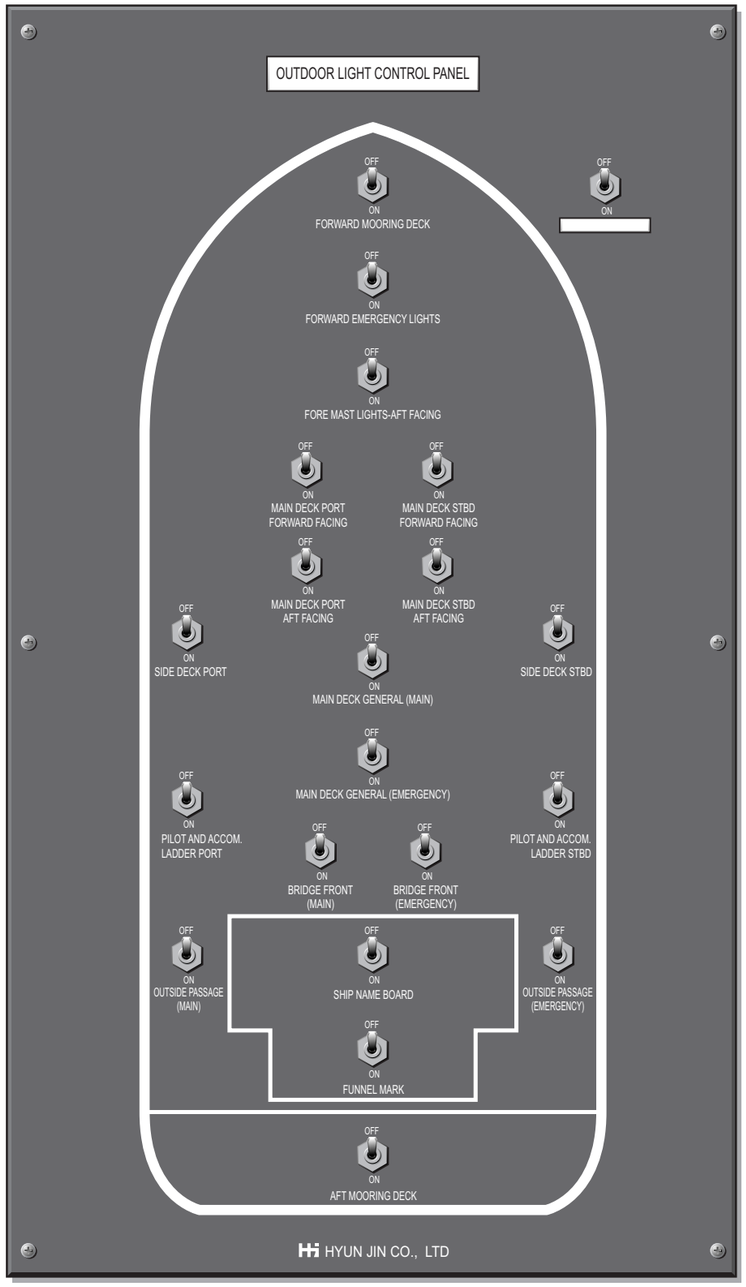
A 100W, explosion-proof cased incandescent lamp is fitted at the forward liferaft storage space. The switch is adjacent to liferaft LE1-3D1.

At the port and starboard shoulders 100W incandescent explosion-proof lights are provided, with local switches to facilitate the launching of the forward liferaft.

Port	LE1-2A1
Starboard	LE1-2B1

All three of these lamps are supplied from the emergency AC 220V system.

Illustration 2.8.2a Outdoor Lighting Control Panel



Floodlights

The trunk deck area illumination is provided mainly by 400W sodium lights, both singly and in pairs, located across the accommodation front, from three lighting posts on the trunk deck and from lights mounted on the foremast shining aft and outboard. Lights on the same light post are switched so that only the forward facing or aft facing lights can be turned on as necessary, to save 'blinding' the bridge view.

Certain of the trunk deck area lights are directed to cover the upper deck walkways.

Trunk Deck Area Illumination

From the Accommodation Front at Navigation Deck Level

4 pairs of 400W sodium lights directed forward.

Light	Distribution Board-Breaker
Port outer	LD2-4A1
Port inner	LD2-5A1
Starboard inner	LD2-6A1
Starboard outer	LD2-7A1

2 single 400W sodium lights directed forward.

Port	LE2-9A1
Starboard	LE2-9A2

Port Aft Lighting Post (Fr 92)

Light-Direction	Distribution Board-Breaker
Single 400W sodium outboard	LD8-11A1
Single 400W sodium aft and outboard	LD8-11A2
Single 400W sodium forward and inboard	LD8-12B1
Single 400W sodium inboard	LD8-17A1
Single 400W sodium aft	LD8-17A2

Starboard Lighting Post (Fr 107)

Light-Direction	Distribution Board-Breaker
Single 400W sodium forward and outboard	LD8-6A1
Single 400W sodium aft and outboard	LD8-6A2
Pair 400W sodium forward	LD8-7A1
Pair 400W sodium forward and inboard	LD8-8A1
Pair 400W sodium aft and outboard	LD8-9A1
Pair 400W sodium aft and inboard	LD8-10A1

Port Forward Lighting Post (Fr 117)

Light-Direction	Distribution Board-Breaker
Single 400W sodium forward and outboard	LD8-1A1
Single 400W sodium aft and outboard	LD8-1A2
Pair 400W sodium forward	LD8-2A1
Pair 400W sodium forward and inboard	LD8-3A1
Single 400W sodium inboard	LD8-3B1
Pair 400W sodium aft and inboard	LD8-4A1
Pair 400W sodium aft	LD8-5A1

Foremast

4 pairs of 400W sodium, directed aft from the foremast.

Light-Position	Distribution Board-Breaker	
Pair 400W sodium upper top port	LD1-3A1	Aft
Pair 400W sodium upper top starboard	LD1-3B1	Aft
Pair 400W sodium lower top port	LD1-4A1	Aft
Pair 400W sodium lower top starboard	LD1-4B1	Aft

On each side of the foremast one single and one double 400W sodium lamps are directed outboard to illuminate the trunk deck.

Pair 400W sodium port	LD1-14A1	Outboard
Pair 400W sodium starboard	LD1-14B1	Outboard
Single 400W sodium port	LE1-1A1	Outboard
Single 400W sodium starboard	LE1-2A1	Outboard

On Top of the Mid Deck Store

Light-Position	Distribution Board-Breaker
Single 400W sodium directed inboard	LD8-13B1
Single 400W sodium directed forward	LD8-13B2
Single 400W sodium directed outboard forward	LD8-14A1
Single 400W sodium directed outboard aft	LD8-14B2

On Top of the Cargo Machinery Room

Light-Position	Distribution Board-Breaker
Single 400W sodium explosion proof directed inboard	LD7-22F
Single 400W sodium explosion proof directed aft	LD8-13C1

Manifold Area

Light-Position	Distribution Board-Breaker
Single 400W sodium explosion proof aft of starboard manifold area directed forward	LD8-12A
Single 400W sodium explosion proof aft of port manifold area directed forward	LD8-13A

Windlass Area

Three pairs of 400W sodium and two single 400W sodium lamps are directed towards the windlass area from the foremast.

Three pairs of 400W sodium directed forward from the foremast towards the windlass area

Light-Position	Distribution Board-Breaker
Pair 400W sodium forward and above camera	LD1-2A1
Pair 400W sodium forward and port of camera	LD1-1A1
Pair 400W sodium forward and starboard of camera	LD1-1B1

Two single 400W sodium directed forward from the foremast towards the windlass area.

Single 400W sodium forward and below camera port	LD1-2B1
Single 400W sodium forward and below camera starboard	LD1-2B2

Illuminating Upper Deck Walkways

In addition to coverage provided by lights directed at the upper deck walkways, lighting is also provided from single 400W sodium lights directed fore and aft from the side light posts, located forward at upper deck level and from the front of the accommodation at B deck level. Additionally three double 20W explosion-proof fluorescent fitting, supplied from the emergency switchboard, are provided under each manifold platform to illuminate the upper deck walkway and the shore connection box.

Handrails at B Deck Level at Front of Accommodation

Light-Position	Distribution Board-Breaker
Single 400W sodium port side forward	LD8-11B1
Single 400W sodium starboard side forward	LD8-14B1

Port Side Light Post – Main Deck

Light-Position	Distribution Board-Breaker
Single 400W sodium forward	LD1-5A1
Single 400W sodium aft	LD1-5A2

Starboard Side Light Post – Main Deck

Light-Position	Distribution Board-Breaker
Single 400W sodium forward	LD1-6A1
Single 400W sodium aft	LD1-6A2

Funnel Deck

Three 500W metal halide lamps are located on the funnel deck, two directed to illuminate the funnel and one to illuminate the handling space area.

Light-Position	Distribution Board-Breaker
500W metal halide port side directed inboard towards funnel	LD2-9A
500W metal halide starboard side directed inboard towards funnel	LD2-9
500W metal halide forward pivotable above handling space area	LD4-17A

A further single 500W metal halide light is provided on the aft end of the accommodation at C deck level to illuminate the swimming pool.

500W metal halide lamp above swimming pool	LD4-18A

Ship's Nameboard Light

A single 500W metal halide lamp is provided to illuminate the ship's nameboard on each side of the monkey island.

Light-Position	Distribution Board-Breaker
500W metal halide lamp port	LD2-8
500W metal halide lamp starboard	LD2-8A

Accommodation/Pilot Ladder Light

A single 500W flame-proof metal halide light is provided on the upper deck on each side to illuminate accommodation ladders.

The bridge wing searchlights are used for accommodation ladder illumination.

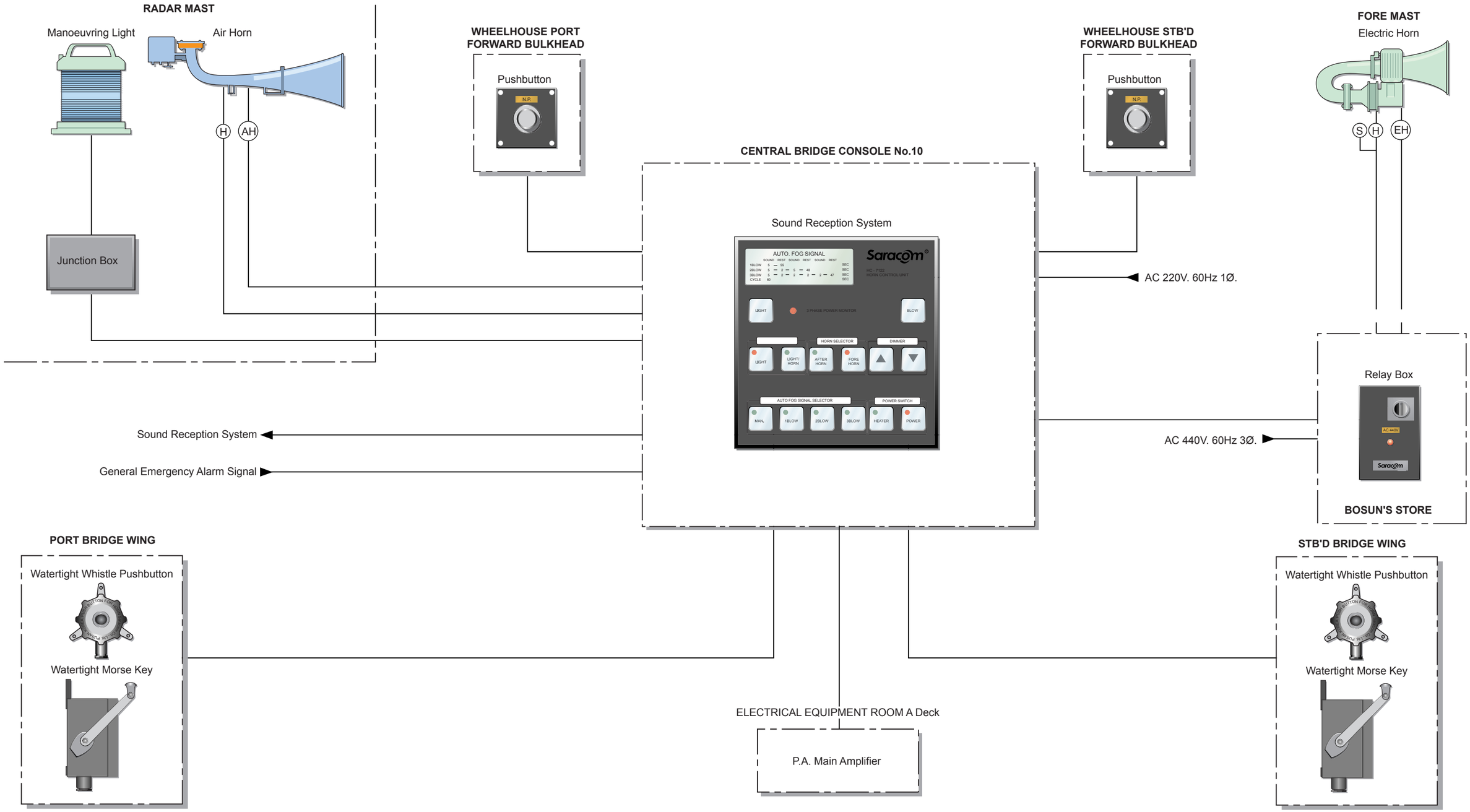
Light-Position	Distribution Board-Breaker
500W explosion-proof metal halide lamp port	LD7-015
500W explosion-proof metal halide lamp starboard	LD7-016

Poop Deck Area

Four pairs of 400W sodium lamps are provided to illuminate the aft mooring area

Light-Position	Distribution Board-Breaker
Pair 400W sodium aft funnel D deck port	LD7-20A1
Pair 400W sodium aft funnel D deck starboard	LD7-20B1
Pair 400W sodium aft funnel C deck port	LD7-21A1
Pair 400W sodium aft funnel C deck starboard	LD7-21B1

Illustration 2.8.3a Whistle System



2.8.3 WHISTLE SYSTEM

Maker: Saracom
Model: HC-7122

Overview

Two whistles are fitted on the vessel. An electrically operated whistle is mounted on the foremast and an air operated whistle is mounted on the radar mast. A manoeuvring light is also fitted on the radar mast.

The whistle control panel unit is mounted on the central bridge console No.10. The general alarm signal is also fed to this unit. Should the general alarm be activated the alarm signal would be sounded through the selected whistle, alerting personnel on deck as well as other vessels in the immediate vicinity.

Two whistle pushbuttons are located in the wheelhouse one on the port forward bulkhead and the other on the starboard forward bulkhead. There is a watertight manual whistle pushbutton and a watertight morse switch situated on each bridge wing.

Operation

Once the unit has been powered up the operator can use the membrane type switches to make the required selection. To make a selection, the switch for the required function must be pressed and the switch LED will be illuminated. To cancel the selection simply press the switch again and the LED will be extinguished. An illuminated LED on a switch indicates that the switch selection is active.

Refer to the illustration opposite for a functional description of each switch.

Illustration 2.8.3b Whistle System Control Panel

An illuminated switch LED indicates that the selection is active.

2.8.4 FOG BELL AND GONG SYSTEM

Fog Bell and Gong System

Maker: Saracom
Type: Amplidan 21500

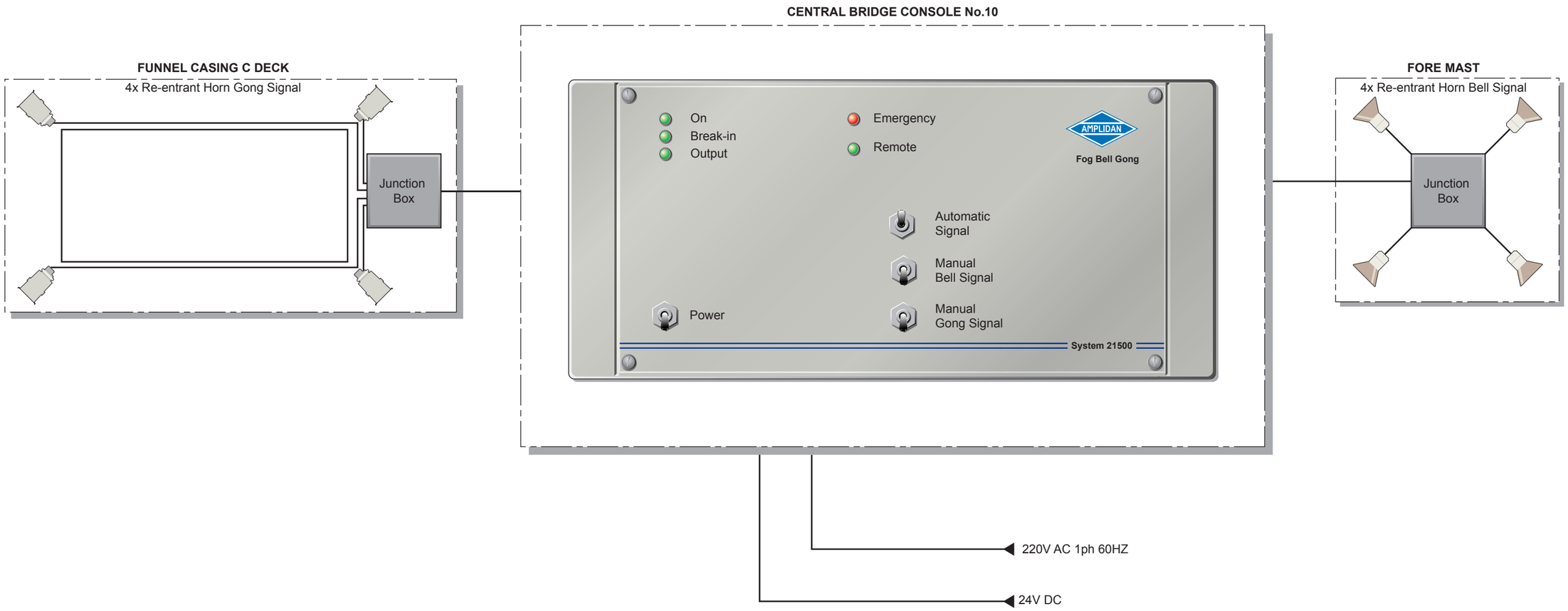
The Fog Bell and Gong system is an audio system for the automatic sounding of bell and gong signals while at anchor in reduced visibility.

The system is designed for centralised operation from the main control unit which is mounted on the central bridge console No.10.

The signal comprises of a 6.6 second bell signal transmitted from the forward re-entrant type horn speakers followed, after a 3.3 second silence period, by a 6.6 second gong signal transmitted from the aft re-entrant type horn speakers. The sequence repeats after a further 16.5 second silence period.

Both the bell and gong system can be operated manually using the manual bell signal and manual gong signal switches on the control panel.

Illustration 2.8.4a Fog Bell and Gong System



2.8.5 SOUND RECEPTION SYSTEM

Maker: Phontech
Model: SR8200

Overview

The sound reception system is an electronic audible aid to navigation. It allows the officer of the watch to hear outside sound signals inside the enclosed wheelhouse. The system as installed on board comprises the following:

- An SR8200 master station (control unit)
- Two SR8201 microphones - both microphones are mounted on top of the wheelhouse, one on the starboard side and one on the port side.

The SR8201 microphones pick up audible signals in the range 70Hz to 820Hz which are then reproduced in the speaker of the master station. The microphones are designed to withstand the elements and their siting is very important.

The system parameters will be set by a commissioning engineer. This system configuration is not compliant with the IMO regulation MSC 70/23/Add.2.

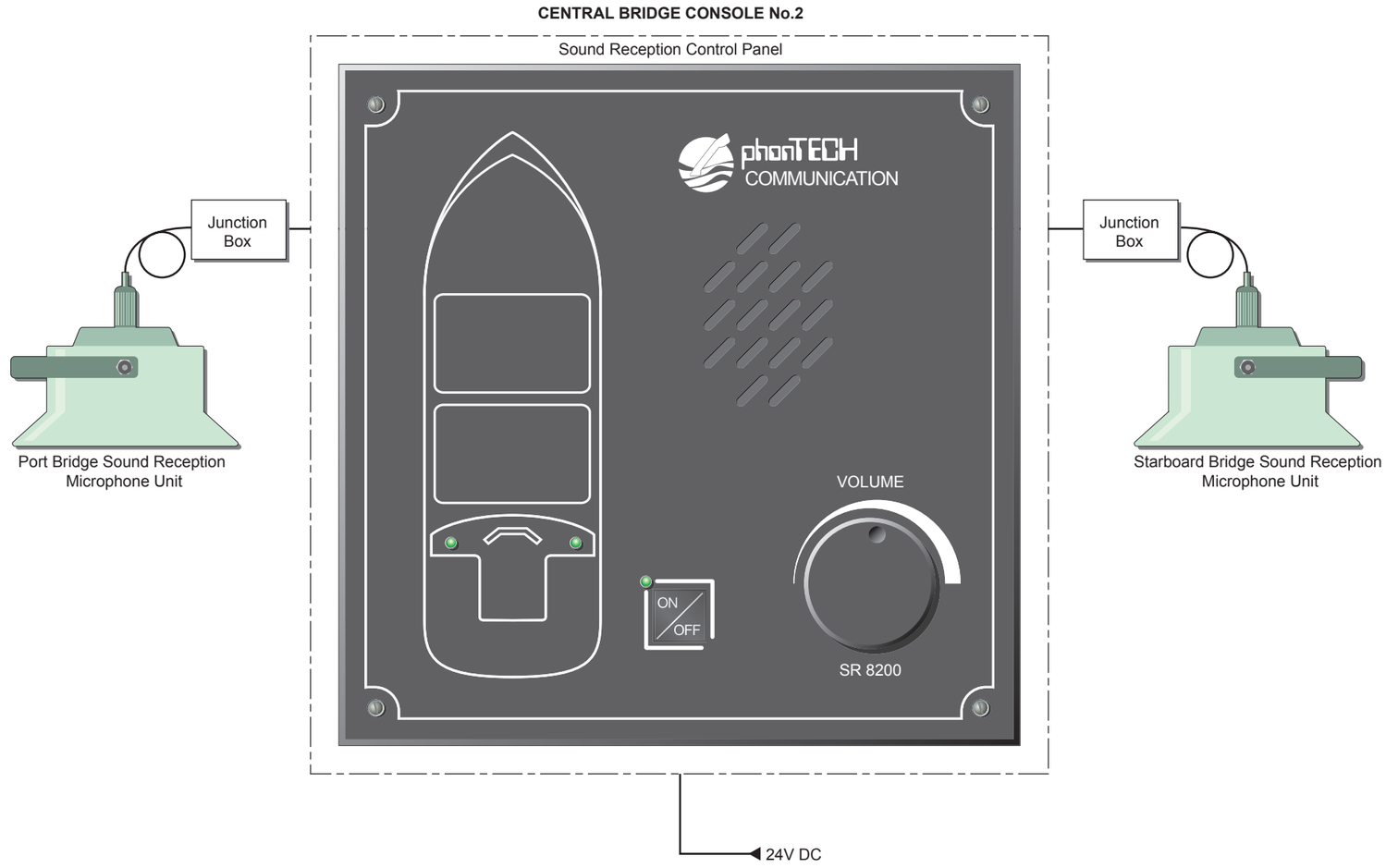
Operation

On the master station unit there is an on/off power switch to switch the unit on or off. When the unit is switched on the speaker volume can be adjusted by rotating the volume control knob clockwise or anti-clockwise.

When a sound signal from another vesel is detected, the red indicator lamp on the panel on the side from which the signal orginates is illuminated. The sound signal is also audible from the speaker unit.

The ship's own fog signal system is linked into the sound reception system, so that when the own ship sounds a fog signal the reception system input from the microphone unit is supressed preventing a false indication and damage to the reception unit.

Illustration 2.8.5a Sound Reception Control Panel

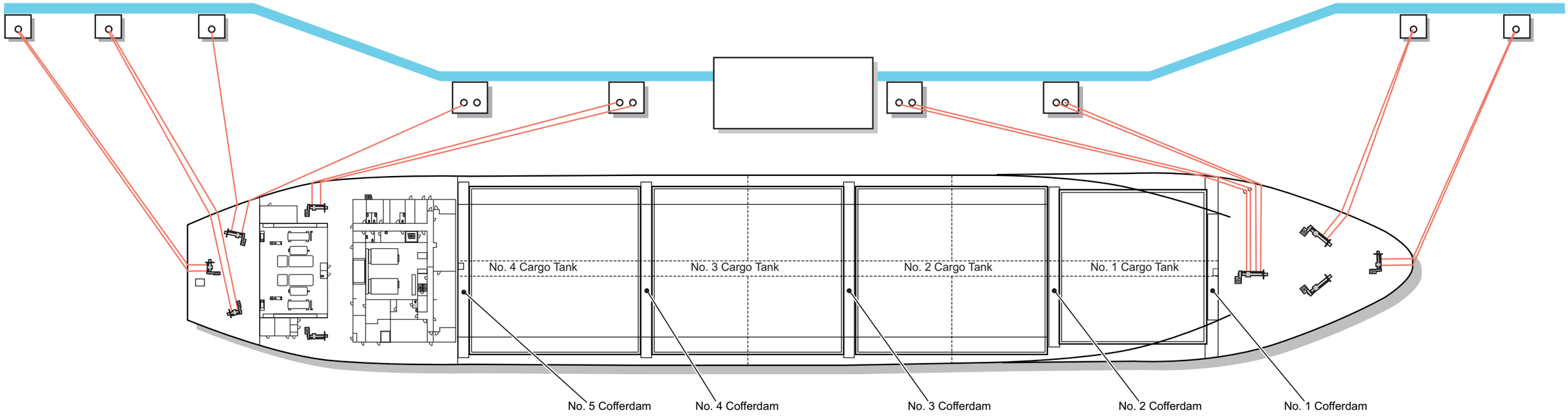


PART: 3: DECK EQUIPMENT

3.1 Mooring Arrangement

Illustrations

Illustration 3.1.1a Mooring Arrangement



3.1 MOORING ARRANGEMENT

3.1.1 MOORING WINCHES AND CAPSTANS

Maker: Friedrich Kocks Gmbh
Model: CEH 5530

Mooring Winch

Nine mooring winches are provided:

- Two on the port and starboard sides of the upper deck forward with two rope drums each, combined with the two anchor windlasses
- One with two rope drums on the centreline of the upper deck forward, aligned fore and aft
- One with three rope drums on the centreline of upper deck forward, aligned athwartships
- Two with two rope drums adjacent to the machinery casing on the upper deck aft, aligned athwartships
- One with two rope drums on the starboard side of the poop deck aft
- One with three rope drums on the port side of the poop deck aft
- One with two rope drums on centerline of the poop deck aft, aligned fore and aft

Driving Unit

All of the winches on the vessel are self-contained units, requiring only an electrical supply to operate. Each drive unit has a constant speed electrical motor (the three drum winches and the windlasses have two drive units) driving a hydraulic pump. The hydraulic pump drives a hydraulic motor which can be varied from no load to full load. The hydraulic motor drives the pinion shaft through a three step reduction gearbox. The individual drums are then manually clutched to the pinion shaft.

(Note: The warping drum is keyed to the pinion shaft and cannot be disconnected.)

All hydraulic components, including the gears, are contained in a single main gear casing. There are separate sumps for the hydraulic components and the gear casing both contained within the main gear casing. The hydraulic oil components are permanently submerged in the hydraulic sump, while the gears are splash lubricated in the gear sump. Pinion bearings are grease lubricated through grease nipples.

The winch is protected from any overload condition by a safety valve on the hydraulic circuit.

Each winch unit has a multi-disc brake located on the shaft of the first intermediate gear. In the event of a power failure or hydraulic failure, the disc brake will close, locking the winch in its current position. The disc brake is in operation at all times except when the winch controls are being used.

Each winch has its own self-contained electrical control panel. This panel fulfils all electrical starting and control functions for the winch unit. It provides controls and alarm functions as follows (for each motor, where applicable):

- Start/stop pushbutton
- Power available
- Running
- High motor temperature
- High oil temperature
- Filter service required

Rope Drum

Each winch has two or three declutchable split drums (as indicated previously) each with a spindle band brake:

Drive source:	Electro-hydraulic
Wire capacity:	275 metre, 44mm diameter rope
Clutch control:	Manual
Brake control:	Manual
Winding load:	300kN
Winding speed:	15 m/min
Slack rope speed:	45 m/min
Brake capacity:	997kN

Warping Drum

Each winch has one fixed warping drum keyed on the main shaft which is of a non-whelp construction:

Winding load:	300kN
Winding speed:	15 m/min
Slack rope speed:	45 m/min

CAUTION

The mooring winch motors are only continuously rated for 60 minutes use. It is therefore important that the winches are not started until they are needed.

Winch Controls

Local

A local control block is mounted on each winch and is activated by a three position lever which, on release, is spring centred to the stop position. The other two positions are heave and lower. The speed is variable, according to the amount the lever is deflected towards the heave or lower positions, within the range of the electro-hydraulic unit. Speed is steplessly controlled by the relative position of the control lever.

Remote

Each winch unit has at least one remote stand positioned at the ship's side in a position with a clear view of the mooring operations. Most of the winch units have two remote control positions on both sides of the vessel. The remote control stands have, in many cases, controls for two of the mooring winches.

The basic controls are identical to the local control levers. Additionally, each remote control stand has the following items:

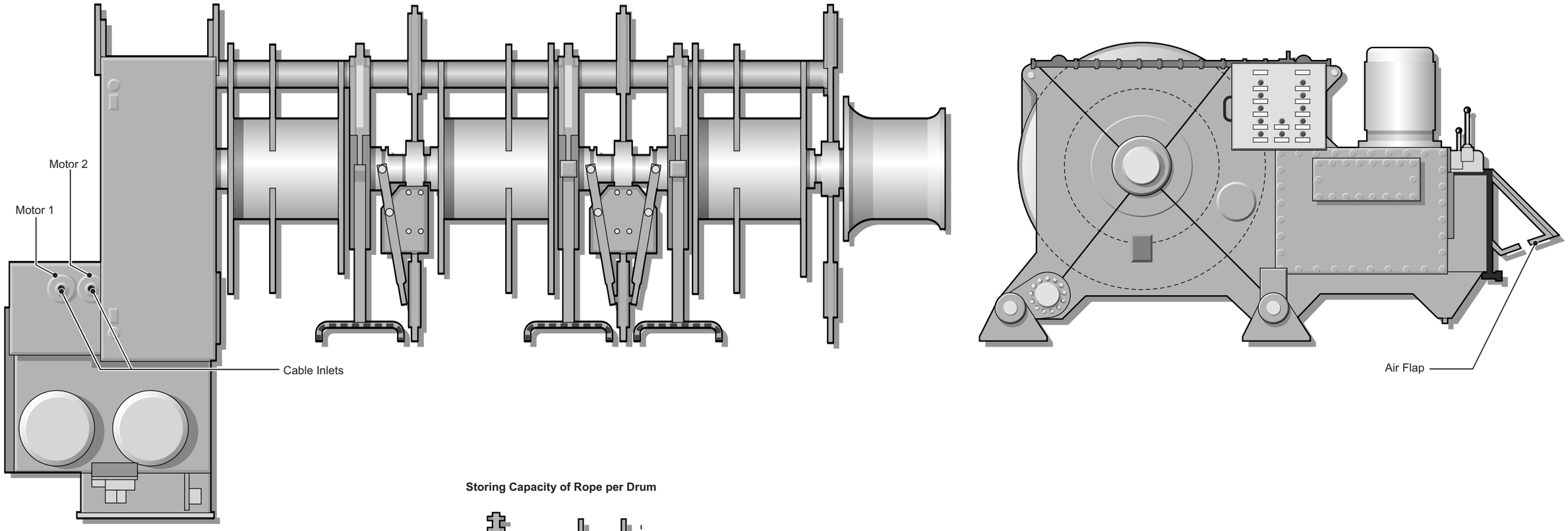
- Pushbutton and indicator light for TAKE OVER, indicating which position has control of the winch
- Emergency stop button
- Ammeter for each individual motor

The remote stands are fitted with protective covers to protect against weather and corrosion.

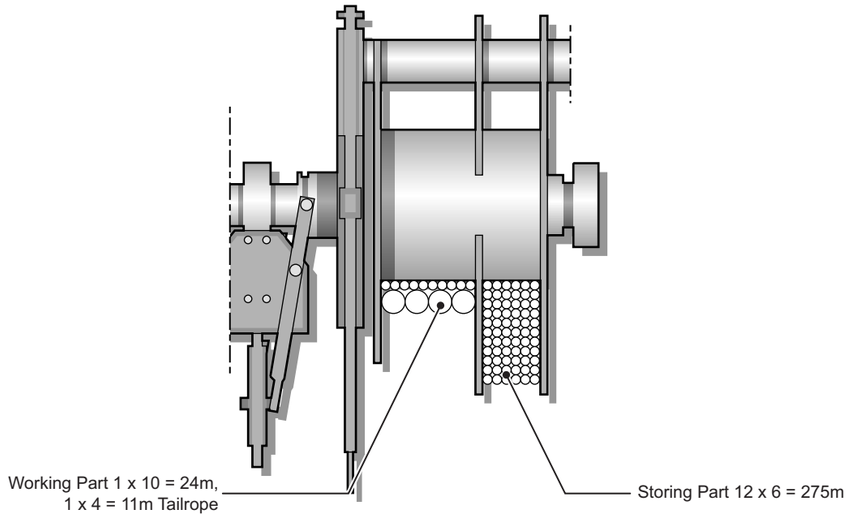
WARNING

On no account must more than one operating position be in use at the same time. The local control position will always override the remote position commands.

Illustration 3.1.1b Three Drum, Two Motor Mooring Winch



Storing Capacity of Rope per Drum



Rope Diameter: 44mm
Capacity: 300kN x 15m/min

Split Type Mooring Drum:
Working Part: 1 Layer/10 Turns
Stowing Part: 12 Layers/6 Turns
BL = 127 Ta = 1.246kN
Brake Holding Force: 997kN

Conventional Mooring

Mooring Complement

No.	Type
22	Mooring ropes, 275m x44mm Marlow STEELITE XTRA SUPERLINE, BS127tonne
22	11m x 88mm Marlow HERCULES 8 strand multiplait polyester rope tails, BS 159 tonne. Each with a leather protected 2m eye for where port regulations require their use
22	TONSBERG PL-95T shackles SWL 61tonne
2	Towing springs, MEGAFlEX, 8 strand plaited (PP danline 60% polyester 40% mixed) BS110 tonne

A typical minimum arrangement for mooring would be using the 2/2/2 configuration, twelve would be in use. Forward on the focsle, the head line winch has two drums and would have two head lines deployed in front of the vessel. Each anchor windlass has two rope drums and the windlass nearest the berth would have its two lines deployed as breast lines. The athwartships winch aft of the anchor windlasses would have two lines deployed as spring lines.

Adjacent to the machinery casing are two further winches, each with two drums. These would normally be used for springs. The poop deck winch nearest the berth would have two lines deployed as breast lines and the stern line winch would have its two lines deployed as stern lines behind the vessel.

The above could be considered as an absolute minimum with further lines to be used as local conditions and berthing arrangements require.

Operation of the Winches

a) Remove the covers from the winch.

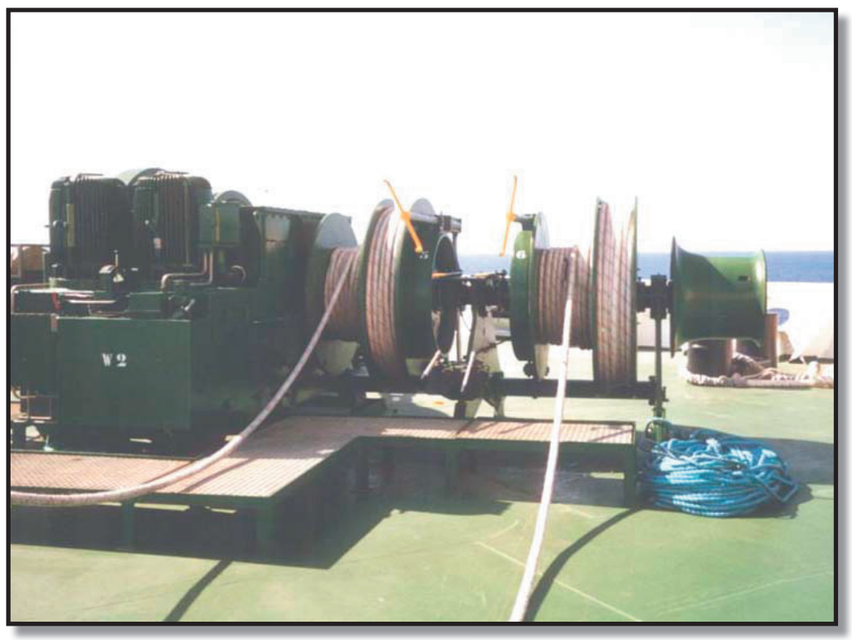
b) Check the oil level in both the hydraulic oil sump and the gearbox sump. Open the oil cooler air flap.

c) Ensure that the control lever is in the NEUTRAL position and that all clutches are disengaged.

d) Turn on the power at the control panel by pressing the START button. Check that the indicating panel shows no irregularities. Ensure that the winch is free to turn in both directions.

e) Engage and lock the required clutch

f) Release the appropriate band brake.



Mooring Winch

g) Move control to the required control stand.

h) Pay out or haul in the rope as required.

i) Stop the winch by ensuring that the control lever is in the NEUTRAL position, then press the STOP button.

j) Engage the drum brake and disengage the clutch lever.

(**Note:** If the units are operating in cold conditions (ambient temperature below +3°C), the winches should be rotated slowly on the low speed setting until the component parts are warm, thereafter use the system as normal.)

Ship Side Controls

Capstans

Maker:	Shin Myung Tech.Co.Ltd.
Winding Load:	1000kg
Winding speed:	25m/min
Diameter of drum:	250mm
Air Motor	
Type:	SMP-7P-600SR
Capacity:	7.3 PS x 660RPM
Air pressure:	9kg/cm^2
Total weight:	450kg/set
No.of capstans:	4

Four air driven capstans are provided to assist with the handling of moorings from tugs etc. They are located at the forward and aft end of the main deck adjacent to the bitts used by the tugs etc.

Operation of the Capstan.

a) Remove the covers from the winch.

b) Check the filters to ensure they are clear.

c) Blow through the deck air connection to remove any moisture in the air supply.

d) Connect the flexible air hose from the deck connection to the capstan.

e) Test the capstan by depressing the foot control pedal.

(**Note:** The direction of turn of the capstan is indicated by a large arrow on the top of the warping drum. The operator should ensure that any ropework is applied in the correct direction with the correct number of turns for the task in hand. Refer to the Oil Companys International Marine Forum booklet Effective Mooring).

Air Driven Capstan

3.1.2 ANCHORING ARRANGEMENT

Combined Anchor Windlass/Mooring Winches

Maker: Friedrich Kocks Gmbh
Model: CEH 1908

Windlass

The windlass consists of one declutchable cast steel cable lifter with a braking unit. There is a chain stopper included for each cable lifter.

Performance of Cable Lifter

Maximum static load:	950kN
Lifting load:	475kN
Lifting speed:	9 m/min
Chain diameter:	100mm
Brake capacity:	3177kN

Details of the Ship's Anchors

No. of anchors:	Two fitted
Weight of anchor:	12,675kg (high holding power)
Diameter of chain:	100mm
Length of chains:	14 shackles port and starboard

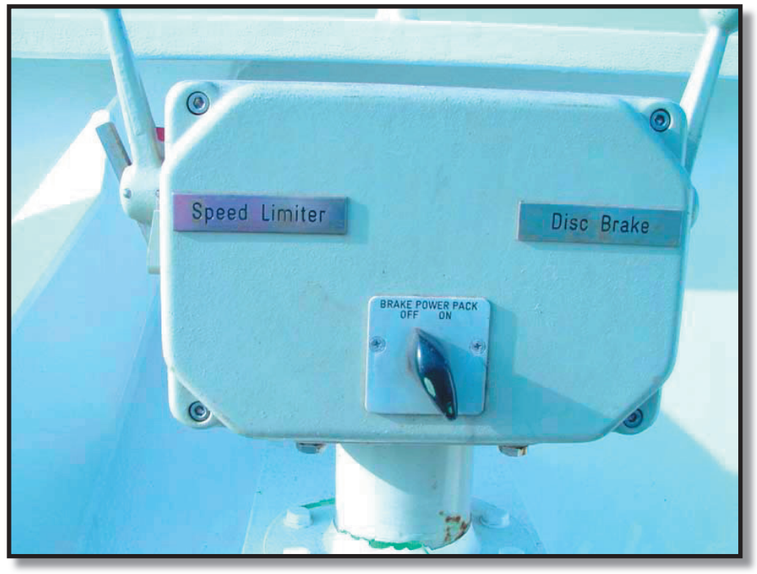
Cable Lifter

Each cable lifter is of five whelp construction and is equipped with a chain stopper unit. The chain stopper unit is of welded steel construction with a bar type compressor and a locking bolt (with toggle pin). Additionally, there is a turnbuckle/wire type chain stopper integral to each chain stopper unit.

Two high holding power anchors of cast steel construction are fitted along with an anchor chain of extra high strength steel. The chain is connected to the anchor with a swivel and Kenter joining shackle. A further joining shackle is fitted every shackle i.e. 1st shackle, 2nd. shackle etc. The end of each anchor cable is secured at the upper part of the chain locker with a release system which can be operated from outside the locker.

Hydraulic Brake Unit

Each windlass is fitted with two separate braking systems. There is a manual/ hydraulic band brake and a hydraulically operated disc brake. These brakes allow safer anchor drops through easier and more precise control of the anchor chain. Both brakes are operated from a remote control stand positioned at the side of the vessel with a clear view of the anchoring operation. The remote control stand incorporates a braking system ON/OFF switch, which activates both systems.



Band Brake

The band brake is the static brake used to secure the anchor when in position. The tension on the band brake can be adjusted using the handwheel. This, in turn, can be used to adjust the final speed of the anchor, thus the band brake acts as a speed limiter. The band brake is disengaged hydraulically and engaged by spring force. The hydraulic tacho-generator measures the chain speed and regulates the pressure in the brake cylinder accordingly. If the chain speed is too high, the oil presssure in the brake cylinder is reduced and the brake engaged by the spring force. Normally, the hydraulic pressure is off the band brake making the anchor secure in its current position.

The band brake can be released hydraulically from the remote operating stand positioned with a view over the side of the vessel. The band brake is released by moving a control lever away from its locked closed position to the locked open position.. The lever is spring centred and if the lock is released, when the lever is in the open position, will return to the closed position, applying the brake. Thus the band brake also acts as a failsafe brake.

The band brake has a pretension indicator, which shows the current setting of the brake. This can be used to adjust the final speed of the descent by using the handwheel to align the the arrow on the plate at the brake cylinder with the grove on the brake spindle. It also allows the brake to be reset to its previous position when it has been released.

Disc Brake

The cable lifter is also fitted with a disc brake. The disc brake consists of a calliper, brake shoes and hydraulic cylinders. It is also operated by a remote lever located on the same remote control stand as the band brake lever. This allows one man to operate both brakes, facilitating easier and more precise anchor handling.

The disc brake is purely a dynamic brake, used to control the descent of the anchor. For this reason, the lever has to be moved to operate the brake. The lever will return to the stop position, i.e. the brake is applied, if the handle is released. It is capable of holding the weight of the anchor but should only be used to do so for a short time, the band brake should be applied as soon as all operations are completed.

Combined Mooring Winch

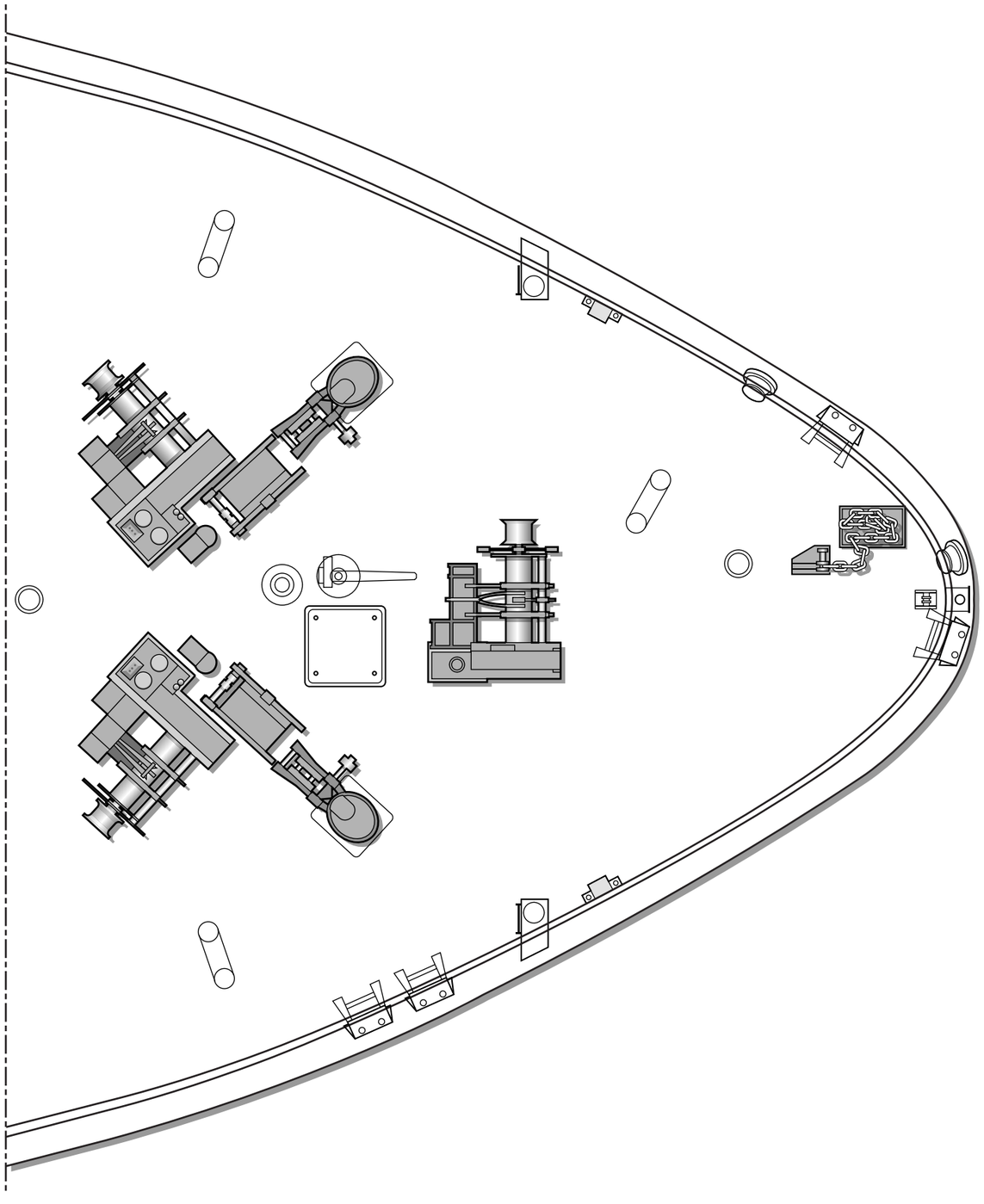
A mooring winch is combined with the anchor windlass and is equipped with two split rope drums and one warping end. This unit has two motors and is identical to all the other winch units on the vessel. For a full description of the mooring winch, see section 3.1.1.

CAUTION

The anchor windlass motors are only continuously rated for 60 minutes use. It is therefore important that the windlasses are not started until they are needed.

Illustration 3.1.3a Forward Emergency Towing Arrangement

Forward Emergency Towing Chain



3.1.3 EMERGENCY TOWING EQUIPMENT

Aft Emergency Towing Arrangement

The Marlow emergency towing system is designed so that a tug can easily pick up the towing wire from the ship, if a main engine failure or other emergency situation should occur and no power is available to the ship's staff.

The system is designed to meet the requirements of IMOs resolution MSC. 35 (63) May 20, 1994, and consists of the following main items:

- Chafing chain 76mm x 8m (SWL 2,000kN)
- Stowage bin for chafing chain
- Smit bracket (SWL 2,000kN)
- ETS fairlead
- Storage box with towing wire
- Pick up gear including messenger line

The Smit bracket and fairlead are of welded steel construction, designed for a rated working strength of 200 tonnes for ships over 50,000 DWT, at a side angle of + 90° and 30° downward.

The Smit bracket and fairlead are mounted along the centreline of the ship. The storage box is then mounted between these two items, adjacent to the centreline to reduce the possibility of any obstruction.

Operating Procedures

a) Check that the chafing chain is connected to the Smit bracket.

b) Go to the pick-up gear container.

c) Release the webbing securing clamps, open the hinged side and lay the side on top of the storage container.

d) Check that the chain is connected to the towing pennant and the towing pennant is connected to the messenger line.

e) Open the valise, take the marker buoy out of the container and check that the strobe light is switched ON.

f) Remove approximately half the messenger line from the top of the container and place it on deck in such a way as to aid deployment.

g) Ensuring that the messenger line is free to flow, pass the marker buoy through the dedicated fairlead and allow it to fall into the sea.

h) Start feeding the messenger rope into the sea. Make sure the pick-up gear is falling freely into the sea.

i) Pull out the remainder of the messenger line from the container and pay it out through the fairlead.

j) When all the messenger line has been passed through the deck chock, the connected towing pennant should be pulled from its valise so that the thimble eye is clear of the box opening and rests on the deck.

k) The tug should collect the messenger and pull the towing pennant wire clear of its stowage until the chafing chain is clear of the vessel and the weight taken in the Smit bracket.

CAUTION

Before the tug starts to pull the towing pennant clear of the vessel, ensure that all personnel are clear of the area as the pennant and chafing chain may move suddenly and violently.

Retrieval Procedure

a) Shackle a mooring wire to the chafing chain and retrieve, ensuring that the stopper is off.

b) Connect the mooring wire to the towing pennant, disconnect the chain and retrieve to the mooring wire drum.

c) Retrieve the messenger and buoy.

d) Restow the towing pennant in the storage bin.

e) Repack the pick-up gear.

f) Reconnect the chafing chain to the Smit bracket and check that the system is ready for use.

Regular Checks

- Check that the chafing chain and Smit bracket are rust free and lubricated.
- Check that the chain, towing pennant and messenger line are correctly connected.
- Check the operation of the light buoy. Ensure that the light on the marker buoy is switched OFF when it is replaced in the storage box.

Test Procedure

a) Follow the emergency procedure above, checking the condition of all component parts.

b) Have the tug practice hooking up to the towing connection and pulling the towing pennant wire and chafing chain out if required.

c) Follow the retrieval procedure above.

Forward Emergency Towing Arrangement

The forward towing gear is supplied by the builder and consists of:

- Chafing chain 76mm x 8m (SWL 2,000kN)
- Towing bracket (SWL 2,000kN)
- Bow fairlead

The chafing chain is designed to extend at least 3m beyond the bow chock when connected to the towing bracket. The links at each end are pear shaped to facilitate connection, both to the towing bracket and the bow shackle for connection to the tug’s line.

Operating Procedures

a) Bring the messenger with tow line from the tug up through the bow fairlead and attach to the other end of the chain by means of the bow shackle.

If the ship is without power, it would be necessary to bring the tug messenger on board by manual means, leading the messenger around the roller fairlead and returning it to the tug, so that the tug can heave its towing line onto the ship’s deck for connection to the chain.

Regular Checks

- Check that the chafing chain and towing bracket are rust free and lubricated.
- Check that the chain is correctly connected to the towing bracket.

3.1.4 ANCHORING, MOORING AND TOWING PROCEDURES

General

When anchoring, mooring or towing, the main priority at all times shall be the safety of personnel, the vessel and its cargo and the prevention of damage to the terminal or berth. This includes other ships, floating hoses, mooring boats, tugs or any other object in the vicinity. Remember a safe operation is an efficient operation.

Safe mooring should also include the use of proper clothing, teamwork, communications, use of a mooring plan, team selection and briefing prior to arrival.

All operations should comply with the Code of Safe Working Practices for Merchant Seamen and the terminal and port requirements.

Anchoring Procedures

Prior to use, the windlass brakes should be checked for lining thickness and adjustment.

Procedure for Lowering the Anchor by the Motor

a) Remove the covers from the windlass.

b) Check the oil level in both the hydraulic oil sump and the gearbox sump. Open the oil cooler air flap.

c) Ensure that the windlass control lever is in the NEUTRAL position and that all clutches are disengaged.

d) Turn on the power at the windlass control panel by pressing the START button. Check that the indicating panel shows no irregularities. Ensure that the winch is free to turn in both directions.

e) Engage the cable lifter claw clutch.

f) Disengage the compressor stopper.

g) Release the cable lifter band brake.

h) Check over the side to ensure that it is clear.

i) Move control of the windlass to the remote control stand at the ship's side.

j) Lower the anchor to the bottom controlling the speed of descent with the control lever on the remote control stand.

k) Secure the anchor and disengage the clutch on completion.

l) Shut down the windlass as required.

Procedure for Lowering the Anchor by the Brake

The procedure for lowering the anchor by the braking system is the same as the procedure for lowering the anchor by motor up to and including i). Then:

j) Slowly lower the anchor to sea level using the windlass controls.

k) Re-engage the band brake at its previous setting for lowering (using the HOLDING POWER scale as a reference).

l) Switch on the brake hydraulic unit using the switch at the brake unit remote control stand.

m) Disengage the cable lifter claw clutch.

n) Engage the disc brake by moving the control lever to its maximum position.

o) Disengage the band brake by moving the band brake control lever to its maximum position.

p) Slowly release the disc brake by easing off the pressure on the disc brake lever. Control the speed of descent by adjusting the position of the disc brake lever.

q) Once the anchor is at the required position/depth, release both levers and secure the anchor by engaging the chain stopper and tightening the band brake.

r) Shut down the windlass as required.

(Note: A careful note should be kept of the settings of the band brake to allow adjustment and resetting of the band brake as required.)

When anchoring, it is preferable to have a slight astern movement over the ground. As a guide, this should not be in excess of half a knot in water of depths up to 20m. Where the water depth is in excess of 20m, it is preferable to have zero speed over the ground, until it is confirmed that the anchor is on the bottom. Slight stern way can then be allowed to build up, with the anchor cable developing a lead and the cable being paid out under control, usually in sections of one shackle or shot, which is 27.5m (emergencies excepted).

Ensure the windlass operator and others in the vicinity wear goggles, hard hats, safety shoes and a good pair of overalls.

Ensure adequate communication is established and maintained between the bridge and focsle.

Anchors housed and not required should be secured against accidental release.

When the vessel has completed anchoring and the brake applied, ensure that the cable stopper is lowered and correctly positioned with lashings to prevent jumping. Cable stoppers form an integral part of cable restraint equipment and are designed to take the loads exerted on the cable whilst the vessel is at anchor.

Weighing Anchor

The procedure for hauling in the anchor is the same as the procedure for lowering the anchor by motor up to and including i). Then:

j) Raise the anchor slowly, controlling the speed of ascent with the control lever on the remote control stand. Watch the load on the windlass (using the remote control stand ammeter) to ensure that the anchor is not snagged.

In the event of there being excessive strain in the cable, it may be necessary to use the vessel’s main engine to relieve it.

k) Haul in the anchor until in the stowed position.

l) Engage the brake band and compressor stopper.

m) Disengage the claw clutch lever.

n) Shut down the windlass as required.

Before entering open seas, ensure that the anchor is not twisted in the hawse pipe and that the flukes are gently heaved hard up against the hull. Cable stoppers must also be in position, together with securing chains. To prevent flooding of the chain locker at sea, ensure the spurling pipes are properly covered and the chain lashed.

It is obviously good seamanship for all deck officers to become acquainted with the method used to secure the cables within the lockers, since the need to slip a cable may be both unexpected and urgent. A prolonged search for the bitter end release mechanism, only to find it seized, is not in keeping with good seamanship. Always keep the mechanism lubricated and free of obstructions.

Tug Operations

Tug operations lead to large loads being applied to ropes, fairleads, bitts and connections. A sudden failure of any part of the tug arrangement can have serious consequences, which should be considered, and appropriate safety precautions taken.

The tug lines and associated equipment must be inspected prior to use. Any line found with defects, and/or excessive wear, must be rejected for use as a tug line. The vessel is supplied with Supermix lines for ad hoc tug use, but normal port operations will be carried out using tugs mooring lines.

Particular attention is drawn to the need to ensure that fairleads, bollards etc. are:

- Suitably sited to avoid obstructions
- Effectively secured to the ship's structure
- Not unacceptably weakened by corrosion or age
- Of suitable design, with a SWL for the intended use

Suitable communications should be established between the bridge and mooring station prior to the commencement of operations.

Persons involved in tug operations should be briefed in their duties and the necessary safety precautions.

Care shall be taken to keep clear of rope bights. Similarly, whiplash areas should be evaluated, with personnel warned of the consequences of parting lines and associated danger zones.

When letting go of tow lines, ensure all personnel are clear of the end eye. Preferably, the eye should be lowered under control of a slip line, thus avoiding danger of injury and line snagging.

The surfaces of fairleads, bollards, bitts and drum ends should be kept clean and maintained in good condition. Rollers and fairleads should turn freely and be in a sound condition.

The decks of mooring areas are coated with non-slip paint. This can easily be accomplished by spreading fine salt free sand on top of wet paint or using dedicated anti-slip paint.

Always ensure there are sufficient personnel available at each mooring station to accomplish their assigned tasks safely.

Handling Moorings

All personnel involved in mooring operations shall make themselves familiar with the following OCIMF publications, as appropriate to their duties and responsibilities:

- Mooring Equipment Guidelines
- Effective Mooring

When handling moorings the following guidelines should be followed.

DO NOT surge synthetic ropes on drum ends.

DO NOT stand too close to winch drum or bitts when holding a line under tension. If the line surges you could be drawn into the drum or bitts. Stand back and hold the line at a point about 1m away from the drum or bitts.

DO NOT apply too many turns; generally 4 turns are sufficient.

DO NOT bend the rope excessively.

DO NOT stand in the bight of a rope.

DO NOT leave loose objects in the line handling area. If a line breaks it may throw such objects around as it snaps back.

DO NOT have more people than necessary in the vicinity of a line.

DO NOT hold a line in position by standing on it.

DO NOT lead wires through excessive angles.

DO NOT use leads out of alignment with the spool or drum end (warping drum).

DO NOT leave winches and windlasses running unattended.

DO NOT attempt to handle a wire or rope on the drum end, unless a second person is available to assist in removing the build up of slack.

DO NOT allow a rope or wire being paid out to run out of control. Always ensure a line has one turn on the bitts before being paid out. Wires on dedicated stowage reels (not mooring winches) must never be paid out directly.

DO NOT use dangerously worn lines.

DO take care when letting go lines, as the end of a line can whiplash and cause injury or snag. To avoid this, it may be necessary to rig a slip line to assist in controlled slacking.

DO wear a safety hat.

DO wear gloves when handling wires.

DO ensure adequate communications are established before starting operations.

DO use split drums correctly, with at least four turns of mooring line on the power section of the drum at all times.

DO ensure that only experienced persons are permitted to operate winches.

DO use all split spool drums correctly, with the last two or three turns changed to the narrow part of the split drum.

DO ensure all spool drums are reeved in the correct direction, so that the load is transferred to the fixed part of the brake band.

DO ensure all winch controls are clearly marked.

DO have an axe and sharp knife always available and a flashlight for night operations.

Fire Wire

These wires must hang over the opposite side of the vessel to the berth and are required so that tugs may pull the ship away from a berth, without the assistance of crew members in the event of an emergency. Two fire wires are fitted, one on the centre line starboard side forward and one the portside aft, and stowed on pnuematic driven reels when not in use. Each fire wire is then rigged in port to comply with terminal requirements and secured on deck with a minimum of six full turns on the bitts.

General Mooring Procedure

Mooring to the Berth

a) Select and brief the mooring party of the known situation prior to the pilot boarding.

b) Consult with the pilot for mooring requirements at the berth and construct the final plan.

c) Brief the officers in charge of the mooring stations regarding the mooring plan, ensure they understand all requirements and that the plan meets with their approval.

d) Prepare mooring stations forward and aft. Lines should be run to the fairleads in accordance with the plan.

e) Have messengers of rope and heaving lines of appropriate size ready in advance.

f) Nobody should attend mooring stations unless they are wearing safety shoes, a safety helmet, a boiler suit, suitable gloves and any other items of safety clothing that may be deemed necessary.

g) Fire wires, fore and aft on the seaward side, must be rigged according to terminal requirements, or with the eye maintained 1m above water level at all times, along with 6 full turns on a pair of bitts.

Requirement for Tug Handling

Only use properly placed closed fairleads and associated bollards, which have a direct lead from fairlead to bollard for the securing of the tug's line.

A means for heaving the tug's line aboard with the ship's heaving line or messenger must be provided, i.e., use of suitable fairleads, bollards, etc., to lead the messenger line on to the warping head of a mooring winch or capstan. The person operating the winch must have line of sight to the person at the ship's side directing the operation.

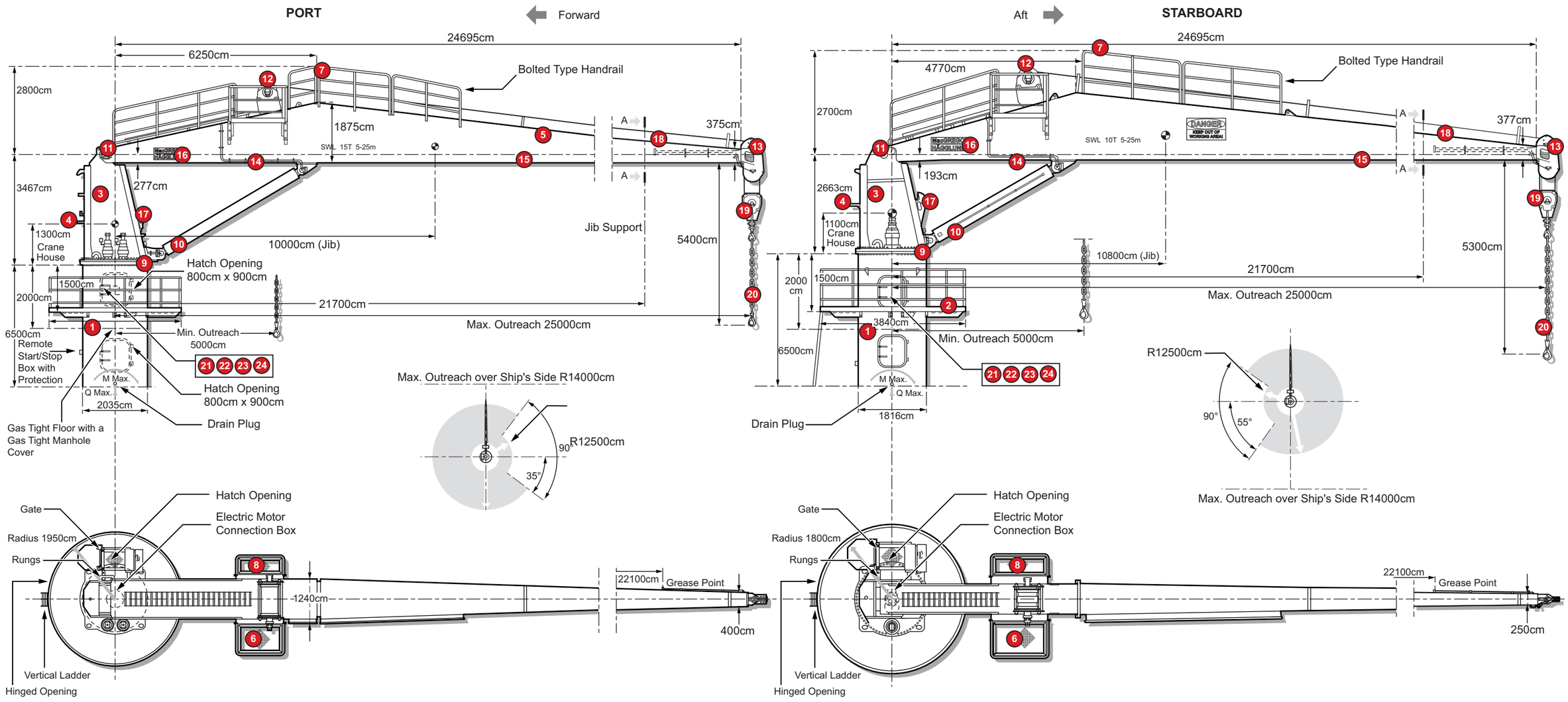
3.2 Lifting Equipment

3.2.1 Deck Cranes

3.2.2 Accommodation and Pilot Ladder Reels

Illustrations

Illustration 3.2.1a Deck Cranes



Key

1. Foundation Weld
2. Foundation Platform
3. Crane House Weld
4. Control Platform
5. Jib Welding
6. Service Platform
7. Handrails, Jib
8. Service Platform
9. Slewing Assembly
10. Cylinder Assembly
11. Jib Bearing Assembly
12. Winch Mounting
13. Jibtop Mounting
14. Lubrication Jib Cylinder
15. Lubrication Jibtop
16. Signs, Mounting
17. Cover Platform
18. Load Wire Rope with Thimble
19. Hook Block SWL 15 Ton
20. Pennant
21. Pump Drive Arrangement
22. Hydraulic Inst House Jib
23. Electric Central/Starter
24. Remote Start/Stop Box
25. Cable Glands List

3.2.1 DECK CRANES

Hose Handling Cranes

Maker:	MacGregor-Hägglunds Cranes AB
No. of sets:	2
Type (port/starboard):	HH630-1525/HH400-1025
Drawing No. (port/starboard):	189 1733B/189 1707B
SWL (port/starboard):	15,000/10,000kg
Radius maximum:	25m
Radius minimum:	5.0m
Hoisting speed No Load:	0 to 25m/min
Hoisting speed at SWL:	0 to 12m/min
Slewing sector:	360°
Slewing speed(port/starboard):	0 to 0.6/0 to 0.7 rpm
Luffing (port/starboard):	100/115 seconds
Lifting height:	46m
List/trim:	5° list / 2° trim
Weight of crane (port/starboard):	32.5/25 tons approximately

Description

Two electro hydraulically driven deck cranes are provided for handling ship's equipment, stores, bunker fuel hoses and Suez mooring boats. These cranes, although similar in design, are of differing capacities. Care must be taken not to confuse the two, resulting in an inadvertent overload of the smaller crane (starboard). A quick reference can be gained by noting the SWL notice on the crane jib.

Crane Control

The cranes are controlled from an open platform above the slewing ring. Entrance to the platform is by ladder. All motions are lever operated and have stepless speed control from 0 to maximum. Two motions can be operated at the same time with full capacity, but with reduced speed.

Load Limiting System

Each hydraulic circuit is provided with equipment for limiting hydraulic pressure to preset values corresponding to the crane capacity. These do not stop the electric motor but divert the oil supply back to the holding tank.

Limit Switches

The cranes are fitted with the following limit switches for safety:• Hook travel upper stop

- Luffing up/down
- Slewing limits (not operational)
- Combined slewing-luffing limits

Electro-Hydraulic Power Pack

The cranes are provided with a built-in power pack. The electric pump/motor is located in the centre of the pedestal with the output shaft pointing upwards and driving the hydraulic pump through a flexible coupling and a cardan shaft. The reservoir for the hydraulic oil is located in the slewing column steel structure. The hydraulic oil circuit has a full flow suction filter with a changeable filter insert. The tank is provided with an oil level indicator, a temperature gauge and an air breather. Start/stop controls are located in the starter box on the pedestal base and on the remote start/stop box on the control platform, the main power isolation switches are in the cable trunking on B deck. Additionally, the in-built safety valves and hydraulically operated fail safe brakes will ensure that the cranes will not lower the load until positive action is taken.

Hoisting Machinery

The winch unit consists of:

- Drum, the connection and stop/start box being on the main deck with bearing and brackets
- Winch gear with hydraulically operated fail safe brake
- Hydraulic motor with safety valve to freeze movement in the event of a pressure drop

The wire ropes are both of 18mm nominal diameter and are of the non-rotating, galvanised type. The wire ropes should be lubricated regularly with an appropriate lubricant.

The wire sheaves are provided with sealed roller bearings on steel axles. All bearings have grease nipple lubrication.

At maximum outrun (hook in its lowest position), there are three locking turns of wire remaining on the drum.

The jib cylinders have spherical bronze bearings on steel axles. The part of the piston rod which is exposed whilst the crane is parked is made of stainless steel to prevent rust.

Provision and Engine Room Cranes

Maker:	MacGregor-Hägglunds Cranes AB
No. of sets:	2
Type (port/starboard):	GP 160-0518/GP 250-1018
Drawing No. (port/starboard):	189 1581B/189 1582B
SWL (port/starboard):	5,000/10,000kg
Radius maximum:	18m
Radius minimum:	3.6m
Average hoisting speed (port/starboard):	20/12m/min
Slewing sector:	265°
Slewing speed (port/starboard):	0 to 1.6/0 to 1.0 rpm
Luffing (port/starboard):	40/75 seconds
Lifting height (port/starboard):	46*/40m
List/trim:	5° list / 2° trim
Weight of crane (port/starboard):	10.9/15.1 tons approximately

Description

Situated at C deck aft, two electro-hydraulically driven deck cranes are provided for handling the engine room stores and general provision requirements for the vessel. These cranes, although similar in design, are of differing capacities. Care must be taken not to confuse the two, resulting in an inadvertent overload of the smaller crane (port). A quick reference can be gained by noting the SWL notice on the crane jib.

(**Note:** * The port engine room crane (5t SWL) is designed to allow loads to be lowered to keel level when the vessel is in dry dock.)

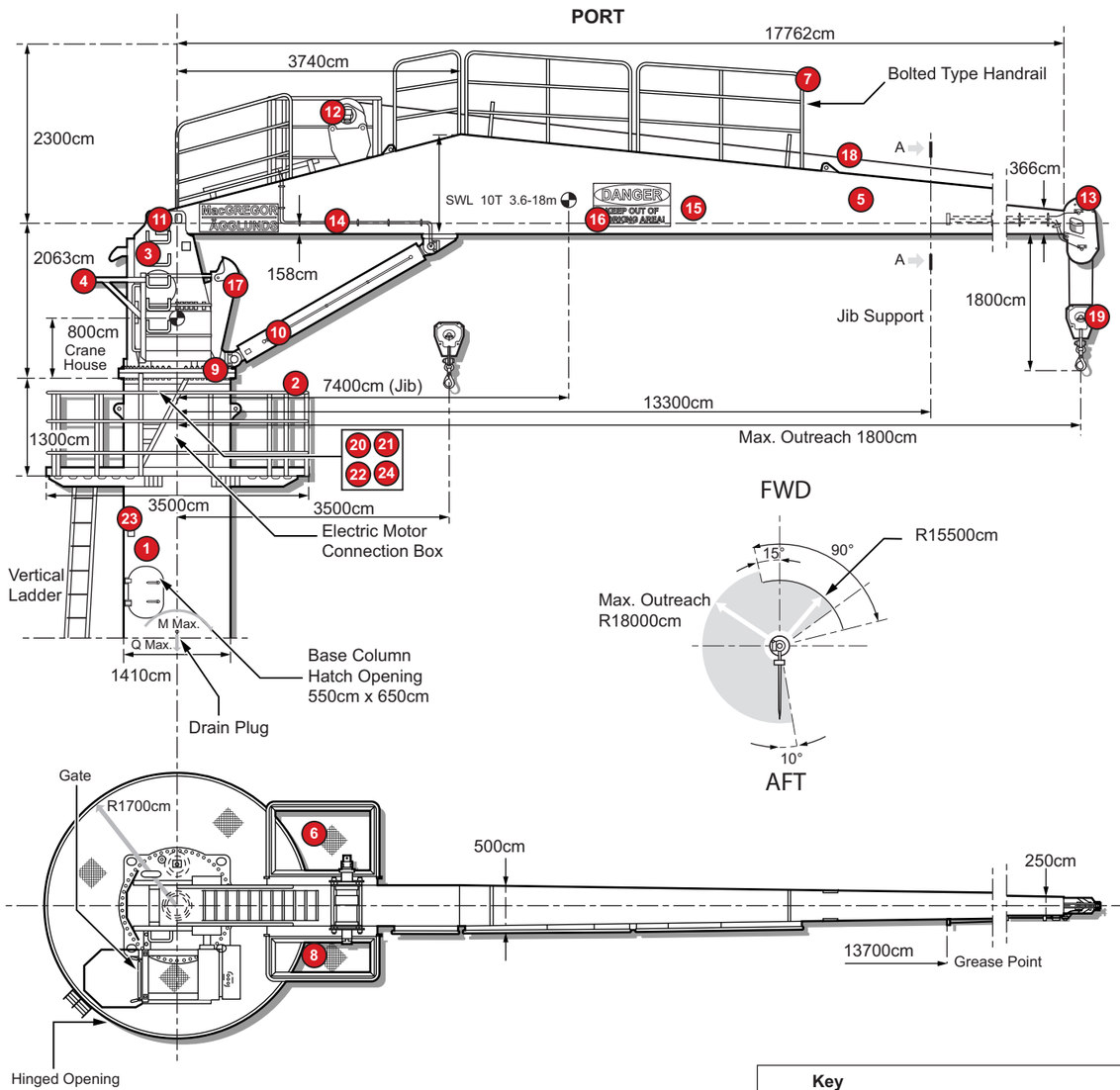
Crane Control

The cranes are normally controlled by use of a portable control box, which is fitted with a 25 metre flexible cable, the connection box being on the aft main deck level close to the crane operating area. The cranes can also be controlled from an open platform above the slewing ring. Entrance to the platform is by ladder. All motions have stepless speed control from 0 to maximum. Two motions can be operated at the same time with full capacity, but with reduced speed.

Load Limiting System

Each hydraulic circuit is provided with equipment for limiting hydraulic pressure to preset values corresponding to the crane capacity. These do not stop the electric motor but divert the oil supply back to the holding tank.

Illustration 3.2.1b Provisions and Engine Room Stores Cranes



Key

1. Foundation Weld
2. Foundation Platform
3. Crane House Weld
4. Control Platform
5. Jib Welding
6. Service Platform
7. Handrails, Jib
8. Service Platform
9. Slewing Assembly
10. Cylinder Assembly
11. Jib Bearing Assembly
12. Winch Mounting
13. Jibtop Mounting
14. Lubrication Jib Cylinder
15. Lubrication Jibtop
16. Signs, Mounting
17. Cover Platform
18. Load Wire Rope with Thimble
19. Hook Block SWL 5 Ton
20. Pump Drive Arrangement
21. Hydraulic Inst House Jib
22. Electric Central/Starter
23. Remote Start/Stop Box
24. Cable Glands List

Limit Switches

The cranes are fitted with the following limit switches for safety:

- Hook travel upper stop
- Luffing up/down
- Slewing limits (not operational)
- Combined slewing-luffing limits

Electro-Hydraulic Power Pack

The cranes are provided with a built-in power pack. The electric pump/motor is located in the centre of the pedestal with the output shaft pointing upwards and driving the hydraulic pump through a flexible coupling and a cardan shaft. The reservoir for the hydraulic oil is located in the slewing column steel structure. The hydraulic oil circuit has a full flow suction filter with a changeable filter insert. The tank is provided with an oil level indicator, a temperature gauge and an air breather. Start/stop controls are located on the starter panel (located on the deck housing aft main deck), on the remote control box and on the control platform. Additionally, the in-built safety valves and hydraulically operated fail safe brakes will ensure that the cranes will not lower the load until positive action is taken.

Hoisting Machinery

The winch unit consists of:

- Drum with bearing and brackets
- Winch gear with hydraulically operated fail safe brake
- Hydraulic motor with safety valve to freeze movement in the event of a of pressure drop

The wire ropes are of 18mm and 13mm nominal diameter respectively and are of the non-rotating, galvanised type. The wire ropes should be lubricated regularly with an appropriate lubricant.

The wire sheaves are provided with sealed roller bearings on steel axles. All bearings have grease nipple lubrication.

The jib cylinders have spherical bronze bearings on steel axles. The part of the piston rod which is exposed whilst the crane is parked is made of stainless steel to prevent rust.

Cargo Machinery Handling Crane

Maker:	MacGregor-Hägglunds Cranes AB
No. of sets:	1
Type:	GP 100-0609
Drawing No.:	189 1577B
SWL:	6,000kg
Radius maximum:	9m
Radius minimum:	2m
Average hoisting speed:	16m/min
Slewing sector:	360°
Slewing speed:	0 to 1.5 rpm
Luffing:	30 seconds
Lifting height:	38m
List/trim:	5° list / 2° trim
Weight of crane:	8.2 tons approximately

Description

Situated on top of the deck cargo machinery house, an electro-hydraulically driven deck crane is provided for handling large items into or out of the deck cargo machinery house.

Crane Control

The crane is controlled from an open platform above the slewing ring. Entrance to the platform is by ladder. All motions are lever operated and have stepless speed control from 0 to maximum. Two motions can be operated at the same time with full capacity, but with reduced speed.

Load Limiting System

Each hydraulic circuit is provided with equipment for limiting hydraulic pressure to preset values corresponding to the crane capacity. These do not stop the electric motor but divert the oil supply back to the holding tank.

Limit Switches

The crane is fitted with the following limit switches for safety:

- Hook travel upper stop
- Luffing up/down

Electro-Hydraulic Power Pack

The crane is provided with a built-in power pack. The electric pump/motor is located in the centre of the pedestal with the output shaft pointing upwards and driving the hydraulic pump through a flexible coupling and a cardan shaft. The reservoir for the hydraulic oil is located in the slewing column steel structure. The hydraulic oil circuit has a full flow suction filter with a changeable filter insert. The tank is provided with an oil level indicator, a temperature gauge and an air breather. Start/stop controls are located on the starter panel on the pedestal and on the control platform. Additionally, the in-built safety valves and hydraulically operated fail safe brakes will ensure that the crane will not lower the load until positive action is taken.

Hoisting Machinery

The winch unit consists of:

- Drum with bearing and brackets
- Winch gear with hydraulically operated fail safe brake
- Hydraulic motor with safety valve to freeze movement in the event of a of pressure drop

The wire rope is of 16mm nominal diameter and is of the non-rotating, galvanised type. The wire rope should be lubricated regularly with an appropriate lubricant.

The wire sheaves are provided with sealed roller bearings on steel axles. All bearings have grease nipple lubrication.

At maximum outrun (hook in its lowest position), there are three locking turns of wire remaining on the drum.

The jib cylinder has spherical bronze bearings on steel axles. The part of the piston rod which is exposed whilst the crane is parked is made of stainless steel to prevent rust.

Starting Procedure for Hydraulic Deck Cranes

a) Check that the control levers are in the NEUTRAL positionl.

b) Check that the wire is run correctly in the sheaves and that the wire rope ends are securely clamped.

c) Check the oil level and condition of the hoses and connections.

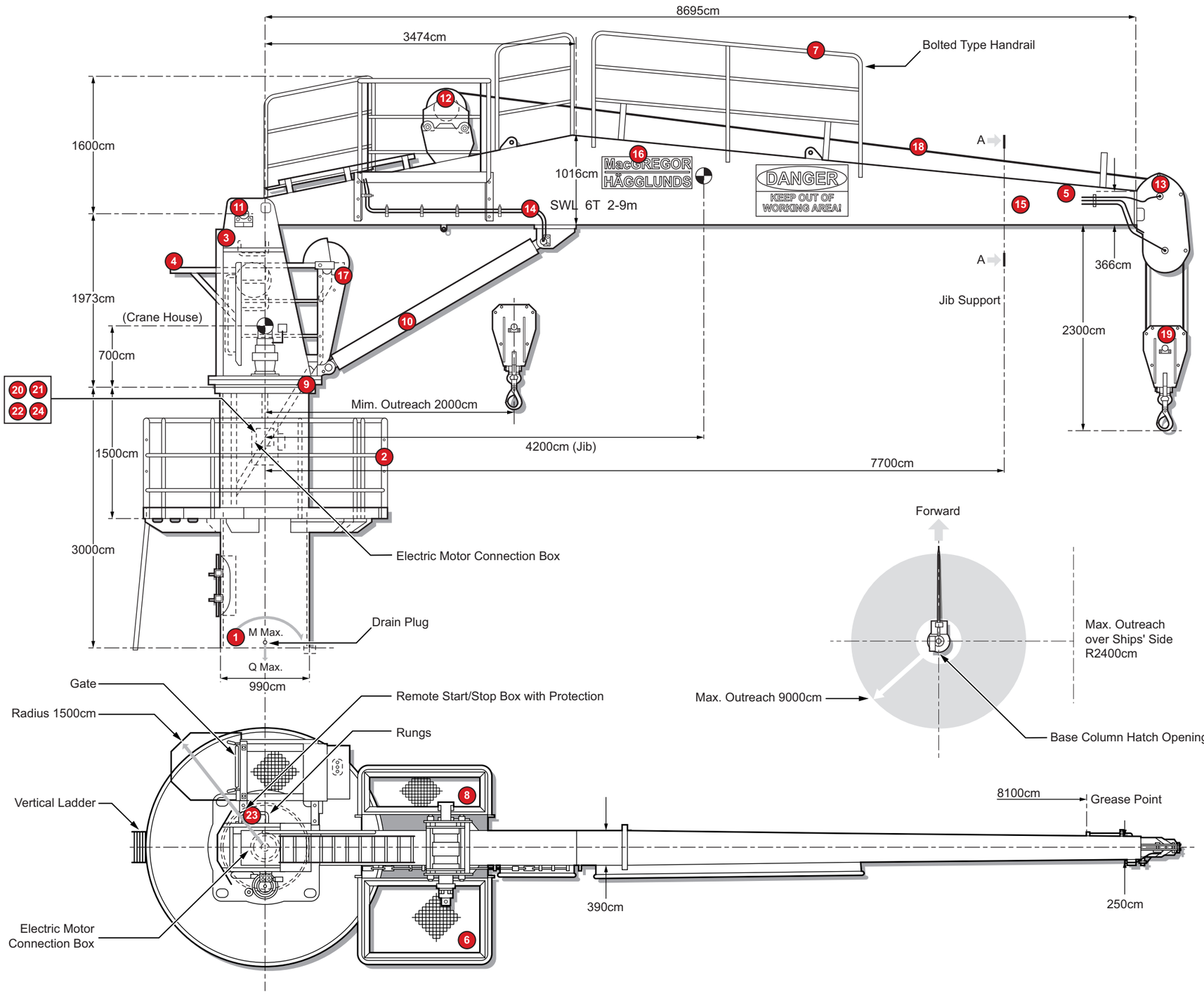
d) Start up the electric motor/hydraulic pump.

e) If the ambient temperature is less than 10ºC, let the crane run until the oil temperature is a minimum of 10ºC.

Illustration 3.2.1c Cargo Machinery Handling Crane

Key

1. Foundation Weld
2. Foundation Platform
3. Crane House Weld
4. Control Platform
5. Jib Welding
6. Service Platform
7. Handrails, Jib
8. Service Platform
9. Slewing Assembly
10. Cylinder Assembly
11. Jib Bearing Assembly
12. Winch Mounting
13. Jibtop Mounting
14. Lubrication Jib Cylinder
15. Lubrication Jibtop
16. Signs, Mounting
17. Cover Platform
18. Load Wire Rope with Thimble
19. Hook Block SWL 8 Ton
20. Pump Drive Arrangement
21. Hydraulic Inst House Jib
22. Electric Central/Starter
23. Remote Start/Stop Box
24. Cable Glands List



f) Check that all movements (hoist-luffing-slewing) are operational without load.

g) The crane is ready for use.

Parking the Hydraulic Deck Cranes

a) Park the crane with the jib in a horizontal position and resting on the jib support cradle.

b) Stop the pump/motor.

c) Fit the jib securing bracket.

Possible Hazards whilst using Deck Cranes

During the operation of any crane, the controls must be operated slowly and smoothly in order not to induce a swinging motion in the hanging load.

Extreme care must also be taken when operating the cranes in the winch up or jib up motion, where the jib angle is nearing its maximum value and the hook is close to the hook stop, as the load may hit the underside of the jib. The operator must always be able to see the landing area for the load, or be in direct contact with somebody who can see the landing area.

Cranes should only be operated by personnel who have received formal onboard training, have achieved the necessary level of competency and have been issued with the appropriate certificate for the equipment they are required to operate.

MISCELLANEOUS DAVITS

These fixed jib davits are positioned at various locations around the vessel in order to facilitate easy handling of large items. As these cranes are rarely used, they are all basic in nature, employing an air motor for lifting/lowering, with all other functions being carried out manually.

All of these davits use air supplied by the deck air system at 9 kg/cm^2.

Injured Person Handling Davit

Maker:	Shin Myung Technical Co. Ltd.
No. of sets:	1
SWL:	200kg
Working radius:	0.6m
Hoisting speed at SWL:	0 to 25m/min
Winch:	Air motor
Type:	SMP-2.5P-60
Maximum height:	30m

Description

The injured person handling davit is a self-contained portable unit. With wheels permanently mounted on the chassis, it can be quickly and easily transported to any location on the ship. The unit is located using the manhole studs as a guide and is manually slewed.

The hoist has an air driven motor which drives a rope winch up to a maximum lift height of 30m. Should the air motor fail, a manual lifting handle is available to complete the lift.

The unit has a 20m air supply hose and works from the 9kg/cm^2 air system.

It should be noted that the SWL is only 200kg and care should be taken not to overload the unit.

Bosun's Store and Bow Thruster Handling Davits

Maker:	Shin Myung Technical Co. Ltd.
No. of sets:	2
SWL:	900kg
Working radius:	1.58m
Hoisting speed at SWL:	0 to 10m/min
Winch:	Air motor
Type:	SMP-4P-600
Maximum height:	25m

Description

Positioned on the forward end of the upper deck, the bosun's store davit is the after unit of the two davits located in this area. This davit is used to facilitate easy handling of larger objects in to and out of the bosun's store.

The bow thruster handling davit is the forward unit of the two davits located in this area. This davit is used to facilitate easy handling of equipment and machinery in to and out of the bow thruster compartment.

The hoists each have an air driven motor which drives a rope winch up to a maximum lift height of 25m. Should the air motor fail, a manual lifting handle is available to complete the lift. This davit is also manually slewed, using a bar.

Steering Gear Space Handling Davits

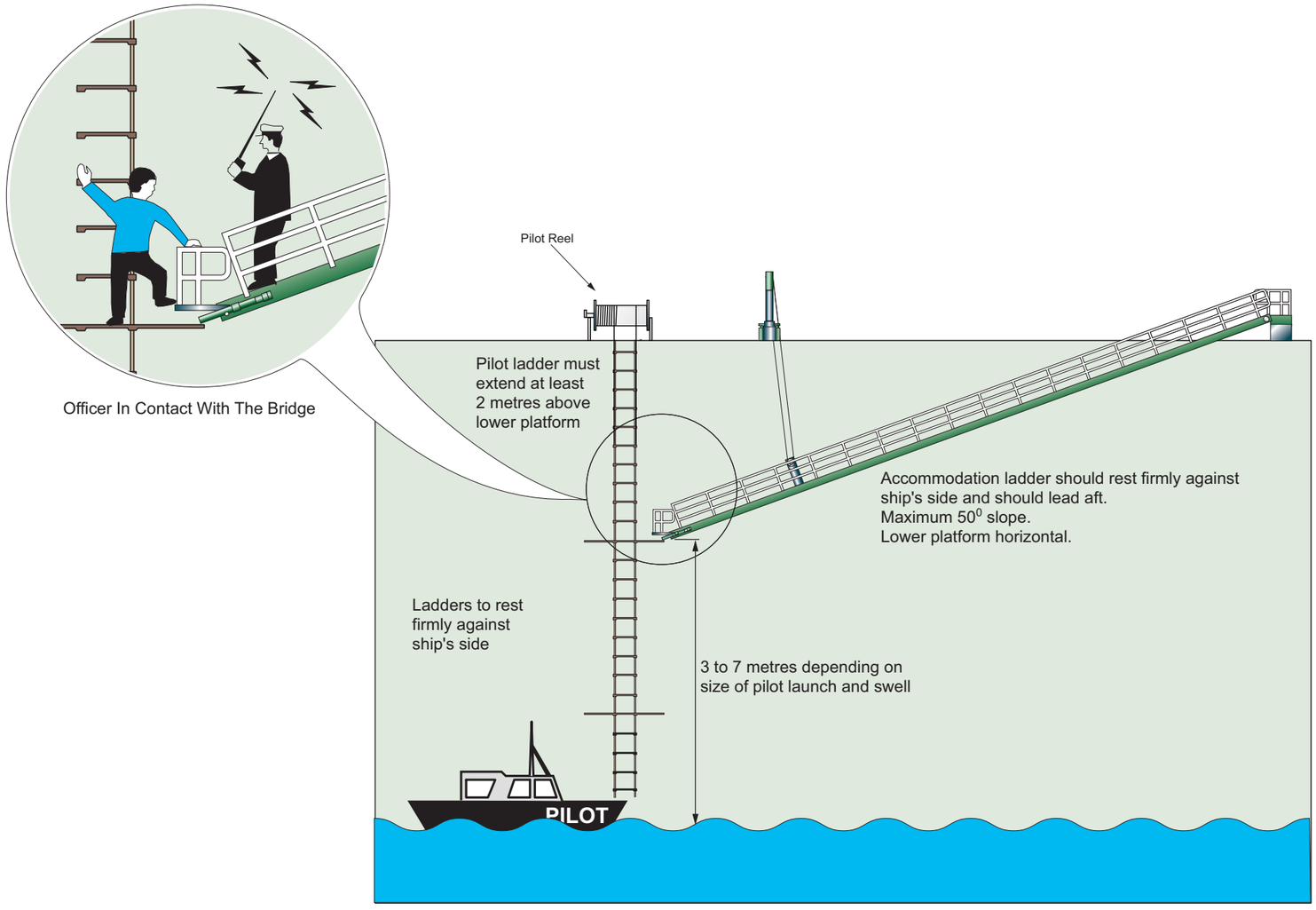
Maker:	Shin Myung Technical Co. Ltd.
No. of sets:	1
SWL:	2000kg
Working radius:	2.46m
Hoisting speed at SWL:	8m/min
Winch:	Air motor
Type:	SMP-7P-600
Maximum height:	10m

Description

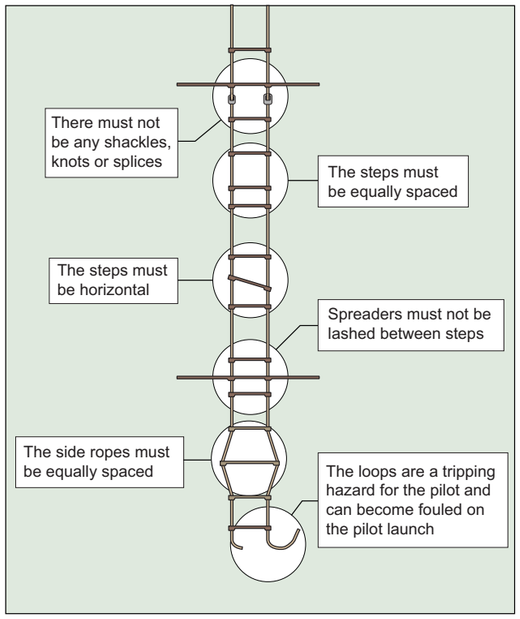
Positioned on the starboard side of the poop deck, they are used to facilitate easy handling of larger objects in to and out of the steering gear space. they are sited so that it is possible to be used to position items within the scope of the starboard stores crane.

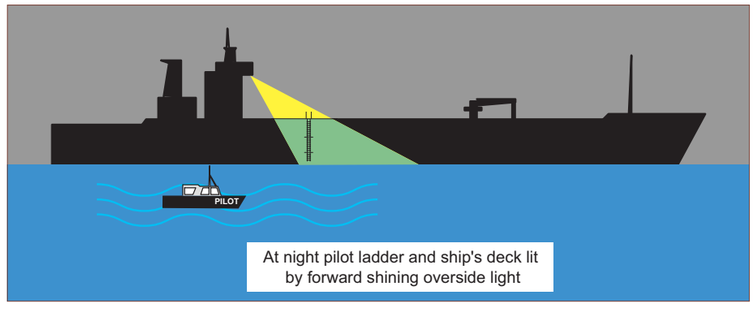
The hoist has an air driven motor which drives a rope winch up to a maximum lift height of 25m. Should the air motor fail, a manual lifting handle is available to complete the lift. This davit is manually slewed, using a winding handle and gearing.

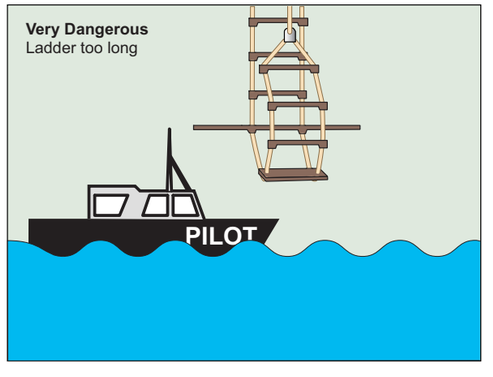
Illustration 3.2.2a Required Boarding Arrangement For Pilot



A Pilot Ladder Combined With An Accommodation Ladder Is Usually The Safer Method Of Embarking Or Disembarking A Pilot On Ships With A Freeboard Of More Than 9 Metres







3.2.2 ACCOMMODATION AND PILOT LADDER REELS

Maker:	Samgong Co. Ltd
Length:	21.38m
Breadth:	600mm
Ladder weight:	1,205kg
Winch motors:	Air operated
Accommodation ladder winch motor type:	7.0PE-600SR
Pilot ladder reel winch motor type:	2.5PE-300DR
Hoisting speed:	25.1m/min
Air pressure:	9kg/cm^2

One aluminium alloy accommodation ladder is provided on each side of the main deck. The accommodation ladder units each include a fixed integral pilot ladder reel. Both the accommodation ladder and pilot ladder reel are operated by means of compressed air motors controlled from a control stand situated at the ship's side, aft of the accommodation ladder units.

Both the accommodation ladder and pilot ladder reel are designed to reach the lowest ballast water line, the accommodation ladder with an angle of inclination of not more than 50°. However, the pilot ladder reel cannot be used in conjunction with the accommodation ladder at this waterline level, being positioned primarily for use in the loaded condition.

For use in pilot embarkation and disembarkation in cases where the pilot ladder reel will not reach the lowered position of the accommodation ladder (lightest ballasted condition), or where the accommodation ladder cannot be used due to sea conditions.

The pilot ladders are removed from their stowage reels and moved to the designated pilot ladder area situated adjacent to the accommodation ladder davit where there are eye plates to secure the pilot rope ladder.

Once the pilot ladder has been secured, it can be lowered slowly over the ship's side and manoeuvred until it is in a suitable position, as indicated in illustration 3.2.2a.

(**Note:** Always leave at least 2 layers of wire on the lowering drum of the accommodation ladder. Always check it is safe to lower or raise the ladders.)

WARNING

This procedure requires work to take place outside of the ship's rails. Appropriate personal protective equipment should be donned including lifelines attached to a suitable strong point. At night there must be adequate illumination to safely complete the task.

Procedure for Lowering the Accommodation Ladder with the Pilot Ladder Reel

The accommodation ladder and the pilot ladder reel on the port or starboard side are controlled from the remote control stand. The controls are simple raise/lower levers for both the accommodation ladder and the pilot ladder reel. Compressed air motors are used to actuate the movements of both ladders.

Rigging

a) From the stowed position, un-ship all of the wire lashings on both the accommodation ladder and the pilot ladder reel (if it is to be used).

b) Ensure the air supply valve is open, blow the air supply line free of water, check there is sufficient oil in the oiler unit and drain the water filter.

c) Adjust the lower platform angle to a suitable position for the intended use. Lower the accommodation ladder to clear it from its stowed position and continue lowering until there is sufficient space underneath the davit to erect the handrails.

d) Two men are required to don safety harnesses and inflatable lifejackets and then rig the stanchions on the upper platform.

e) One man is to go down the accommodation ladder until he is just below the davit, and raise each handrail in turn. The man at the ladder top secures the handrails with the pins. In order to move up and down the accommodation ladder safely, the safety harness can be attached to the wire lashings.

f) The two lower lightweight platform stanchions are then fitted. Roping of the lower platform is then carried out and when complete, the ropes are led up each side of the ladder forming the middle rail.

g) Fit the upper platform ropes. The ladder is now rigged and can be lowered when required, keeping an eye on the tightness of the ropes.

h) Once the accommodation ladder is in position, place the pilot ladder in a safe position to lower. Once clear, lower the pilot ladder until it reaches the desired position.

i) Check there is a lifebuoy available, that the deck is clear of obstructions and a heaving line is ready. If using the ladder in port, a safety net is to be rigged.

Securing

a) Hoist the pilot ladder reel until the pilot ladder is clear of the side of the vessel. Once clear, the reel may be secured.

b) Hoist the accommodation ladder until the handrails are just below the davit.

c) One man wearing a harness and an inflatable lifejacket unlashes the platform and ladder ropes.

d) Swivel and remove the stanchions from the upper and lower platforms of the ladder.

e) The second man wearing a harness and an inflatable lifejacket removes the pins securing the ladder handrails, one at a time. He then lowers each handrail in turn, so that the handrails rest flat on the ladder.

f) When the men are clear, hoist the ladder until it is vertical.

g) Secure the accommodation ladder with all the lashings.

h) Close the main air supply valve. Apply the covers to both winches and air motors. Remove the hoses from the air motors and stow them to ensure that the deck is kept clear.

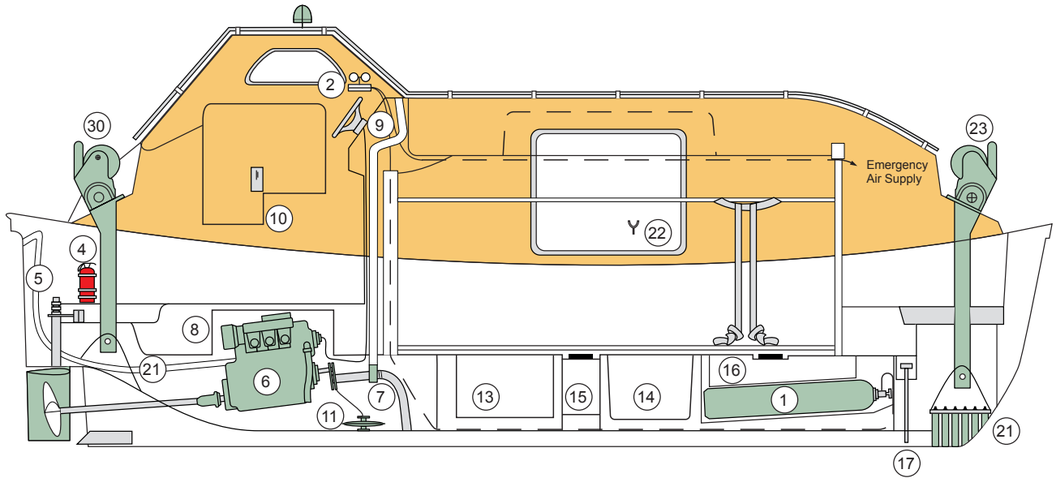
3.3 Lifesaving Equipment

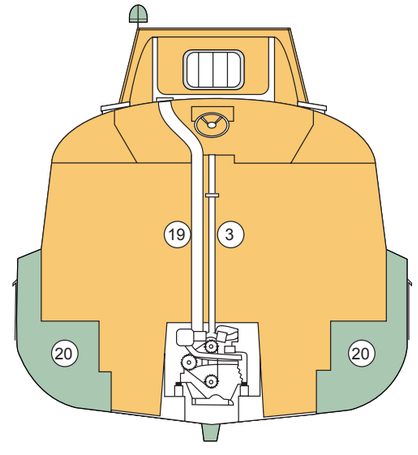
Illustrations

3.3.1 List of Lifesaving Equipment

EQUIPMENT DESCRIPTION	QUANTITY
Life jacket, 96 SOLAS - Type: Cosalt Premier Adult Lifejacket - with whistle, jacket light, reflective tape and spray hood	93
Lifebuoy, 96 SOLAS - Type: Perrybuoy 760mm (4.3Kg) Lifebuoy, 96 SOLAS - Type: Perrybuoy 760mm (2.5Kg)	2 14
Buoyant lifeline, 40m length	2
Line throwing appliance Type: Pains-Wessex Speedline 250	4
Light/ smoke signal with bracket - Type: Pains Wessex Man OverboardMcMurdo L7	2
Self igniting life jacket light with bracket - Type: Cosalt L7	93
Rocket parachite signal - Type: Pains Wessex Bridge Set	1 set of 12 pieces
Immersion suit Type: Cosalt Crewsaver 8800-S	6
Neil Robertson Stretcher	1
Paraguard Stretcher	1
Oxygen Resuscitator - RESMAR 2000	2
First Aid Kit	3
Oxygen Therapy Unit	1
Lifebuoy Lights - McMurdo L40	5
Emergency Life Saving Apparatus (ELSA)	16

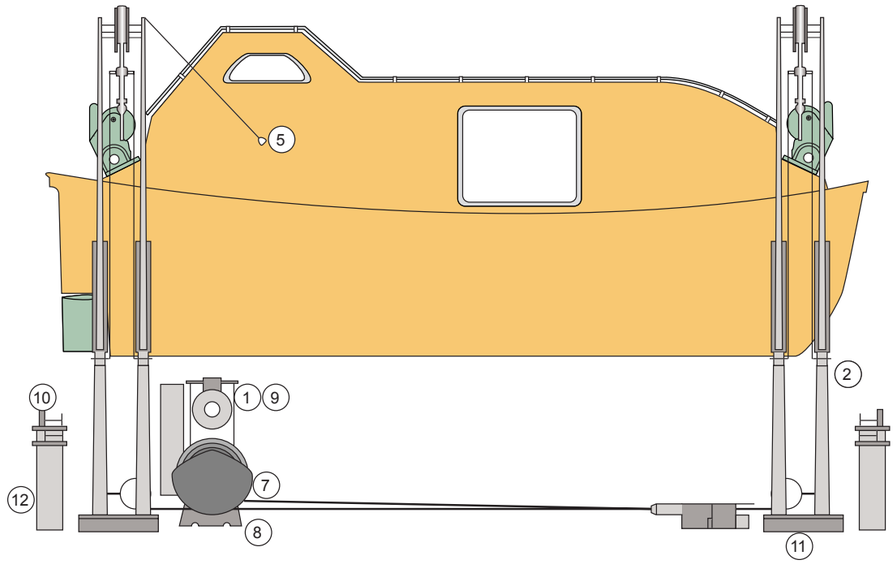
Illustration 3.3.2a Lifeboats and Davits

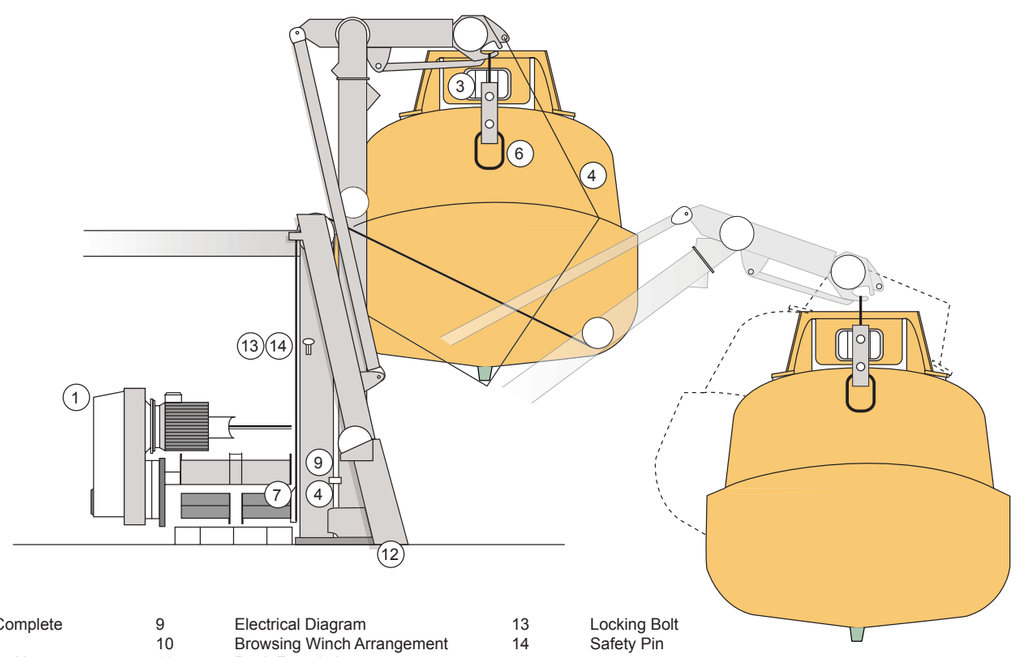




Key

1	Emergency Air Bottle	5	Engine Exhaust Pipe	9	Steering Console	13	Fuel Tank	17	Drain Valve	21	Hook Bracket
2	Air Regulator	6	Engine SAAB Lister L3	10	Helmsman Seat	14	Water Tank	18	Seat Belts	22	Rowlock
3	Central Wall	7	Sprinkler Intake Valve	11	Hydrostatic Valve	15	Equipment Tank	19	Fresh Air Ventilation	23	Mills Titan Hook Forward
4	Fire Extinguisher	8	Engine Casing	12	Hook Release Level	16	Provision Tank	20	Hull Buoyancy	24	Mills Titan Hook Aft





Key

1	Winch W 120L (Lefthanded)	5	Remote Control Complete	9	Electrical Diagram	13	Locking Bolt
2	Assembly Drawing	6	End Link	10	Browsing Winch Arrangement	14	Safety Pin
3	Hook with Wedge	7	Adjustable Sheave House	11	Davit Foundation		
4	Lashing/Limit Switch Arrangement	8	Winch Foundation	12	Foundation for Bowsing Winch		

3.3 LIFESAVING EQUIPMENT

3.3.2 LIFEBOATS AND DAVITS

Lifeboats General

Maker:	Schat Harding
No. of sets:	2
Model:	MCB24
Dimensions (L x B x H):	7.46m x 2.9m x 2.96m
Number of persons:	45
Weight:	Light load (including loose equipment) 3,850kg
	Total davit load for lowering 7,225kg
Engine maker:	Saab
Model:	L3.139LB
Engine type:	Diesel, fresh water cooled
Rating:	29hp
Starting system:	Electric motor
Speed:	6 knots
Fuel tank capacity:	210 litres, 24 hours duration at 6 knots

The lifeboat is moulded from fire retardant polyester resins and fibreglass, with the space between the seats and hull, canopy and canopy liner filled with polyurethane buoyancy foam, which provides the craft with enough buoyancy to remain afloat and upright, even if holed below the waterline. The lifeboat is totally self-righting when fully loaded and flooded.

The craft is fitted with two lifting hooks, which are designed to be released simultaneously from inside the craft when the lifeboat becomes fully waterborne.

The steering position is arranged so that there is an adequate view forward, aft and both sides for safe launching and manoeuvring.

The main engine starting battery and the emergency starting battery are contained in watertight boxes. There is a sprinkler pump which is driven directly from the main engine and is used to protect the lifeboat to give an external water spray on the canopy of the boat, providing the outside of the boat with a protective layer of water should fire be encountered on the surface of the sea. The self-priming water spray pump is driven from the main propulsion engine via clutch-in belt drive. The spray water is delivered to the spray rail via an isolating valve inside the lifeboat.

Three internal 40 litre air cylinders are installed which, when operated, will provide the passengers and engine with air at a controlled rate for at least 10 minutes.

Natural ventilation is achieved via automatic valves located on the aft end of the steering position canopy. These valves prevent the cabin from becoming dangerously underpressurised when the engine is running. An overpressure relief valve is mounted aft, on the rear door inside the canopy. This valve prevents the cabin from becoming dangerously overpressurised when the emergency air system is in operation.

The three emergency air system cylinders are pressurised to 200 bar and should be topped up if the pressure drops to less than 190 bar.

A fuel shut off valve is situated on top of the fuel tank.

The centre section of the boat contains the water tank, fuel tank and equipment tanks, with access available to the drain plug. A manual bilge pump is provided.

The hydraulic steering system is fitted with an emergency tiller arm.

External water spray systems are installed on the canopies of the boats, which will provide the outside of the boat with a protective layer of water, should fire be encountered on the surface of the sea.

Lifeboat Davit

Maker:	Schat-Harding
No. of sets:	2
Type:	VIP 8/W 120 L
SWL:	7,848kg
Hoisting speed:	0 to 5.9m/min
Lifting height:	47m
Weight of davit and winch:	5,140kg
Bowsing:	Tandweil Wandlier winch

The lifeboat davit is a wire operated davit with a fully inboard recovery position. The jib swivels around hinges at the base, with movement restricted by inductive type limit switches.

The electric winch is operated from a position with a clear view of the winching operation at the ship's side. The motor is fitted with a heater and is fitted at a position aft of the davit with the winch unit. The 22mm galvanised wire ropes are led around steel sheaves to the falls.

The winch unit consists of twin drums which can hold up to 47 metres of wire each in two layers, with two brakes. The hydraulic brake controls the speed of lowering which is adjustable up to 90 metres per minute, while the multiple disc brake is the holding brake. The brake can be controlled by a remote control wire, operated by the coxswain on the lifeboat, from the ship side rail or by a direct control using a brake arm on the winch unit.

Lifeboat Lowering Procedure

a) Rig the lifeboat painter to the designated strong point forward of the davit.

b) Engage the crank handle and tighten the boat falls to take the wieght of the boat off the gripes, then remove the crank handle.

c) Release the gripe lashings slip hook, the lashings will now be released.

d) Slide open the entrance door at the side end of the boat. The helmsman should enter first and fit the drain plug then prepare to start the engine.

e) Ensure all personnel are wearing their life jackets. Embark all personnel through the side hatch, ensure an even distribution of weight and that they are strapped in. The seating positions and seatbelts are clearly marked. The seatbelts are colour coded to ensure that the personnel choose the correct matching straps. Close the hatch and secure.

f) Check the fuel tank cock is open.

g) To start the engine, turn either of the battery supply switches through 90° to the ON position. Check that the engine control lever is in the NEUTRAL position, press the button on the side of the lever to disengage the gear box and then move the lever forward to the MAXIMUM position.

On the main console turn the starter switch to the IGNITION position, continue to turn the switch to the HEATING position, hold at this position for 10 to 20 seconds. After the preheating phase turn the switch to START. Return the switch back to the IGNITION position when the engine has started.

(**Note:** If the engine has not started within 10 seconds, return the switch to the IGNITION position and wait 60 seconds to allow the starter motor to cool down before attempting to restart the engine.

CAUTION

The lifeboat engine may be run for a maximum of five minutes whilst not water borne. During this period the propeller clutch must not be engaged, otherwise the propeller gland seal will be damaged.

h) Once engine is started, pull back the engine control lever to the NEUTRAL position, the button is released and the gearbox engaged.

k) Pull continuously on the brake remote control wire until the lifeboat reaches the water, or lift the brake lever manually on the boat deck.

l) When the lifeboat reaches the waterline, release the brake remote control wire and operate the falls hook quick release lever as follows.

m) Ensure that the hydrostatic indicator is pointing to the OK position. Remove the safety pin on the release handle then pull the release handle full back. The lifting hooks will now open.

n) Check that the falls have released from the hooks and are clear.

o) When ready, release the toggle painter, move ahead on the engine and steer away from the vessel.

Operation of the Sprinkler System

The sprinkler pump is directly driven from the front of the lifeboat engine by a belt drive and runs continuously. A series of four loops on the canopy ensure that the canopy and helm position are adequately covered by a water spray when the system is in operation.

To operate the water spray, pull the control lever back at the helm console position, the discharge valve will now open supplying water to the canopy. There is a connection on a loop above the helm position for connecting a fresh water hose to flush through the system after use.

(**Note:** The sprinkler system is most efficient when the engine is at full speed.. If in a fire situation the external air supply to the engine must be closed and the emergency air supply to the lifeboat opened)

Operation of the Emergency Air Supply System

Ensure that the air cylinder isolating valves are open, in normal operation these valves are left open. Open the shut-off valve which is located next to the regulating valve on the left hand side of the steering console. Air will now be supplied to the lifeboat interior for a period of approximately 10 minutes.

Operation of the Emergency Steering

Under the rear seat port aft, operate the manual bypass valve by turning it through 90° to an inline position. It is now possible to connect the emergency tiller arm to the rudder stock and control the rudder movement directly.

Lifeboat Recovery Procedure

a) Ensure the brake lever on the winch is in the fully closed position.

b) Reset the lifting hook quick release mechanism inside the lifeboat before coming back alongside below the falls.

c) Check that the starter main switch, located on the air handling room switchboard, is ON.

d) Ensure the emergency stop button in the shipside control box is reset.

e) Hook on the fall suspension chains to the forward and aft hooks on the lifeboat and reset the hydrostatic release mechanism. To reset the hydrostatic release mechanism, ensure that the fall suspension chains are secure in the hooks and that the hooks forward and aft are closed.

f) At the hydrostatic release control stand, pull out the position pin locking the release lever in the open position and move the release lever to the LOCKED position, release the position pin and insert the safety pin. Visually check that the amplifying arm and cam release are in their correct position.

g) Signal the deck party to begin hoisting the lifeboat.

h) Push the UP button on the winch motor remote control unit to start raising the lifeboat. When the lifeboat is just clear of the water stop hoisting and check that the hydrostatic release indicator has moved to the NO position. Visually check the amplifying arms and cam release are still in their correct position. If all is correct continue to hoist the boat. The engine should now be turned off and the battery power selection switch turned to the OFF position.

(**Note:** The winch motor will lift the lifeboat with a weight of 4,700kgs, weight of boat, equipment and approximately six persons.)

i) Check that limit switch operates and stops the motor just short of the fully raised position.

j) Engage the winch handle and manually wind in the lifeboat the remainder of the way then remove the winding handle.

k) Disembark the lifeboat crew members.

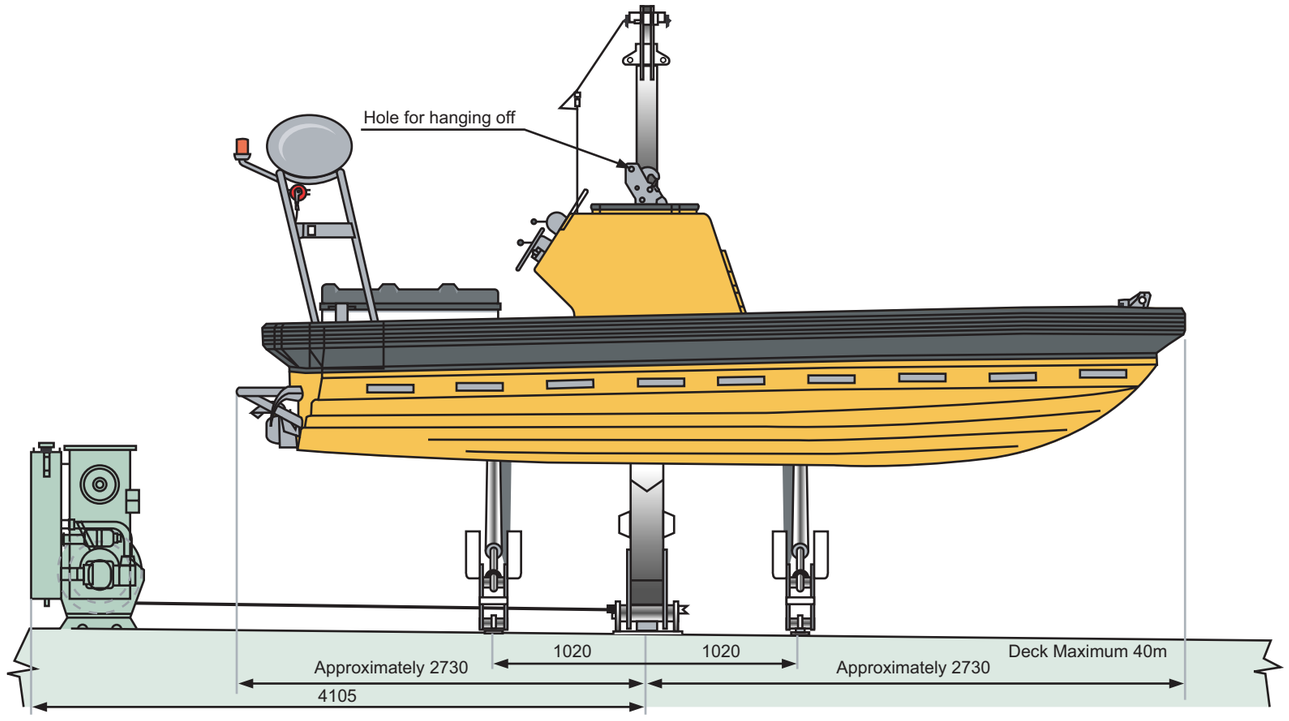
l) Return the davit arm stoppers units to the CLOSED position and refit the safety pin.

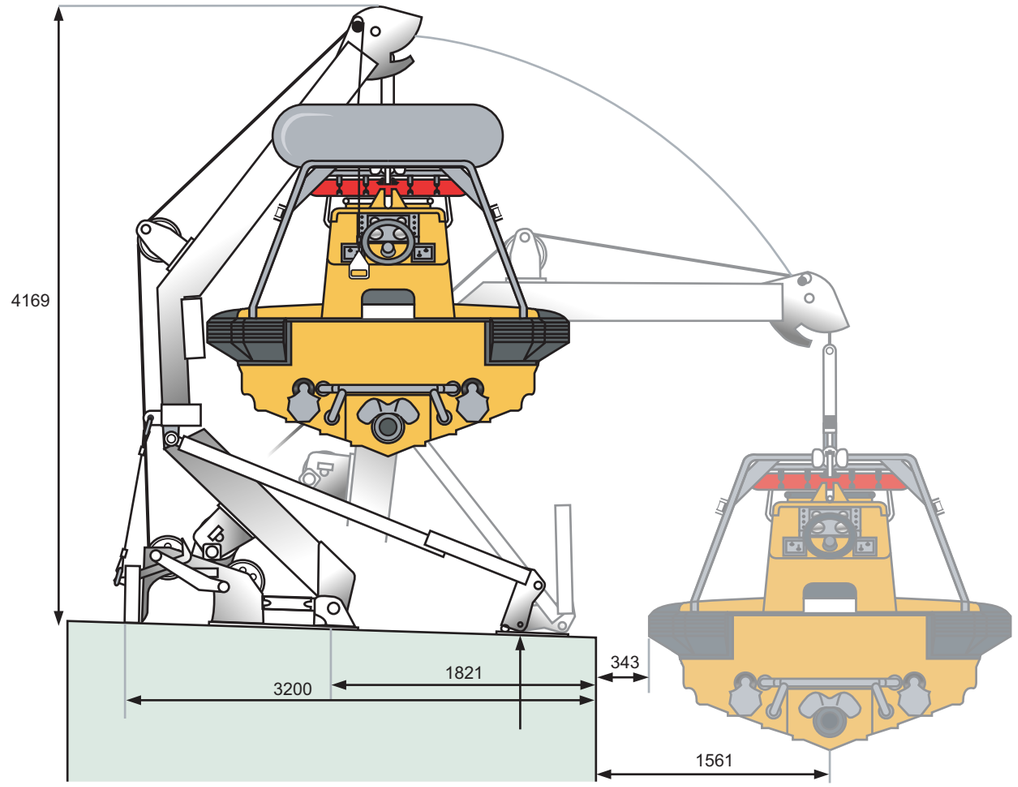
m) Slack off the brake until the boat is lowered onto the suspension hooks at the davit head.

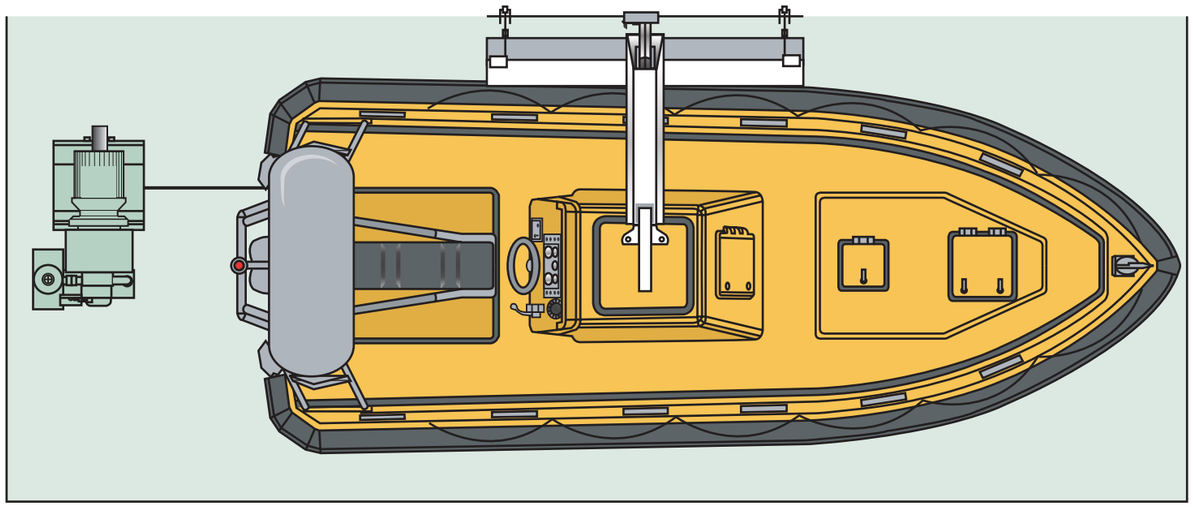
n) Connect the slip hooks on the gripes and secure with the turnbuckle.

o) Turn the starter main switch OFF.

Illustration 3.3.3a Rescue Boat and Davit







3.3.3 RESCUE BOAT

Maker:	Norsafe AS
Type:	Diesel jet fast rescue boat
Model:	Merlin 6.15m
Length overall:	6.25m
Beam:	2.4m
Depth:	1m
Capacity:	6 persons (up to 15 persons in an emergency)
Boat weight with equipment:	1,450kg
Full weight with 3 persons:	1,725kg
Lifting arrangement:	Off-load rescue boat hook
Maker:	Norsaf AS
Type:	Offload K4-FM 47
Propulsion:	144hp inboard diesel engine with waterjet
Engine maker:	Steyr
Speed with 3 (15) persons:	28 knots (8 knots)
Range with 3 persons:	110 nautical miles (4 hours)

Description

The fast rescue boat is supplied for use specifically as a search and rescue craft or as a liferaft towing and marshalling craft. However, the layout and performance of the craft allow it to be used as an all purpose workboat when necessary. The fast rescue boat must be kept in a state of constant readiness at all times, to deal with any emergencies such as man overboard, etc that might occur.

The handling and control of a fast rescue boat is a highly specialised task with command of the boat only being delegated to authorised personnel who have attended the specialist company approved training course.

For information in relation to recognised search patterns, refer to section 5.3.3.

The fast rescue boat can be launched whilst the vessel is underway using the painter, at the Master's discretion. At least once a month, the fast rescue boat should be launched and the engine run in the ahead and astern positions.

Construction

The fenders are made of polyethylene foam with a reinforced PVC cover. These provide the hull with protection from impacts. The hull and deck are made from glass reinforced polyester (GRP) with fittings made from stainless steel, aluminium or galvanised steel, as appropriate. Surfaces are prepared with a non-slip coating. The buoyancy material where fitted is made from polyurethane foam.

The space between the hull and the inner liner is filled with 2,000 litres of buoyancy material which will allow the boat to float safely in the fully flooded and fully loaded condition should the hull be damaged below the waterline. The fenders add another 500 litres of buoyancy to assist this flotation safety feature.

The hull has two longitudinal bulkheads, transverse bulkheads and sprayrails to provide structural strength. It is a full planing deep V type with a transom dead rise of 21°, giving excellent sea keeping characteristics.

Lifting is facilitated by a single point arrangement, consisting of an approved off load release hook with a connection ring for a davit hook installed on top of the reinforced engine compartment.

A permanently inflated self-righting bag is fitted to the top of the rear frame which self-rights the boat in the event of a capsize.

Other features of the hull construction include:

- Self-bailing from two drainage outlets at the stern
- Watertight console including instrument panel, engine start/stop controls, steering/engine controls and hook release
- Seating for three people above the transmission compartment
- Electric bilge pump located in the transmission compartment (a manual bilge pump is also provided)
- Towing attachments at each aft corner
- Secure grab handles throughout the boat

Propulsion System

The rescue boat is fitted with a 144hp SOLAS approved inboard diesel engine driving an Alamarin waterjet with the following features:

- Electric starter with two batteries
- Fresh water cooling through a sea water cooled heat exchanger
- Waterjet with a dry run capability, allowing the boat to be run in the davit for a maximum of thirty minutes
- Waterjet protection in the form of a protection frame fixed to the transom
- Twin engine and fuel shut off system in case of capsize or coxswain loss, consisting of a mercury switch and a dead man switch
- Exhaust system designed to prevent water ingress in the event of a capsize

Rescue Boat Davit

Maker:	Schat-Harding
No. of sets:	1
Type:	SA3.5/W 50 RS
SWL:	3,433.5kg
Overside reach maximum	1.561m
Hoisting speed:	0 to 20m/min
Lifting height:	40m
Weight of davit and winch:	3,000kg

The rescue boat davit is a wire operated davit with a fully inboard recovery position. The fixed length jib swivels around hinges at the base, with movement restricted by inductive type limit switches.

The electric winch is operated from a position with a clear view of the winching operation at the ship's side. The motor is fitted with a heater and is fitted at a position aft of the davit with the winch unit. The 18mm galvanised wire rope is led around steel sheaves to the falls.

The winch unit consists of a drum which can hold up to 44 metres of wire in two layers, with two brakes. The hydraulic brake controls the speed of lowering which is adjustable up to 90 metres per minute, while the multiple disc brake is the holding brake. The brake is controlled by a remote control wire, operated by the coxswain on the rescue boat.

Rescue Boat

Procedure for Lowering the Rescue Boat

a) Remove all covers and lashings from the rescue boat and davit. Ensure that the electric charging plug is removed.

b) Ensure that the safety bolt has been removed from the davit.

c) Turn the main power ON (in case immediate recovery is required). Main power switch located in the Air Handling Room.

d) Check that the painter is correctly fastened to the rescue boat and to the designated secure point forward of the davit. The painter length should be appropriate to the vessel's freeboard and should be adjusted as necessary.

e) The rescue party can now board the rescue boat, wearing the appropriate survival gear.

f) The engine should now be started and its correct operation checked.

g) Once the coxswain is satisfied with the engine, they should check that the crew is ready to lower, then lower the boat in a safe and controlled fashion.

h) On approach to the water surface, the coxswain should assess the approach and set the boat controls to suit the conditions, i.e. set the engine running slowly ahead if the vessel is under way and ensure that the painter is not slack.

i) Once the boat is fully waterborne, the designated crew member should remove the safety pin from the hook and stand clear. He should then inform the coxswain that the hook is active.

j) The coxswain should then pull the hook release handle aftwards until the hook is clear of the falls.

k) The boat controls can then be adjusted to assume control of the rescue boat. Once fully under control, the designated crewman can pull the painter release handle and the boat can immediately be steered away from the vessel.

(**Note:** Whilst adjusting the rescue boat controls alongside the vessel, the crew should keep clear of the falls.)

l) Reset the quick release hook mechanism and replace the safety pin.

Procedure for Recovering the Rescue Boat

a) Ensure that the lifting hook quick release mechanism inside the rescue boat has been reset before coming back alongside below the falls and that the safety pin is in its correct position.

b) Once alongside, retrieve the painter line and attach it to the painter release hook.

c) The lifting hook can then be attached to the falls, ensuring that the housing unit is correctly positioned.

d) Once correctly attached and all crew and passengers are safely positioned, signal the deck party to begin hoisting the rescue boat.

e) The boat can then be hoisted until it is fully recovered.

(**Note:** The winch motor will lift the rescue boat with a maximum of six persons on board.)

f) Once the boat is fully recovered, stop the engine.

g) Disembark all passengers and crew.

h) Secure the rescue boat, then prepare for immediate relaunch.

i) Finalise all securing arrangements and recover the boat.

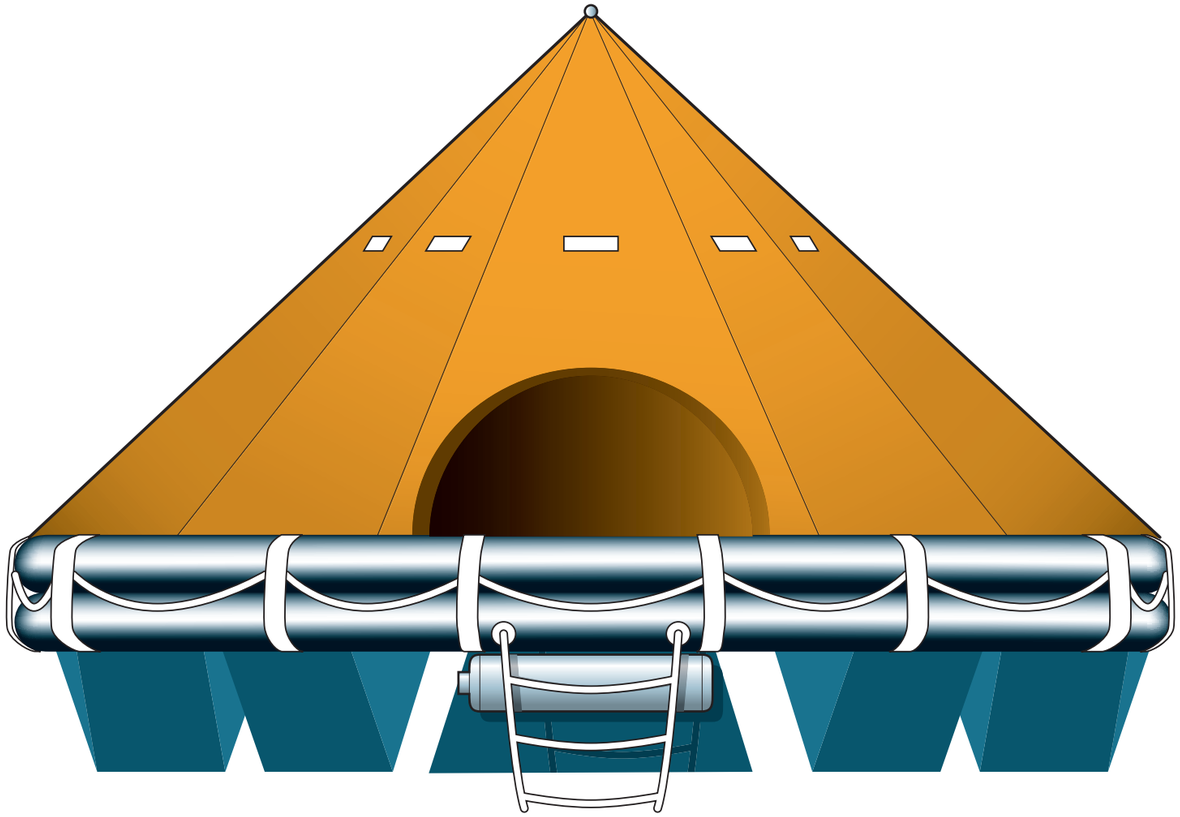
Rescue Boat Equipment

The crew should at all times whilst in the rescue boat be wearing the recognised safety gear i.e. thermal protective suits, safety helmets, inflatable lifejackets and be carrying the waterproof VHF communication equipment held on the bridge for this purpose.

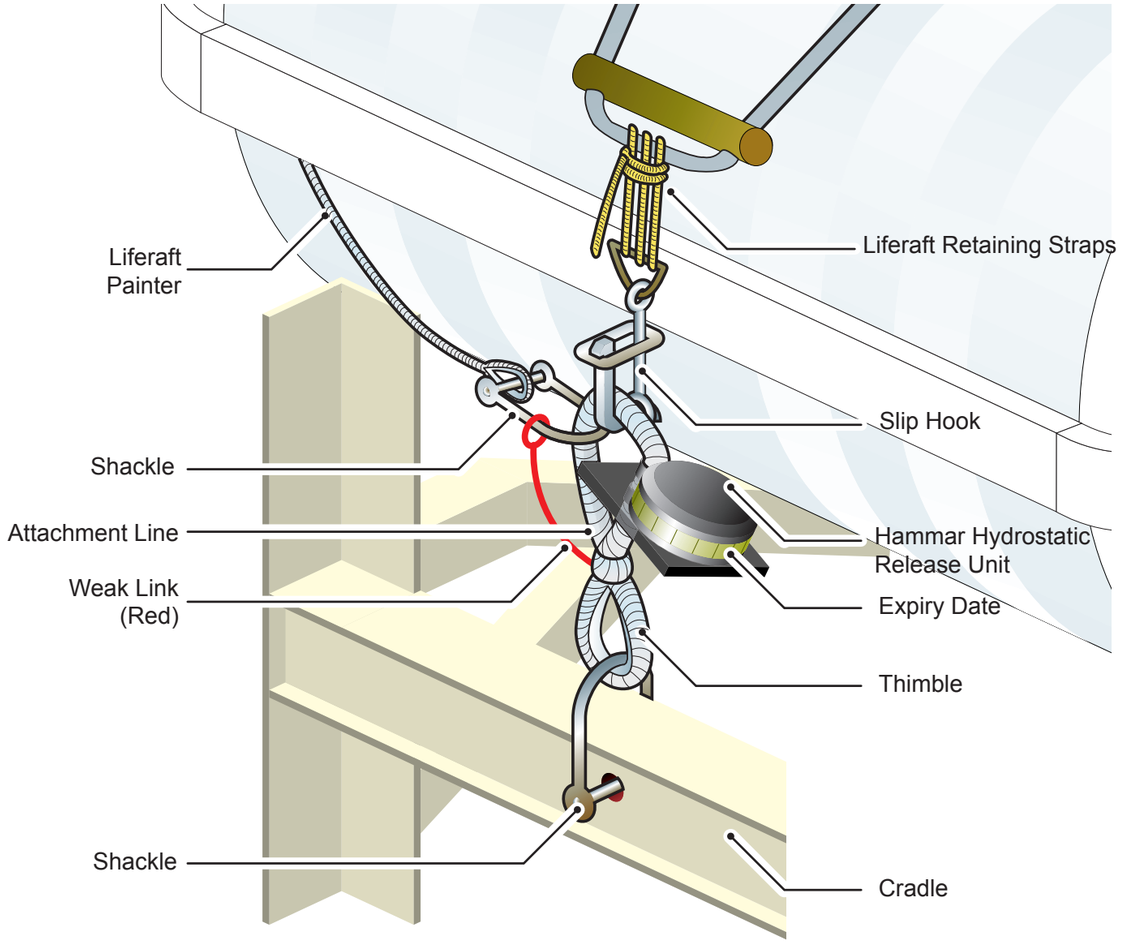
Additionally, the rescue boat has the following equipment on board;

- Buoyant paddles (2 sets)
- Boathook
- Buoyant bailer
- Bucket, with line
- Compass
- Sea anchor with tripping line
- Painter
- Buoyant towing line
- Waterproof signalling torch (with spare batteries and bulb)
- Whistle
- Waterproof first aid kit
- Buoyant rescue quoit and line
- Engine tool set
- Portable fire extinguisher
- Searchlight
- Knife on a lanyard
- Radar reflector
- Rope ladder
- Thermal protective aids
- Chemical light
- Lantern

Illustration 3.3.4a Liferafts



Liferaft



Hydrostatic Release

3.3.4 LIFERAFTS

Maker:	Viking Lifesaving Equipment Ltd
Type:	4 x 25 person manual launch
	1 x 6 person manual launch
Total weight:	183kg each (25 person manual launch)
	77kg each (6 person manual launch)

General

There are four 25 person liferafts in total, two stowed close by each lifeboat on A deck and one 6 person liferaft stowed on the forward focsle deck.

All four 25 person liferafts are of the manual launch variety, with hydrostatic release. The forward 6 person liferaft is not fitted with a hydrostatic release unit.

All the liferafts are constructed with twin buoyancy chambers, one above the other. The bottom and the canopy of the rafts are of double construction and may be inflated by bellows.

The rafts are provided with boarding ladders, inside and outside gripping lines, capsize stabilisers and a salt water activated battery for both internal and external lighting.

Accessories supplied are a rescue line with rubber quoit, repair outfit, hand bellows, floating knife, operational instructions, sea anchor (drogue) and an emergency pack to SOLAS standards.

Release of Rafts

Hydrostatic Release Units (HRU) are fitted to each of the large rafts. These will activate when submerged to a depth of two to four metres, releasing the rafts to float towards the surface.

After activation of the HRU, the raft is still secured to the vessel by a weak link. After inflation, sufficient drag is applied to break the weak link and allow it to float free.

The rafts may be released manually by unfastening the slip hook securing the lashing round the container. Ensure the ring on the end of the painter is still attached to the HRU, or a strong point on the ship's deck.

When the raft is thrown over the side, the painter is pulled out until the CO_2 cylinder is activated and the raft inflates.

Operation

a) After launching the liferaft, the painter must be cut with the knife provided to avoid the raft being pulled under.

b) Paddle away from the danger zone using the paddles placed in a bag close to the entrance of the raft.

c) Alternatively one of the lifeboats or the rescue boat could be used to tow the raft clear.

When the raft is full of survivors, others can hold onto the lifeline around it. The raft is capable of supporting double the number of persons it is certified to carry.

d) When clear of the danger zone, stream the sea anchor or drogue.

The sea anchor stabilises the raft and helps to minimise drift.

e) Inflate the canopy and the bottom of the raft as this gives excellent insulation against the cold. To do this connect the bellows to each topping up valve in turn, which are placed in the raft floor and inner canopy.

The bellows are located in a bag at the entrance.

After a long stay in the raft it may be necessary to top up the two buoyancy tubes.

f) Connect the bellow's plastic tube to the yellow topping up valves.

If an empty raft should capsize, the following procedure should be adopted.

(**Note:** The side of the raft where the CO_2 cylinder is attached lies deepest in the water. The place is marked 'right here'.)

g) Stand with the feet on the cylinder, hold onto the righting strap (placed across the bottom of the raft).

h) Manoeuvre the raft so that the opposite side is facing into the wind.

i) Throw the body backwards while holding onto the righting strap and keeping the feet on the cylinder.

When the wind is very strong, the lifeline can be tied around the waist to prevent the raft being blown away.

A non-swimmer should keep hold of the righting strap and allow the raft to fall back on him (the rubber raft will not injure him). He can then work his way back to the raft entrance under water, holding onto the strap of the lifeline.

If automatic inflation does not work:

j) Swim up to the container, tear off the black rubber bands between the brass rings on the two nylon bands and release the raft by pulling the release wire or use the bellows placed inside the raft.

The valves for inflation by means of the bellows are inside the raft and are coloured yellow.

Port Side Liferafts

3.3.5 SCABA SYSTEMS AND EQUIPMENT

The vessel is supplied with six sets of positive pressure self-contained breathing apparatus (SCABA). Four sets are kept in the safety equipment room on port side of the upper deck accommodation and two sets in the safety equipment locker on A deck starboard side. The following equipment is kept beside each set, ready for immediate use:

Spare cylinders:	3
Safety line and harness:	3
Protective fire jacket:	3
UHF radio:	2
Protective fire trousers:	3
Rechargable Wolflamp:	1
Protective fire gloves (pair):	3
Flash hood:	3
Protective safety boots:	3
Small hatchet:	3
Torch:	3

The apparatus has an estimated working duration of 20 minutes with a 1,200 litre cylinder, plus approximately 10 minutes duration once the whistle is activated. It consists of a high-pressure air cylinder mounted on a lightweight frame. The padded synthetic harness, developed from the Bergen rucksack principle, is fully adjustable to fit all sizes of wearer. A special lifting harness is fitted to all sets required for marine use, a lifeline is connected to this to give the wearer added security when entering enclosed spaces.

The cylinder air is reduced by a single stage pressure reduction system. The air leaves the cylinder and passes through a sintered bronze filter, located in the cylinder connector manifold, then via a stainless steel reinforced PTFE supply hose to the positive pressure demand valve, where it is reduced to a breathable pressure.

The tilt operated demand valve has a spring-loaded neoprene diaphragm to give long reliable service. The simplicity of the valve eliminates the need for adjustment. The demand valve switch enables the wearer to apply positive pressure to the mask by releasing the spring on the diaphragm. This ensures that the air pressure in the face mask is always above the external atmospheric pressure. Any leakage of air from the face mask, due to poor sealing, will be forced out to the atmosphere.

A pressure gauge is attached, via a fire resistant stainless steel reinforced tube, which indicates cylinder pressure, and a whistle unit warns the user when approximately 10 minutes of air remains.

The face mask is moulded in black non-dermatitic neoprene with a deep tapered reflex edge seal.

When not in use a neck strap enables the mask to be carried on the chest. A fully adjustable five-point head harness holds the face mask to the face when required. An integral speech diaphragm is moulded into the front of the face mask which requires no maintenance.

Pre-Use Checklist

Switch Off the Demand Valve

Turn off the black positive pressure knob on the demand valve.

Check the Cylinder is Full

Open the cylinder valve slowly and check the gauge against the pressure stated on the cylinder.

Leak Test of Apparatus

Open the cylinder valve slowly and close again, the gauge reading should not fall by more than 10 bar per minute.

Check the Whistle Setting

Gradually reduce the pressure in the system by partially turning the ON/OFF demand valve switch. Let the pressure reading fall slowly, the whistle should blow at 68 bar for the 1,200 litre cylinder.

Donning the Apparatus

With the shoulder straps and waist belt slackened, put on the apparatus and adjust the shoulder straps until the cylinder is held snugly on the back. Fit the waist belt and adjust as required. Hang the face mask strap around the neck. Secure the lifeline to D ring. Now fit the leg straps of the lifting harness and secure through the D rings. Check the demand valve is in the OFF position, turn on the cylinder air valve slowly. With the thumbs inside the head harness straps, put the chin into the mask first and pull the straps over head. Position the mask so that the chin fits snugly into the chin cup and then gently tighten the head harness, lower straps first. Do not over tighten.

Check for Positive Pressure

Turn the black knob on the demand valve to the ON position, gently lift the mask seal off the cheek and ensure that air flows out of the mask, proving that the air pressure in the mask is positive. Allow the mask to re-seal and hold breath. There should be no leakage from the exhale valve, as denoted by the sound of a constant flow of air from the demand valve.

Check Face Mask Leakage

Close the cylinder valve and continue to breathe normally, until air in the apparatus is exhausted and the face mask is pulled gently on to the face. When the pressure gauge shows zero, hold breath for 10 seconds; any leakage will either be heard or shown by the mask moving away from the face. If a leak is detected, turn on the cylinder valve, readjust the mask and head harness, then retest.

Check the Actual Cylinder Pressure

Turn the cylinder valve fully ON and check the reading on the pressure gauge.

Check the Supplementary Air Supply

To operate the supplementary air supply (demand valve override) depress the purge button on the demand valve cover. This action causes the tilt valve mechanism to be displaced and releases air into the face mask.

CAUTION

In toxic atmospheres where the contamination has exceeded certain levels, reference should be made to BS 4275 for guidance.

In the event of the wearer using spectacles, or having facial hair, it is likely that the face seal fit will be impaired.

At very high work rates the pressure in the face mask of positive pressure breathing apparatus may become negative at peak inhalations.

After Use Procedure

a) Turn off the positive pressure demand valve switch.

b) Slacken off the head harness and remove the face mask.

c) Turn off the cylinder valve.

d) Slacken off shoulder straps, undo the waist belt and leg harness.

e) Take off the apparatus. Release air trapped in the system by turning the demand valve to the ON then the OFF position.

f) Remove cylinder from apparatus and mark it MT (empty) for refilling.

g) Place a fully charged cylinder in the apparatus so that it is ready for instant use.

h) Fully slacken off the head harness straps.

i) Clean the face mask by removing the demand valve and washing the mask in soapy water (do not use detergent). After drying, lightly dust the face mask with French chalk. The interior of the visor may be wiped with a demisting agent and the whole polished with a clean lint free cloth.

Maintenance

Monthly

The apparatus should be subjected to the test as stated in the Pre-Use and Positive Pressure checks.

Annually

The demand valve diaphragm and all seals should be replaced annually, or more frequently as a result of the monthly inspection.

Breathing Apparatus Sets in Safety Equipment Locker

3.3.6 SCABA AIR COMPRESSOR

Model: Premiair 350
No. of sets: 1

The SCABA air compressor is specially designed for recharging SCABA cylinders with clean dry high pressure air up to 300 bar. The unit is mounted on a skid located in safety equipment room on port side of the upper deck accommodation. Additionally the compressor is used to recharge the lifeboat air cylinders up to a pressure of 200 bar.

There are two discharge pressure hoses, the pressure line (with associated pressure gauge) with the red locking nut is used on the SCABA cylinders and the pressure line with the black locking nut (with associated pressure gauge) is used for the lifeboat air cylinders.

The unit is supplied from the emergency switchboard 440V feeder panel, isolation breaker EP-013.

Procedure for Operation

a) Check the compressor sump level and top up if required.

b) Open the purifier/filter drain valves and blow through.

c) Open the water separator drain valve and blow through.

d) Connect up the air cylinder to be recharged to the correct pressure line, see above.

e) Start the air compressor.

When the cylinders have been recharged, shut down the compressor and log the running hours. The purifier/filter should be changed according to the manufacturer's operating instructions

SCABA Air Compressor in Safety Equipment Locker Upper Deck Port Side

3.3.7 LIFEBOAT/LIFERAFT SURVIVAL GUIDE

In the event that the vessel has to be abandoned, it is necessary to make some very important decisions and carry out certain actions quickly. These are summarised as follows:

Prior to Abandonment

If time and circumstances permit

- Put on extra clothing
- Put on a life jacket
- Take extra clothing or blankets
- Drink water
- Take water in sealed containers

In addition to the SART, EPIRB and GMDSS radios the following items will be of use :

- Extra lifejackets
- Extra survival bags
- Small plastic bags
- Extra medical supplies
- Extra electric torches and batteries
- Paper and pencil
- Portable radio receivers, books, playing cards etc
- Navigational instruments, books, chart and chronometer
- Ship Captain's Medical Guide

Abandoning Vessel

All personnel should, if possible, board the lifeboat without getting wet.

If for some reason this is not possible and a jump into the water has to be made, the follow procedure should be adopted.

- Make sure it is clear to jump
- Hold your nose
- Hold down your life jacket
- Put your feet together
- Look ahead when you jump

Additional Duties Allocated on the Lifeboat Muster List

- SARTS (Radar Transponders) to the lifeboats
- GMDSS portable radios to the lifeboats
- EPIRB to lifeboat
- Blankets and provisions

Equipment Found in Liferafts and Lifeboats

Liferaft Equipment

- Operational instructions
- Two sea anchors and cord
- Two paddles
- Rescue quoit with line
- Bellows
- Repair kit
- One buoyant safety knife - two in rafts for more than twelve persons
- Four rocket parachute flares
- Six hand flares
- Two buoyant smoke signals
- Electric torch with spare bulb and batteries
- Whistle
- Signalling mirror
- Scissors
- Instructions for survival
- Illustrated table of lifesaving signals
- One bailer, two in rafts for more than twelve persons
- Two sponges
- Emergency ration, 10,000kJ per person
- Drinking water, 1.5 litre per person
- One drinking vessel
- Three tin openers
- Fishing tackle
- Medicine box
- Anti-seasickness medicine, 6 doses per person
- Seasickness bag, 1 per person
- Radar reflector and radar transponder
- Thermal protective aids for 10% of the number of persons permitted in the liferaft, but at least for 2 persons

Lifeboat Equipment

- One set of oars
- One set of crutches
- Two boat hooks
- One bailer
- Two buckets, with lanyards
- One survival manual
- One compass in binnacle
- One sea-anchor
- Two painters
- Two hatchets
- Three litres of fresh water per person
- One rustproof dipper with lanyard
- One rustproof, graduated cup
- One ration of provision with at feast 10,000kJ for each person
- Four parachute flares
- Six hand flares
- Two smoke signals
- One flashlight (Morse) with spare batteries and bulb
- One signal mirror
- One copy of rescue signals
- One whistle
- One medicine chest
- Six doses of anti-seasickness medicine for each person
- One seasickness bag for each person
- One pocket knife with lanyard
- Three can openers
- Two rescue quoits with line
- One manual pump
- One set of fishing tackle
- One fire extinguisher

- One searchlight
- Thermal protection suits
- One efficient radar reflector
- One set of tools for minor adjustments of the engine
- One female plug
- One set of first aid instructions

Aboard the Survival Craft

First Actions

- Elect a leader, this may be the most senior officer or the person appointed on the muster list.
- Give an anti-seasickness tablet to all personnel.
- Activate the EPIRB (Emergency Position Indicating Radio Beacon).
- Take a muster of persons on board.
- Search the area for other survivors or survival craft.
- Liaise with any other survival craft to ensure that all persons are accounted for.
- Assess the situation. Is rescue likely and how long will it take?
- Do you stay close to the position of the sinking or proceed towards the nearest land?
- Put the food and water under the control of one person who will be responsible for distribution of the rations.
- Collect in all additional food, clothing and sharp objects or weapons that may have been brought into the survival craft.
- No food or water should be issued for the first 24 hours.
- The leader should nominate different people to the following positions, first aid, signalman, hull repairs, engine repairs, recorder of voyage log, navigator, helmsman and lookouts.

Stay Close to Position of Abandonment

With the improvements brought about by the GMDSS system in maritime search and rescue this is the most likely decision that will be made. Prior to taking to the lifeboat a DSC Distress Alert should be sent out. This can be done at the touch of a single button. In addition there are the EPIRB and SARTS which should be taken to the lifeboats when abandoning ship. The EPIRB when activated allows the marine rescue co-ordination centre (MRCC) to locate the position of survivors and guide vessels and aircraft to the rescue position. Should the EPIRB not be in the survival craft when the vessel sinks the hydrostatic release unit will automatically release it, and it will then automatically start its transmissions. Where possible it is therefore beneficial for all the survival craft to stay together, if possible by tying the survival craft together.

The SARTS should be positioned on the extension pole, switched on and mounted as high as possible.

To minimise drift, rig the sea anchor, issue anti seasickness tablets, ensure that any persons in the water are accommodated in the lifeboat or liferaft, if possible.

Listen for whistles and look for survivors, signalling lights and lights of other rafts, ships or aircraft. The lookouts should be properly briefed in their duties with regard to the collection of useful debris, how to keep a lookout, sector searches and the use of pyrotechnics.

Proceed Towards the Nearest Land

In some circumstances this will be the most obvious choice. Factors to take into consideration are:-

- Was a distress alert sent?
- If no EPIRB is in the boat, search the area of the sinking to see if it has surfaced.
- How far to the nearest land, is the nearest land within the fuel range of your craft?

Indications of the proximity of land are changes in the wind direction around sunset and sunrise. The land and sea breeze effect can be quite distinct in some areas. A single cumulus cloud, or occasionally several, appears to be stationary close to the horizon whilst others are moving, is a good indication of land beneath. Also if a single cloud, with no others around, remains stationary close to the horizon. There are many other indications such as a green and blue reflection on the underside of the clouds in low latitudes, the direction that birds fly in either early in the morning or in the evening also the change in colour of the sea from green or blue to a lighter colour.

Do not approach land at night unless you know exactly where you are and that the landing area or harbour entrance can be safely transited. During the hours of darkness lookouts should keep a good watch for the sound of surf and report to the watch leader any visual or audible occurrences.

Settling Down to a Period before Rescue

Having made an assessment of how long it will be before rescue is likely it is now necessary to decide how the available food and water will be divided and issued. The following are a few guidelines.

The minimum daily water ration should be around 450ml to 500ml given in three separate issues at sunrise, noon and sunset. This quantity will be sufficient to avoid severe dehydration. The daily food ration should consist of 800kJ to 850kJ of the emergency rations given in three equal amounts as for the water. (This equates to around 500g)

To make the decision as to how much should be issued take the total available, separate one third as emergency stock should rescue not be forthcoming when expected, then apportion the remainder where possible on the above basis as a minimum.

In each lifeboat there will be 3 litres of water and 10000kJ of food for each person that the boat is certified to carry. It should be noted that the emergency rations consist mainly of carbohydrates, some fat and minimal protein. These rations do not require the consumption of water or body fluid so that they can be digested, which is of great importance.

Food and water should be issued in such a way that all can see that it is fair. Everyone will become thirsty and as time passes human nature will make the ration distribution a very difficult and harrowing experience and also the highlight of the day.

If a desalination plant is available, this should be put into operation immediately and its output used in preference to the internal water.

Passing the Time

The leader has to face and resolve the following problems:

Maintain morale, this is best approached by giving duties to each person which are meaningful, and ensuring that they are carried out.

Duties such as lookout, helmsman and baler should be rotated at intervals of not more than one hour, as this will prevent boredom and lack of vigilance from setting in.

Continually show confidence that rescue will take place. Do not allow individuals to lapse into melancholy. Try to make everyone think of factors other than the present situation by introducing games of various forms. If a portable radio is available tune it in and listen to the various programmes. Playing card games is useful, as considerable concentration is required.

Maintain the health of all on board, both mental and physical. Routines can be counter productive. Where possible restrict movement to a minimum as all movement consumes body fluid. Body fluid is probably the most significant single factor to control whether or not you survive.

The initial withholding of food and water for 24 hours puts the body into a slightly dehydrated state, which is the ideal situation for a prolonged period in a survival craft, during this period all persons should be encouraged to urinate, this will assist in reducing urinary retention problems later.

Do not consume food high in protein as this causes defecating which in turn causes you to use up your body fluids which you will be unable to replace.

If possible keep a good flow of fresh air through the boat as this will help to reduce seasickness. Ensure that all persons take the anti-seasickness tablets for the first two days. After this, most people will be acclimatised to the motion of the craft.

Towards the evening try to hang out any damp clothing and make sure it is dry for the evening chill in the tropics. This avoids the loss of body fluid as body heat dries the clothing and reduces the internal body temperature.

As thirst grows, the temptation increases to drink seawater. This temptation must be resisted at all costs.

All parts of the body should be shaded from the sun and the elements. This will reduce the loss of body fluid and also reduce the risk sunburn or frostbite.

If your water ration is at least one litre per person daily then fishing can be a worthwhile exercise. However, remember that fish are high in protein which brings its own problems as previously mentioned.

The blood of sea birds is quite nutritious. To catch sea birds, try putting some of the fish guts on a piece of wood with a hook in the middle and allow it to float a little way from the craft.

Do not encourage swimming as a form of exercise, this will use up energy and can put the individuals at risk from sharks.

Exposure Hypothermia

There is a risk of hypothermia in water below about 25°C. Extra clothing will delay the onset of hypothermia even if immersed, and of course will provide extra warmth for the survivor in the lifeboat even though immersion takes place. Totally enclosed or partially enclosed lifeboats provide far better protection from the elements than the older open type, but extra clothing is still essential for warmth in nearly all climates. If a survivor has been immersed in water and has hypothermia, strip off the wet clothing and replace with dry garments, if available. Warm the patient with extra layers of clothing and use life-jackets as extra insulation. Use a thermal protective aid (plastic survival bag) if available. Persons particularly at risk from hypothermia should be positioned nearer the engine, which will run for 24 hours at full power and much longer if kept at reduced speed.

The engine can be a very valuable source of warmth in cold weather, but fuel should be conserved as much as possible, dependant upon sea conditions, by running at reduced speed or using the engine for certain periods only.

Dehydration

This is a fact of life in a survival craft. All you can endeavour to do is minimise the rate at which your body looses fluid. Drinking either sea water or urine increases the rate at which precious body fluids are used up and in turn makes the person even thirstier, eventually the person will lapse into unconsciousness and die. Avoid eating proteins, minimise exercise and try to stay dry and comfortable.

Emergency Repair of Life Saving Appliances

A repair kit should be included in the liferaft onboard equipment pack. Small leakages can be stopped using the leakstoppers found in the repair kit. As a last resort wet rags may be inserted into a hole or bound over using tape or whatever means can be found.

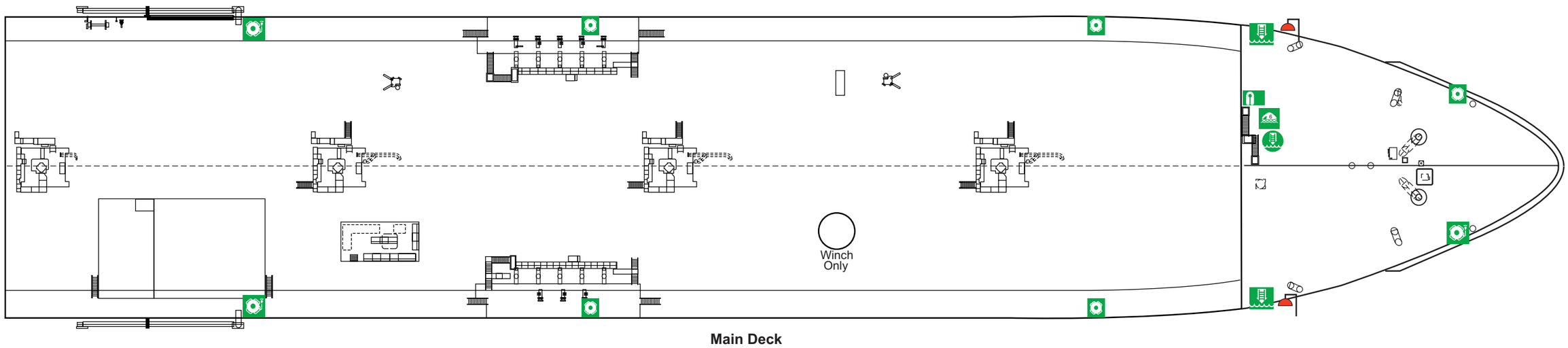
Damage below the waterline can be repaired by moving the weight within the raft to the opposite side so that the damaged part is lifted clear of the water permitting the repair to be made.

Repairs can be made to dry surfaces using the adhesive tape supplied in the repair kit.

These are only temporary repairs and should be replaced by making a permanent repair using the special glue and patches provided.

3.3.8 LIFESAVING EQUIPMENT

Illustration 3.3.8a (1) Lifesaving Equipment on the Main Deck



Main Deck

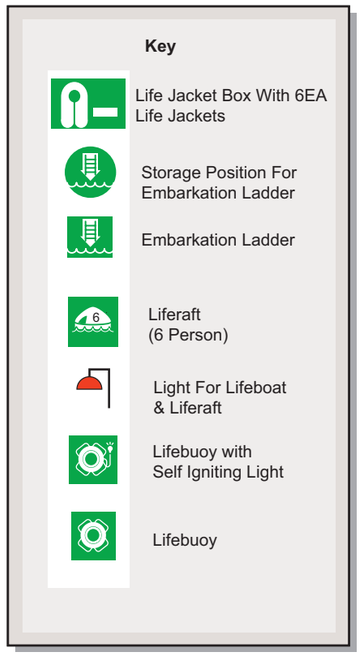


Illustration 3.3.8a (2) Lifesaving Equipment on Navigation Bridge Deck and Escape Routes

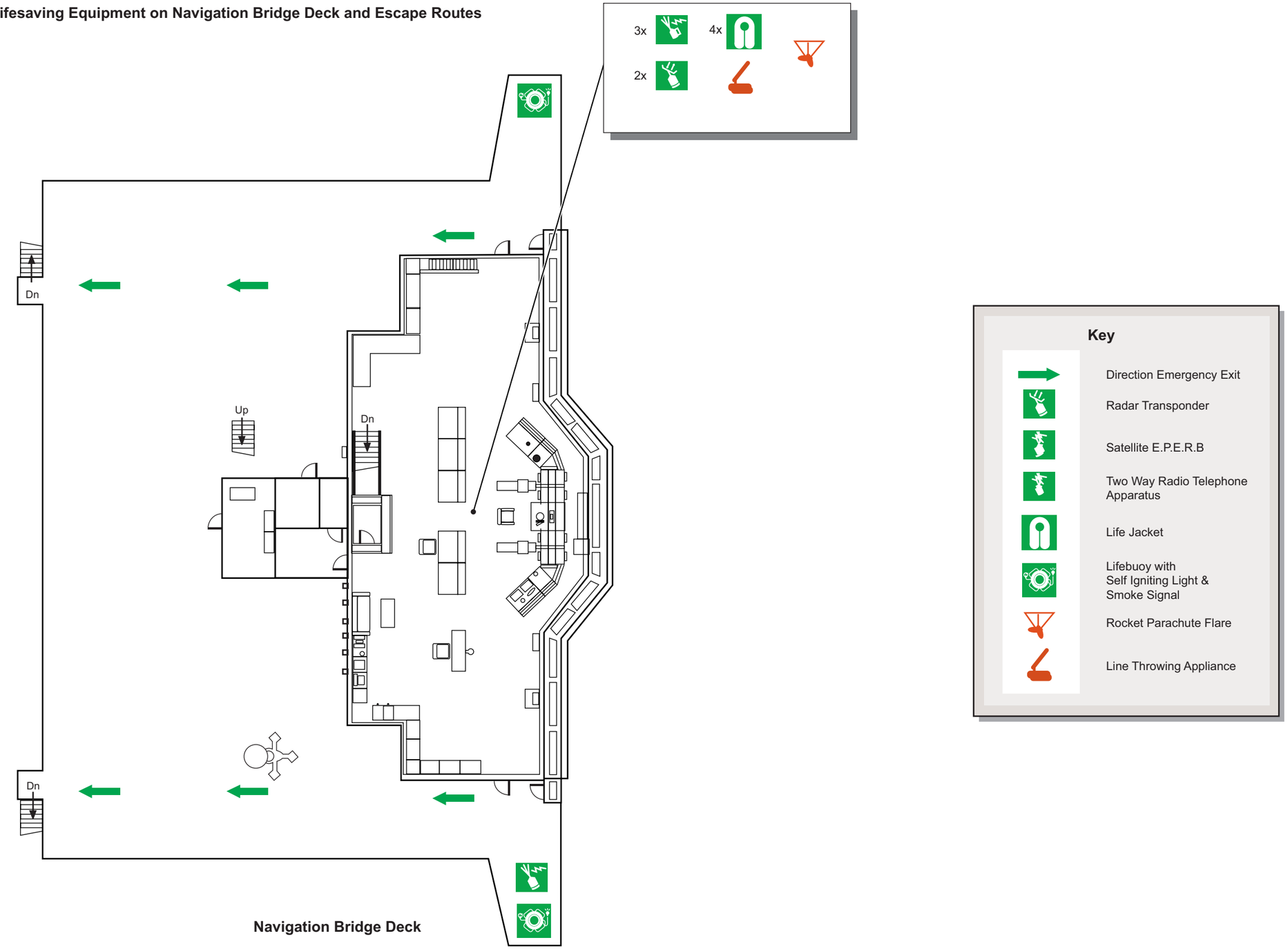
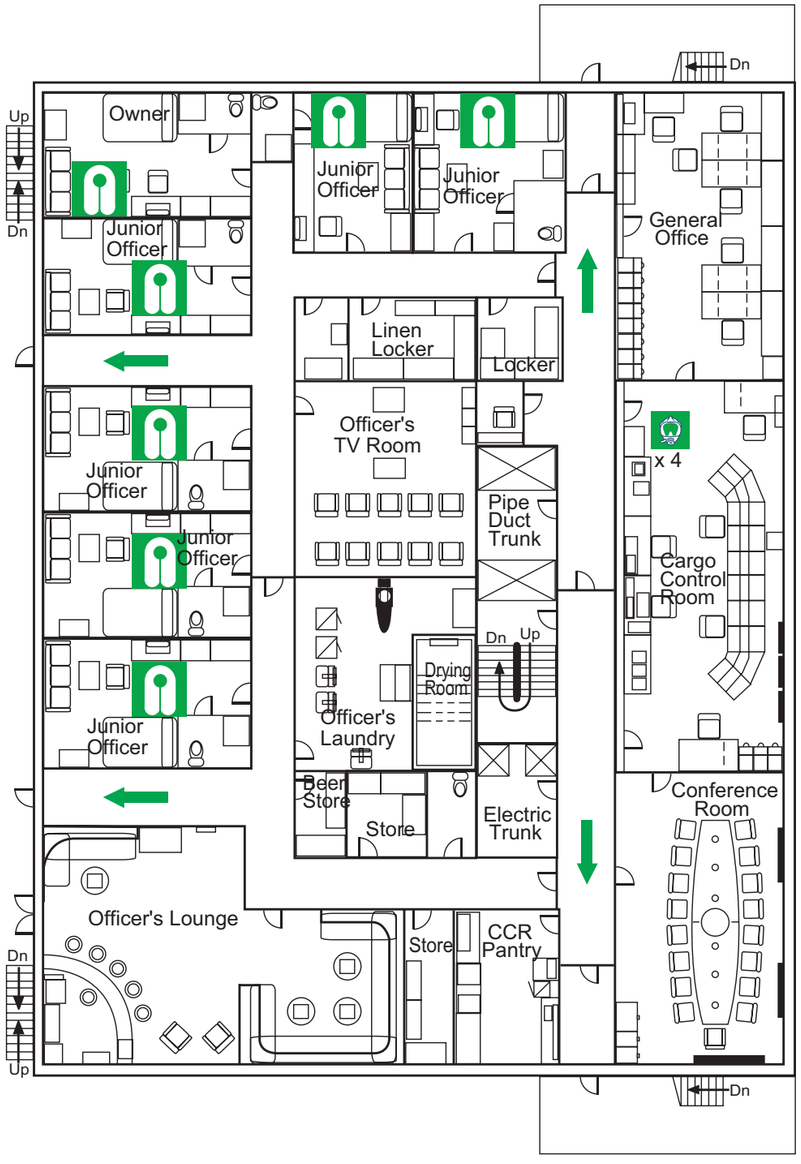
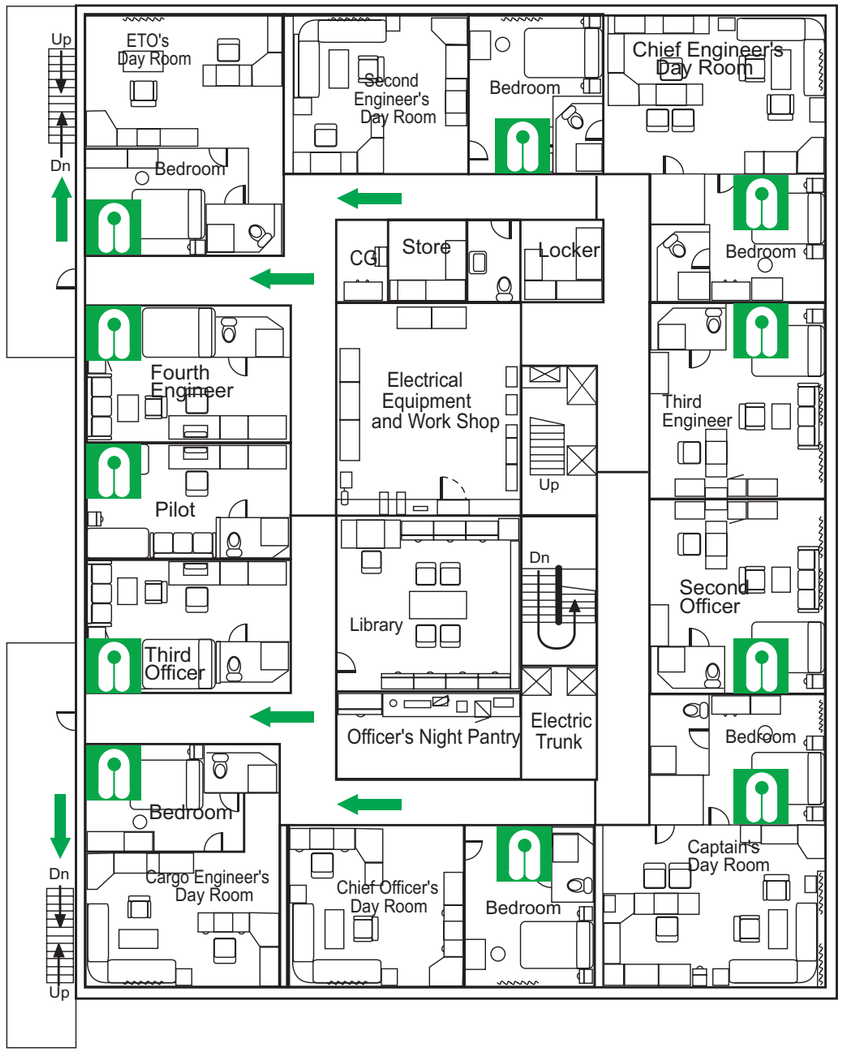


Illustration 3.3.8a (3) Lifesaving Equipment on C and D Decks and Escape Routes



C Deck

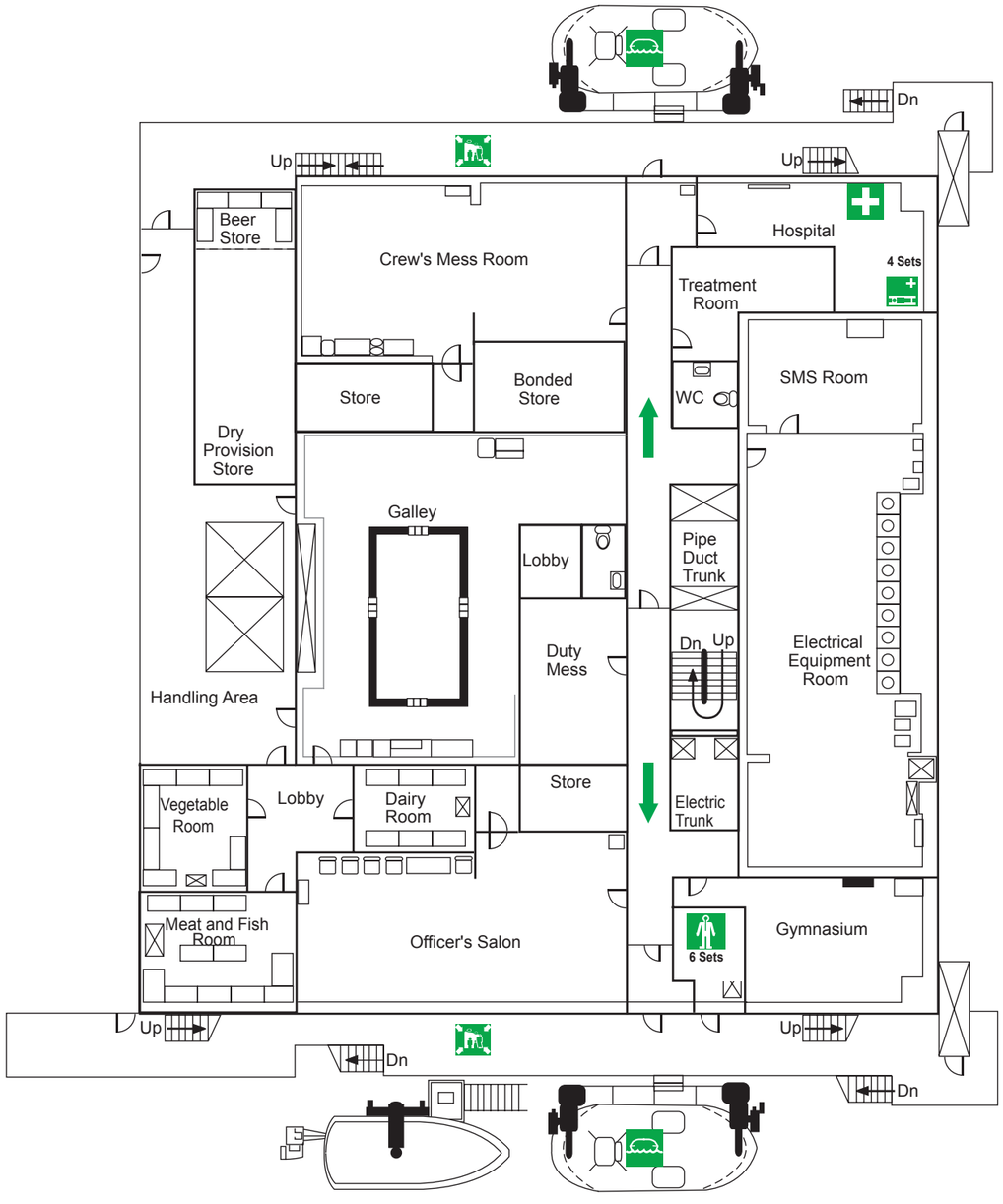


D Deck

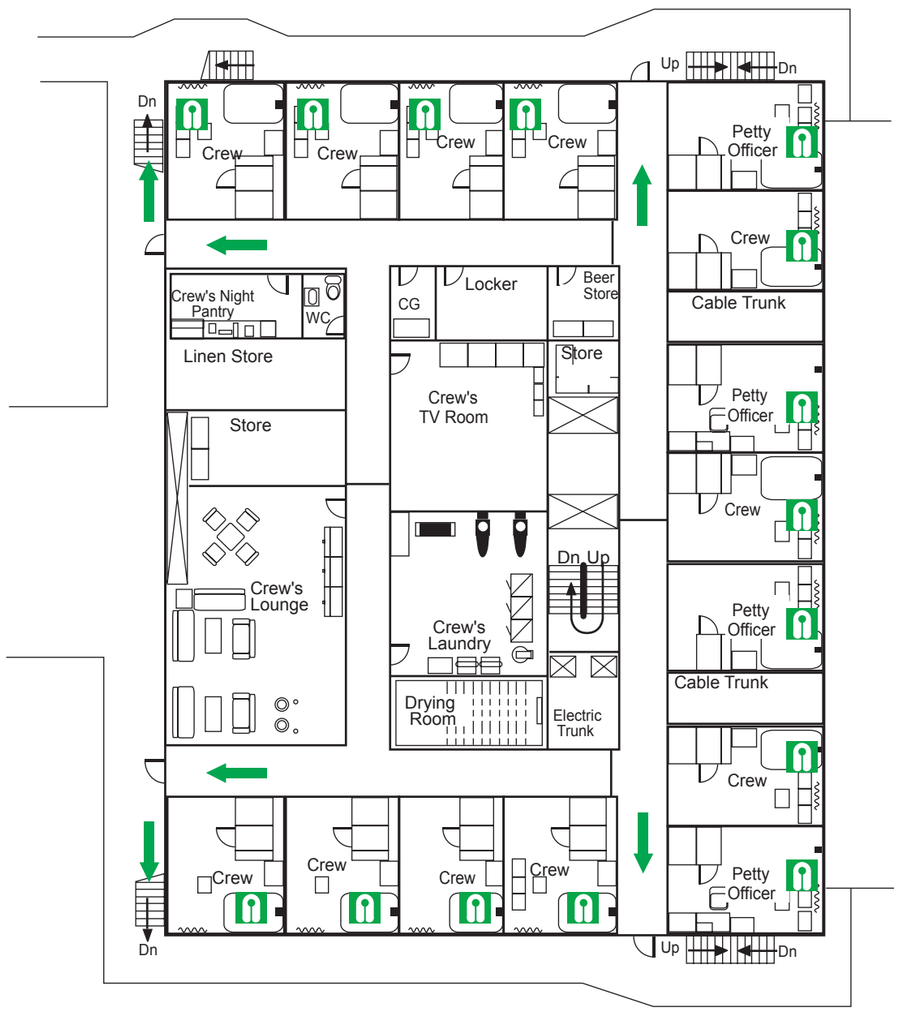
Key

- Direction Emergency Exit
- Life Jacket
- Emergency Escape Breathing Device

Illustration 3.3.8a (4) Lifesaving Equipment on A and B Decks and Escape Routes



A Deck



B Deck

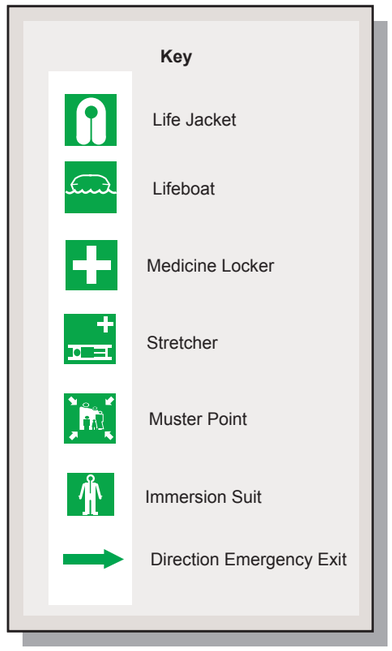
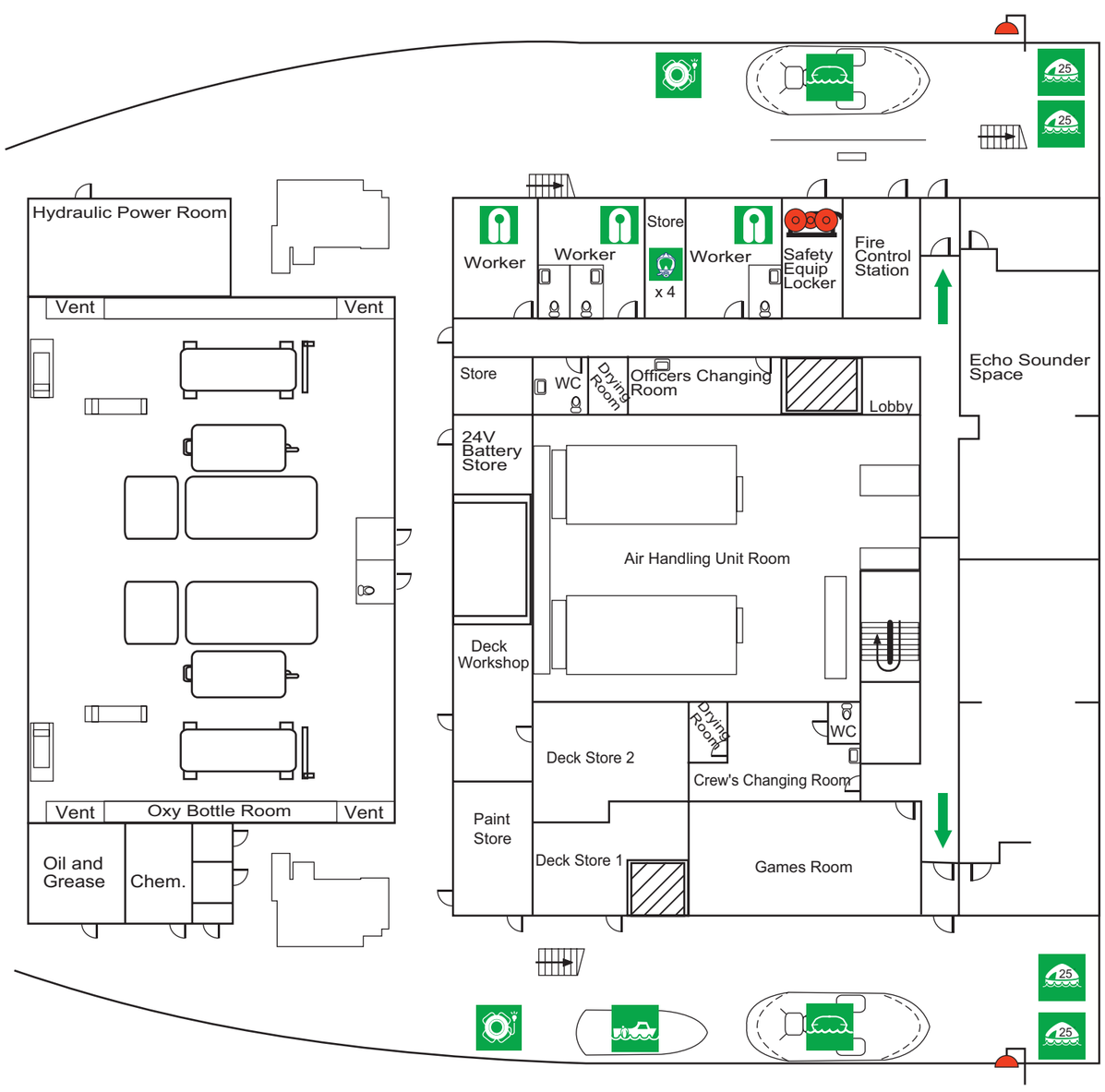
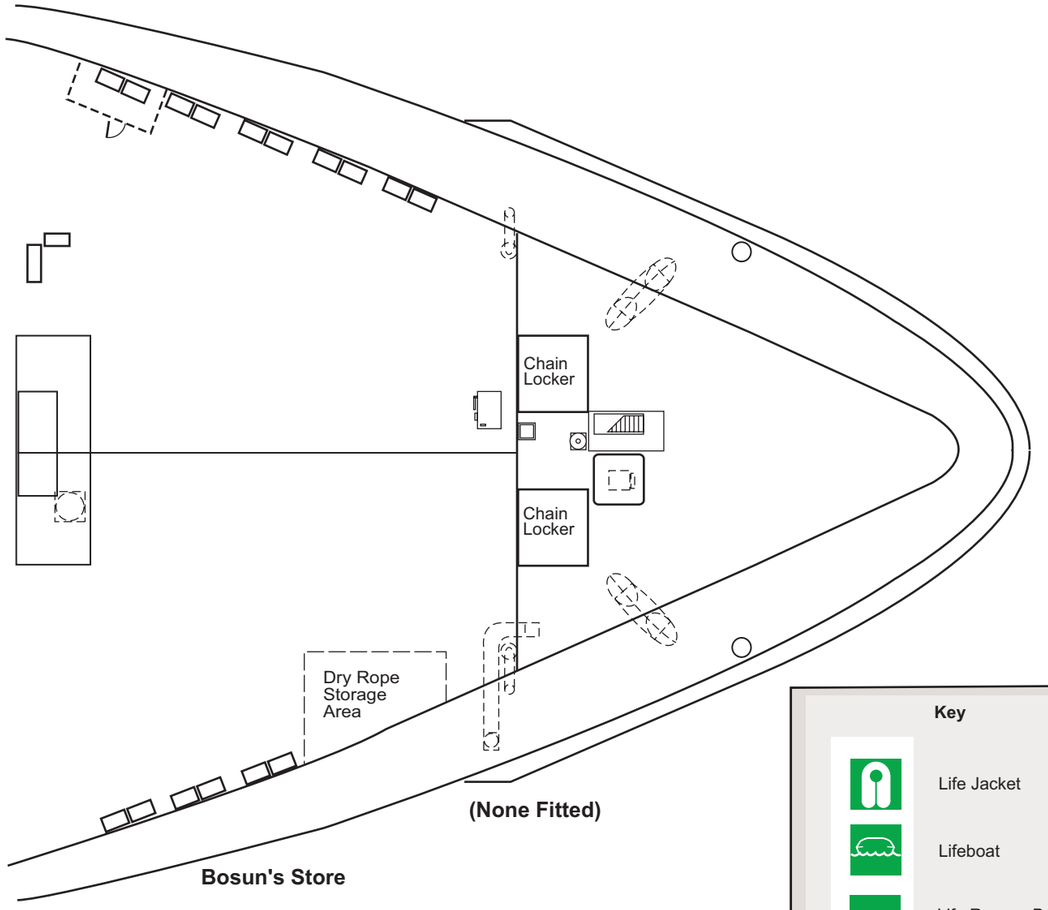


Illustration 3.3.8a (5) Lifesaving Equipment on Upper Deck, Bosun's Store and Bow Thruster Room and Escape Routes

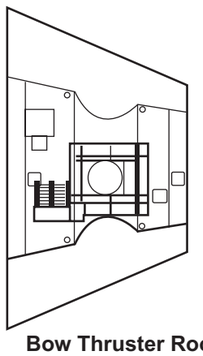


Main Deck



(None Fitted)

Bosun's Store



(None Fitted)

Bow Thruster Room

Illustration 3.3.8a (6) Lifesaving Equipment on Engine Room 2nd Deck and Escape Routes

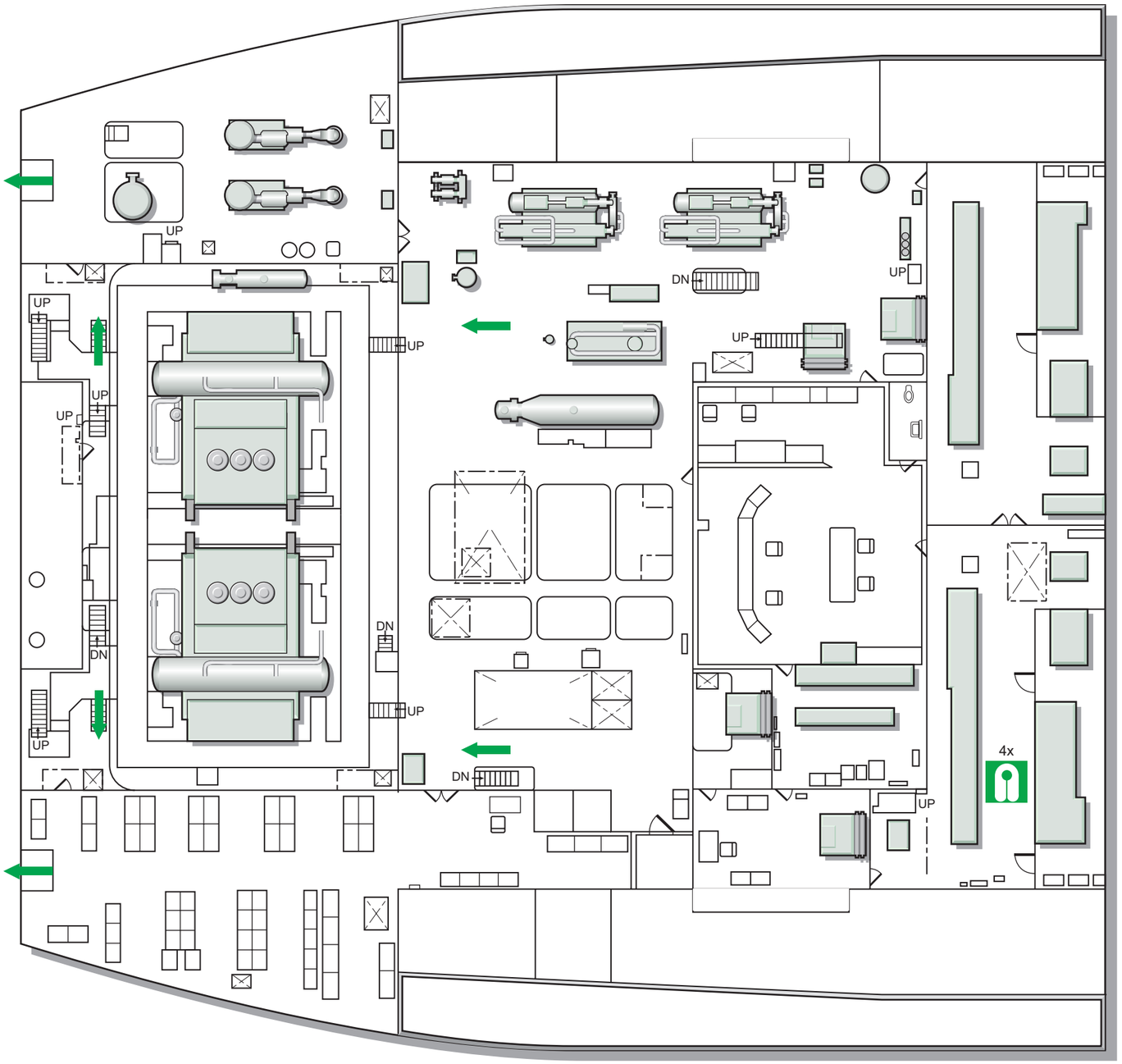


Illustration 3.3.8a (7) Lifesaving Equipment on Engine Room 3rd Deck and Escape Routes

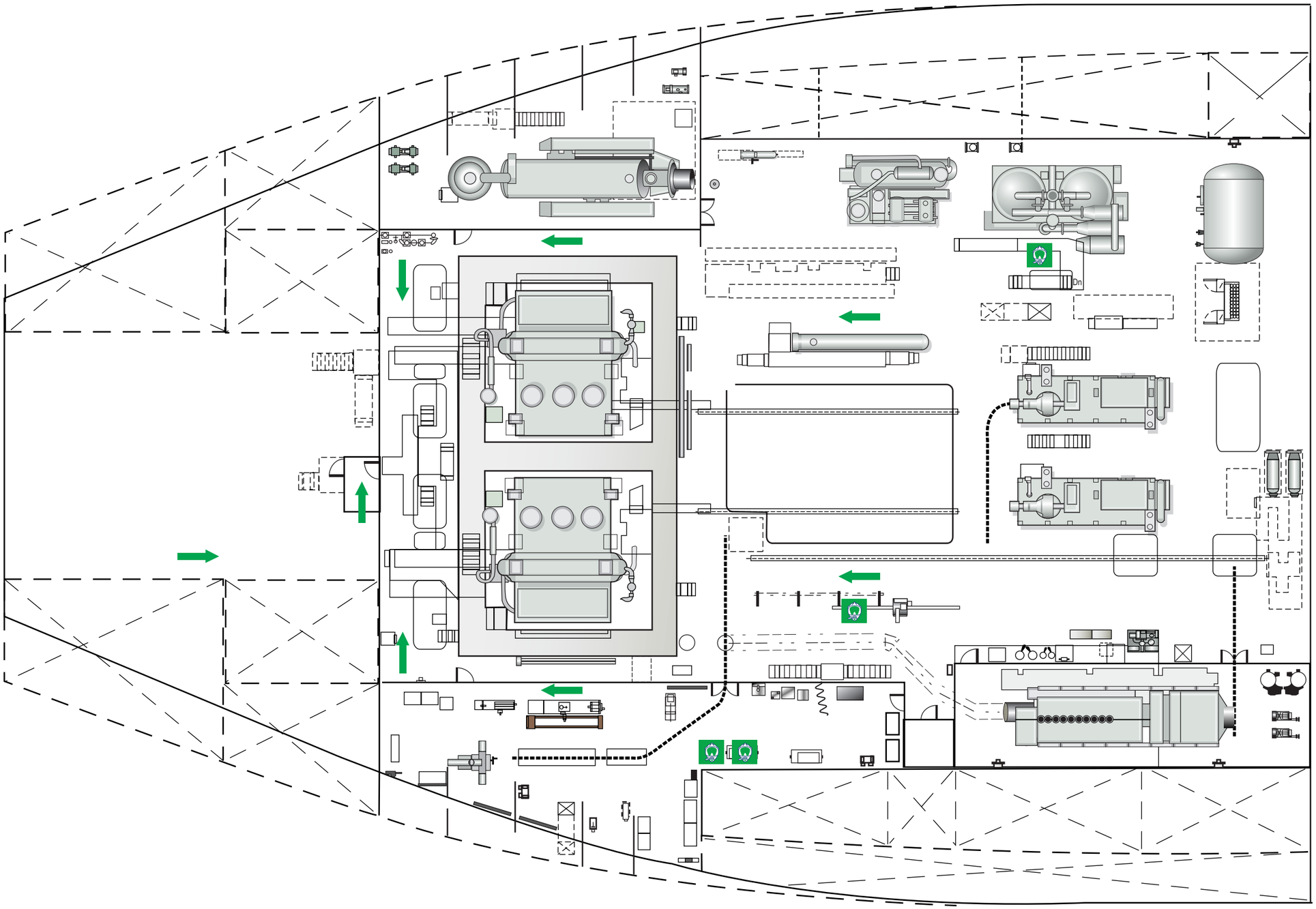
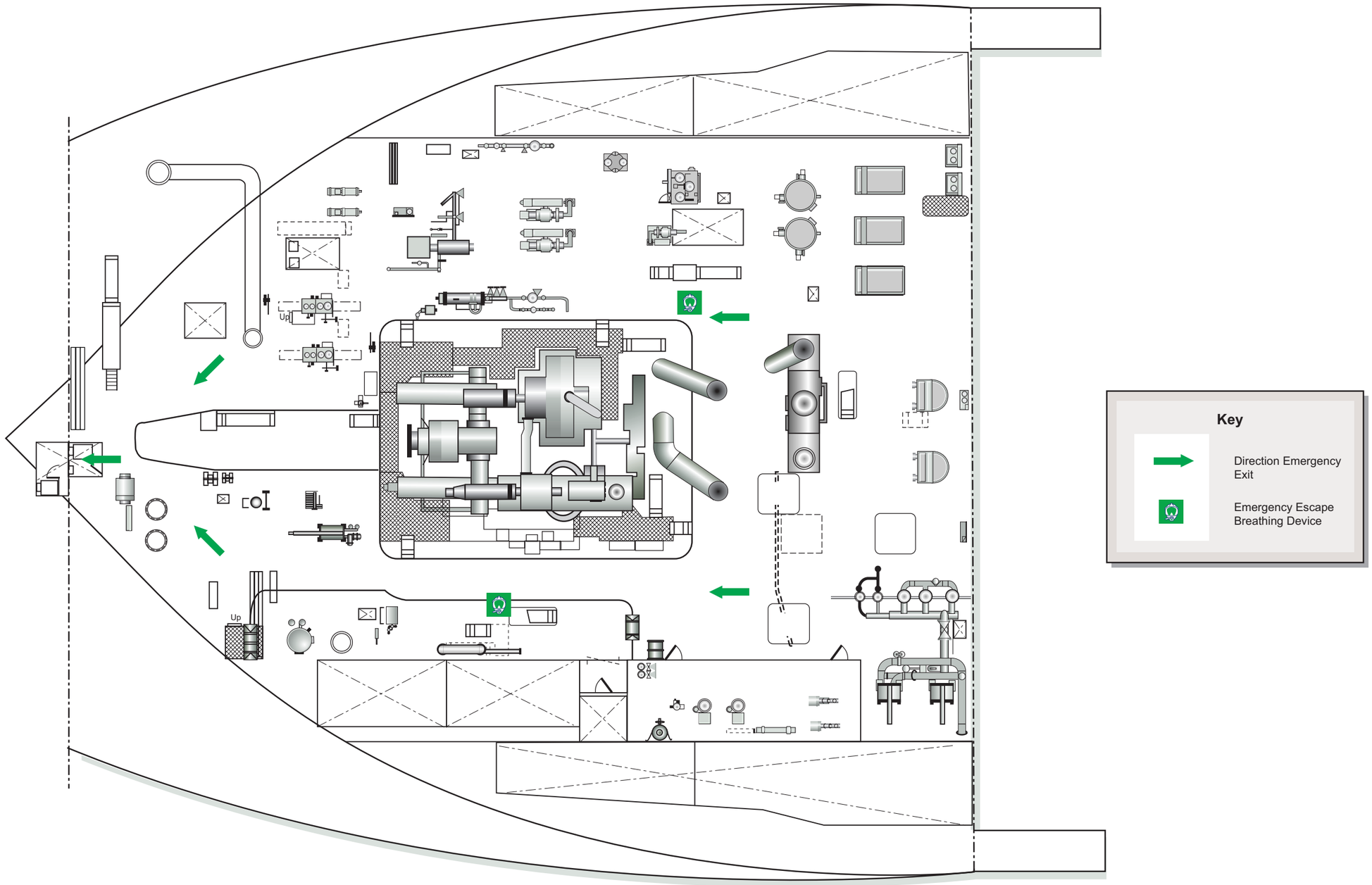
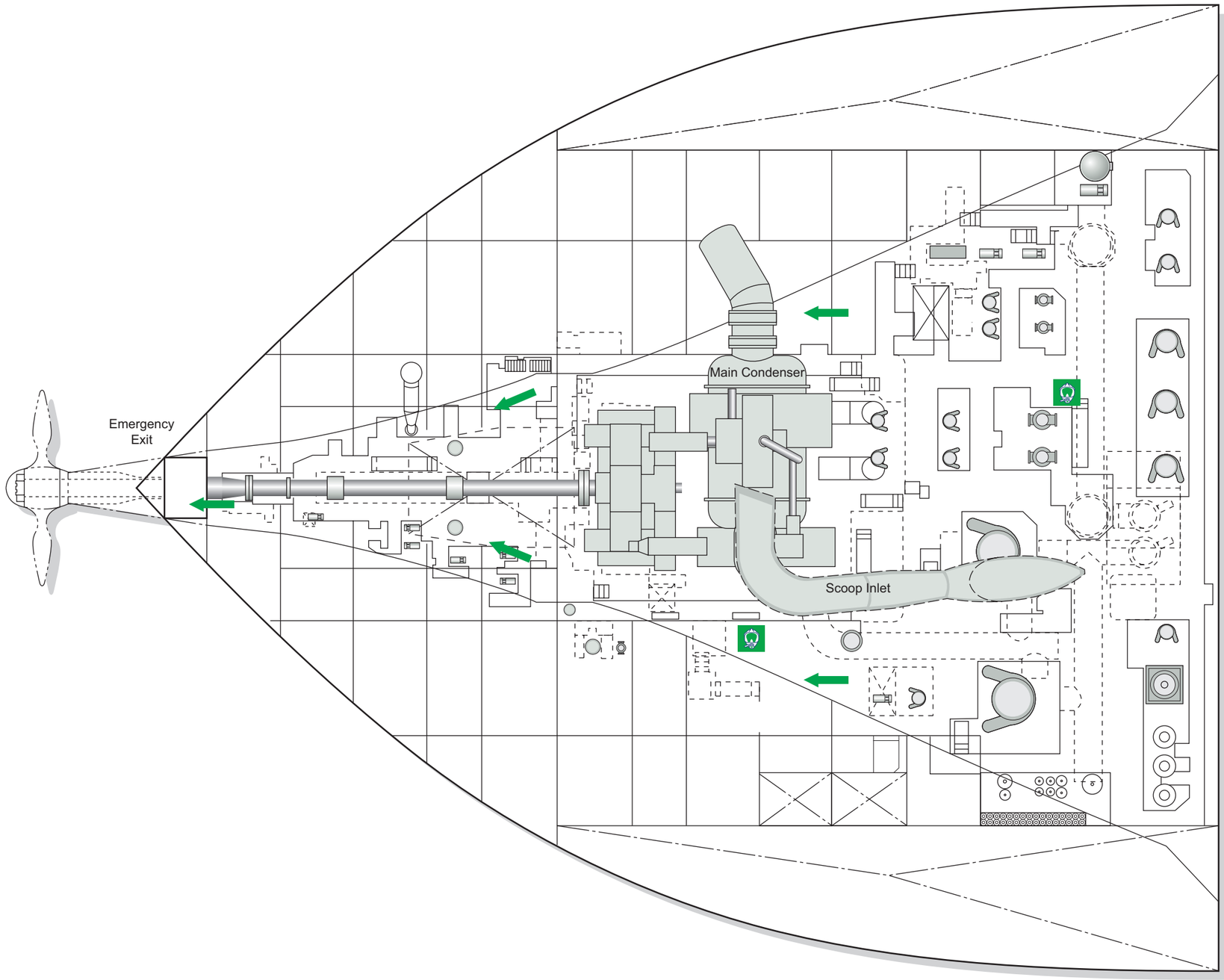


Illustration 3.3.8a (8) Lifesaving Equipment on Engine Room 4th Deck and Escape Routes



Engine Room 4th Deck

Illustration 3.3.8a (9) Lifesaving Equipment on Engine Room Floor and Escape Routes



3.4 Fire Fighting Systems

Illustrations

Illustration 3.4.1a Emergency Stop List

Location of Pushbuttons: Fire Control Station and Engine Control Room

Stop Group	Load Group	Circuit	Description
ES1A	Engine Room Fuel Oil and LO Pumps	1P-008	MGO Supply Pump for Inert Gas Generator
		1GP-001	No.1 Stern Tube Lubricating Oil Pump
		1GP-004	No.1 Auxiliary LO Pump for Main Turbine
		1GP-017	No.1 Lubricating Oil Purifier
		1GP-018	No.1 Lubricating Oil Purifier Supply Pump
		1GP-020	Lubricating Oil TransferPump
		1GP-027	No.1 Boiler HFO Supply Pump
		1GP-029	Sludge Pump
		1GP-030	Diesel Oil Transfer Pump
		EP-009	Diesel Generator Pre-lubrication Oil Pump
		EP-010	No.1 Turbine Generator Auxiliary LO Pump
		EP-014	No.1 Main FW Pump Auxiliary LO Pump
		3PD-004	Marine Diesel Oil CJC Filter
		3PD-006	Oily Water Separator

Stop Group	Load Group	Circuit	Description
ES1B	Engine Room Fuel Oil and LO Pumps	2GP-001	No.2 Stern Tube Lubricating Oil Pump
		2GP-010	Aft Seal Tank Lubricating Oil Supplement Pump
		2GP-017	No.2 Lubricating Oil Purifier
		2GP-018	No.2 Lubricating Oil Purifier Supply Pump
		2GP-027	No.2 Boiler HFO Supply Pump
		1GP-020	Lubricating Oil TransferPump
		2GP-029	MGO Transfer Pump
		2GP-030	Engine Room HFO Transfer Pump
		EP-011	No.2 Turbine Generator Auxiliary LO Pump
		EP-009	Diesel Generator Pre-lubrication Oil Pump
		EP-015	No.2 Main FW Pump Auxiliary LO Pump
		EGP-007	No.2 Auxiliary LO Pump for Main Turbine
		15LD-004	Lubricating Oil Filter

Stop Group	Load Group	Circuit	Description
ES2B	Engine Room Vent Fans	2P-006	No.2 Blower for Inert Gas Generator
		2P-013	Starboard Main Switchboard Packaged AC Unit
		2P-018	No.2 Packaged AC Unit for Engine Control Room
		2GP-011	No.2 Engine Room Supply Fan
		2GP-012	No.2 Engine Room Exhaust Fan
		2GP-014	No.2 BOG Extraction Fan
		2GP-015	No.2 Boiler Forced Draught Fan
		2GP-016	No.2 Boiler Seal Air Fan
		EGP-002	No.1 Engine Room Supply Fan
		2GP-019	Welding Space Exhaust Fan
		2GP-020	Boiler Test Space Exhaust Fan
		2GP-025	Purifier Room Exhaust Fan
		2P-009	Sootblower Control Panel

Stop Group	Load Group	Circuit	Description
ES2A	Engine Room Vent Fans	1P-006	No.1 Blower for Inert Gas Generator
		1P-013	Port Main Switchboard Packaged AC Unit
		1P-018	No.1 Packaged AC Unit for Engine Control Room
		1P-020	Incinerator
		1P-010	Dryer Unit for Inert Gas Generator
		1GP-011	No.1 Engine Room Supply Fan
		1GP-014	No.1 BOG Extraction Fan
		1GP-015	No.1 Boiler Forced Draught Fan
		1GP-016	No.1 Boiler Seal Air Fan
		1GP-019	Toilet Extraction Fan
		1GP-025	Gland Steam Condenser Extraction Fan
		EGP-003	No.4 Engine Room Supply Fan
		EGP-004	No.1 Engine Room Supply Fan
		2PD-001	No.1 Engine Room Workshop Packaged AC Unit
		2PD-002	No.2 Engine Room Workshop Packaged AC Unit

3.4 FIRE FIGHTING SYSTEMS

INTRODUCTION

The vessel's fire fighting capacity is enhanced by the inclusion of systems that can detect and fight the types of fires which might occur due to the ignition of fuel oil, lubricating oil and cargo. The choice of fire fighting system to use will depend on the location and nature of the fire. Initially any fire is attacked using portable extinguishers and if that method fails the following systems are considered. The use of fire fighting equipment and fire fighting techniques are discussed fully in the SOLAS FIRE TRAINING MANUAL which is available in the ship's general office.

Portable Fire Extinguishers

There are three types on board:

1. Carbon Dioxide - CO_2

- Suitable for class A and B fires and for class C fires when in a liquid state, such as liquid gas leak.
- Safe for use in fighting electrical fires.
- May not be effective when used outside, especially in a breeze.

Identification Colour Code

The extinguisher is red with a black horizontal band and has CO_2 written in white bold lettering.

Dangers in Use

- Hold only the insulated parts of the discharge hose and horn. With the expansion and evaporation of the CO_2 there are cooling processes and a danger of frost burn if the discharge horn comes into contact with the skin.
- When using a CO_2 extinguisher in an explosive atmosphere, stand on the ground to ensure that any electrostatic charge is dissipated.
- Do not use without a discharge horn as the discharge will then entrain air and cause an increase in the intensity of the fire.
- Do not remain in the area after the discharge as CO_2 is asphyxiating.

Operating Procedure

a) Remove the safety pin.

b) Direct the horn at the base of the fire.

c) Press the lever down fully.

d) Direct the CO_2 at the base of the fire.

2. Foam

- Suitable for use on liquid spills and contained liquid fire of oils, paints, cleaning fluids and fires involving liquified solids such as fats and waxes (Class B fires).

Identification Colour Code

The extinguisher is red with a yellow horizontal band and has FOAM written in white bold lettering.

Dangers in Use

- Do not use on fires where there is live electricity in the vicinity.

Operating Procedure

a) Remove the safety pin.

b) Press the operating handle.

c) Squeeze the trigger.

d) Point the spray at the base of the fire.

3. Dry Powder

- Suitable for use on fires involving liquids and liquified solids.
- Suitable for use, with the correct techique, on extinuishing a high pressure gas flame (Class C Fires).
- Suitable for use against carbonaceous fires (Class A fires).
- Dry powder gives a fast flame knock-down and may be used on fires involving live electrical equipment.

Identification Colour Code

The extinguisher is red with a blue horizontal band and has POWDER written in white bold lettering.

Dangers in Use

- May not be effective against a deep seated fire.
- Avoid inhalation of the powder.

Operating Procedure

a) Remove the safety pin.

b) Press the operating handle.

c) Squeeze the trigger.

b) Point the spray at the base of the fire.

Fire Main System (see section 5.4.1)

This system is continually pressurised by a sea water hydrophore tank and fire jockey pump (7.5kW). The jockey pump only supplies a limited number of 20mm accommodation hoses so the fire pump is started at the earliest opportunity to ensure that a sufficient amount of sea water is available. The automatic start facility, due to a low fire main pressure, is not used because the pump will run without a fire hydrant outlet available and may damage the pump seals. The system can also be supplied by the bilge, fire and GS pumps, the water spray pump and the emergency fire pump.

The suction and discharge valves of the fire pump and one bilge, fire and GS pump are locked in the open position and the pumps can be started locally, at the fire control station, cargo control room, at No.2 group starter panel or at the bridge emergency console.

The pipelines and fittings are painted red and fire hoses and hydrants are startegically positioned in the engine room, accommodation and on deck.

Water Spray System (see section 5.4.2)

In the event of a fire on deck, the water spray system is used for cooling and drenching the affected areas. A water spray pump situated in the engine room, with a back-up pump situated in the steering gear room for the lifeboat area, supplies sea water to the spray nozzles at the following group locations:

- Group 1 - accommodation exterior bulkheads and lifeboat stations
- Group 2 - cargo machinery and electric motor room exterior bulkheads

Illustration 3.4.1a Emergency Stop List

Location of Pushbuttons: Fire Control Station and Wheelhouse Emergency Panel

Stop Group	Load Group	Circuit	Description
ES3	Accomm Vent Fans	3GP-001	No.1 Main AC Plant (AHU)
		3GP-002	Refrigeration Provision Plant (Unit Cooler Panel)
		3GP-011	No.1 Sanitary Exhaust Fan
		3GP-012	Galley Supply Fan
		3GP-015	Paint Store Exhaust Fan
		3GP-021	No.2 Main AC Plant (AHU)
		3GP-027	H/H Defogging System
		3GP-031	No.2 Sanitary Exhaust Fan
		3GP-032	Galley Exhaust Fan
		3GP-033	Wheelhouse Fan Coil Unit
		3GP-036	Battery Room Exhaust Fan
		3GP-037	24V DC Battery Store Exhaust Fan
		1L-007	Accomm 220V Distribution Board (14LD)

Stop Group	Load Group	Circuit	Description
ES4A	Other Deck FO/LO Pumps and Vent Fans	1GP-024	No.1 Forward HFO Transfer Pump
		1CGP-003	No.1 HD Compressor Auxiliary LO Pump
		1CGP-004	No.1 LD Compressor Auxiliary LO Pump
		1CGP-006	No.1 Air Lock Supply fan
		1CGP-007	No.1 Cargo Machinery Room Exhaust Fan
		1CGP-008	No.1 Electric Motor Room Supply Fan
		1CGP-009	No.1 Passageway Exhaust Fan
		1CGP-010	Mid Deck Store Exhaust Fan
		1CGP-022	No.1 Hydraulic Pump Starter for Cargo Valves
		2CGP-022	No.1 Hydraulic Pump Starter for Ballast Valves
		EGP-005	CO_2 Room Exhaust Fan
		EGP-006	Emergency Generator Room Supply Fan
		EGP-008	Steering Gear Room Exhaust Fan
		1PD-002	Bow Thruster Room Supply Fan
		EP-016	Forward Pump Room Exhaust Fan
		1PD-006	Bosun's Store Exhaust Fan
		1PD-007	Hydraulic Oil Pump for Bow Thruster
		3GP-034	Hydraulic Power Pack Room Exhaust Fan
		3GP-013	Oil and Grease Store Exhaust Fan
		3GP-014	Chemical Store Exhaust Fan
		1CGP-023	Hydraulic Power Pack Brake

Stop Group	Load Group	Circuit	Description
ES4B	Other Deck FO/LO Pumps and Vent Fans	2GP-024	No.2 Forward HFO Transfer Pump
		2CGP-003	No.2 HD Compressor Auxiliary LO Pump
		2CGP-004	No.2 LD Compressor Auxiliary LO Pump
		2CGP-006	No.2 Air Lock Supply fan
		2CGP-007	No.2 Cargo Machinery Room Exhaust Fan
		2CGP-008	No.2 Electric Motor Room Supply Fan
		2CGP-009	No.1 Passageway Exhaust Fan
		2CGP-010	Duct Keel Exhaust Fan
		EP-005	No.2 Hydraulic Pump Starter for Cargo Valves
		EP-006	No.1 Hydraulic Pump Starter for Ballast Valves

- Group 3 - cargo manifold area
- Group 4 - cargo tank liquid and gas domes

Dry Powder System (see Section 5.4.3)

The cargo manifold areas are protected by dry powder monitors which are situated just aft of the cargo discharge manifold and aligned to face and cover the liquid and vapour lines and valves at either the port or starboard manifold.

The monitors are supplied by two tanks containing the sodium bicarbarbonate connected to a battery of N_2 cylinders which are operated by CO_2 cylinders from either the cargo control room, the fire control station or locally.

The N_2 cylinders can be opened either manually or remotely from six positions, they can also be cross-connected. Activation of any CO_2 bottle and operation of the ball valve will open the N_2 battery bank and start the fire fighting operation.

This system also comprises of two tanks containing the dry powder feeding 4 hose reels each. Operation is the same as for the monitors; on opening the CO_2 cylinders and ball valves the N_2 cylinders are opened and fire fighting begins.

CO_2 Flooding System for the Engine Room (see section 5.4.4)

A central bank of 576 cylinders each containing 45kg of CO_2 located in the CO_2 room, is situated on the starboard side of the engine casing on A deck. The system protects the engine room, No.1 and No.2 main switchboard rooms, purifier room, diesel generator room and the inert gas generator room.

Outlets for CO_2 are located in the protected spaces so as to give an even spread of CO_2 quickly throughout the compartment when the gas is released.
The system can be operated from the following positions:

- Engine room - fire control station or the CO_2 room
- No.1 and No.2 main switchbaord rooms - fire control station or at the entrance to the rooms
- Purifier room - fire control station or at the entrance to the room
- Diesel generator room - fire control station or at the entrance to the room
- Inert gas generator room - fire control station or at the entrance to the room

CO_2 Flooding System for the Cargo Area (see section 5.4.4)

A central bank of 22 cylinders each containing 45kg of CO_2 located in the CO_2 room, is situated on the starboard side of the engine casing on A deck. The system protects the port and starboard cargo switchboard, cargo machinery room, electric motor room, emergency generator room and the emergency switchboard room.

CO_2 Flooding System for the Deck Stores (see section 5.4.4)

Each store has a cylinder containing 45kg of CO_2 located outside the store room. The system protects the paint store, chemical store and the oil/grease store.

Emergency Fire Pump (see Section 5.4.6)

A self-contained emergency fire pump is fitted in the bosun's store. The drive unit consists of a diesel engine, which drives the main pump, and the hydraulic pump which powers the hydraulic motor driving the feeding pump. The diesel engine, main fire pump, hydraulic pump and oil tank are located in the bosun's store.

The feeding pump and its hydraulic drive motor are located at the bottom of the forward pump room below the waterline. The feeding pump is driven by the hydraulic motor operated by the oil from the hydraulic pump.

The feeding pump ensures that the main fire pump is supplied with water no matter what the draught of the ship.

The emergency fire pump may be started locally or remotely from the fire control station and the bridge emergency console.

Water Mist System (see section 5.4.8)

This system consists of fresh water at high pressure injected into the protected machinery space through special spray heads which break down the water stream into very fine mist-like particles.

The basic principle of the water mist system is that the very fine droplets of water tend to exclude oxygen from the area of the fire, thereby starving the burning material of oxygen. When the fine water droplets come into contact with the flames they are rapidly evaporated because of their large surface area for a small mass and this has a rapid cooling effect on the fire. The steam produced by the evaporation acts to further reduce the space available for oxygen. Because the water is in mist form the system is effective for oil fires.

The system protects the incinerator room, hydraulic power pack room, port and starboard boiler burner platforms, inert gas generator room, the steering gear room, diesel generator room and the purifier room.

The system is self-contained and consists of a pump driven by an air motor, supplied by the control air system, which takes suction from the fresh water tanks and maintains the system pressure at 2.45MPa up to the control valves. From the control valves a set of piston type pumps driven by pressurised N_2 cylinders, supply the fresh water at a rate of 11 litres/minute through each of the spray heads.

The system control valves can be activated locally or by pressing the operating pushbutton at each location.

Quick-Closing Valves and Fire Dampers System (see section 5.4.7)

This system is used, in the event of a major fire in the machinery spaces, to close the ventilation dampers and the outlet valves on the tanks containing fuel oil and lubricating oil. The system is operated from the fire control station where valves are positioned to direct the air, contained in a pressurised tank, to the quick-closing valves and to vent the damper cylinders. The pressurised tank is maintained at 9kg/cm^2 by the control air system.

The emergency generator room fuel oil tank outlet valve is operated by wire rope and handle from outside the rooms.

A similar arrangement for the incinerator room DO tank and waste oil tank outlet valves is installed as a local back-up to the pneumatic system.

Fire Detection System (see section 5.4.5)

This system will raise an alarm to alert the ship’s staff and has a direct input into the IAS for recording any alarms, faults and disconnections. The operating panel, control unit and power supply are contained in a central cabinet in the fire control station on the port side of the accommodation on the upper deck. The system uses 8 detector loops, connected to a 7.2Ah battery system back-up in the event of a power failure and detects any source of smoke, heat or flames in the protected spaces. The digital outputs of the system are used to stop the ventilation fans, release the fire doors and operate the water mist system. The system is looped to the gas sampling and alarm system and to the IAS cabinet in the electrical equipment room on A deck.

Emergency Life Saving Apparatus (ELSA)

The ELSA breathing devices are provided so that, in the event of a fire or other emergency, they are readily available, near the escape routes, to aid escape.

They consist of a compressed air breathing set with a limited time of approximately 5 or 10 minutes. The breathing apparatus is in a carrying bag that can be slung over the shoulder and includes a high visibilty hood which incorporates a nasal mask and neck seal.

There are sixteen sets on board:

- Four sets in the cargo control room
- Two sets in the engine room workshop on the engine room 3rd deck
- One set near the port turbine generator on the engine room 3rd deck
- One set near the starboard generator on the engine room 3rd deck
- One set on the port side, at the base of the stairs on the engine room 4th deck
- One set on the starboard side, at the base of the stairs on the engine room 4th deck
- One set on the port forward side, at the base of the stairs on the engine room floor deck
- One set on the starboard side, near the scoop main condenser pipe on the engine room floor deck
- Four spare sets in the stores on the port side of the accommodation upper deck

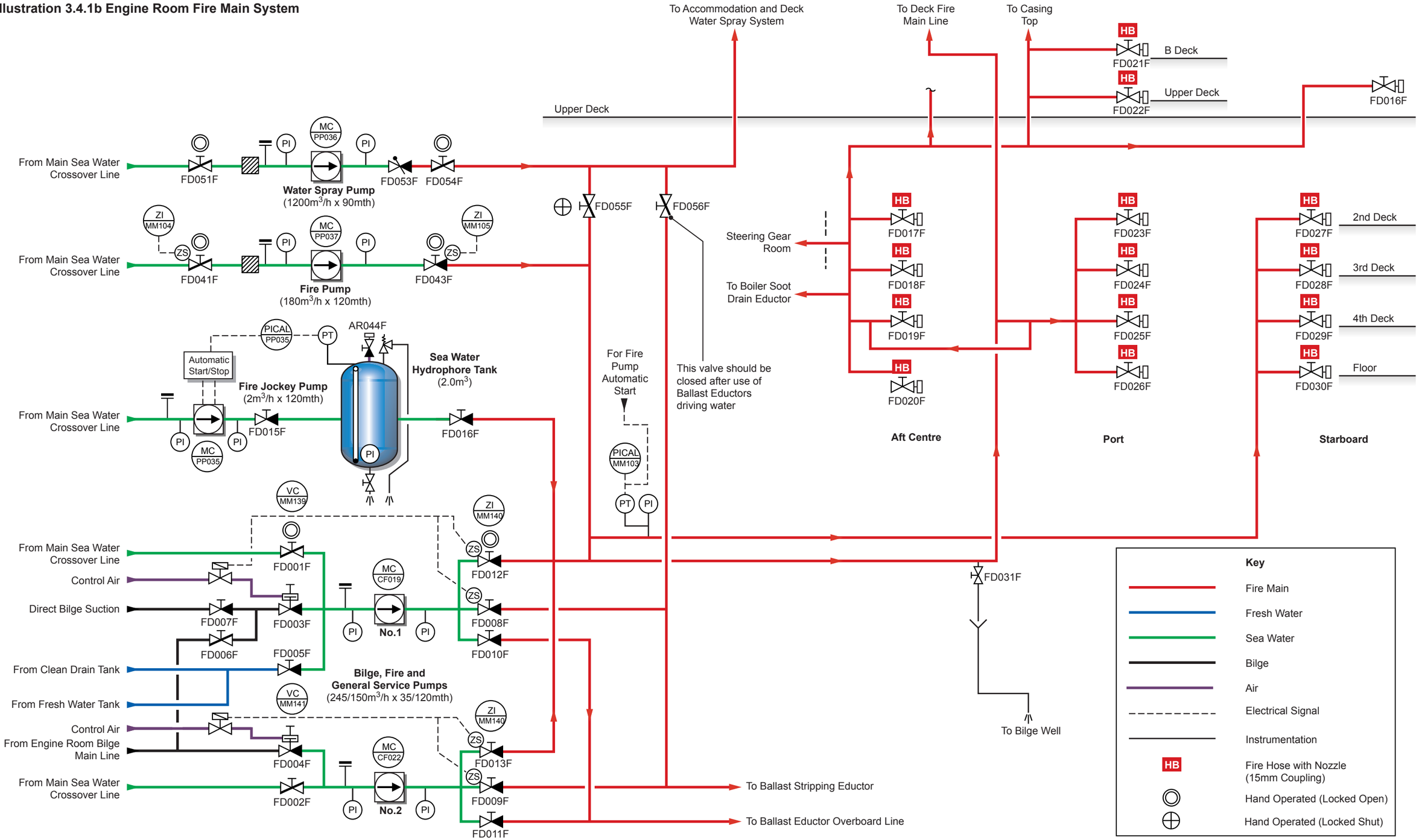
ELSA Situated In Engine Room

Emergency Light Sticks

There are emergency light sticks positioned in all the accommodation and work areas. These are activated by bending the stick, which snaps the glass phial and allows the two liquids to react and create a light source, which will last long enough to allow an escape from the lowest regions of the vessel.

Emergency Escape Door in Engine Room with Emergency Lighting Stick Available

Illustration 3.4.1b Engine Room Fire Main System



3.4.1 ENGINE ROOM FIRE MAIN SYSTEM

Fire Pump

Maker:	Shinko Industries Ltd
No. of sets:	1
Type:	Centrifugal self-priming
Model:	RVS200-2MS
Capacity:	180m^3/h at 120mth

Water Spray Pump

Maker:	Shinko Industries Ltd
No. of sets:	1
Type:	Centrifugal self-priming
Model:	KV350K
Capacity:	1,200m^3/h at 90mth

Bilge, Fire and General Service Pump

Maker:	Shinko Industries Ltd
No. of sets:	2
Type:	Centrifugal self-priming
Model:	RVS200-2MS
Capacity:	245/150m^3/h at 35/120mth

Fire Jockey Pump

Maker:	Shinko Industries Ltd
No. of sets:	1
Type:	Centrifugal
Model:	SQH50MM
Capacity:	2m^3/h at 120mth

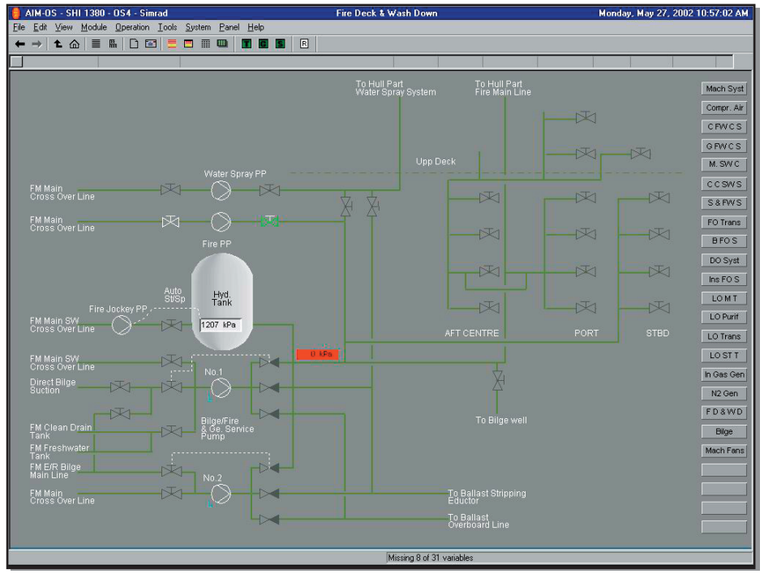
Emergency Fire Pump (Main Punp)

Maker:	Iron Pump A/S
Type:	CN100-100/315
Capacity:	72m^3/h at 97mth

Introduction

The engine room fire main system can supply sea water to:

- The fire hydrants in the engine room
- The fire hydrants on deck
- The fire hydrants in the accommodation block
- Hawse pipes
- Forward bilge eductors
- Passageway bilge eductors
- Hold bilge eductors
- The accommodation and cargo manifold water curtain spray system
- Boiler soot drain eductor



The fire pump, water spray pump and the bilge, fire and general service pumps are located in the engine room and are all driven by electric motors.

The emergency fire pump is located in the bosun's store. The pump is driven by a diesel engine and there is also a feeder pump for the main pump. The feeder pump is situated at the bottom of the forward pump room and has its own sea suction. The feeding pump is driven by an hydraulic motor, the hydraulic pump unit being driven by the diesel engine which powers the main pump (see section 3.4.7).

The fire pump, emergency fire pump and the fire, bilge and general service pump supply water to the fire and wash deck main.

The water spray pump can also supply the fire and wash deck main, but is normally used to supply water to either the ballast water eductor or, in an emergency, the water spray system.

The fire main is automatically pressurised at all times by means of a sea water hydrophore unit which is maintained under pressure by the fire jockey pump. The sea water hydrophore unit has a pump cut-in pressure of 0.8MPa and a cut out pressure of 1.18MPa. The sea water hydrophore unit operates in the same way as the fresh water hydrophore units with air pressure providing the loading in the hydrophore tanks. The connection from the sea water hydrophore unit to the fire main is at the outlet manifold from the fire pump and the fire, bilge and GS pumps.

The fire pump may be started and stopped locally or from the following locations, provided that the local selector switch is set to remote:

- Engine control room
- Fire control station
- Wheelhouse
- Cargo control room
- IAS operator stations

The fire pump, the fire jockey pump, water spray pumps and the fire, bilge and GS pumps all take suction from the sea water main. Either the high or low sea chest must be open to this suction main at all times.

Preparation for the Operation of the Fire Hydrant System

The fire main must be kept under pressure at all times by the sea water hydrophore unit. It is assumed that the fire main is already flooded before starting the sea water hydrophore unit.

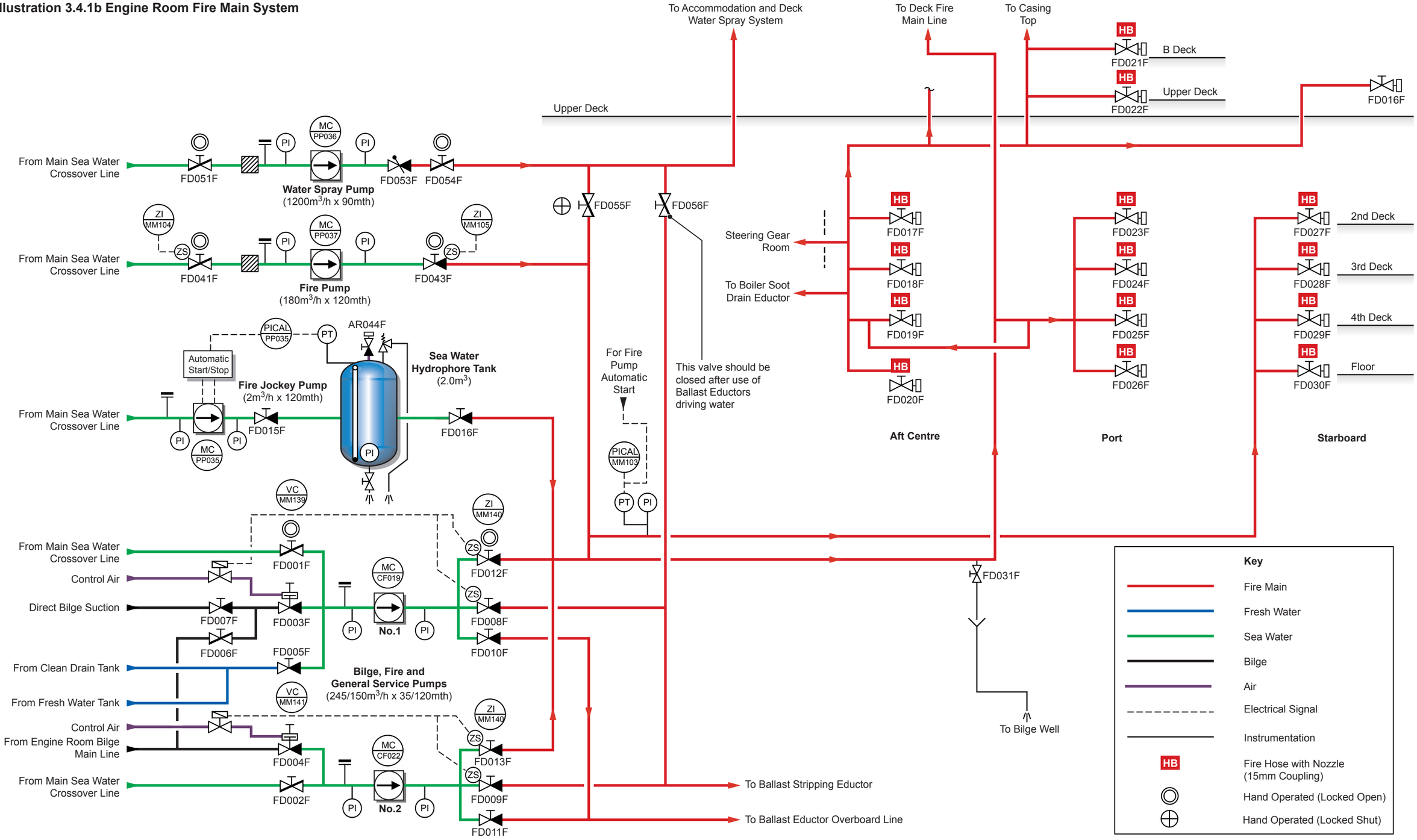
Procedure to Operate the Sea Water Hydrophore Unit

a) Ensure that the sea water suction main is flooded with either the high or low sea suction valve open.

b) Vent the fresh water hydrophore tank and, using the fire jockey pump, fill it until the water level gauge glass is ¾ full, then stop the pump. Open the suction valve FD014F from the sea water main and the pump discharge valve FD015F.

c) Connect a GS air flexible hose to the air inlet valve AR044F and pressurise the hydrophore tank to the general service air supply pressure of approximately 880kPa. Ensure that the hydrophore tank gauge valves are open.

Illustration 3.4.1b Engine Room Fire Main System



d) Close the air inlet valve when the hydrophore tank is pressurised and disconnect the flexible hose.

e) The sea water hydrophore tank is now operational and sea water can be supplied to the fire main by opening valve FD016F.

f) Select the AUTOMATIC operation for the fire jockey pump.

The fire jockey pump should maintain the pressure in the fire hydrant system.

Procedure for Supplying Sea Water to the Fire and Wash Deck System

The fire and wash deck system may be supplied with water by the fire pump, located in the engine room, and by either of the two fire, bilge and GS pumps, also located in the engine room. These pumps take suction from the sea water main and so this must be open and operating (see section 2.3).

a) All intermediate isolating valves along the fire main on the main deck must be open.

b) All hydrant outlet valves must be closed.

c) Set up the valves as shown in the table below:

It is assumed that the SW main suction valves at the SW valve chest(s) are open to provide SW suction.

Position	Description	Valve
Fire Pump		
Open(locked)	SW main suction valve	FD041F
Open(locked)	Fire pump discharge valve	FD043F
Closed(locked)	Cross-connection valve to water spray system	FD055F
No.1 Fire and Bilge Pump		
Open(locked)	SW main suction valve	FD001F
Open(locked)	No.1 fire and bilge pump discharge to fire main	FD012F
No.2 Fire, Bilge and GS Pump		
Open	SW main suction valve	FD002F
Open	No.2 fire and GS pump discharge to fire main	FD013F

d) Start the main fire pump or the selected fire, bilge and GS pump. These pumps must be selected as REMOTE at their local selector switches in order to allow them to be started from the remote locations.

e) Open the desired hydrant valves on the fire main after connecting the fire hose.

(**Note:** In order to avoid cavitation and overheating of the pump at least one outlet on the system should be opened to allow some flow through the pump. This would usually be an anchor washer.)

Fire mains run along the port and starboard sides of the ship in the under deck passage. Hydrant connectors are provided at strategic positions so that all parts of the deck may be reached by water spray from the appropriate hoses. The cargo manifold side shell water curtain is supplied with water from the fire and wash deck main.

Water from the fire and wash deck main is used for driving the forward bilge and under passageway bilge eductors as described in section 2.8.2.

Emergency Fire Pump

The emergency fire pump unit is powered by a diesel engine acting through a hydraulic pump and motor for the feeding pump. It is essential that the diesel engine fuel tank is maintained in a full condition and that the engine lubricating oil system and the hydraulic oil system are checked frequently and replenished as necessary.

If the emergency fire pump is to be used this can be started remotely from the following locations:

- Fire control station
- Wheelhouse
- Cargo control room

The emergency fire pump may also be started locally from the top of the bosun's store, but if it is to be started remotely the local selector switch must be put to the REMOTE position.

The emergency fire pump feeding pump suction valve FD515F and the main pump discharge valve FD513F are always kept locked open so that the pump can be started and can supply water to the fire main pump immediately. The main pump discharge valve is a non-return valve. Although these valves are normally kept open they should, however, be operated periodically in order to ensure that they are free to be closed should the need arise.

See section 3.4.7 for the operation of the emergency fire pump.

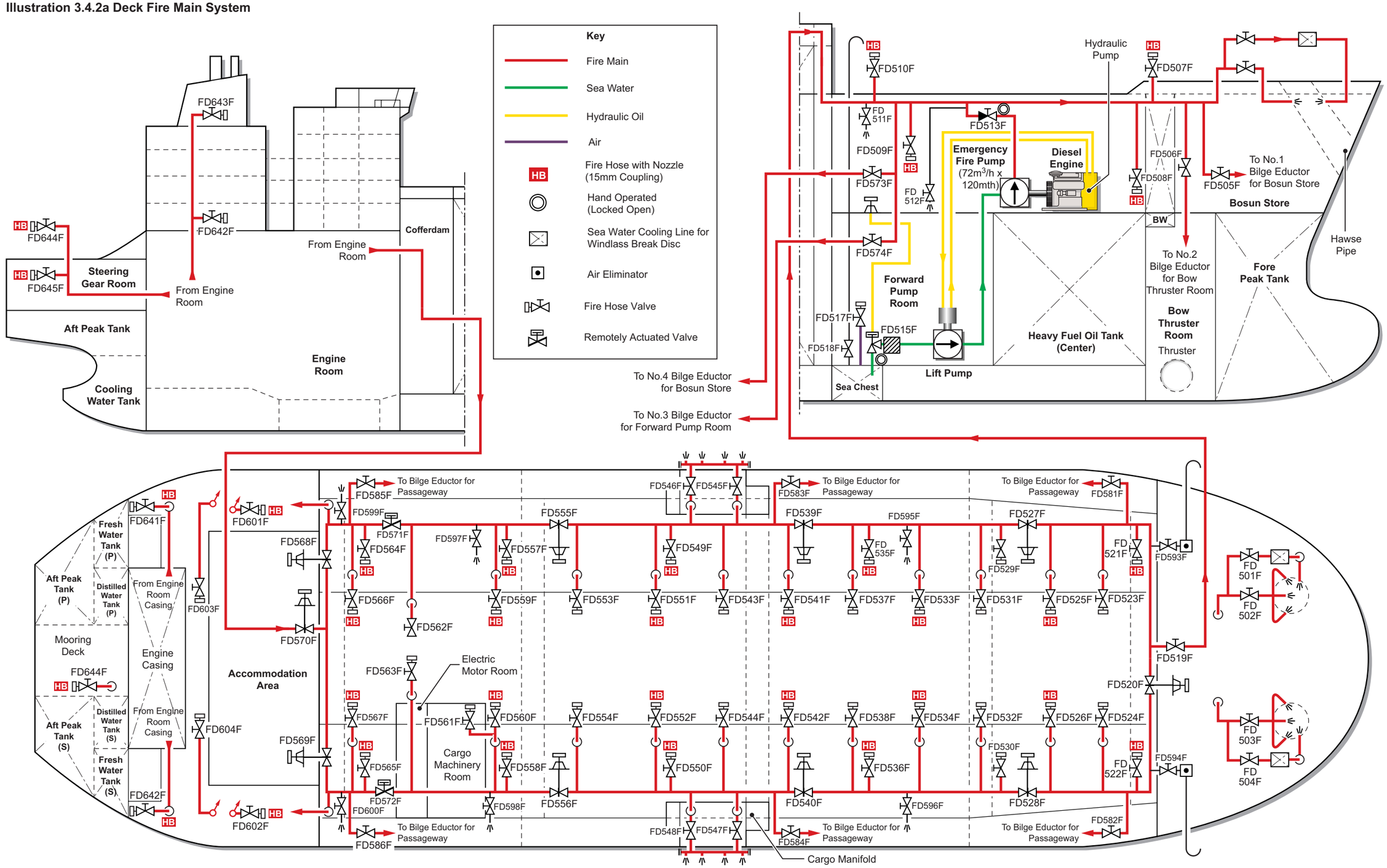
Water Spray System

The water spray pump supplies the water spray system, however the pump may also be used for operating the ballast stripping eductor. This will require the normally locked closed cross-connection valve FD055F to be opened and with this valve open the fire pump and bilge, fire and GS pumps may also serve the water spray system.

The water spray pump may be controlled locally by setting its selector switch to LOCAL but it is normally operated from the central control room mimic panel and to allow for this the selector switch must be turned to the REMOTE position.

Engine Room Fire Jockey Pump and Hydrophore Tank

Illustration 3.4.2a Deck Fire Main System



3.4.2 DECK AND ACCOMMODATION FIRE MAIN SYSTEM

Introduction

The fire main system is maintained under pressure by the hydrophore tank system with its associated jockey pump as described in section 5.2. The fire main supplies hydrants in the engine room and on deck. If one of the fire hydrant valves is opened the pressure in the fire main falls because the fire jockey pump has insufficient capacity to maintain the pressure. The fire pump is set to automatic operation and will start automatically when its pressure switch detects the fall in fire main pressure. By this means the fire main is automatically maintained under pressure in order to supply water to any of the hydrants.

The deck fire main system comprises the fire hydrants at the accommodation block and the fire hydrants on the ring fire main which runs around the main deck. Fire hydrants in the after deck areas and the funnel uptake block are supplied directly from the fire main system in the engine room via branch pipes.

Hydrant valves are normally kept closed but isolating valves on sections of the deck fire ring main are kept in the open position at all times except when there is a need to isolate a section of the fire main for any reason. As the deck fire main is a ring main all hydrants can be supplied with water except those located between any pair of closed isolating valves.

Procedure for Operating the Deck Fire Main

a) Ensure that the fire main is pressurised using the hydrophore tank and fire jockey pump as in section 5.2. Ensure that the fire pump is set for automatic operation as in section 5.2 and that the emergency fire pump is set for operation as in section 5.8.

b) Open the fire main isolating valves as in the following table.

Description	Valve
Port main line isolating valve	FD568F
Starboard main line isolating valve	FD569F
Port remotely operated fire safe isolating valve	FD571F
Port isolating valve aft of cargo manifold	FD555F
Port isolating valve forward of cargo manifold	FD539F
Port isolating valve at forward cargo tank	FD527F
Starboard remotely operated fire safe isolating valve	FD572F
Starboard isolating valve aft of cargo manifold	FD556F
Starboard isolating valve forward of cargo manifold	FD540F
Starboard isolating valve at forward cargo tank	FD528F
Forward ring main isolating valve	FD520F
Bow fire main isolating valve	FD519F

c) Open the deck fire main supply isolating valve FD570F and pressurise the deck fire main. Air eliminator valves are fitted at the ends of the port and starboard sections of the fire main.

d) The deck fire main is now pressurised and the main fire pump will start automatically if any fire hydrant valve on the deck system is opened.

(**Note:** During routine deck washing procedures one of the two bilge, fire and general service pumps may be used for supplying water to the fire main in order to prevent constant use of the fire pump for such duties. Normally No.1 bilge, fire and general service pump is set to supply the fire main with its sea suction and fire main discharge valves open. If a bilge, fire and general service pump is used to supply sea water to the fire main for deck washing duties the fire pump must be set to manual operation so that it will not operate automatically when the fire main pressure falls. After deck washing is finished it is essential that the fire pump is restored to automatic operation, see section 5.2.)

The Bow Fire Main System

Water supplied by the fire main is also used as flushing water at the hawse pipes and as cooling water for the windlass disc brakes. Supply valves to the windlass disc brake cooling system, FD501F for the port windlass and FD504F for the starboard windlass, are opened as required, as are the port hawse pipe valve FD502F and starboard hawse pipe valve FD503F.

Valve FD505F supplies operating water for the bosun's store bilge eductor and valve FD506F supplies operating water for the bow thruster bilge eductor.

The After Deck System

Fire hydrants in the steering gear room and on the aft mooring deck are supplied from the fire main in the engine room.

Cargo Manifold Water Curtains

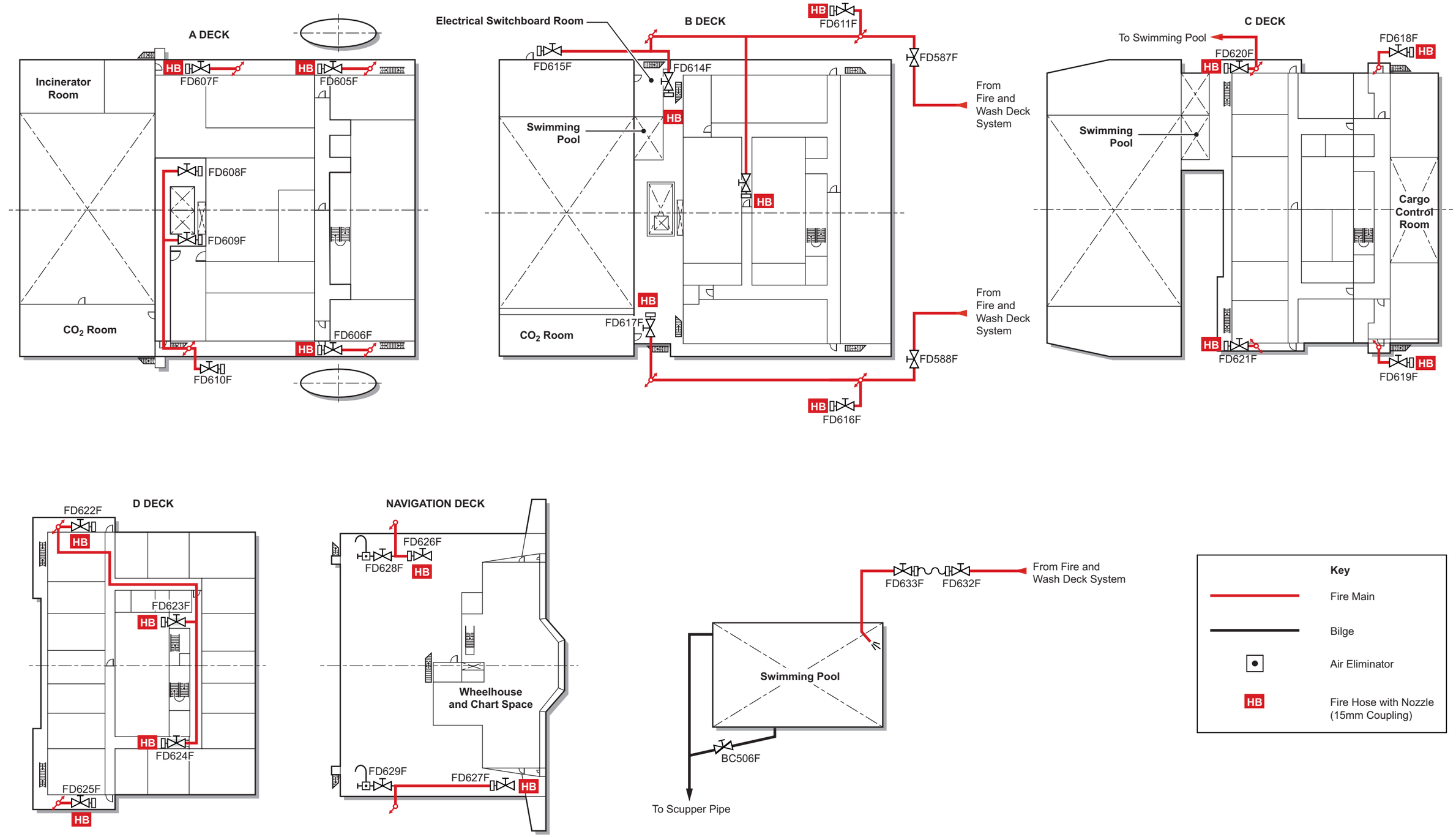
The port and starboard cargo manifold water curtains are supplied with water from the fire main. Each water curtain is supplied by means of two valves, one at each end of each water curtain. The valves are manually operated and the water curtains may also be supplied with fresh water.

Port Water Curtain Valves
FD546F and FD545F

Starboard Water Curtain Valves
FD548F and FD547F

The water curtain valves from the fire main are operated as required but the fire main must be pressurised as described above.

Illustration 3.4.2b Accommodation Fire Main System



The Accommodation Block

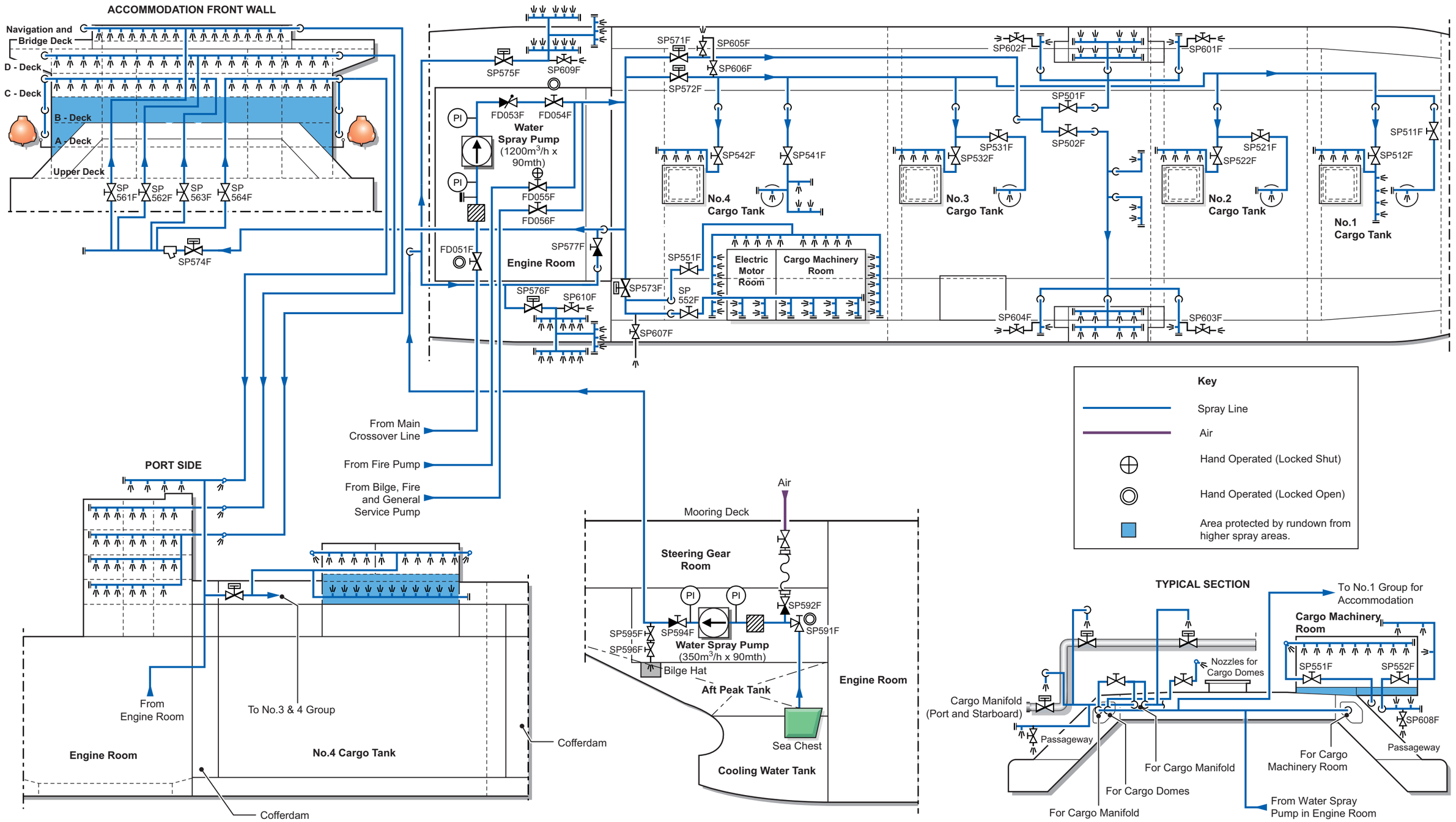
Fire hydrants on the port and starboard sides of the accommodation block are supplied with water from the fire main and are used as required. The swimming pool is filled from the fire main. Air eliminator valves are fitted at the uppermost parts of the fire main at the accommodation block.

(**Note:** All hydrant valves should be opened at frequent intervals in order to ensure that they will be free should they be required in an emergency. Use of all deck valves should take place at least once every two months and this can be achieved during fire drills and normal deck washing procedures.)

Hose Boxes

Hose boxes are located close to each fire hydrant. The hose box contains a fire hose with nozzle and standard fixture to the fire hydrant. Hoses and nozzles must be stored correctly after use.

Illustration 3.4.3a Water Spray System



3.4.3 WATER SPRAY SYSTEM

Introduction

The system can be supplied by the following pumps:

Water Spray (Engine Room)

Maker:	Shinko Industries
Type:	KV 350K
Capacity:	1,200m^3/h at 907mth
Motor:	450kW

Water Spray (Steering Gear Room)

Maker:	Shinko Industries
Type:	RVP200-2MS self priming
Capacity:	350m^3/h at 90mth
Motor:	150kW

Bilge, Fire and General Service Pump

Maker:	Shinko Industries
No. of sets:	2
Type:	RVP200-2MS
Capacity:	245m^3/h and 150m^3/h at 35mth and 120mth
Motor:	45kW and 150kW

Fire Pump

Maker:	Shinko Industries
Type:	RVP200-2MS
Capacity:	180m^3/h at 120mth
Motor:	132kW

The pumps supply sea water to the spray nozzles at the following group locations:

- Group 1 - accommodation exterior bulkheads and lifeboat stations
- Group 2 - cargo machinery and electric motor room exterior bulkheads
- Group 3 - cargo manifold water curtain spray system
- Group 4 - cargo tank liquid and gas domes

Each group of spray nozzles has a remotely operated hydraulic isolating valve controlled from the fire control station.

The engine room water spray pump and fire pump are located on the starboard forward side of the engine room floor and the bilge, fire and general service pumps are located on the port forward side of the engine room floor. All take suction from the main sea water crossover pipe and either the high or low sea chest must be open to this suction main at all times. The water spray system can also be supplied by the fire pump and the port bilge, fire and general service pump, via cross-connecting valve FD055F and by the starboard bilge, fire and general service pump via cross-connecting valve FD056F.

The engine room water spray pump may also be used for operating the ballast stripping eductors, via cross-connecting valve FD056F and the fire main system, via cross-connecting valve FD055F if necessary.

CAUTION

Valve FD055F should normally be locked closed and after operating the ballast eductors, valve FD056F should be closed.

The water spray pump in the steering gear has a dedicated sea chest and only supplies the accommodation exterior bulkheads and the lifeboat stations. It is isolated from the rest of the system by the non-return valve SP557F positioned forward of the accommodation.

To maintain the water spray system in the standby condition, the suction and discharge valves of both water spray pumps and the manually operated isolating valves on the groups are normally in the open position.

The pumps may be controlled locally by setting their selector switches to LOCAL, but they are normally operated from the IAS graphic screens and to allow for this their selector switches must be turned to the REMOTE position. At the IAS graphic screen the pumps are started and stopped from their faceplates which are called up by clicking on the pump icon.

The water spray pumps can be started from the IAS graphic screens at the following locations:

- Cargo control room
- Engine control room
- Wheelhouse

In an emergency the water spray pumps can be started using the pushbutton on the emergency panel in the fire control station.

Procedure for Supplying Sea Water to the Water Spray System

It is assumed that the sea water main suction valves at the sea water valve chest(s) are open to provide sea water suction.

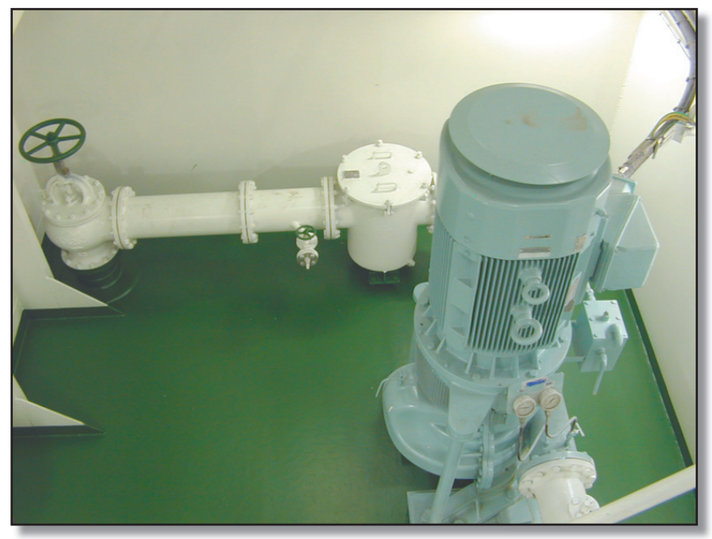
a) All intermediate isolating valves along the water spray system on the deck must be open.

b) Set up the group valves as shown in the table below:

Position	Description	Valve
Open	Supply valve to group 1 water spray system	SP574F
Open	Supply valve to group 2 water spray system	SP573F
Open	Supply valve to group 3 water spray system	SP571F
Open	Supply valve to group 4 water spray system	SP572F

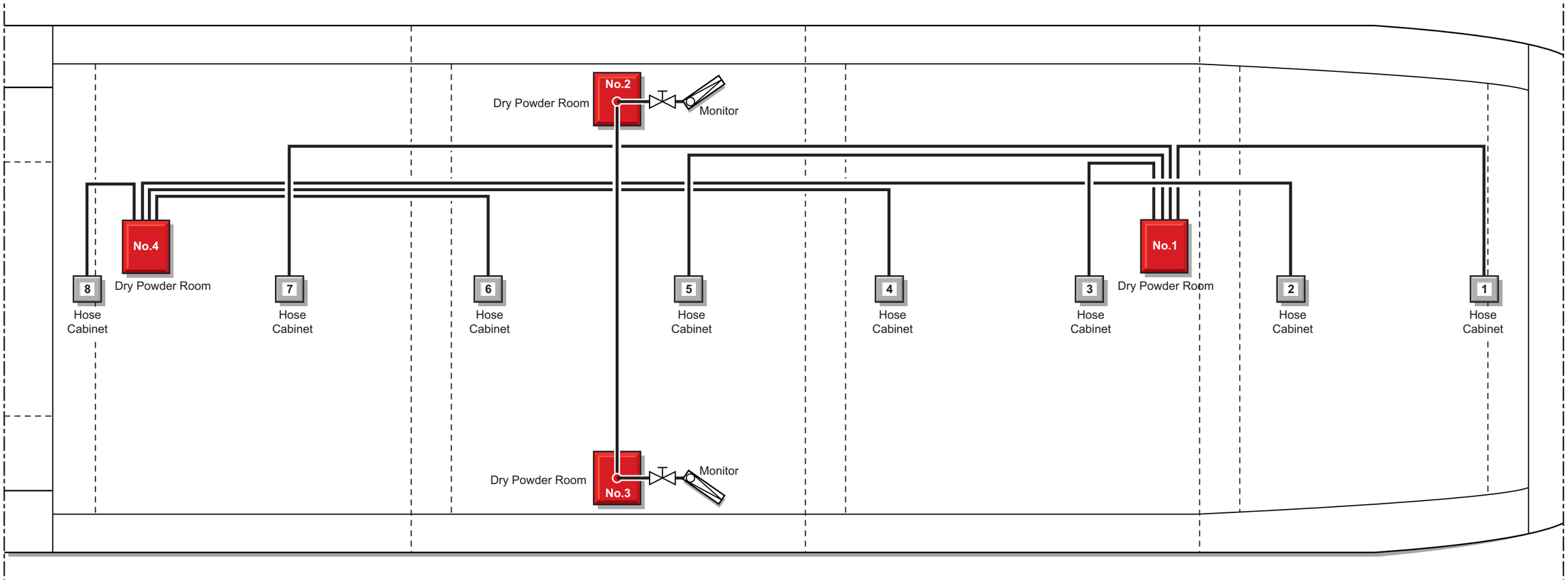
c) Start the engine room pump either from the IAS screen or from the emergency panel and supply water to the water spray system. These pumps must be selected as REMOTE at their local selector switches in order to allow them to be started from the IAS screen.

The water spray system is now in use and delivering water to all the selected spray nozzles on deck.



Water Spray Pump Situated in the Steering Gear Room

Illustration 3.4.4a Dry Powder System on Deck



TO OPERATE DRY POWDER

Monitor Release Cabinet

1. Open this door.
2. Open one cylinder valve.
3. Open ball valve.
4. Now System is operated.
5. If dry powder did not discharge go to the dry powder unit and follow the emergency operation on the chart.

EMERGENCY OPERATING

1. Open valves (1 - 2) and (10 - 2).

AFTER USE OF SYSTEM

1. Set No.3 control valve to "close" position.
→ Main valve is closed.
2. Set No.1 control valve to "N_2 STOP" position.
→ Stop pressurising dry powder tank.
3. Set exhaust valve to "OPEN" position.
→ Dissipate remaining gas in dry powder tank.
4. Set exhaust valve to "CLOSE" position.
5. Set agitation valve to "OPEN" position.
6. Set No.2 control valve to "N_2 RELEASE" position. (for about 5 seconds.)
7. Set No.2 control valve "NORMAL" position. (slowly changeover)
8. Set No.3 ball valve to "CLOSE" position.
9. Set cleaning valve to "CLEANING" position.
10. Set No.2 control valve "N_2 RELEASE" position.
11. Set exhaust valve to "OPEN" position.
12. Return valve to normal positions after all nitrogen gas has been dissipated.
13. Recharge N_2 cylinders.
14. Refill dry chemical agents to dry chemical container.

Key
Dry Powder

3.4.4 DRY POWDER SYSTEM

Maker:	NK Co Ltd
No. of sets:	4 consisting of: 2 tank units supplying 2 monitors port and starboard 2 tank units supplying a total of 8 hand hose nozzles, forward and aft
Type:	Sodium bicarbonate with anti-caking agent
Tank capacities:	Monitor units - 1,600 litres Hand hose units - 1,000 litres
N_2 cylinders:	Monitor stations - 8 sets each station Hand units 5 sets each station
Location of sets:	Monitors - port and starboard of cargo manifold Hand hoses - to port of centre line each hose being 33m in length
Minimum discharge time:	60 seconds with 1 monitor and 4 hoses in operation at their specified discharge rates, this is for each dry powder tank
Capacities:	Monitor - 25kg/sec Hand hoses - 3.5kg/sec
	Monitor angular sweep horizontal - 360° Vertical - + 80° to - 40°
Monitor release positions:	6

Introduction

Monitor System

The system comprises two tanks containing the sodium bicarbarbonate connected to a battery of N_2 cylinders which are operated by CO_2 cylinders from either the cargo control room, the fire control station or locally.

The monitors are situated just aft of the cargo discharge manifold and aligned to face and cover the liquid and vapour lines and valves at either the port or starboard manifold.

The N_2 cylinders can be opened either manually or remotely from six positions, they can also be cross-connected. Activation of any CO_2 bottle and operation of the ball valve will open the N_2 battery bank and start the fire fighting operation.

Hand Hose System

This system comprises two tanks containing the dry powder feeding four hose reels each. Operation is the same as for the monitors; on opening the CO_2 cylinders and ball valves the N_2 cylinders are opened and fire fighting begins.

Procedure for Operating the System

a) The monitor should have been pre-aligned with the cargo discharge manifold and the dry powder supply valve left in the open position. This area is the most susceptible to gas leaks and fires.

b) Open the CO_2 cabinet door.

c) Remove the securing device from one CO_2 cylinder.

d) Open the CO_2 cylinder valve by turning valve handle anti-clockwise fully.

e) Open the ball valve to allow CO_2 gas to open the N_2 battery by moving handle downwards. This activates the pressurising of the dry powder charge and opens the selection valve and main valve.

Dry powder discharge begins.

Procedure for Operating Port (No.1) Tank with the Starboard Manifold Monitor and vice versa

a) Crossover valves P32 and S32, together with the monitor isolating valves PM1 and SM1 must remain FULL OPEN when the systems are at STANDBY READY FOR USE condition.

b) Should the starboard manifold monitor be in use, resulting in the total consumption of No.2 tank dry powder charge and further fire fighting capability being required, the No.1 tank dry powder charge can be discharged via the starboard monitor as follows:

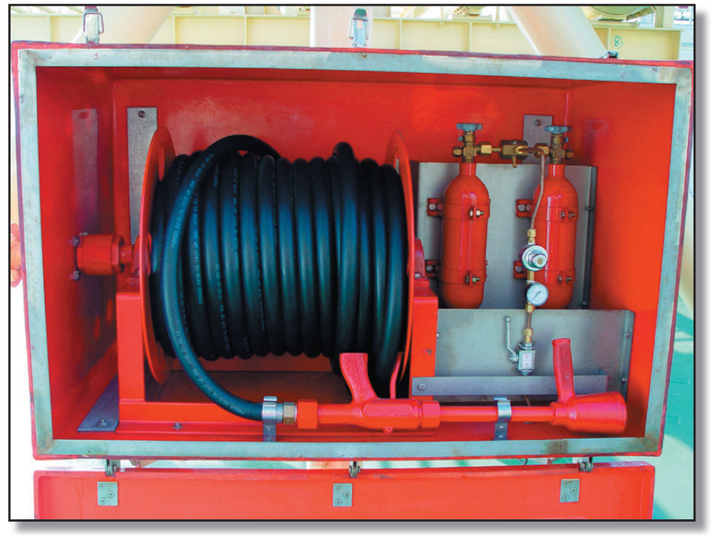
1. Open the appropriate second starting CO_2 cylinder valve.

2. Open the corresponding valve P~S in either the fire control station, cargo control room or at the port dry powder tank unit.

c) Similarly should the port manifold monitor be in use, resulting in the total consumption of No.1 tank dry powder charge and further fire fighting capability being required, the No.2 tank dry powder charge can be discharged via the port monitor as follows:

1. Open the appropriate second starting CO_2 cylinder valve.

2. Open the corresponding valve P~S in either the fire control station, cargo control room or at the port dry powder tank unit.



Deck Dry Powder Hose Cabinet

Procedure for Operating of the Dry Powder Fire Extinguishing System using the Hand Hoses

a) Open the dry powder hand hose cabinet door.

b) Remove the securing device on the CO_2 bottle.

c) Open the CO_2 cylinder valve by turning it fully anti-clockwise.

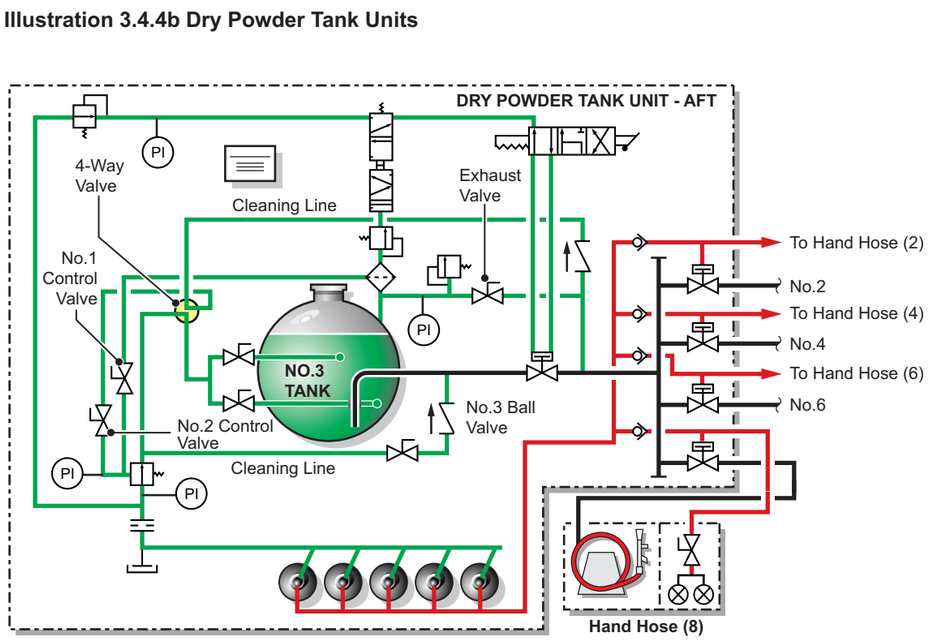
d) Open the ball valve by turning the handle downwards.

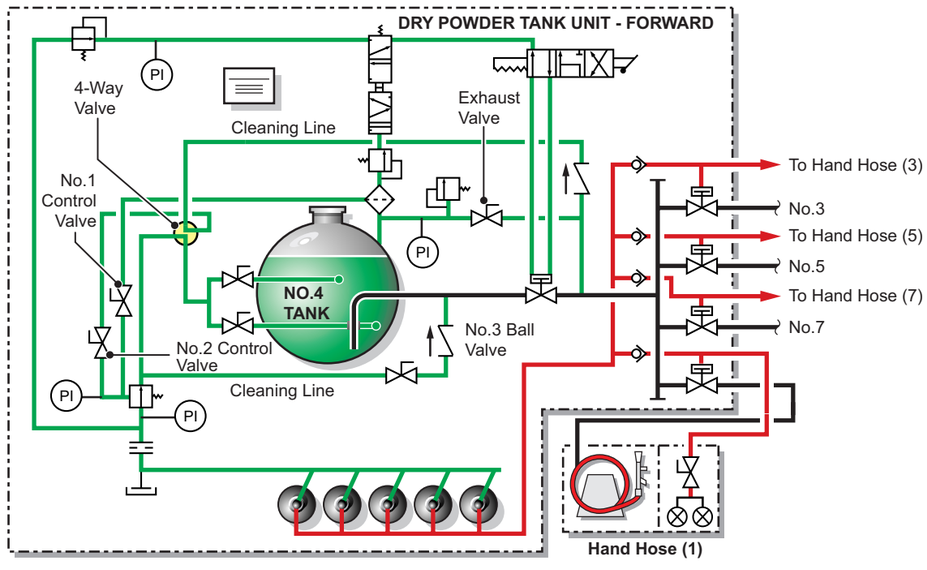
e) Pull out a complete length of hose from the drum, about 33 metres.

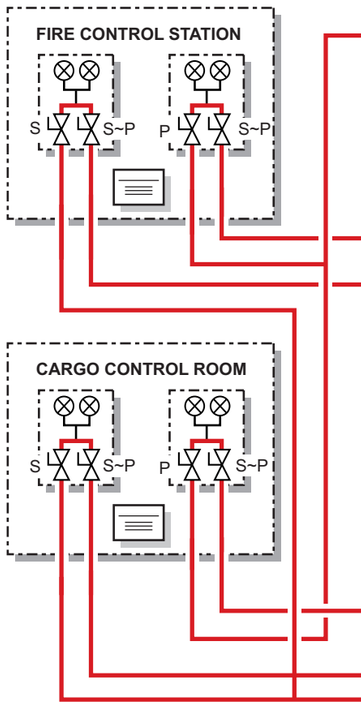
f) Aim the nozzle at the side of the fire scene and pull the fire nozzle trigger.

g) Sweep the dry powder jet across the fire scene from side to side.

Illustration 3.4.4b Dry Powder Tank Units







P = Port to Port Monitor

S = Starboard to Starboard Monitor

P ~ S Port Charge to Starboard Monitor

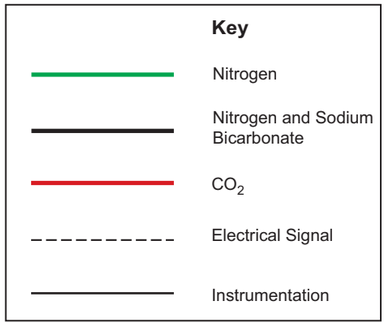
S ~ P Starboard Charge to Port Monitor

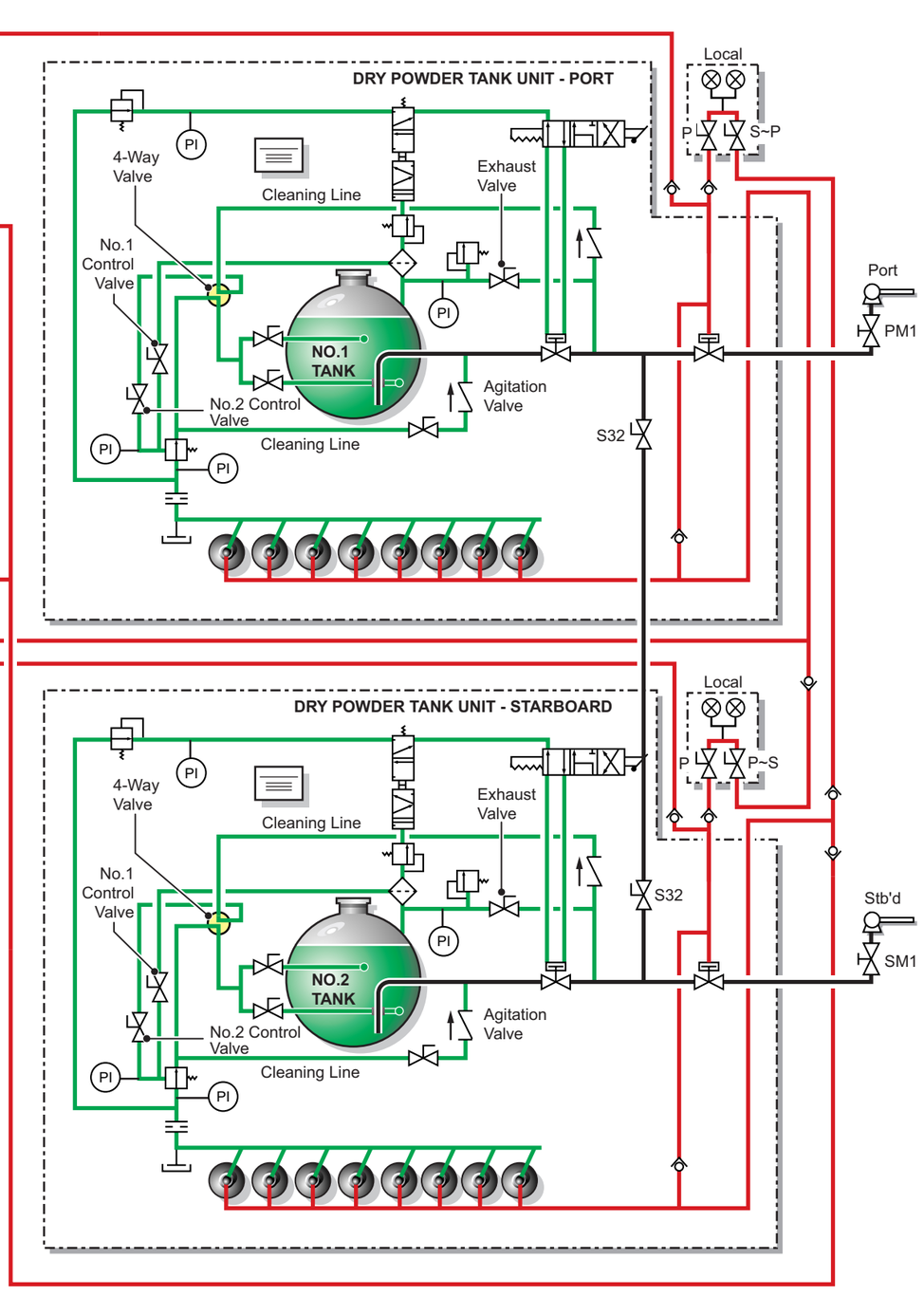
P32 Port Crossover Valve

S32 Starboard Crossover Valve

PM1 Port Monitor Isolating Valve

SM1 Starboard Monitor Isolating Valve





Precautions

- Always wear full fireproof clothing and personal protection equipment
- After opening the cabinet door the operation must begin quickly to prevent the powder caking
- Be aware of the reaction of the nozzle gun on commencing discharging
- Prevent kinking of the hose and twists in the line

Procedure for Cleaning the Dry Powder System after Use

After any operation of the dry powder system it is essential the system is cleaned at once with N_2. This is to prevent any residue powder remaining in the lines thereby causing a blockage to subsequent useage. There is usually enough N_2 remaining in the bottle bank to do this.

a) No.3 control valve is set to CLOSE. The main valve is closed.

b) No.1 control valve to the N_2 STOP position. This stops pressurising the dry powder tank.

c) Set the exhaust valve to the OPEN position. This exhausts the remaining gas in the powder tank.

d) Set the exhaust valve to the CLOSE position.

e) Set the agitation valve to the OPEN position.

f) Set No.2 control valve to the N_2 RELEASE position, for about 5 seconds.

g) Set No.2 control valve to the NORMAL position.

h) Set the agitation valve to the CLOSE position.

i) Set the cleaning valve to the CLEAN position.

j) Set No.2 control valve to the N_2 RELEASE position.

k) Set the exhaust valve to the OPEN position.

l) Restore all the valves to their normal positions after the N_2 gas has been exhausted.

m) Recharge the N_2 cylinders.

n) Refill the dry powder tank.

Procedure for Exhausting N_2 and CO_2 from the Control Lines, Valves and Main Tanks

a) Exhaust the N_2 in the dry powder tank by releasing the securing bolts on the dry powder filling connection on top of the dry powder tank.

CAUTION

During this operation care should be taken during the release of the residual gases. To minimise the risk of injury the flange should be released gradually.

b) To completely exhaust the CO_2 in the control lines one of the connections on the N_2 cylinders should be released, again care being taken when doing this.

Closing the Main and Selection Valves

c) As these valves are operated by N_2 and CO_2 respectively, to close the valves the manual operating handle is used.

(**Note:** The valve seat and ball of the MAIN and SELECTION valves should be cleaned in accordance with the maker's instructions before returning them to service.)

Recharging the Dry Powder Tank

d) After release of the N_2 in the dry powder tank it is refilled with the correct quantity of the dry powder. This should be of the sodium bicarbonate type. No other type of of agent should be used.

e) After refilling the tank through the manhole the tank should be resecured by securing the blind flange to the tank flange. All bolts should be tightened correctly.

d) After recharging the dry powder, carry out the routine for agitating the charge using the ship's N_2 supply via the portable hose.

Procedure to Recharge the N_2 Cylinders

This recharging process is achieved by changing the exhausted N_2 bottles for full ones. This is done as follows

a) Remove the actuating cylinder from the cylinder valve.

b) Unscrew the union nut of the connecting link line at the cylinder valve, remove the connecting line being careful of the seal on the ends of the line and valve.

c) Screw the protecting cap onto the discharged N_2 cylinder.

d) Unscrew the clamping device(s) from the discharged gas cylinder.

e) Remove the discharged cylinder.

f) Replace the full N_2 cylinder.

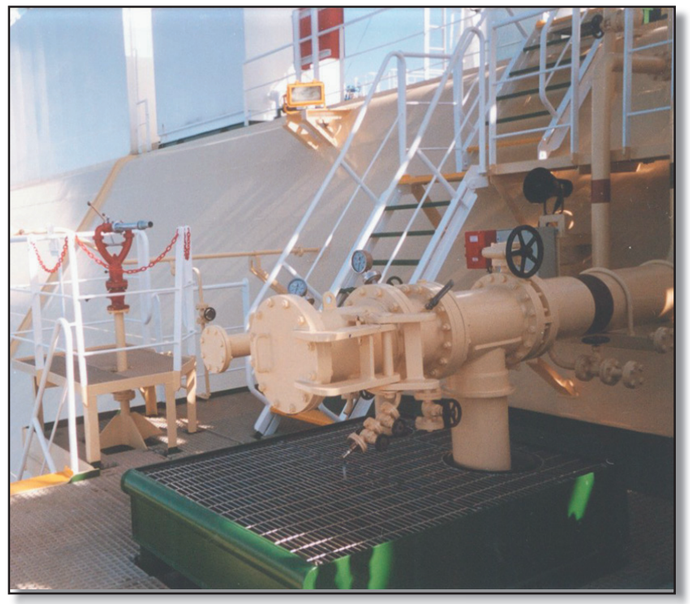
g) Replace the clamping device(s) and leave slack until the bottle is lined up with the piping.

h) Remove the protection from the valve on the new cylinder and align the bottle with the connecting piping.

i) Reconnect the cylinder with the connecting piping on both the CO_2 and the N_2 lines.

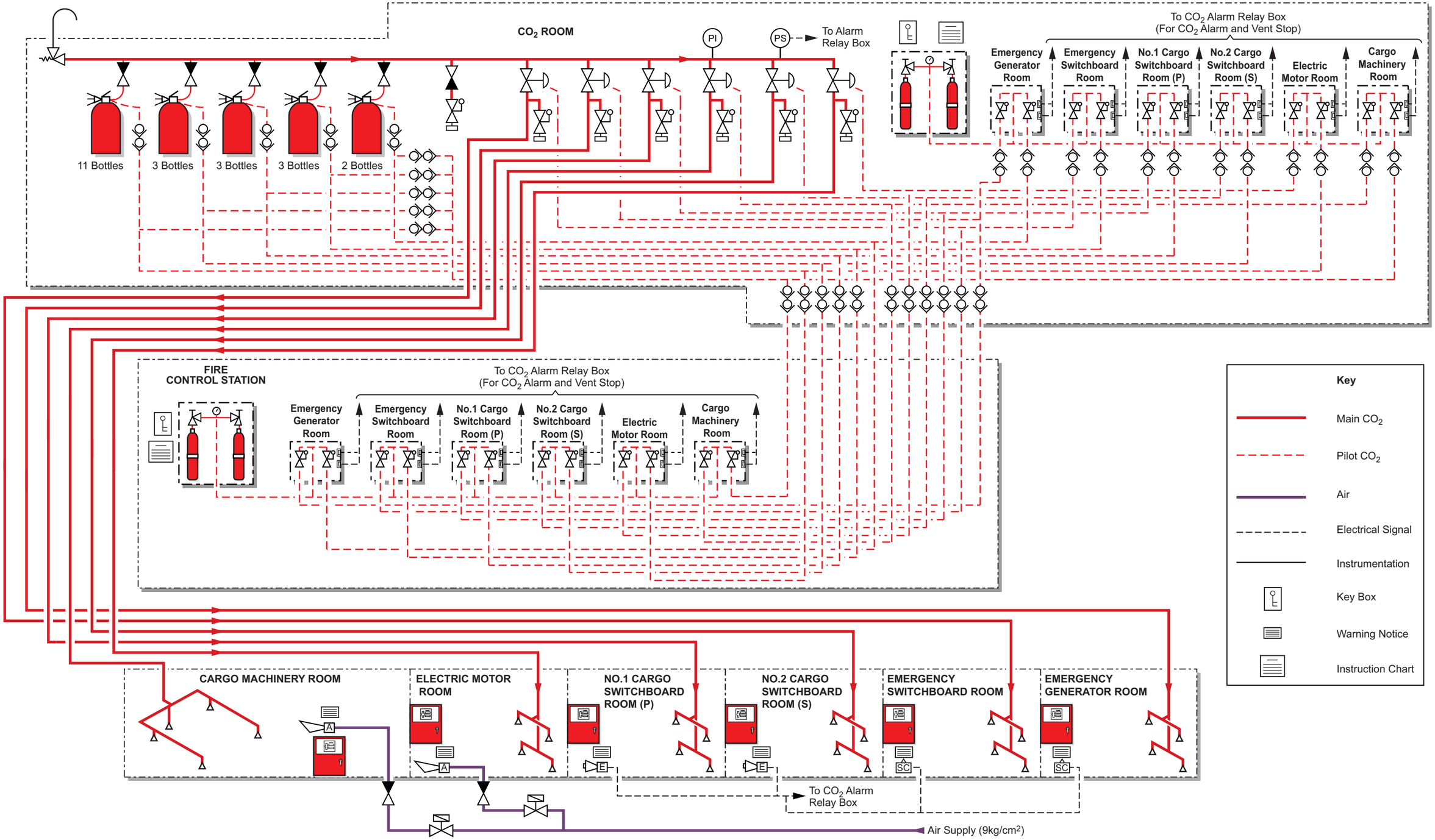
j) Tighten all connections.

k) Replace the actuating cylinder.



Starboard Manifold Area Dry Powder Monitor

Illustration 3.4.5a CO_2 System



3.4.5 CO_2 SYSTEM

Maker: NK Co. Ltd.
Type: High pressure
Capacity: 22 cylinders each containing 45kg

INTRODUCTION

Dependent upon the application, CO_2 is normally employed at levels of between 35% and 50% by volume to produce an oxygen deficiency and thus extinguish a fire. This level of oxygen reduction is also capable of causing asphyxiation. Fixed systems are therefore designed to include safeguards which prevent the automatic release of the CO_2 whilst the protected area is occupied. The users of portable extinguishers should ensure that there is sufficient air to breathe normally. CO_2 is not generally regarded as having a high intrinsic toxicity and is not normally considered to produce decomposite products in a fire situation.

The CO_2 cylinders are fitted with safety devices to relieve excess pressure caused by high temperatures. To avoid these operating, it is recommended that cylinders are located in areas where the ambient temperature will not exceed 46°C. Cylinders must not be stored in direct sunlight.

Certain gaseous extinguishing agents may cause low temperature burns when in contact with the skin. In such cases the affected area should be thoroughly irrigated with clean water and afterwards dressed by a trained person.

WARNING
DANGER OF ASPHYXIATION
Re-entry to a CO_2 flooded area should not be made until the area has been thoroughly ventilated.

SYSTEM DESCRIPTION

Areas Protected

The central bank CO_2 system installed in the ship protects the port and starboard cargo switchboard rooms, cargo machinery room, electric motor room, emergency switchboard room, emergency generator room, paint store, chemical store and the oil/grease store. Outlets for CO_2 are located in the protected spaces so as to give an even spread of CO_2 quickly throughout the compartment when the gas is released.

Additionally the following spaces are protected under the engine room protection system - main engine room, diesel generator room, inert gas generator room, purifier room and No.1 and 2 main switchboard rooms.

Central Bank CO_2 System for Cargo Machinery

The central bank CO_2 system consists of 22 cylinders each containing 45kg of CO_2 located in the CO_2 room, which is situated on the starboard side of the engine casing on A deck.

These cylinders are connected to discharge nozzles within the protected space via cylinder manifolds and distribution pipework.

A pressure gauge and pressure switch are fitted to the main CO_2 manifold.

The system is designed to discharge the required number of cylinders into the protected space at the same time. Each protected space requires a certain number of cylinders to give a 40% concentration of CO_2. The total number of cylinders is determined by the largest protected compartment.

When the release system is activated for a particular protected space, only the required number of cylinders for that space are released.

Protected Space	Number of Cylinders Required
Cargo switchboard room (port)	3
Cargo switchboard room (starboard)	3
Cargo machinery room	22
Electric motor room	11
Emergency generator room	2
Emergency switchboard room	3

The alarm is raised via the IAS when CO_2 is released into the protected spaces. Air horns also operate in the following spaces - cargo machinery room, engine control room and No.1 and 2 cargo switchboard rooms.

It has to be appreciated that if any of the cylinders are released to protect a space then there is no longer sufficient capacity to provide total protection for the cargo compressor room and the efforts must be made to have the CO_2 cylinders replenished at the next port.

Control Cabinet

Discharge of the CO_2 is manually accomplished from a control cabinet located in the fire control station and CO_2 room. Operation of the release system opens the cylinder release valves and the main line discharge valve(s) to the protected spaces.

Alarms and Trips

The valve cabinet door situated near the control cabinet door is fitted with electrical contacts which activate an alarm.

The alarms are fitted to the protected spaces and consist of visual and audible signals.

Opening the cabinet door in either the CO_2 room or the fire control station will trip the following:

Circuit	Description
EGP-006	Emergency generator room supply fan
1CGP-007	No.1 cargo machinery room exhaust fan
2CGP-007	No.2 cargo machinery room exhaust fan
1CGP-008	No.1 electric motor room exhaust fan
2CGP-008	No.2 electric motor room exhaust fan

Control Cylinder Cabinet

The system is operated by a supply of CO_2 separate from the main fire extinguishing CO_2. It is stored in small pilot cylinders installed within the control cylinder cabinet. The pilot cylinders are connected to the main pilot system pipework via two isolation valves installed within the control cabinet.

One isolation valve is connected via small bore pilot gas pipework to the cylinder bank to open the cylinders, the other is connected via a separate pilot gas line to open the line valve to the protected spaces. The isolation valves are positioned so that the control cabinet door cannot be closed with the valves in the open position. It is also arranged that the control cabinet door will operate the switches when in the open position, to initiate audible and visual alarms.

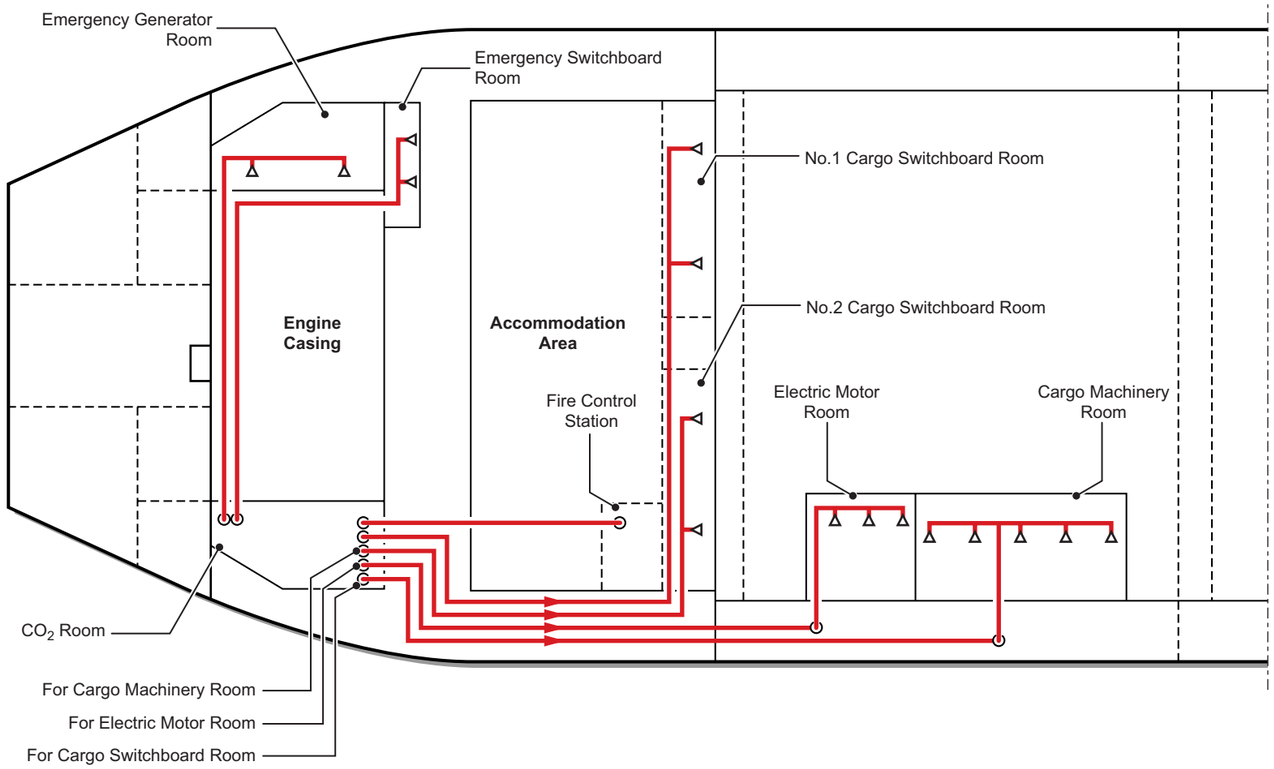
A time delay unit is located in the pilot CO_2 pipeline to the main storage bottles. This unit allows for a time delay of about 30 seconds between actuation of the main cylinder release isolating valve and the actual operation of the cylinder release valves. This delay offers time for personnel in the protected spaces to evacuate them after the CO_2 release alarm has sounded.

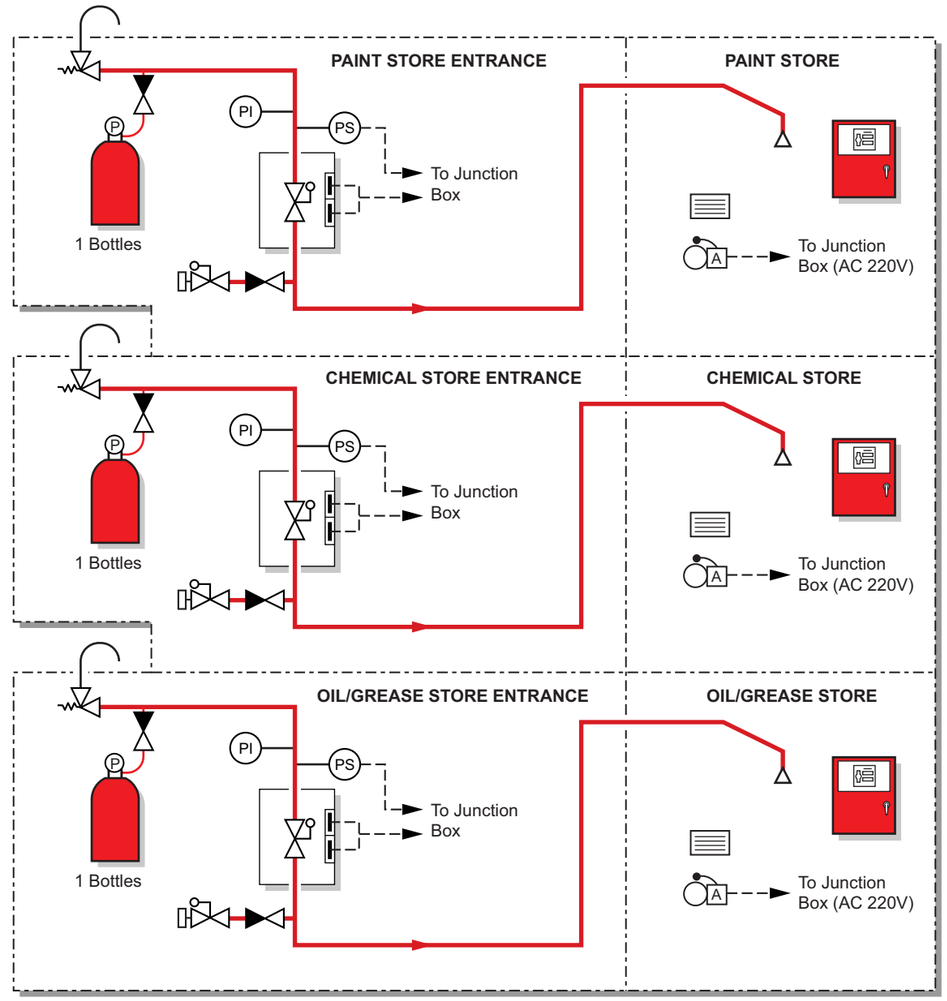
A pressure gauge is fitted to the pilot CO_2 pipeline to indicate pilot CO_2 pressure.

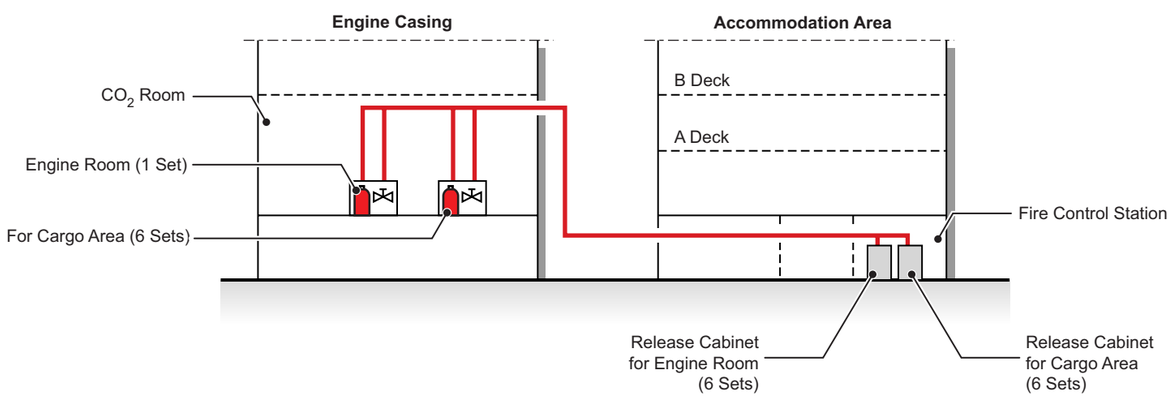
Operating Procedure

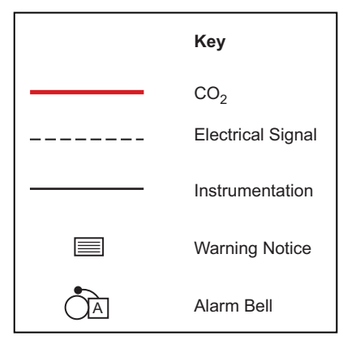
a) On discovering a fire in a protected space, shut down the machinery in that space together with fuel supplies, if any, and ventilating systems. Close all doors, ventilators and other openings having first ensured that all personnel have been evacuated.

Illustration 3.4.5b Cargo Area CO_2 System









b) Conduct a muster of all personnel ensuring that everyone is accounted for. The gas must not be released until any missing persons are accounted for and are known not to be in the protected space where CO_2 is to be released.

c) Go to the CO_2 system control cabinet in the fire control station and break the glass key cabinet and obtain the key.

d) Use the key to open the control cylinder cabinet door.

e) Open one of the cylinder valves in the control cylinder cabinet.

f) Go to the control valve cabinet for the protected space where the fire has occurred and open the cabinet door which activates an alarm.

g) Open the No.1 and No.2 ball valves to release the pilot CO_2 to the cylinders isolating valves (for cylinder banks) and protected space isolating valve for release of main CO cylinders. The gas is released to the protected space after the time delay period.

h) After 10 minutes, close the pilot cylinder hand wheel valve.

i) When the pilot pressure gauge within the control box is zero, close both pilot isolation valves.

This procedure can also be performed from the CO_2 room.

(**Note:** Allow time for structural cooling before opening the protected space and ventilating the CO_2 gas.)

WARNING

Do not enter the space for at least 24 hours. Ensure all reasonable precautions have been taken, such as maintaining boundary inspections, noting cooling down rates and/or any hot spots which may have been found. After this period an assessment party, wearing breathing apparatus, can enter the space quickly through a door which they shut behind them. Check that the fire is extinguished and that all surfaces have cooled prior to ventilating the space. Premature opening can cause re-ignition if oxygen contacts hot combustible material.

Procedure to Release CO_2 Manually

In the unlikely event of pilot gas initiation failure, the CO_2 system may be operated from the CO_2 room.

a) Open the control box door so that the alarms will still be activated.

b) In the CO_2 room manually open the relevant main valve for the protected space into which CO_2 is to be released by pulling up the lever on the valve.

c) Ensure that all personnel have left the space and ensure that all vents and doors are closed.

d) Remove the safety pins on the valve actuator mounted on the CO_2 cylinders to be released. A check must be made to determine how many cylinders are needed for the space in which the fire has occurred.

e) Pull down the operating lever on the valve actuator of the cylinders to be released. CO_2 will now be discharged.

In the Event of a Fire in the Deck Store Rooms and Galley

The local area CO_2 system for the store rooms and galley consist of 1 cylinder each containing 45kg of CO_2. The cylinders are located outside the store rooms.

The local area CO_2 system protects the following spaces:

Protected Space	Number of Cylinders Required
Paint store	1
Chemical store	1
Oil and grease store	1
Galley	1

The alarm is raised via the IAS when CO_2 is released into the protected spaces:

Opening the cabinet door will trip the following:

Circuit	Description
3GP-015	Paint store exhaust fan
3GP-014	Chemical store exhaust fan
3GP-013	Oil and grease store exhaust fan
3GP-032	Galley exhaust fan
3GP-012	Galley supply fan

Operating Procedure

a) Go to the local cabinet outside the protected space containing the fire.

b) Open the ball valve cabinet.

c) The CO_2 alarm bell will sound in the space.

d) The ventilation fan will stop.

e) Ensure all personnel have evacuated the space and that all personnel are accounted for.

f) Close and check that all appropriate doors, hatches and fire flaps are shut.

g) Isolate electrical power supplies to the space.

h) Remove the safety pin on the valve actuator on the CO_2 cylinder and pull down the operating lever.

i) Open the ball valve in the ball valve cabinet.

j) The cylinder will now discharge into the space.

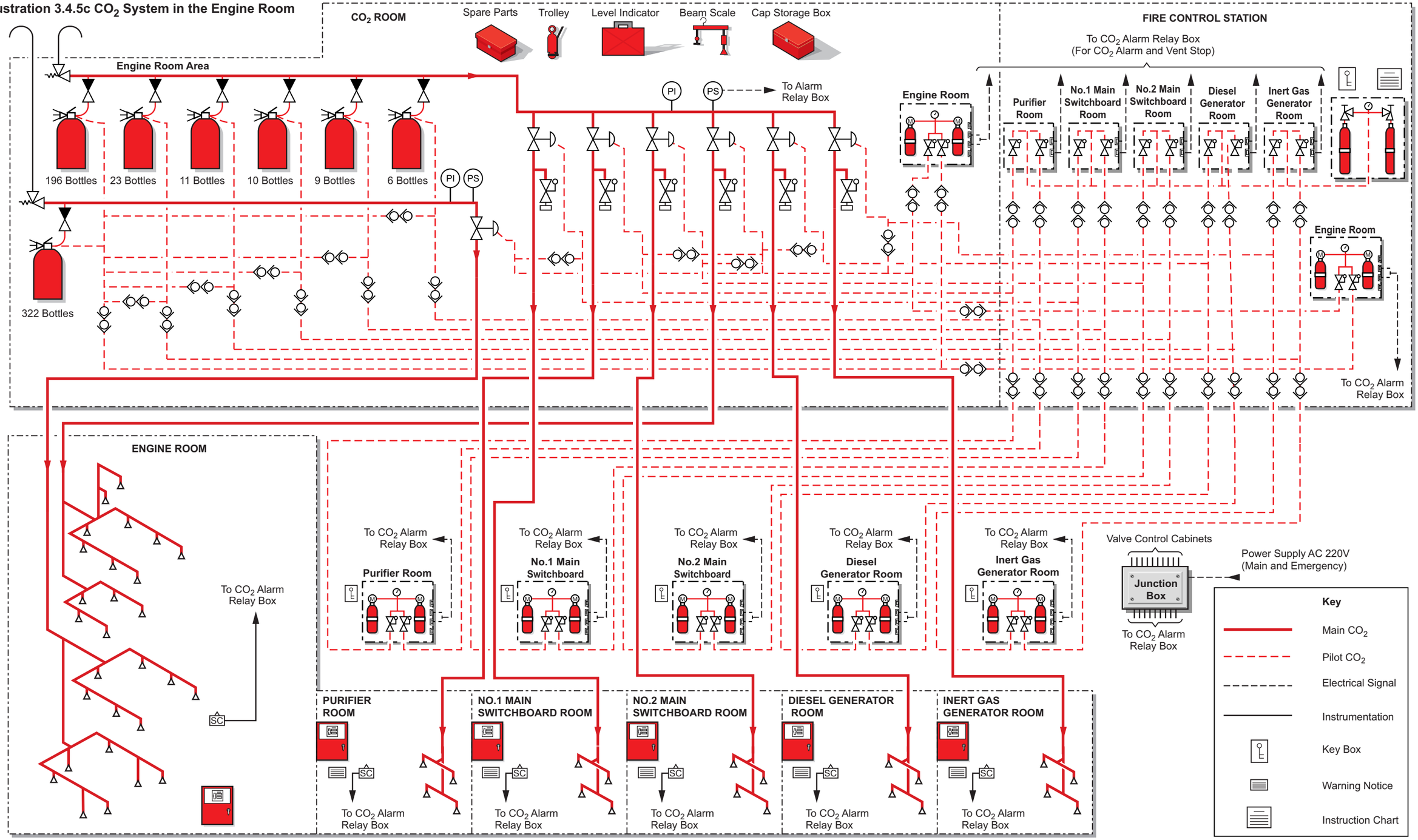
WARNING

Do not enter the space for at least 24 hours. Ensure all reasonable precautions have been taken, such as maintaining boundary inspections, noting cooling down rates and/or any hot spots which may have been found. After this period an assessment party, wearing breathing apparatus, can enter the space quickly through a door which they shut behind them. Check that the fire is extinguished and that all surfaces have cooled prior to ventilating the space. Premature opening can cause re-ignition if oxygen contacts hot combustible material.

Should the cylinder discharge accidentally, it will pressurise the line up to the ball valve. This line is monitored by a pressure switch which will activate CO_2 leakage alarms in the protected space.

Overpressure of the CO_2 line is prevented by a safety valve, which will vent the gas to atmosphere.

Illustration 3.4.5c CO_2 System in the Engine Room



Engine Room System

Maker: NK Co. Ltd
Type: High pressure
Capacity: 576 cylinders each containing 45kg

INTRODUCTION

Dependent upon the application, CO_2 is normally employed at levels of between 35% and 50% by volume to produce an oxygen deficiency and thus extinguish a fire. This level of oxygen reduction is also capable of causing asphyxiation. Fixed systems are therefore designed to include safeguards which prevent the automatic release of the CO_2 whilst the protected area is occupied. The users of portable extinguishers should ensure that there is sufficient air to breathe normally. CO_2 is not generally regarded as having a high intrinsic toxicity and is not normally considered to produce decomposite products in a fire situation.

The CO_2 cylinders are fitted with safety devices to relieve excess pressure caused by high temperatures. To avoid these operating, it is recommended that cylinders are located in areas where the ambient temperature will not exceed 46°C. Cylinders must not be stored in direct sunlight.

Certain gaseous extinguishing agents may cause low temperature burns when in contact with the skin. In such cases the affected area should be thoroughly irrigated with clean water and afterwards dressed by a trained person.

WARNING
DANGER OF ASPHYXIATION
Re-entry to a CO_2 flooded area should not be made until the area has been thoroughly ventilated.

System Description

Areas Protected

The central bank CO_2 system installed in the ship protects the engine room, No.1 and No.2 main switchboard rooms, purifier room, diesel generator room and the inert gas generator room. Outlets for CO_2 are located in the protected spaces so as to give an even spread of CO_2 quickly throughout the compartment when the gas is released.

Also within the CO_2 room is a central bank CO_2 system which is installed to protect the cargo area, which includes the cargo machinery room, cargo motor room, No.1 and No.2 cargo switchboard rooms, emergency generator room and emrgency switchboard room. Single cylinder individual systems are provided to protect the paint store, chemical store and the oil/grease store.

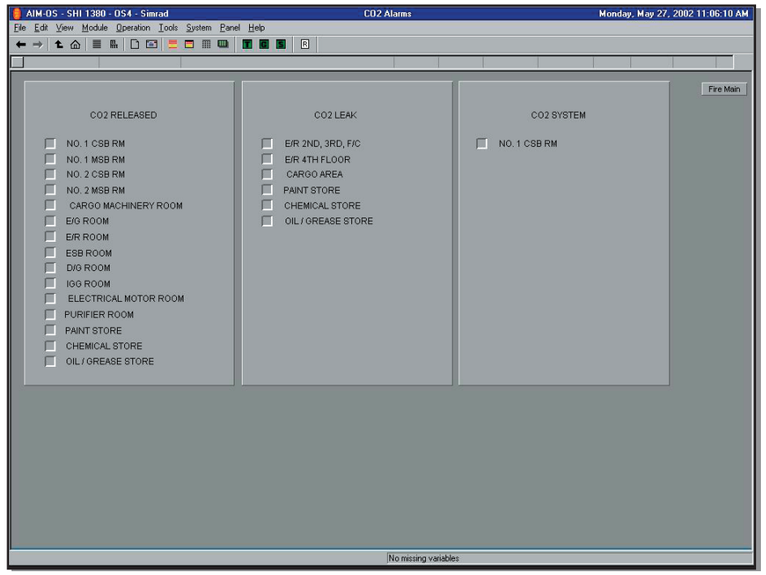
Central Bank CO_2 System for the Engine Room

The central bank CO_2 system consists of 576 cylinders each containing 45kg of CO_2 located in the CO_2 room, which is situated on the starboard side of the engine casing on A deck.

These cylinders are connected to discharge nozzles within the protected space via cylinder manifolds, distribution pipework and isolating valves.

A pressure gauge and pressure switch are fitted to the main CO_2 manifold.

The system is designed to discharge the required number of cylinders into the protected space at the same time. Each protected space requires a certain number of cylinders to give a 40% concentration of CO_2. The total number of cylinders is determined by the largest protected compartment.



When the release system is activated for a particular protected space, only the required number of cylinders for that space are released.

Protected Space	Number of Cylinders Required
Main engine room, including casing:	576
Diesel generator room:	11
Inert gas generator room:	23
Purifier room:	6
No. 1 main switchboard room:	9
No. 2 main switchboard room:	10

It has to be appreciated that if any of the cylinders are released to protect a space then there is no longer sufficient capacity to provide total protection for the engine room and the efforts must be made to have the CO_2 cylinders replenished at the next port.

The alarm is raised via the IAS when CO_2 is released into the protected spaces.

Control Cabinet

Discharge of the CO_2 is manually accomplished from a control cabinet located in the fire control station. The engine room system can also be activated from a panel in the CO_2 room. Operation of the release system opens the cylinder release valves and the main line discharge valve(s) to the protected spaces.

Alarms and Trips

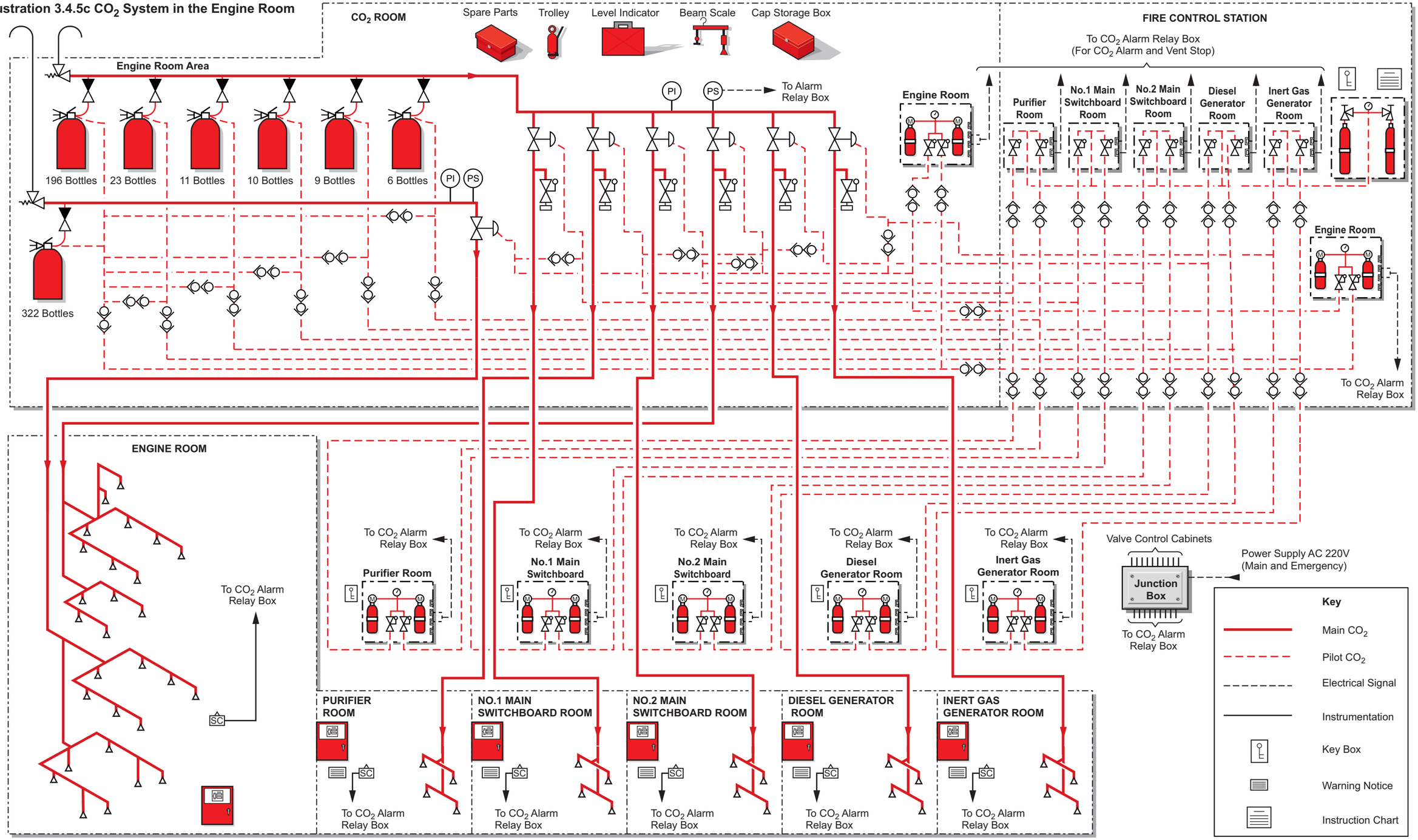
The valve cabinet door situated near the control cabinet door is fitted with electrical contacts which activate an alarm.

The alarms are fitted to the protected spaces and consist of visual and audible signals.

Opening the cabinet door in either the CO_2 room or the fire control station will trip the following:

Circuit	Description
1P-018	No.1 packaged air conditioning unit for the ECR
2P-018	No.2 packaged air conditioning unit for the ECR
2P-009	Sootblower control panel
1GP-011	No.1 engine room supply fan
2GP-011	No.2 engine room supply fan
EGP-002	No.3 engine room supply fan
EGP-003	No.4 engine room supply fan
1GP-014	No.1 boil-off gas extraction fan
2GP-014	No.2 boil-off gas extraction fan
EGP-004	No.1 engine room exhaust fan
2GP-012	No.2 engine room exhaust fan
1GP-015	No.1 boiler forced draught fan
2GP-015	No.2 boiler forced draught fan
1GP-016	No.1 boiler seal air fan
2GP-016	No.2 boiler seal air fan

Illustration 3.4.5c CO_2 System in the Engine Room



Circuit	Description
1GP-019	Toilet exhaust fan
2GP-019	Welding space exhaust fan
1GP-025	Gland steam condenser exhaust fan
1P-010	Dryer unit for inert gas generator
2GP-020	Boiler water test space (workshop) exhaust fan

Opening the cabinet door in either the CO_2 room, their local CO_2 cabinet or the fire control station will trip the following:

Circuit	Description
2GP-025	Purifier room exhaust fan
1P-006	No.1 blower for the inert gas generator
2P-006	No.2 blower for the inert gas generator
1P-013	Port main switchboard packaged air conditioning unit
2P-013	Starboard main switchboard packaged air conditioning unit

Control Cylinder Cabinet

The system is operated by a supply of CO_2 separate from the main fire extinguishing CO_2. It is stored in small pilot cylinders installed within the control cylinder cabinet. The pilot cylinders are connected to the main pilot system pipework via two isolation valves installed within the control cabinet.

One isolation valve is connected via small bore pilot gas pipework to the cylinder bank to open the cylinders, the other is connected via a separate pilot gas line to open the line valve to the protected spaces. The isolation valves are positioned so that the control cabinet door cannot be closed with the valves in the open position. It is also arranged that the control cabinet door will operate the switches when in the open position, to initiate audible and visual alarms.

A time delay unit is located in the pilot CO_2 pipeline to the main storage bottles. This unit allows for a time delay of about 30 seconds between actuation of the main cylinder release isolating valve and the actual operation of the cylinder release valves. This delay offers time for personnel in the protected spaces to evacuate them after the CO_2 release alarm has sounded.

A pressure gauge is fitted to the pilot CO_2 pipeline to indicate pilot CO_2 pressure.

Operating Procedure

a) On discovering a fire in a protected space, shut down the machinery in that space together with fuel supplies, if any, and ventilating systems. Close all doors, ventilators and other openings having first ensured that all personnel have been evacuated.

b) Conduct a muster of all personnel ensuring that everyone is accounted for. The gas must not be released until any missing persons are accounted for and are known not to be in the protected space where CO_2 is to be released.

c) Go to the CO_2 system control cabinet in the fire control station and break the glass key cabinet and obtain the key.

d) Use the key to open the control cylinder cabinet door.

e) Open one of the cylinder valves in the control cylinder cabinet.

f) Go to the control valve cabinet for the protected space where the fire has occurred and open the cabinet door which activates an alarm.

g) Open the No.1 and No.2 ball valves to release the pilot CO_2 to the cylinder isolating valves (for cylinder banks) and protected space isolating valve for releasing of the main CO_2 supply. The gas is released to the protected space after the time delay period.

(**Note:** Local control cabinets are provided close to the protected spaces of the purifier room, No.1 and 2 switchboard rooms, diesel generator room and the inert gas generator room. The CO_2 may be released into a particular space by undertaking steps f) and g) above at the local control cabinet, after opening the selected pilot cylinder valve.)

h) After 10 minutes, close the pilot cylinder hand wheel valve.

i) When the pilot pressure gauge within the control box is zero, close both pilot isolation valves.

(**Note:** Allow time for structural cooling before opening the protected space and ventilating the CO_2 gas.)

WARNING

Do not enter the space for at least 24 hours. Ensure all reasonable precautions have been taken, such as maintaining boundary inspections, noting cooling down rates and/or any hot spots which may have been found. After this period an assessment party, wearing breathing apparatus, can enter the space quickly through a door which they shut behind them. Check that the fire is extinguished and that all surfaces have cooled prior to ventilating the space. Premature opening can cause re-ignition if oxygen contacts hot combustible material.

Procedure to Release CO_2 Manually

In the unlikely event of pilot gas initiation failure, the CO_2 system may be operated from the CO_2 room.

a) Open the control box door so that the alarms will still be activated.

b) Ensure that all personnel have left the space and ensure that all vents and doors are closed.

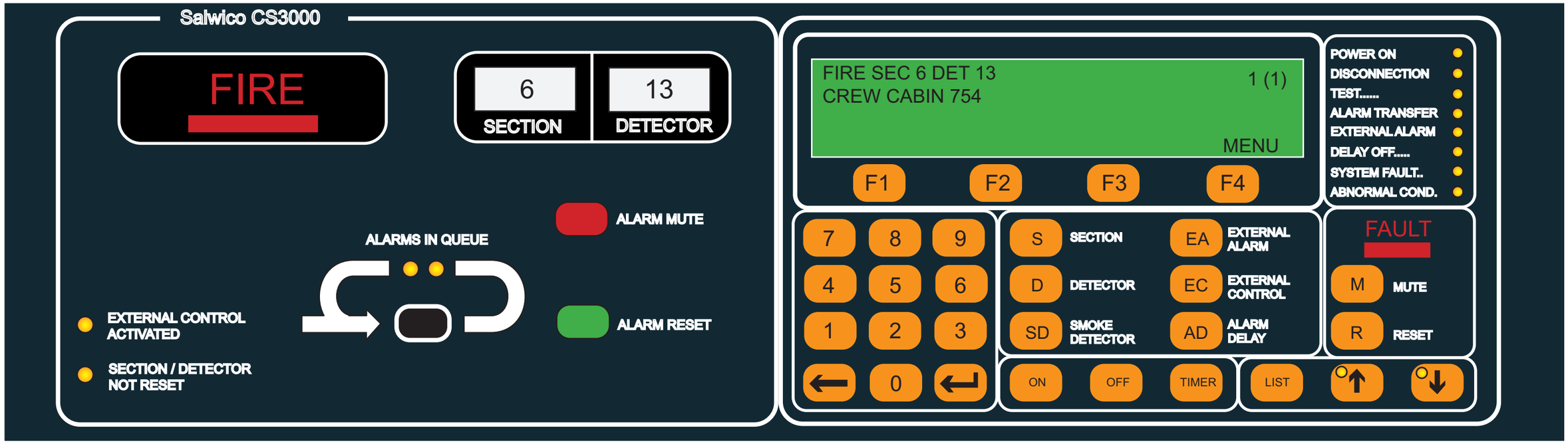
c) In the CO_2 room manually open the relevant main valve for the protected space into which CO_2 is to be released, by turning the cylinder valve handle anticlockwise and pulling down the lever on the valve.

d) Remove the safety pins on the valve actuator mounted on the CO_2 cylinders to be released. A check must be made to determine how many cylinders are needed for the space in which the fire has occurred.

e) Pull down the operating lever on the valve actuator of the cylinders to be released. CO_2 will now be discharged.

Illustration 3.4.6a Fire Detection Panel

Central Unit Panel



Fire Alarm Panel

Operating Panel

3.4.6 FIRE DETECTION SYSTEM

Maker: Consilium Marine

Type: CS 3000 Salwico Fire Detection System

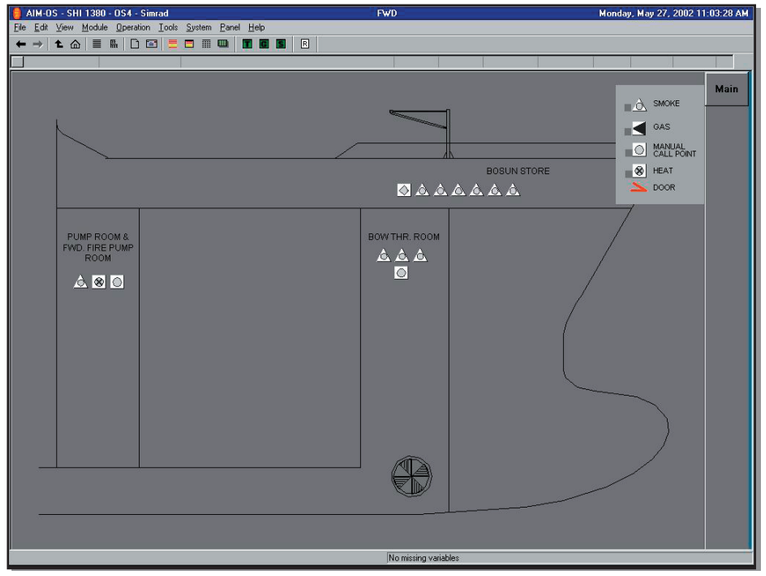
General Description

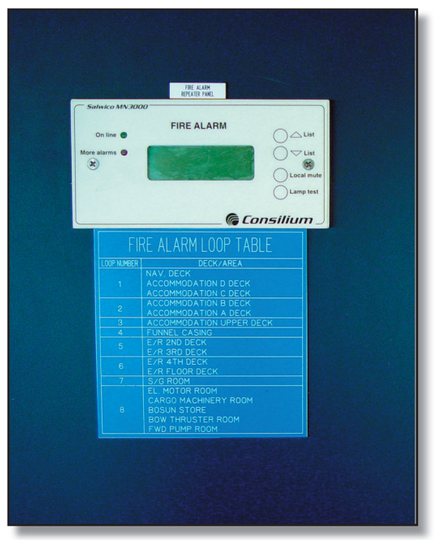
The CS3000 Fire Detection system is a computerised, fully addressable analogue fire alarm system with analogue detectors. The operating panel, control unit and power supply are contained in a central cabinet in the fire control station on the upper deck port side of the accommodation. There are 8 detector loops connected to the system with a 7.2Ah battery system back-up in the event of a power failure. The fire detection system has a direct input into the IAS for recording any alarms, faults and disconnections. The digital outputs of the system are used to stop the ventilation fans, release the fire doors and operate the water mist system see section 5.6. The system operates the water spray system when two detectors are activated in a protected area. The system is looped to the gas sampling and alarm system and to the IAS cabinet in the electrical equipment room on A deck.

The Salwico CS3000 comprises a wide range of detectors and sensors to suit different needs and conditions. It includes detectors for different alarm parameters, for example, smoke, heat and flames. Manual call points, short circuit isolators and a timer are connected to the loop where required. A fault in the system or a false alarm is detected immediately since the function of the detectors and other installed loop units are automatically and continuously tested.

The fire alarm repeater alarm unit, type MN3000 is fitted in the wheelhouse safety console. The repeater panel allows the ship's staff to monitor alarms and scroll through alarms in the queue list but not to accept any alarms or perform any disconnections or reconnections. The system can also identify defective detectors in each loop.

The system can be monitored via the IAS and a typical screen display is shown here.





Fire Alarm Repeater Unit on Wheelhouse Safety Console

Central Unit Panel

The central unit panel is divided into two parts, the fire alarm panel and the operating panel. The fire alarm panel is activated when there is a fire alarm in the system. The operator verifies and supervises the system by using the different keys and the display on the operating panel.

Fire Alarm Panel

The fire alarm panel is activated when a fire alarm is detected on the system.

The FIRE indicator flashes and the section number and detector address in alarm are displayed on the numeric display.

Keys	**Operation**
ALARM MUTE:	This key is used to acknowledge the fire alarm and mute the buzzers.
ALARM RESET:	This key is used to reset the fire alarm.
ALARMS IN QUEUE:	LEDs indicate multiple alarms which can be scrolled through using this key. Each alarm is listed in the alphanumeric display.

Indicators	**Description**
EXT. CONTROL ACTIVATED:	LED indicating that an external control output is active.
SECTION/DETECTOR NOT RESET:	LED indicating that an alarm reset has been attempted but failed. (Detector still in alarm)

Operating Panel

The operating panel is used for controlling the system and to display extra information in case of a fire alarm. The alphanumeric display is used as a complement to the numeric display on the fire alarm panel, as a communication medium when operating the system and to display guiding texts for the function keys. Under normal conditions, when the central unit is in normal status, the text ‘Salwico CS3000’ is displayed together with the date and time.

Keys	Operation
F1, F2, F3, F4:	Function keys, used for choosing functions from the menus in the display and for entering certain characters with no keys of their own.
0-9:	Numeric keys.
Correction key:	The last key stroke is erased.
Return key:	The system returns to normal status, ‘Salwico CS30000’ is displayed.
S, D, SD, EA, AD:	Command keys used to choose the unit (section/detector no. etc) to operate.
MUTE:	Fault handling key used to acknowledge faults and to mute the buzzers.
RESET:	Fault handling key used to reset the faults.
ON, OFF, TIMER:	Operation keys used to choose the operation to perform.
LIST:	List handling keys, the LIST key is used to open the list function. The arrow keys are used to scroll through the lists.

Indicators	Description
POWER ON:	Illuminated when the power is on.
DISCONNECTION:	General disconnection of detectors indicator.
TEST:	Is lit when the central unit is in test mode.
ALARM TRANSFER:	Is lit when the dedicated fire output is activated (steady light) and is flashing when the door is open, the fire output is deactivated.
EXTERNAL ALARM:	Is lit when an external alarm output is disconnected or faulty.
DELAY OFF:	Is lit when the time delay is deactivated.
SYSTEM FAULT:	Is lit when a fault occurs in the system.
ABNORMAL COND:	Is lit when an abnormal condition has occurred.

System Operation

Detection of a Fire Alarm

FIRE lamp is flashing: A fire alarm is detected in the system.

a) Press ALARM MUTE, to mute and acknowledge the fire alarm.

b) The FIRE indicator stops blinking and becomes steady red. The audible fire alarm, including the internal buzzer is permanently silenced when the ALARM MUTE is pressed.

c) The section number and detector address in alarm are displayed on the fire alarm panel and on the alphanumerical display on the operating panel.

d) The section number and the detector address are displayed on the first line and additional information about the location is displayed on the second line, if provided.

ALARMS IN QUEUE lamp is flashing. There is more than one fire alarm in the system.

a) Press ALARM MUTE repeatedly, to mute and acknowledge all the fire alarms.

b) The FIRE and ALARMS IN QUEUE indicators stop flashing and become steady red when all the fire alarms are muted. The audible fire alarm is permanently silenced when the ALARM MUTE is pressed.

c) The section number and detector address in alarm are displayed on the fire alarm panel and on the alphanumerical display on the operating panel.

d) The address of the first fire alarm is displayed on the first line and additional information about the alarming unit is displayed on the second line, if provided. The address of the latest fire alarm is displayed on the third line and additional information about this unit is displayed on the fourth line. The total number of fire alarms is shown to the right on line one.

e) Press the ALARMS IN QUEUE button to display the next fire alarm.

f) The second fire alarm address is displayed both on the fire alarm panel and on the alphanumerical display. The fire alarm is presented on the two first lines on the display. Five seconds after pressing ALARMS IN QUEUE, the first fire alarm is displayed again.

g) If ALARMS IN QUEUE is pressed when the last fire alarm is displayed, the first fire alarm is displayed again and the ALARMS IN QUEUE indicator goes out for 5 seconds.

Reset Fire Alarm

Only one fire alarm can be reset at a time, i.e. the displayed fire alarm.

a) Press the ALARMS IN QUEUE button repeatedly to select the appropriate fire alarm.

b) Press ALARM RESET to reset the fire alarm. The system tries to reset the fire alarm.

c) When a fire alarm is reset it disappears from the display and the fire alarm is moved to the fire alarm history list. The next fire alarm is then displayed or if there are no more fire alarms the system returns to normal status, ‘Salwico CS3004’ is displayed with date and time.

d) If the fire alarm does not reset, the reason is displayed on line three. The indicator SECTION/DET NOT RESET is displayed. This could be because the detector still detects high levels of smoke, fumes and/or ionisation etc. The actual detector may also be faulty and should be investigated.

Fire Alarms That Do Not Reset

A detector that cannot be reset can be listed in two ways. Press the LIST or ALARMS IN QUEUE key.

The ALARMS IN QUEUE key can only list the non-resettable fire alarms if all fire alarms are acknowledged and reset (ie the ALARMS IN QUEUE LEDs are not lit) and if all faults are acknowledged. If this is not the case, the ALARMS IN QUEUE key will only list the fire alarms that are not reset.

a) Press ALARMS IN QUEUE repeatedly to select the appropriate fire alarm. The fire alarm address is displayed on the fire alarm panel and the operating panel alphanumerical display.

b) Press ALARM RESET. The system tries to reset the fire alarm.

If no key is depressed for about 60 seconds the display returns to the first non-resettable fire alarm. If the fire alarm is reset it disappears from the display and from the fire alarm list. The display then returns to the next fire alarm or if there are no more fire alarms it returns to normal status, 'Salwico CS3004' is displayed. If the alarm does not reset, the reason is displayed on line three. The problem should be investigated. The non-resettable fire alarm is displayed again.

The LIST key can always be used regardless of system status. Pressing LIST shows the fire alarms one by one on the first line of the alphanumerical display. They can then be reset in the normal way one by one. If the alarm does not reset, the reason is displayed on line three. The problem should be investigated. The not resettable fire alarm is displayed again.

Fault Indication

The FAULT indicator is flashing and the internal buzzer is sounding. One or more faults are detected in the system and the latest fault is displayed on the alphanumeric display. The first line displays the word FAULT, a fault code followed by the section number, the detector address, and a fault message. Additional text is displayed on line two, if provided The fault codes are listed in the manufacturer's manual. Only one fault can be acknowledged at a time. Press M in the FAULT field to acknowledge the fault and mute the buzzer.

The FAULT indication stops flashing and becomes steady yellow. The internal buzzer is permanently silenced. The fault is placed in a fault list and the alphanumeric display is erased. The next fault is displayed if there are more faults. Otherwise the display is erased and it returns to its previous status. The number of faults in the system and the order they occurred is displayed on line three. The fault list can be scrolled through by using the up and down arrow keys.

To Reset Faults

a) Press LIST to open the list function, Faults can only be reset from the fault list.

b) Press F2 to select the fault list. The latest fault is always displayed first. The fault list can be scrolled through using the list key. The LED on the arrow key is lit if there are more faults to be listed.

c) Press the arrow keys until the appropriate fault is displayed.

d) Press R in the FAULT field to reset the fault. The system attempts to reset the fault.

e) The fault is reset if it disappears from the list. The next fault is displayed after about 5 seconds. If the fault list is empty, the text LIST EMPTY is displayed, and the system returns to normal status, 'Salwico CS3000' is displayed. If the fault is not reset, the reason is displayed on line three. Investigation is required.

Disconnections

Different parts of the fire alarm system can be disconnected for instance, sections, detectors, manual call points, section units, alarm devices, external control devices and loops. This can be useful when there is welding in a particular section or removal of detectors is required due to structural shipboard work etc. A whole section can be disconnected permanently or for a defined time interval using the timer function. The disconnected section can only be reconnected from the 'Disconnections' list.

When operating the system a mistake can be corrected using the BACK key to erase one step at a time backwards. To interrupt the disconnection function and return to normal status, press the RETURN key . The system returns to normal status and 'Salwico CS3000' is indicated.

Disconnection Process

a) Press S to select the section.

b) Enter a section number and the section menu is displayed.

c) Press OFF to disconnect the section.

d) When the section is disconnected the text on line three is changed to ORDER DONE.

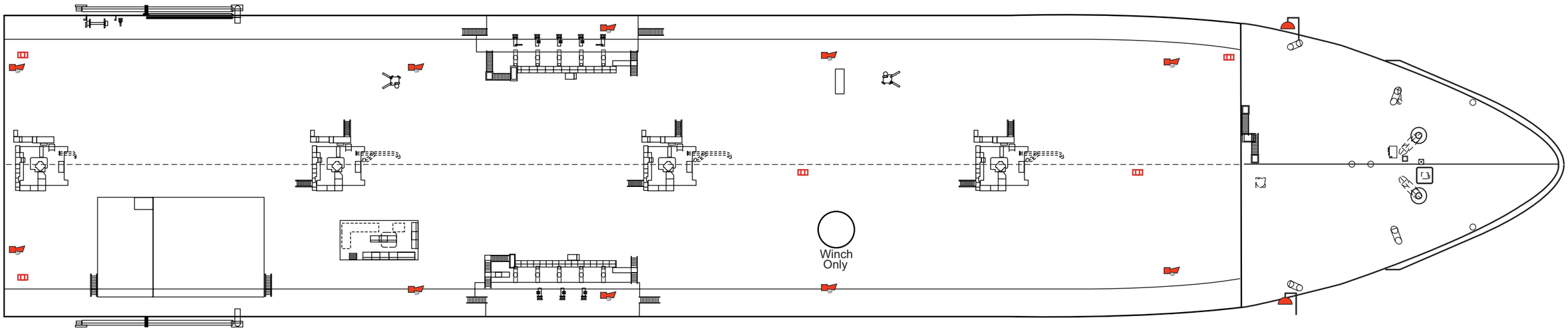
e) The DISCONNECTION LED is lit if this is the first active disconnection in the system.

f) A message is displayed on line three, for about five seconds, if the system cannot disconnect the section. The system then returns to the previous menu.

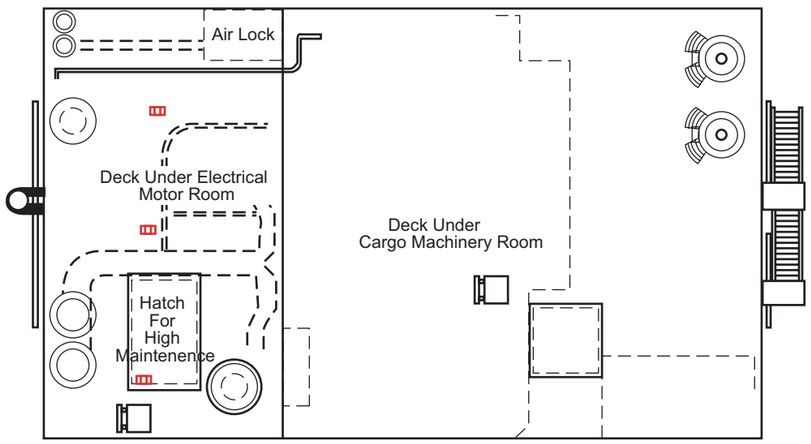
g) Continue to define the next disconnection or, if finished, return to normal by pressing RETURN.

Further in-depth operations are available from the manufacturer's manual.

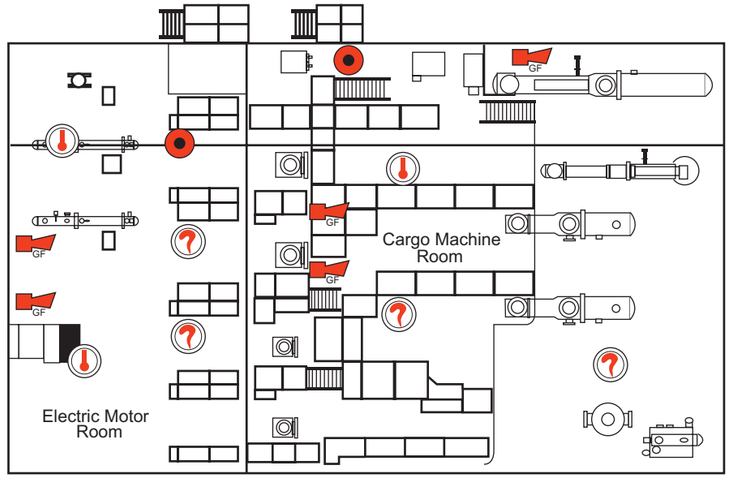
Illustration 3.4.6b (1) Fire Detection Equipment and Alarms on the Main Deck, Electric Motor Room and Cargo Machinery Room



Main Deck

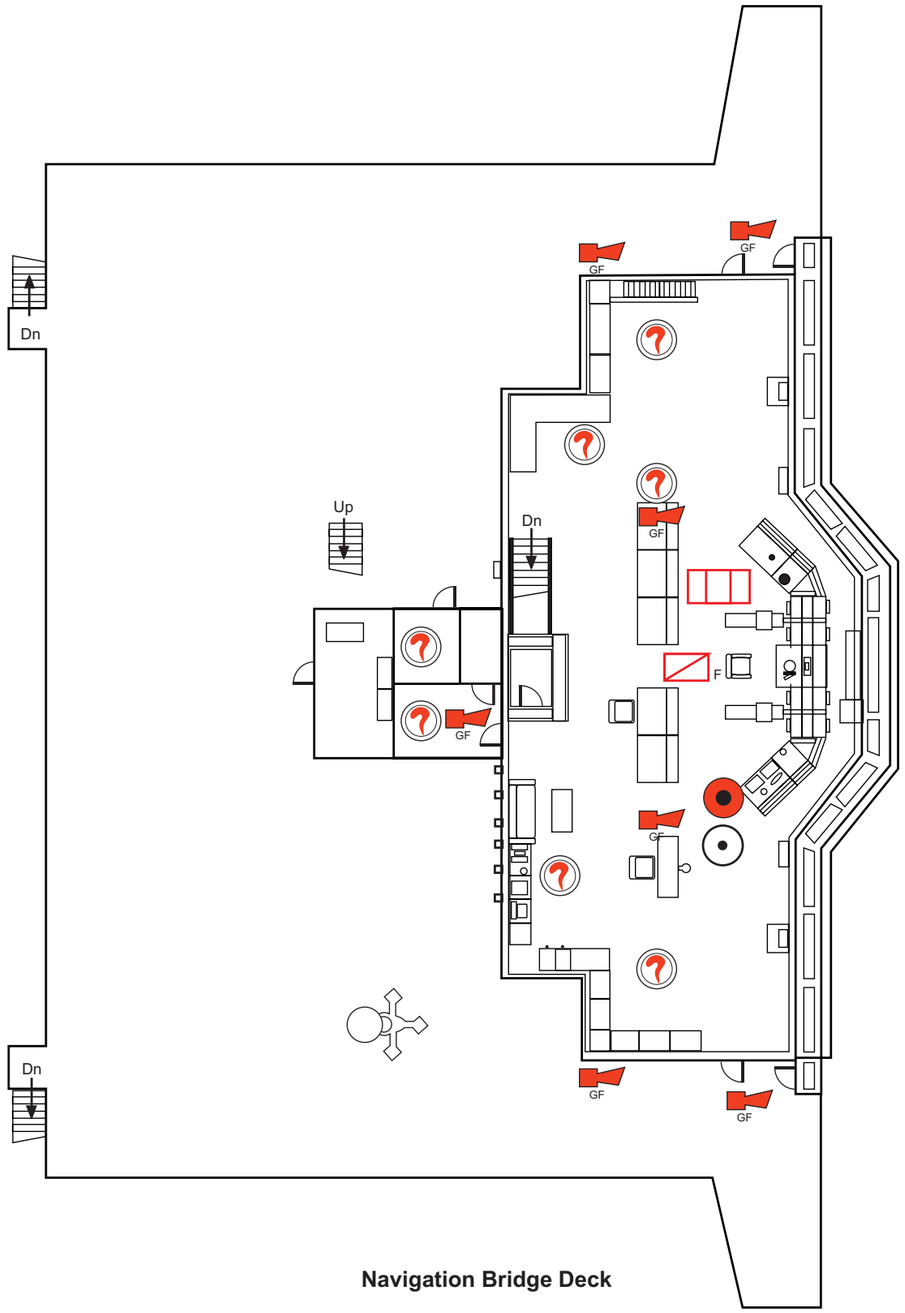


Electric Motor Room



Cargo Machinery Room

Illustration 3.4.6b (2) Fire Detection Equipment and Alarms on Navigation Bridge Deck and Wheelhouse Top



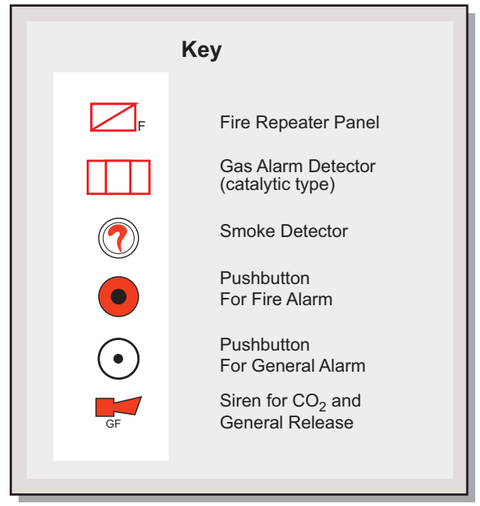
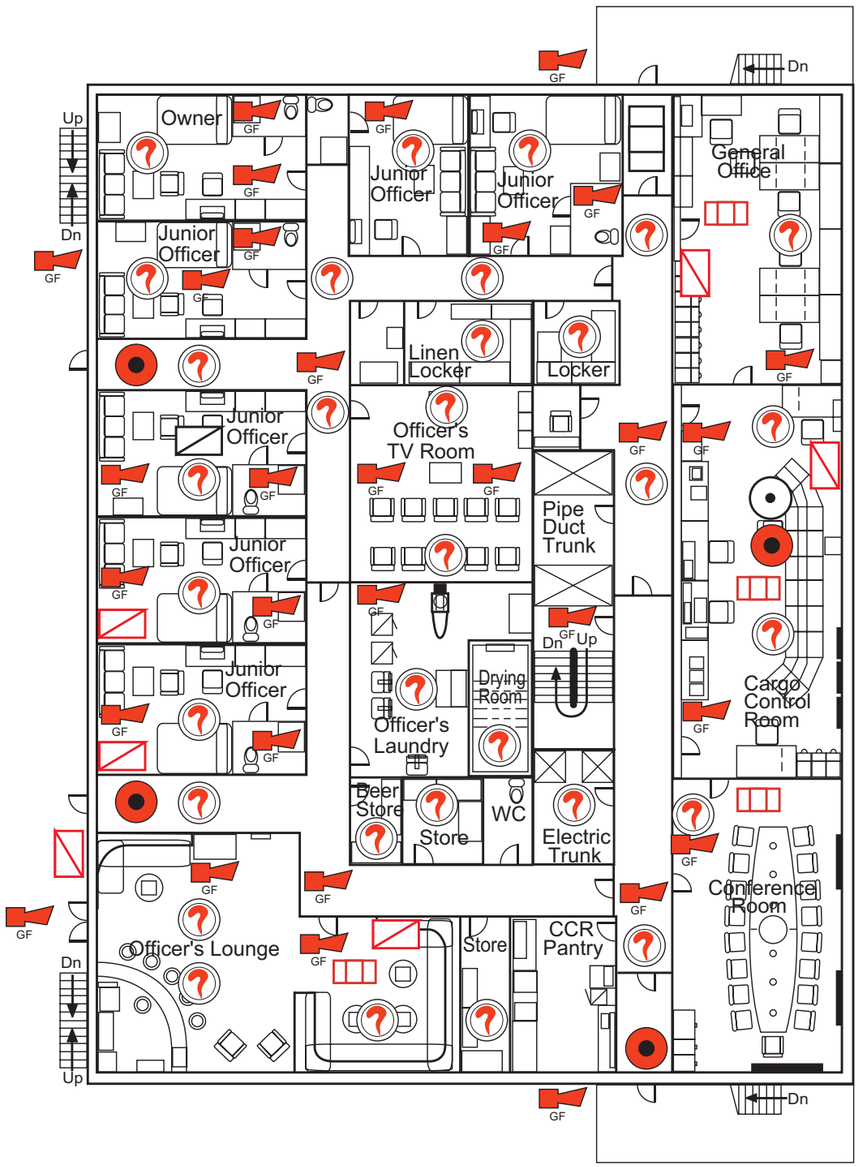
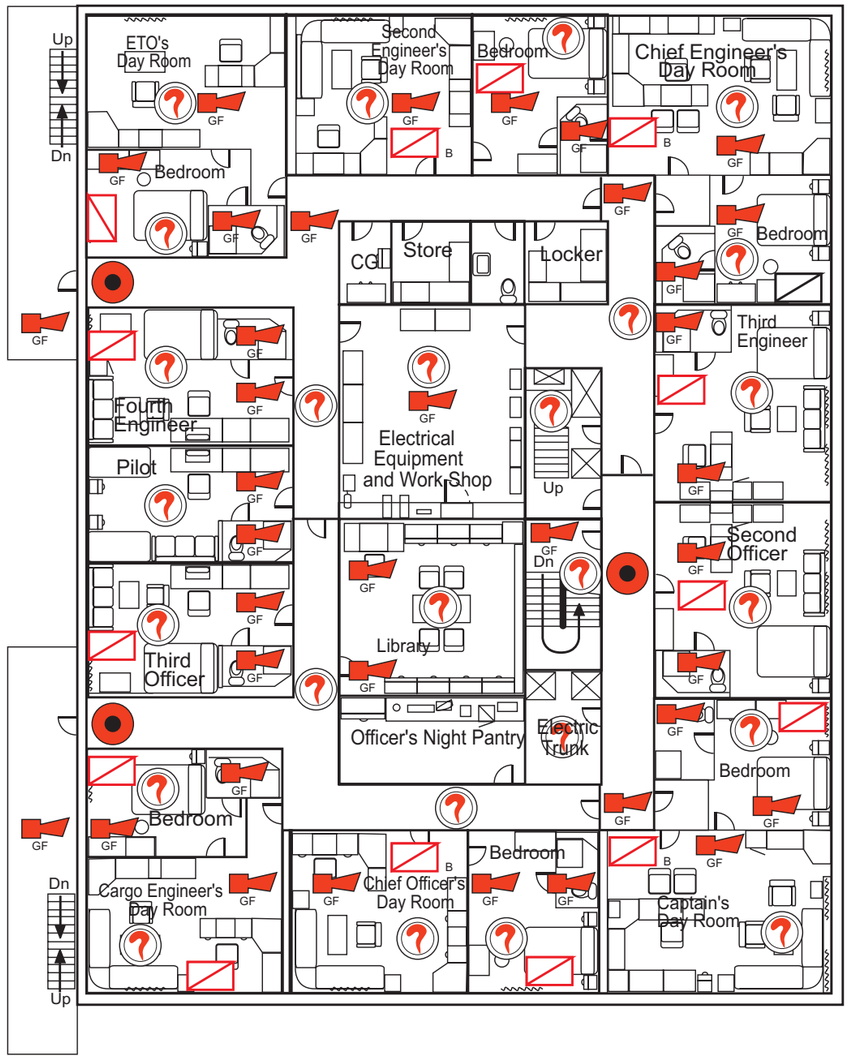


Illustration 3.4.6b (3) Fire Detection Equipment and Alarms on C and D Decks



C Deck



D Deck

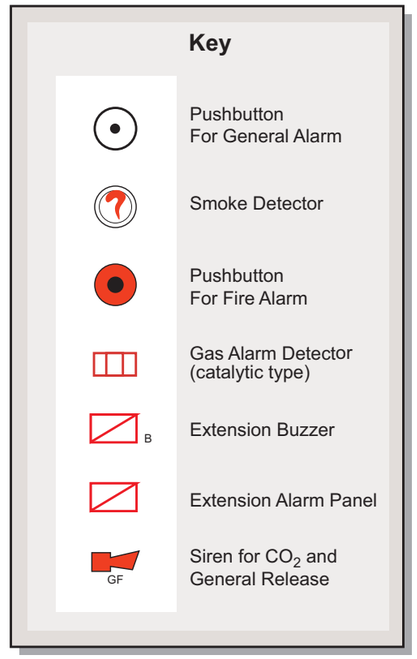
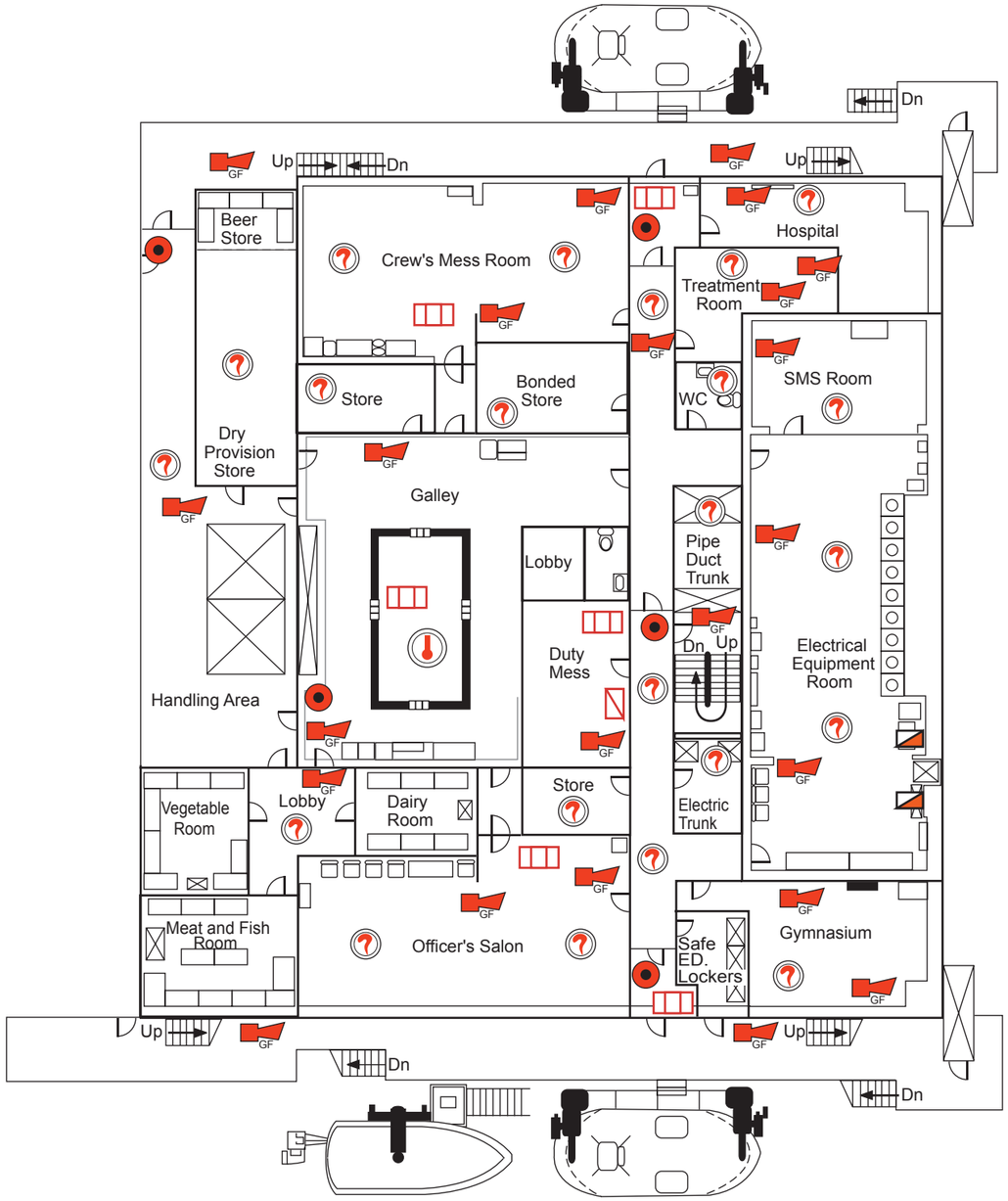
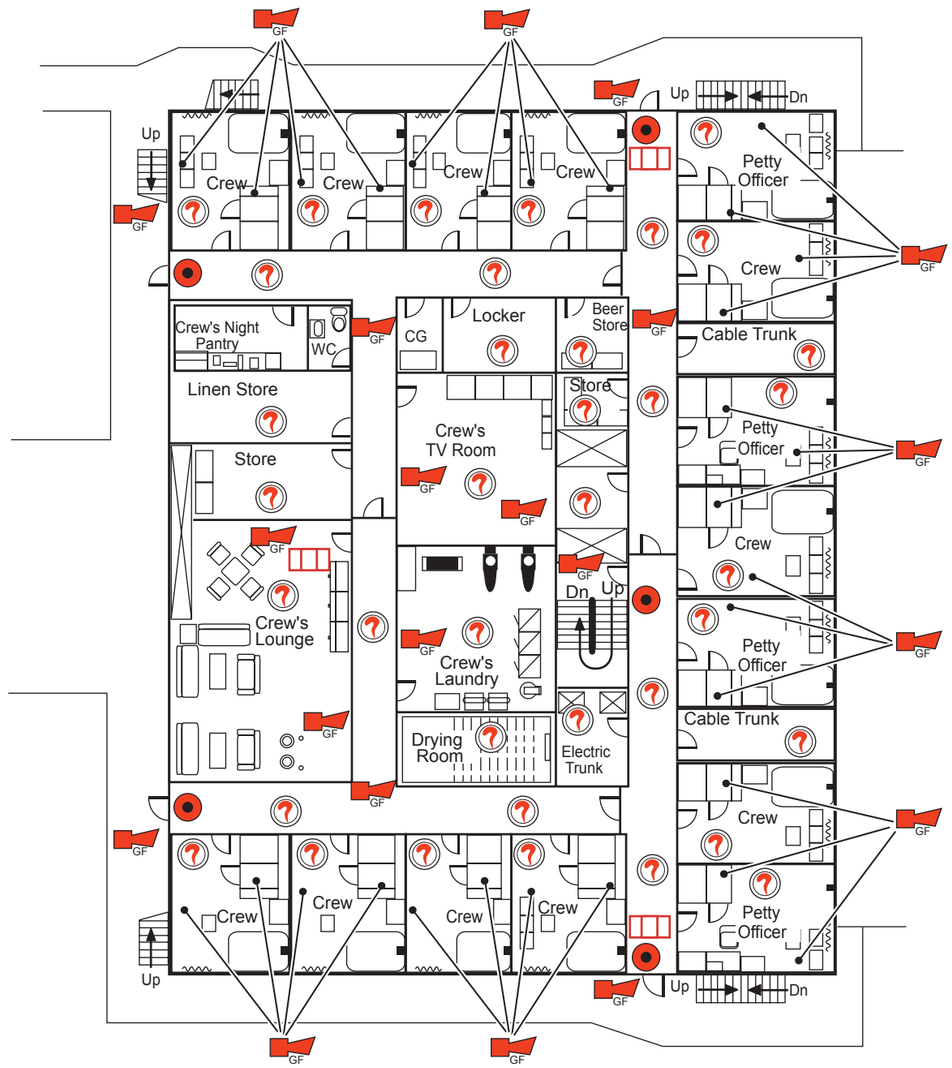


Illustration 3.4.6b (4) Fire Detection and Alarms on A and B Decks



A Deck



B Deck

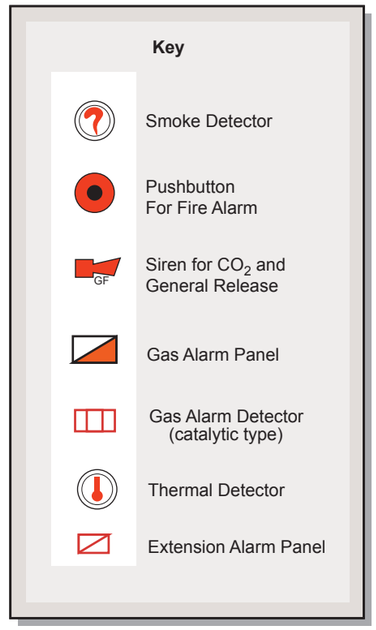
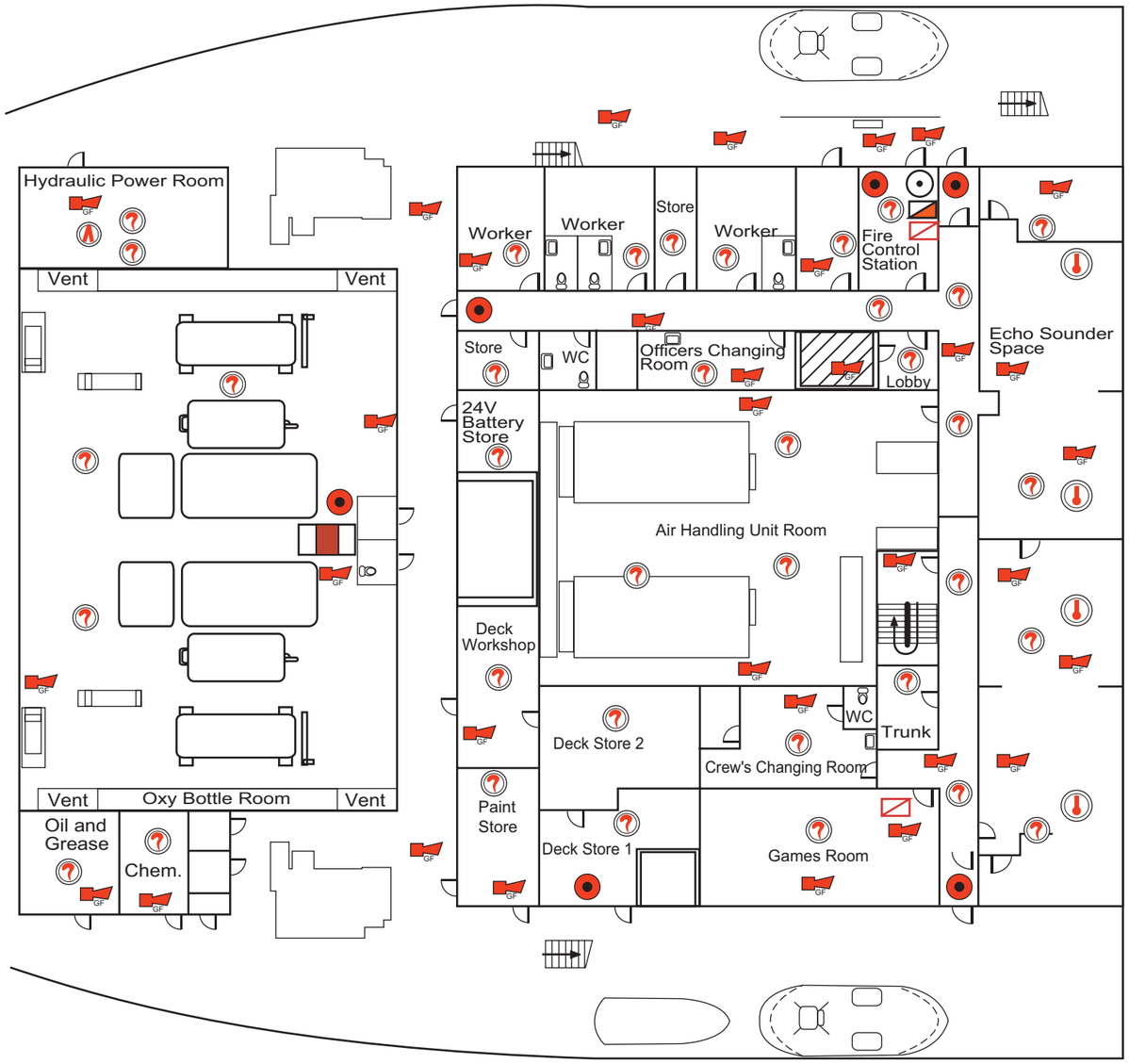
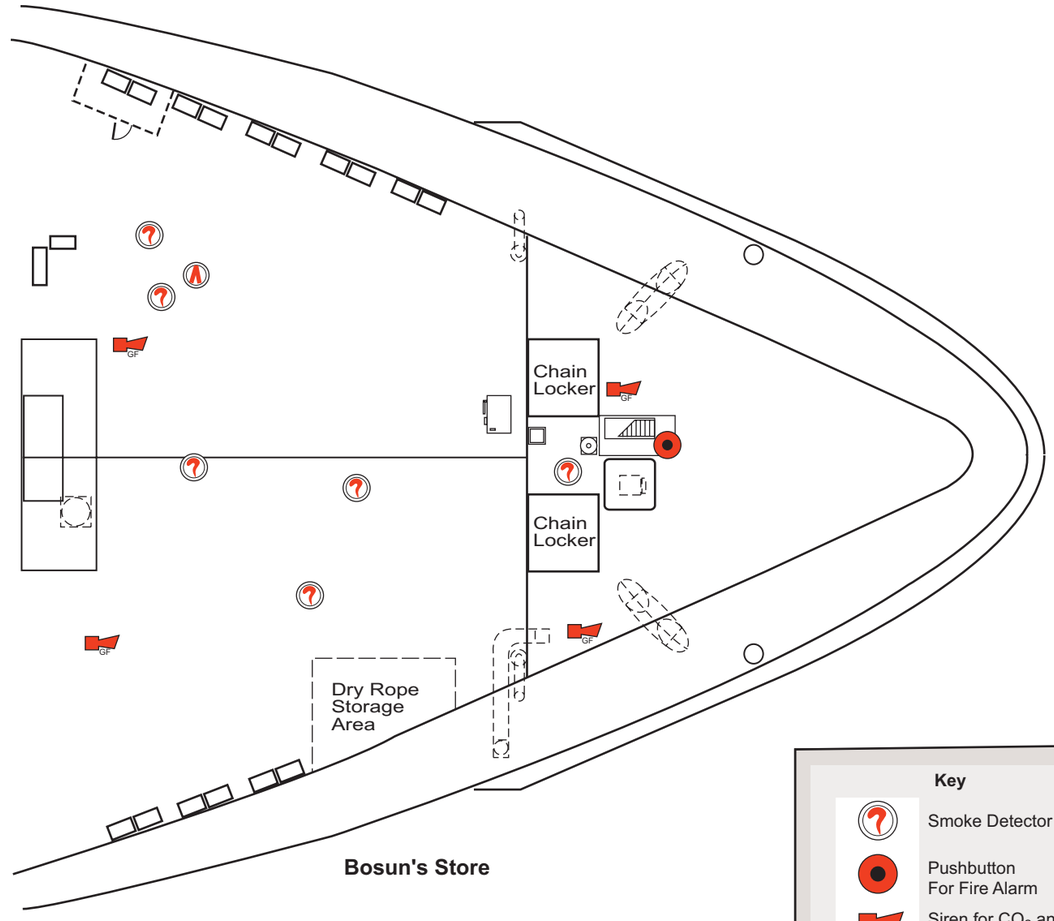


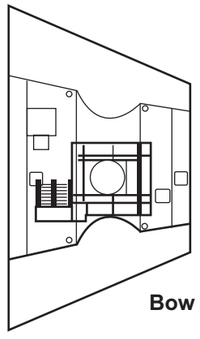
Illustration 3.4.6b (5) Fire Detection and Alarms on Upper Deck, Bosun's Store and Bow Thruster Room



Main Deck



Bosun's Store



(None Fitted)

Bow Thruster Room

Key

- Smoke Detector
- Pushbutton For Fire Alarm
- Siren for CO_2 and General Release
- Gas Alarm Panel
- Light Signal Column Alarm
- Gas Alarm Detector (catalytic type)
- Thermal Detector
- Extension Alarm Panel
- Flame Detector
- Pushbutton For General Alarm

Illustration 3.4.6b (6) Fire Detection Equipment and Alarms on Engine Room 2nd Deck

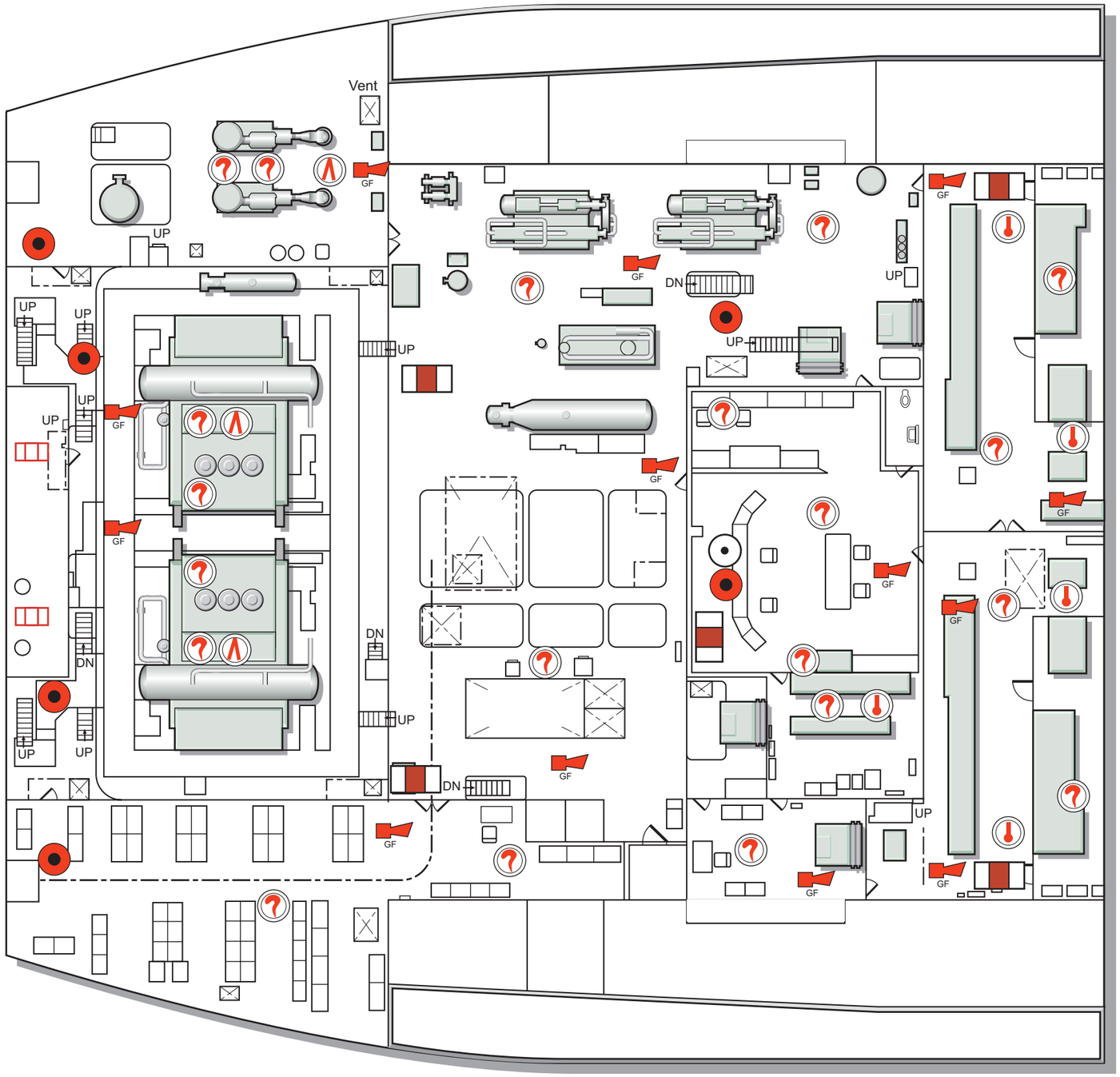


Illustration 3.4.6b (7) Fire Detection Equipment and Alarms on Engine Room 3rd Deck

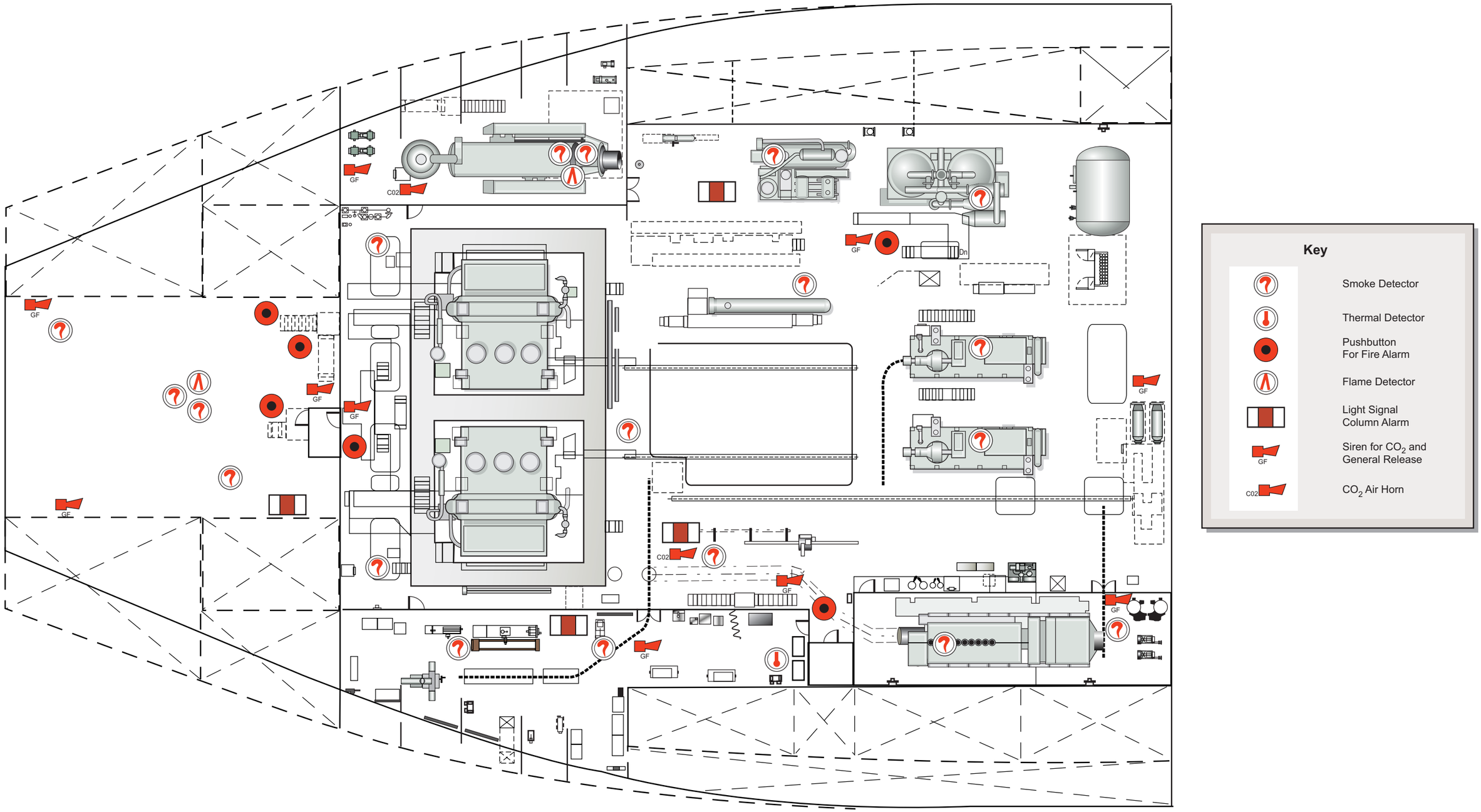
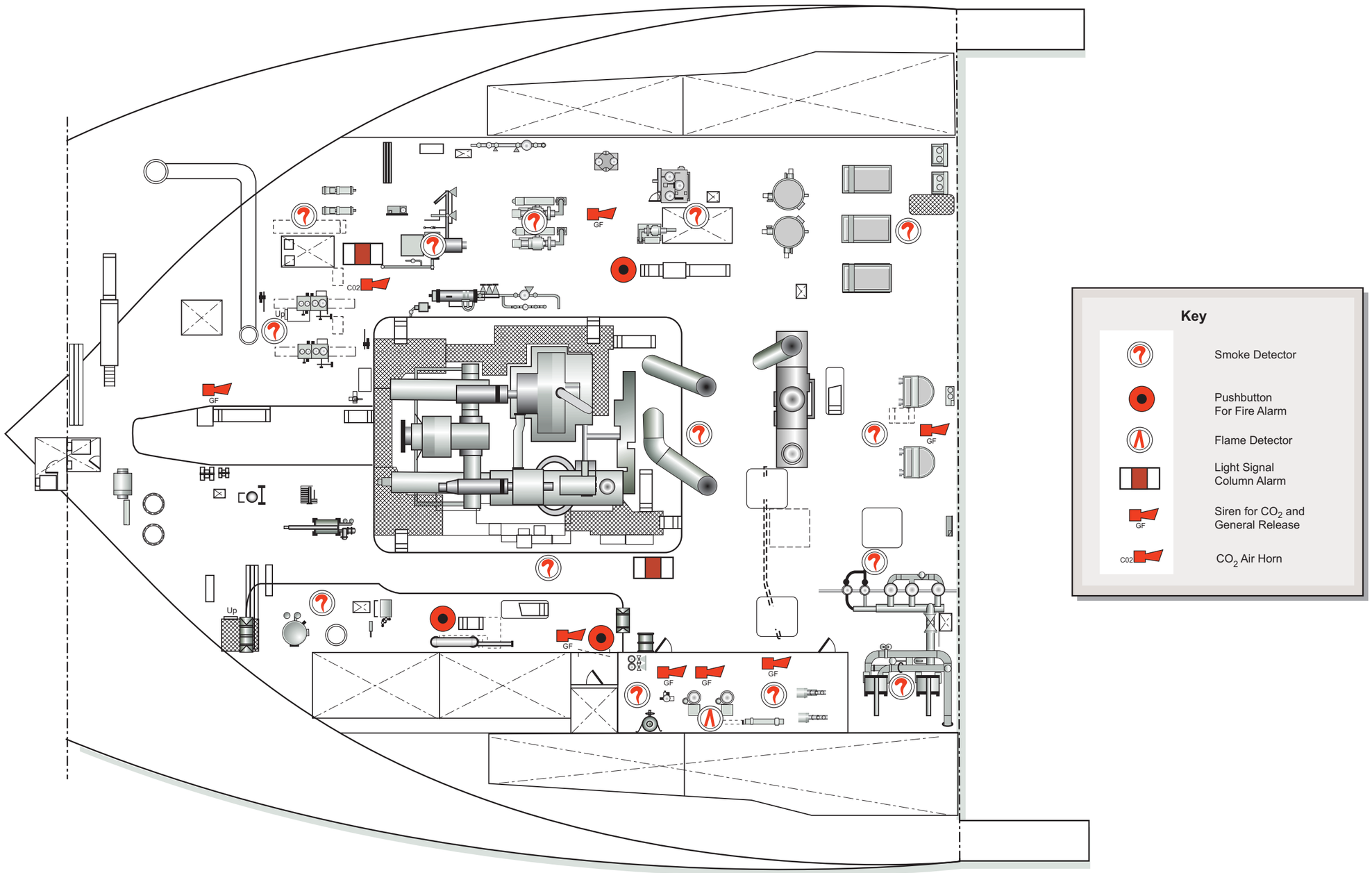


Illustration 3.4.6b (8) Fire Detection Equipment and Alarms on Engine Room 4th Deck



Engine Room 4th Deck

Illustration 3.4.6b (9) Fire Detection Equipment and Alarms on Engine Room Floor

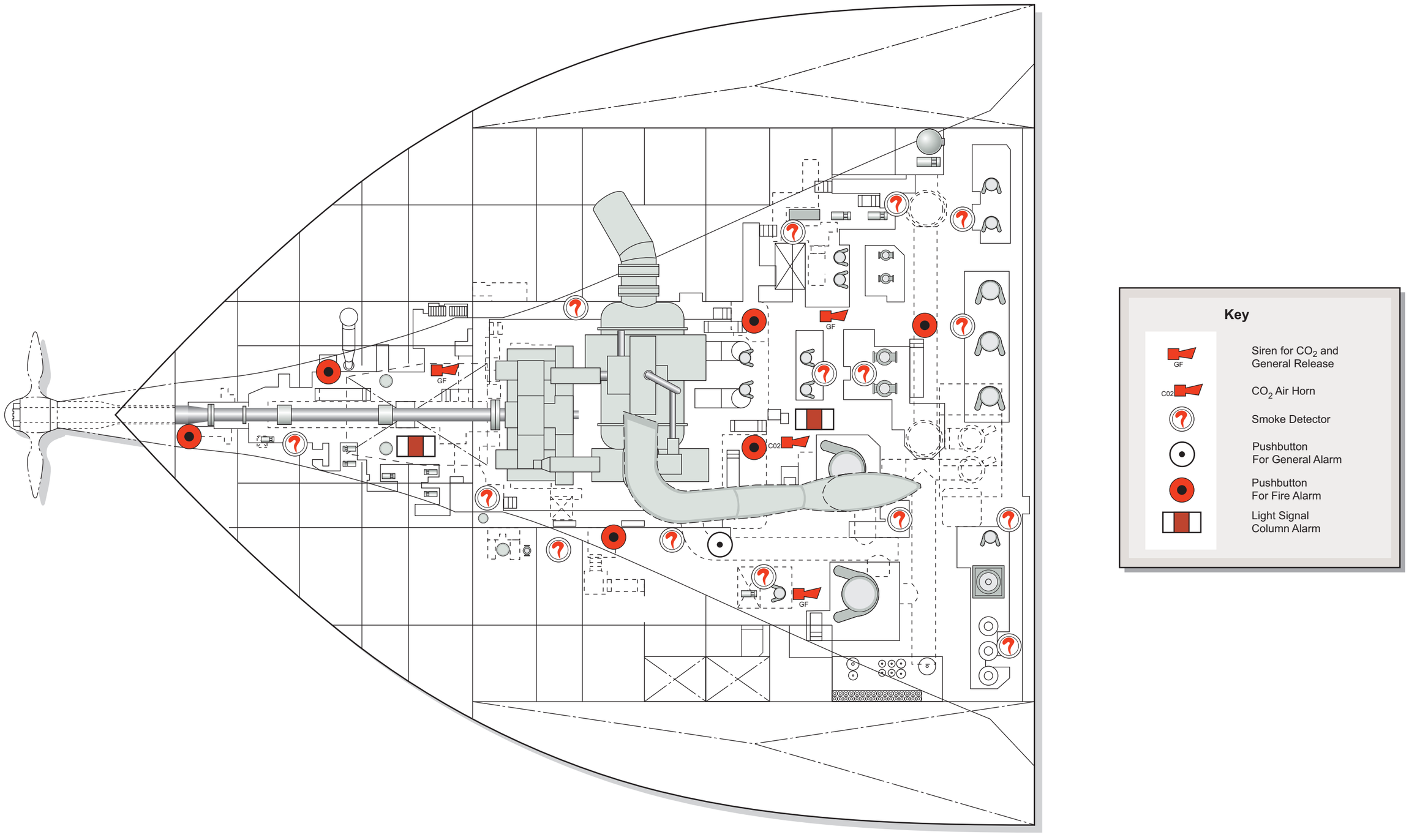
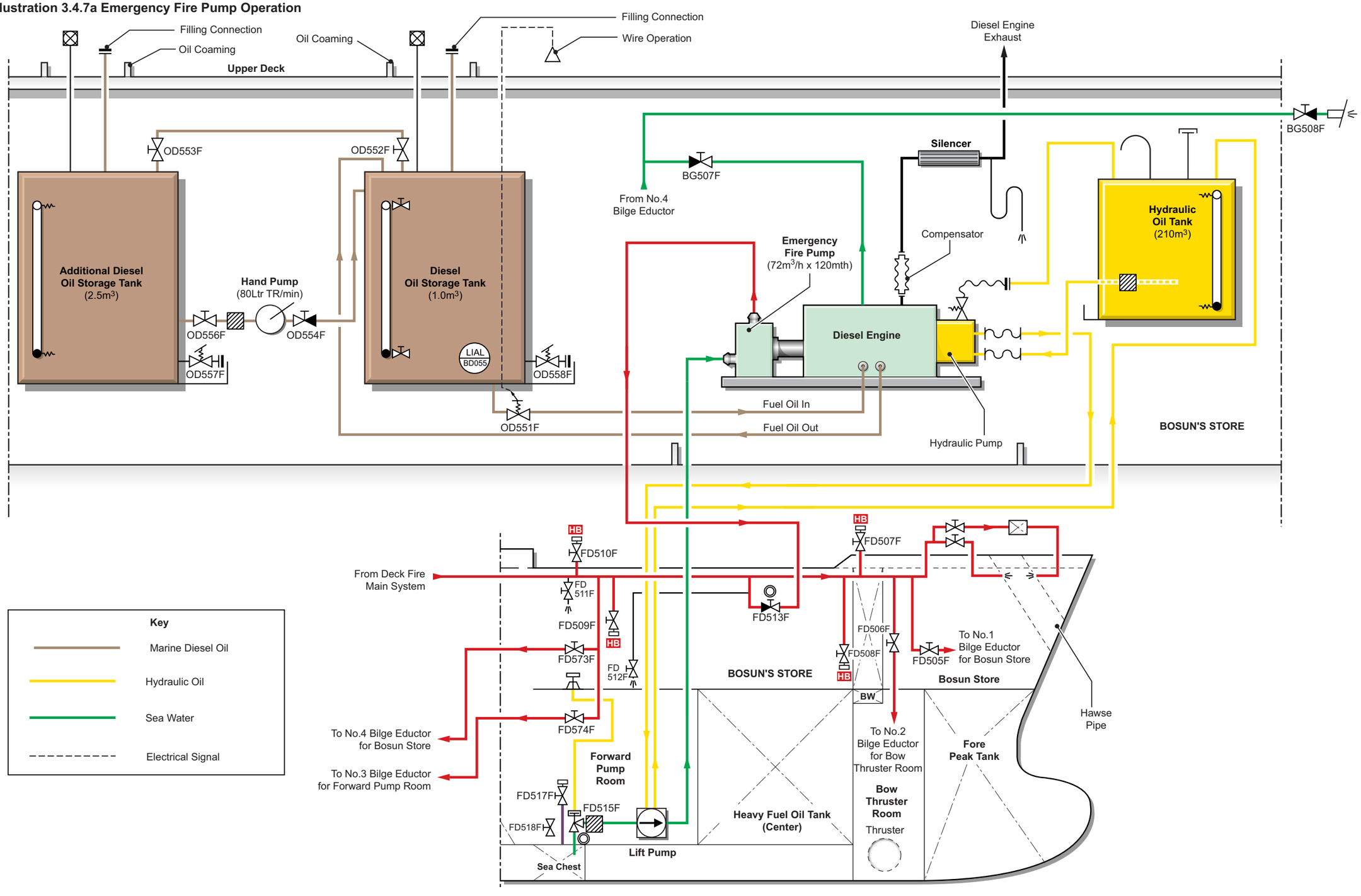


Illustration 3.4.7a Emergency Fire Pump Operation



3.4.7 EMERGENCY FIRE PUMP OPERATION

Fire Pump System

Maker: Ellehammer Laboratorium AS

Diesel Engine

Maker: Cummins
Type: 4B3, 9 - 4 cylinder, 4 stroke, water cooled
Power: 56kW at 2,500 rpm

Main Pump

Maker: Iron Pump A/S
Type: CN100-100/315
Capacity: 72m^3/h at 97mth

Priming Pump

Maker: Iron Pump A/S
Type: CNLB 100-100/200
Capacity: 72m^3/h at 23mth

Hydraulic Pump

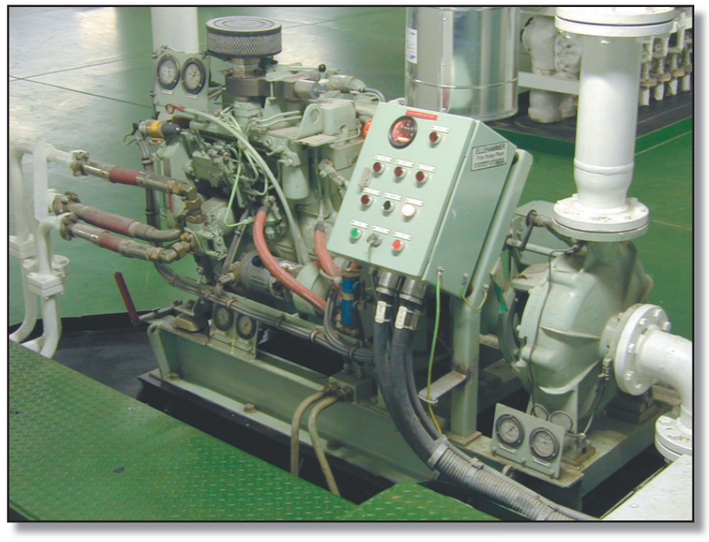
Maker: Denison Hydraulics
Type: TB-008-4-R-01-A-1-01
Working pressure: 12MPa

Hydraulic Motor for Feeding Pump

Maker: Denison Hydraulics
Type: M4C1-024
Working pressure: 12MPa

Safety Valve

Maker: Denison Hydraulics
Type: R5V 06



Emergency Fire Pump

INTRODUCTION

The emergency fire pump is located in the bosun's store. The drive unit consists of a diesel engine, which drives the main pump, and the hydraulic pump which powers the hydraulic motor driving the priming pump. The diesel engine, main fire pump, hydraulic pump and oil tank are located in the bosun's store.

The priming pump and its hydraulic drive motor are located at the bottom of the forward pump room below the waterline and it ensures that the main fire pump is supplied with water no matter what the draught of the ship.

The emergency fire pump supplies water to the fire main and wash deck line.

The diesel engine can be started by an electric starter motor which is supplied by a battery, maintained on charge at all times or by a spring inertia starter. The engine is fresh water cooled with a fresh water/sea water heat exchanger cooled via a connection from the main fire pump.

The fire pump engine and hydraulic system are fitted with alarms as follows:

- High engine temperature - 100°C
- Low lubricating oil pressure - 170kPa
- Overspeed - 2,875 rpm
- Heater failure
- Start failure
- Battery charger failure
- High pressure FO pipes leak

The overspeed results in automatic shutdown.

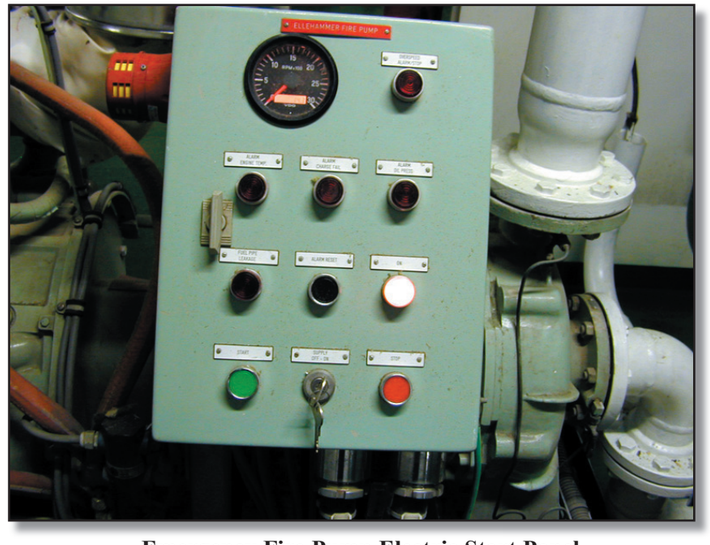
The emergency fire pump may be started locally or remotely from the fire control station and the bridge emergency console. There is no operation from the IAS. When the fire pump starts it also starts the forward pump room ventilation fan.

For the pump to be able to operate in remote mode, the supply key switch at the local control panel must be turned to the ON position.

In order to allow for operation of the emergency fire pump at any time the priming pump sea suction valve FD515F at the bottom of the forward pump room and the main pump discharge valve FD513F must be locked open.

Because the pump may be called upon to operate at any time, it is essential that the drive engine and hydraulic motor/pump system are capable of immediate operation and the following checks must be made at intervals not exceeding one week:

1. The level of fuel in the fuel tank must be checked frequently and the tank replenished as necessary.
2. The hydraulic oil tank must be checked and replenished as required and the hydraulic system checked for leaks.
3. The engine coolant and lubricating oil levels must be checked and the systems checked for leaks.
4. The battery charger is operational and the battery system is fully charged.



Emergency Fire Pump Electric Start Panel

Procedure for Local Operation of the Emergency Fire Pump

To Electrically Start the Emergency Fire Pump

a) Check the fuel, oil, water and battery systems and rectify any shortages if necessary.

b) At the starting panel, press the START pushbutton. The engine will continue to crank over whilst the start button is pressed.

c) When the engine fires the START pushbutton is released. The engine will run up to speed and the RUNNING lamp will be illuminated.

d) The feeding pump will supply water to the main pump and the main pump will deliver water at the required pressure to the fire main.

At normal running conditions the LO pressure is 380kPa and the cooling water pressure is 200kPa.

To Stop the Emergency Fire Pump

a) Press the STOP button at the local control panel.

In an emergency, if the control system is not operating, the engine may be stopped at the governor control. Move the governor stop lever to the STOP position and keep it there until the engine has stopped.

When the engine has stopped check all systems and replenish fuel, lubricating/ hydraulic oil and cooling water as necessary.

Procedure for Remote Operation of the Emergency Fire Pump

To start the emergency fire pump from either the fire control station or the bridge emergency console.

a) In order for the emergency fire pump to be started remotely, the supply key switch at the local control panel must be turned to the ON position. The REMOTE lamp will illuminate at the control stations.

b) Press the LAMP TEST pushbutton to check the operation of lamps on the remote control panel.

c) In the fire control station and at the bridge emergency console., turn the START key switch to the right, push inwards and turn to the right again. The engine will start, run up to speed and the hydraulic pump will operate. The running lamp will be illuminated.

d) The feeding pump will supply water to the main pump and the main pump will deliver water at the required pressure to the fire main.

To Stop the Emergency Fire Pump

a) Press the STOP button at the local control panel.

Procedure for Starting the Emergency Fire Pump Engine using the Inertia Starter

Assuming that the electric start system is not available, the inertia starter can be used.

(**Note:** Ensure that the engine is not in the decompressed condition before operating the inertia starter.)

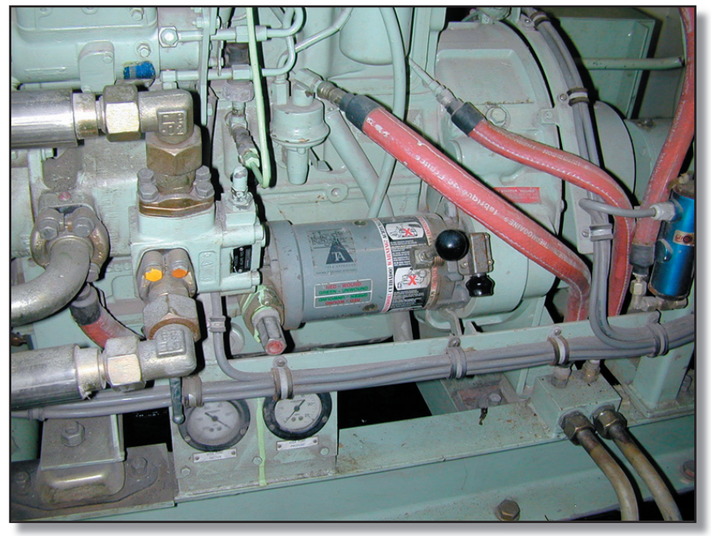
a) Press the RESET pushbutton on the inertia starter.

b) Fit the crank handle in place and wind in a clockwise direction.

c) The small sight glass on the top of the inertia starter will show green before the winding process starts, but eventually a white line will appear followed by a red line. When the white line is at the centre of the sight glass the inertia starter is fully charged.

d) Remove the handle and pull the operating lever in the downwards direction.

This will cause the engine to turn and start

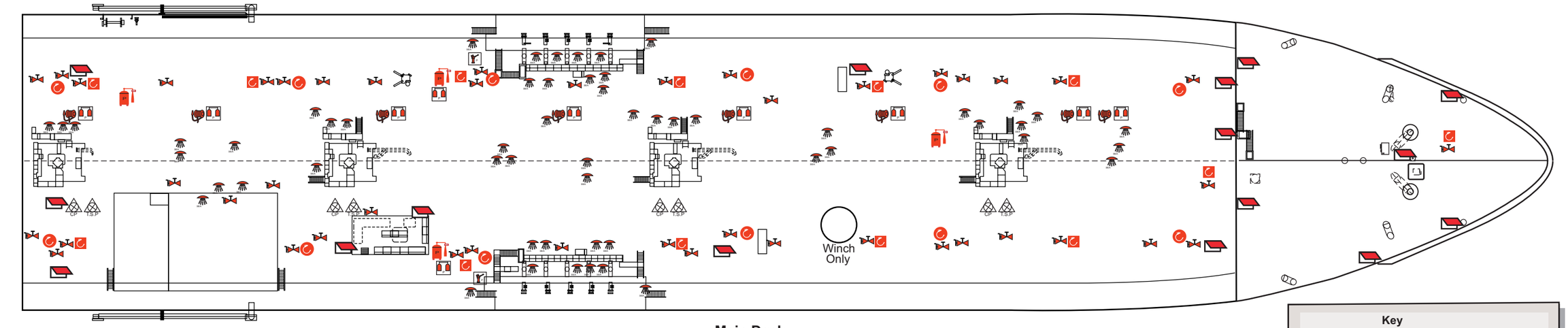


Emergency Fire Pump Inertia Starter

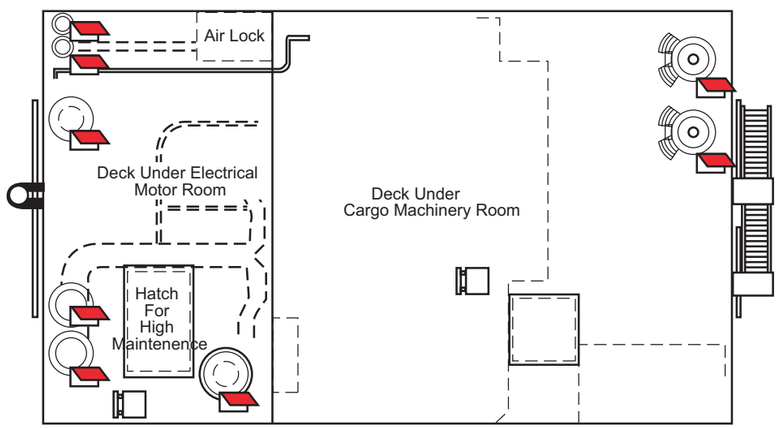
Emergency Fire Pump - Priming Pump
in Forward Pump Room

3.4.8 FIRE FIGHTING EQUIPMENT

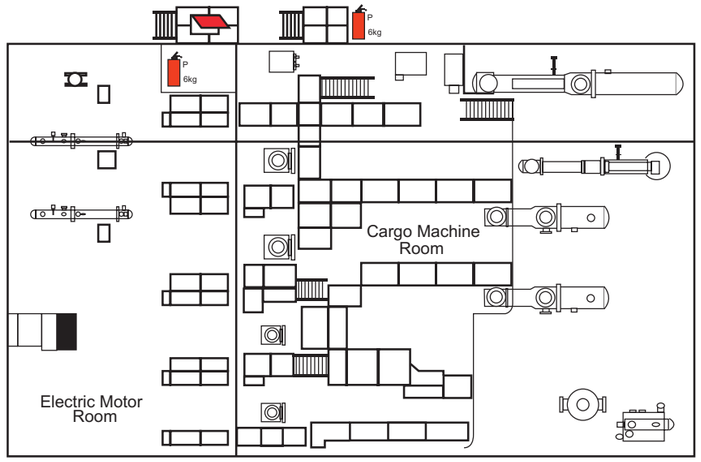
Illustration 3.4.8a (1) Fire Fighting Equipment on Main Deck, Electric Motor Room and Cargo Machinery Room



Main Deck



Electric Motor Room



Cargo Machinery Room

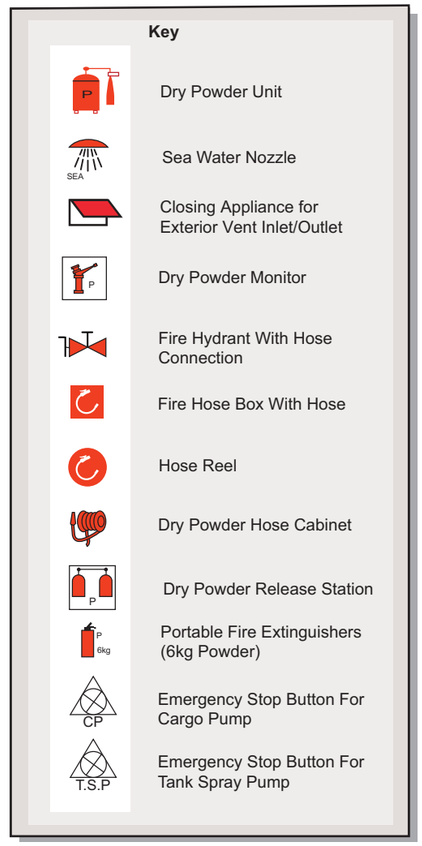
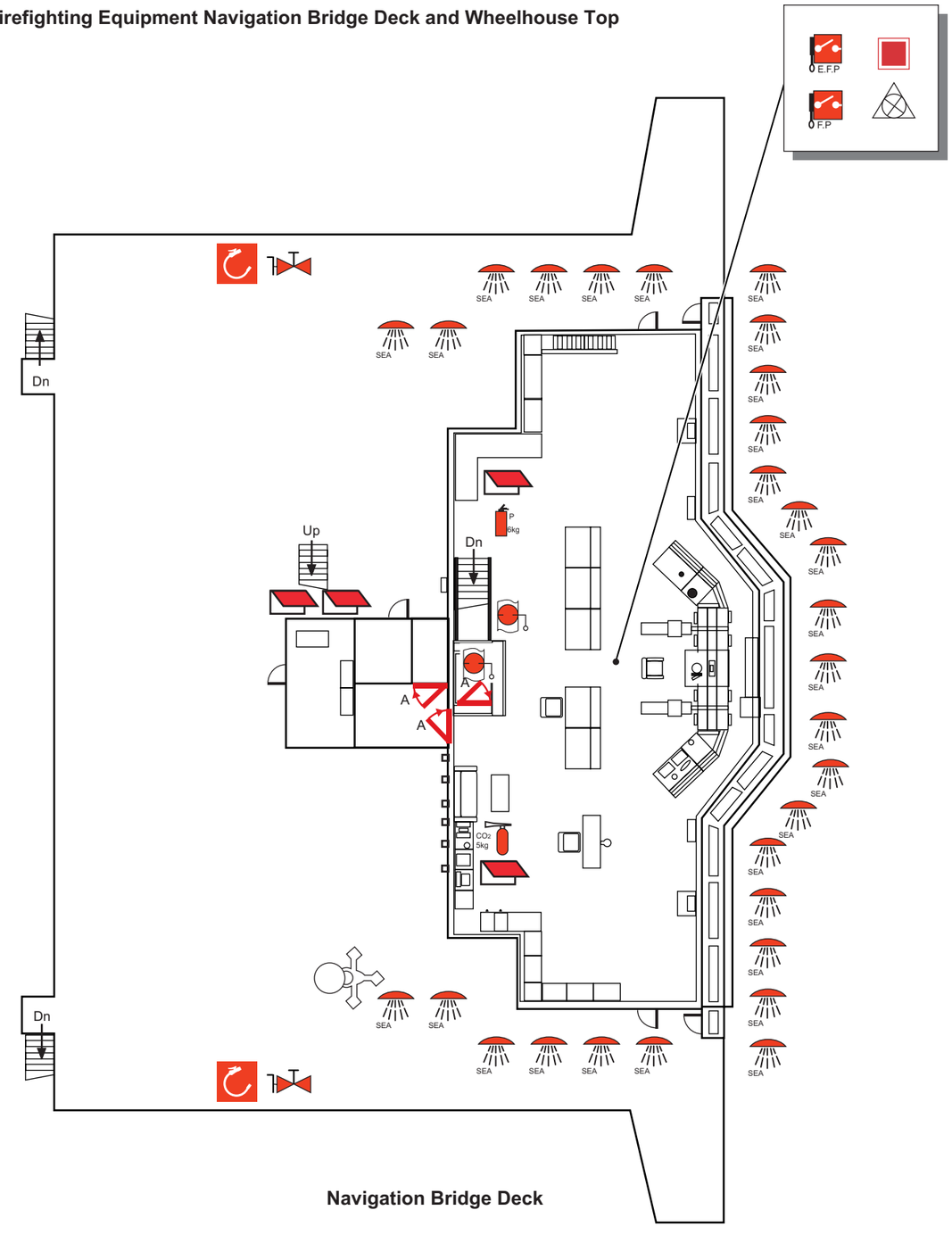


Illustration 3.4.8a (2) Firefighting Equipment Navigation Bridge Deck and Wheelhouse Top

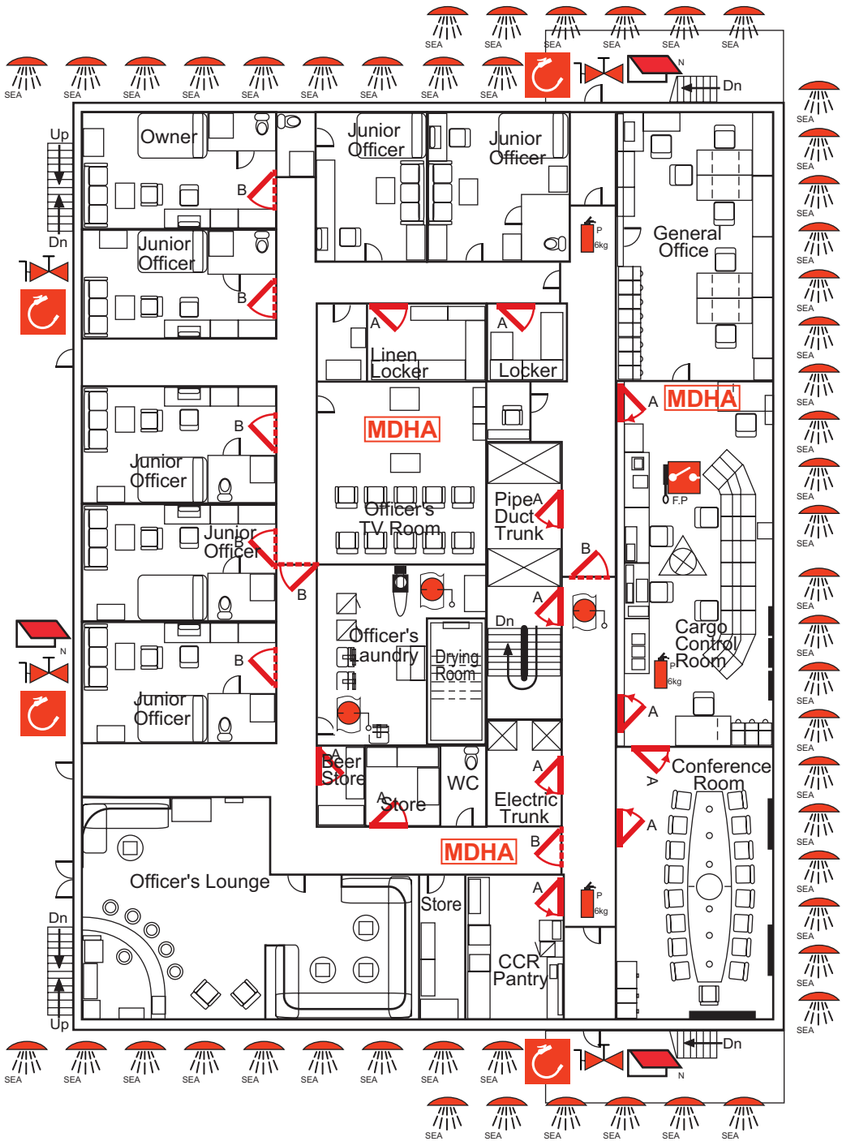


Navigation Bridge Deck

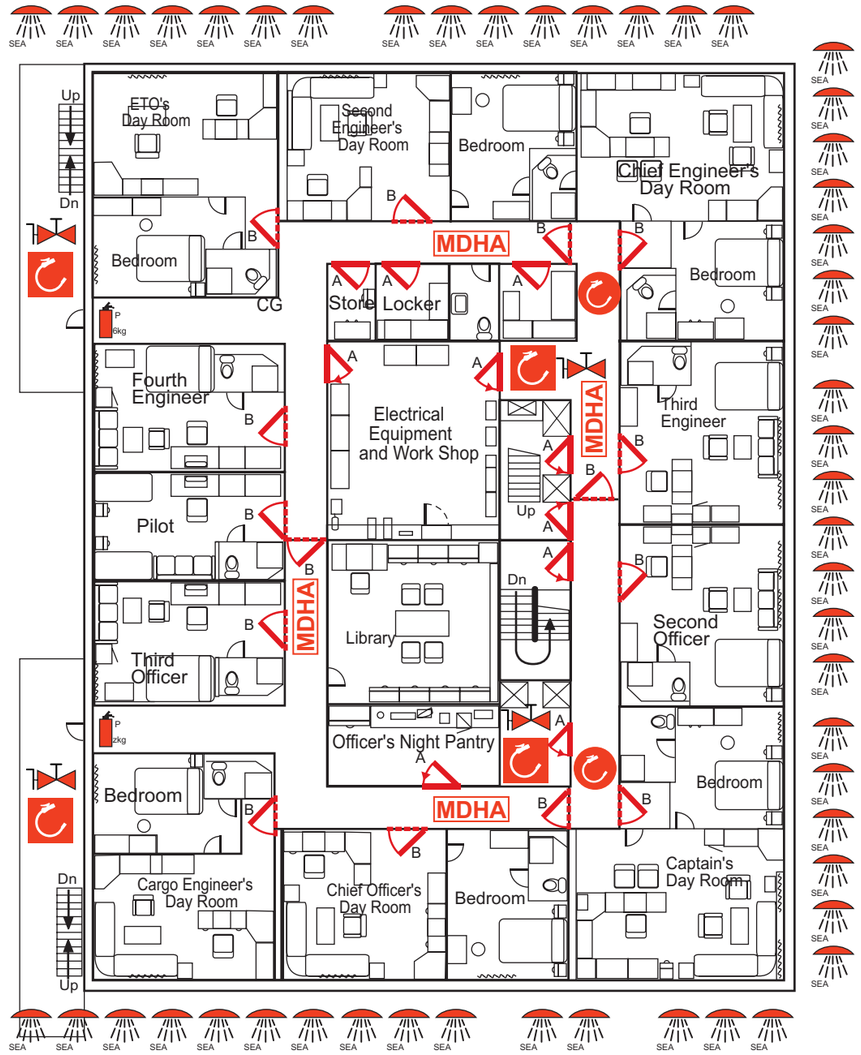
Key

- Fire Hose Box With Hose
- Fire Main With Valves
- Portable Fire Extinguishers (5kg CO_2)
- Remote Control for Emergengy Fire Pump
- Fire Pump Start/Stop
- Muster and Emergency Instructions
- Portable Fire Extinguishers (6kg Powder)
- Emergency Stop Button For LO Pumps, Vent Fans, and Accommodation Fans
- Sea Water Nozzle
- Closing Appliance for Exterior Vent Inlet/Outlet
- Fire Damper
- 'A' Class Fire Door Self-Closing

Illustration 3.4.8a (3) Fire Fighting Equipment on C and D Decks



C Deck

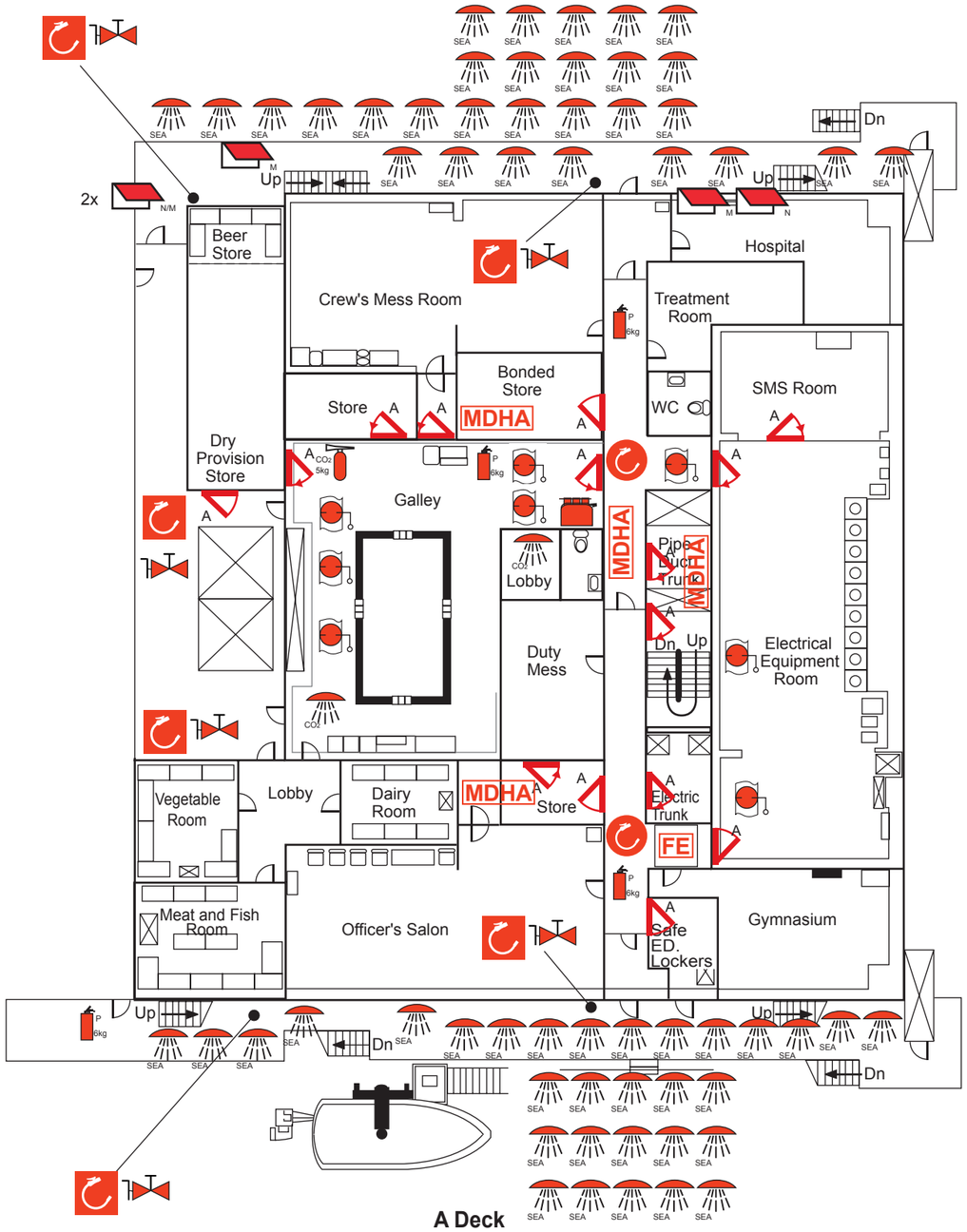


D Deck

Key

- Fixed Foam Fire Extinguisher (F 135L)
- Portable Foam Applicator
- Fire Hose Box With Hose
- Fire Main With Valves
- Bilge and GS Fire Pump Start/Stop (BI.F.P)
- Portable Fire Extinguishers (5kg CO_2)
- Water Spray Pump Start/Stop (W.S.P)
- Fire Pump Start/Stop (F.P)
- Foam Applicator (20L) Muster and Emergency Instruction (owner supply)
- Portable Fire Extinguishers (12kg Powder)
- Emergency Stop Button For LO Pumps, Vent Fans, and Accommodation Fans
- Portable Foam Fire Extinguisher (F 9L)
- Portable Fire Extinguishers (6kg Powder)
- High-Fog Spray Head (H/F)
- Fire Damper
- MDHA Magnetic Door Holder
- Hose Reel
- Sea Water Nozzle (SEA)
- Closing Appliance for Exterior Vent Inlet/Outlet (Natural)
- 'A' Class Fire Door Self-Closing
- 'A' Class Fire Door
- 'B' Class Fire Door Self-Closing
- 'B' Class Fire Door

Illustration 3.4.8a (4) Fire Fighting Equipment on A and B Decks



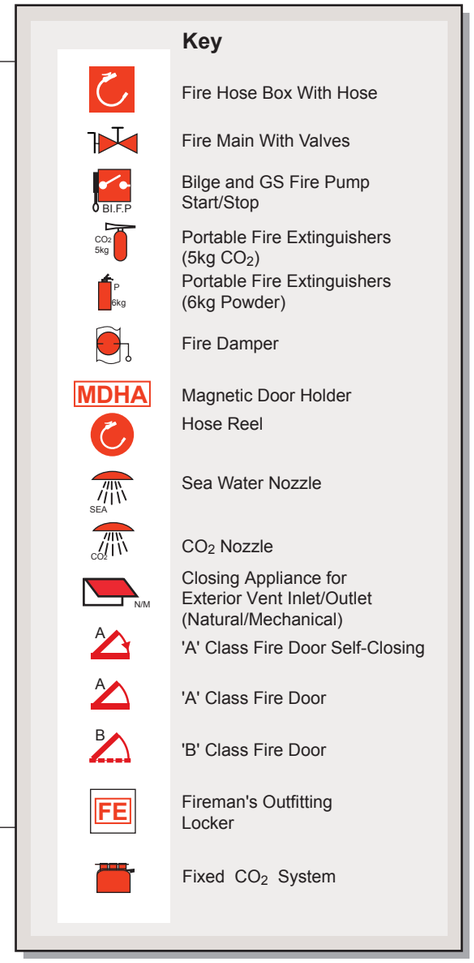
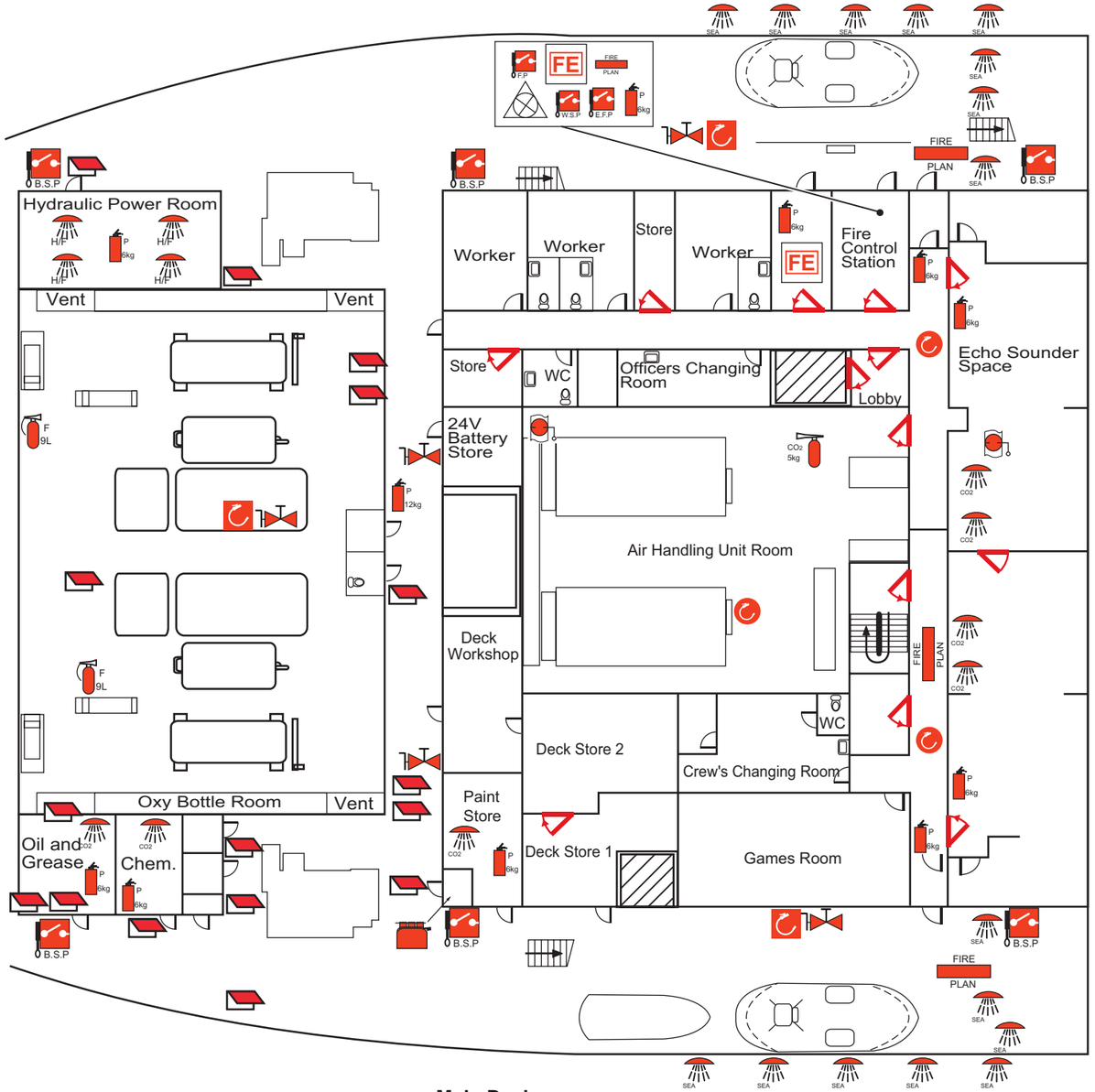
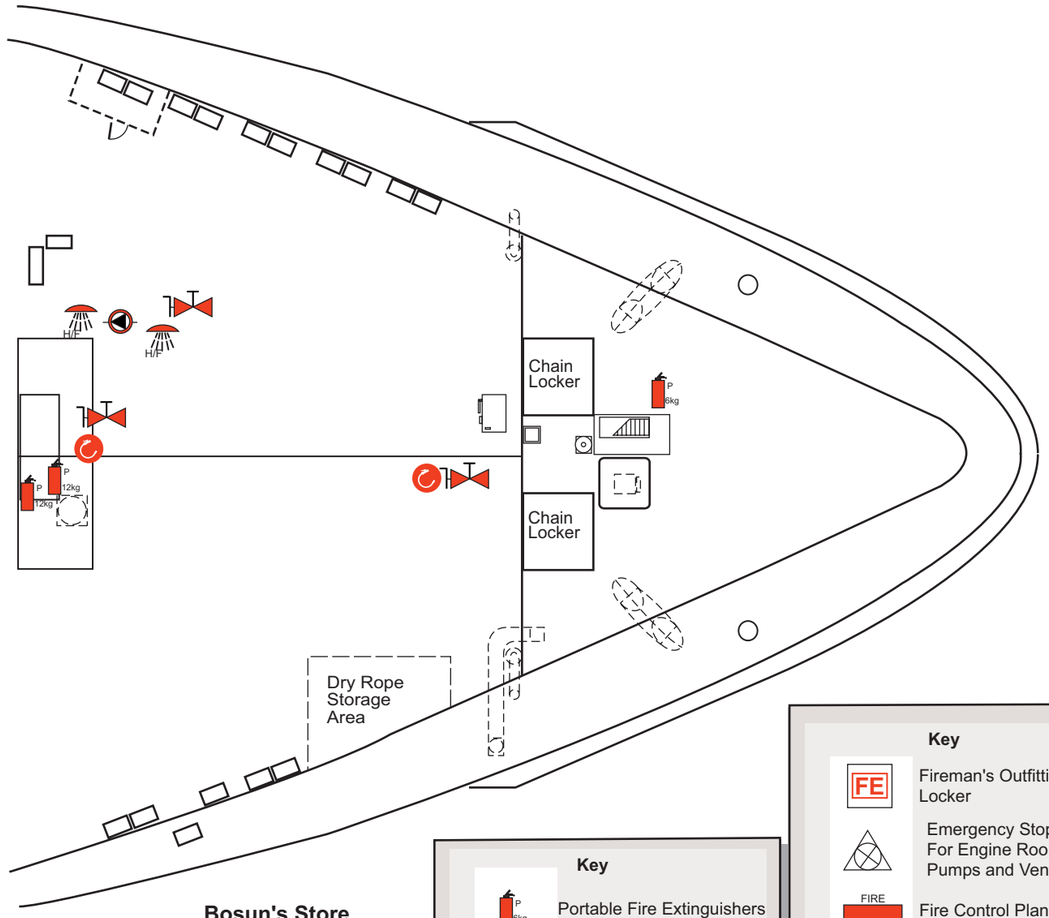
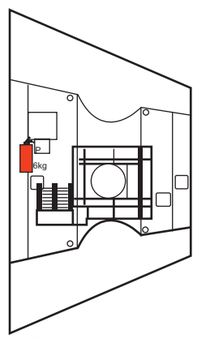


Illustration 3.4.8a (5) Fire Fighting Equipment on Upper Deck, Bosun's Store and Bow Thruster Room







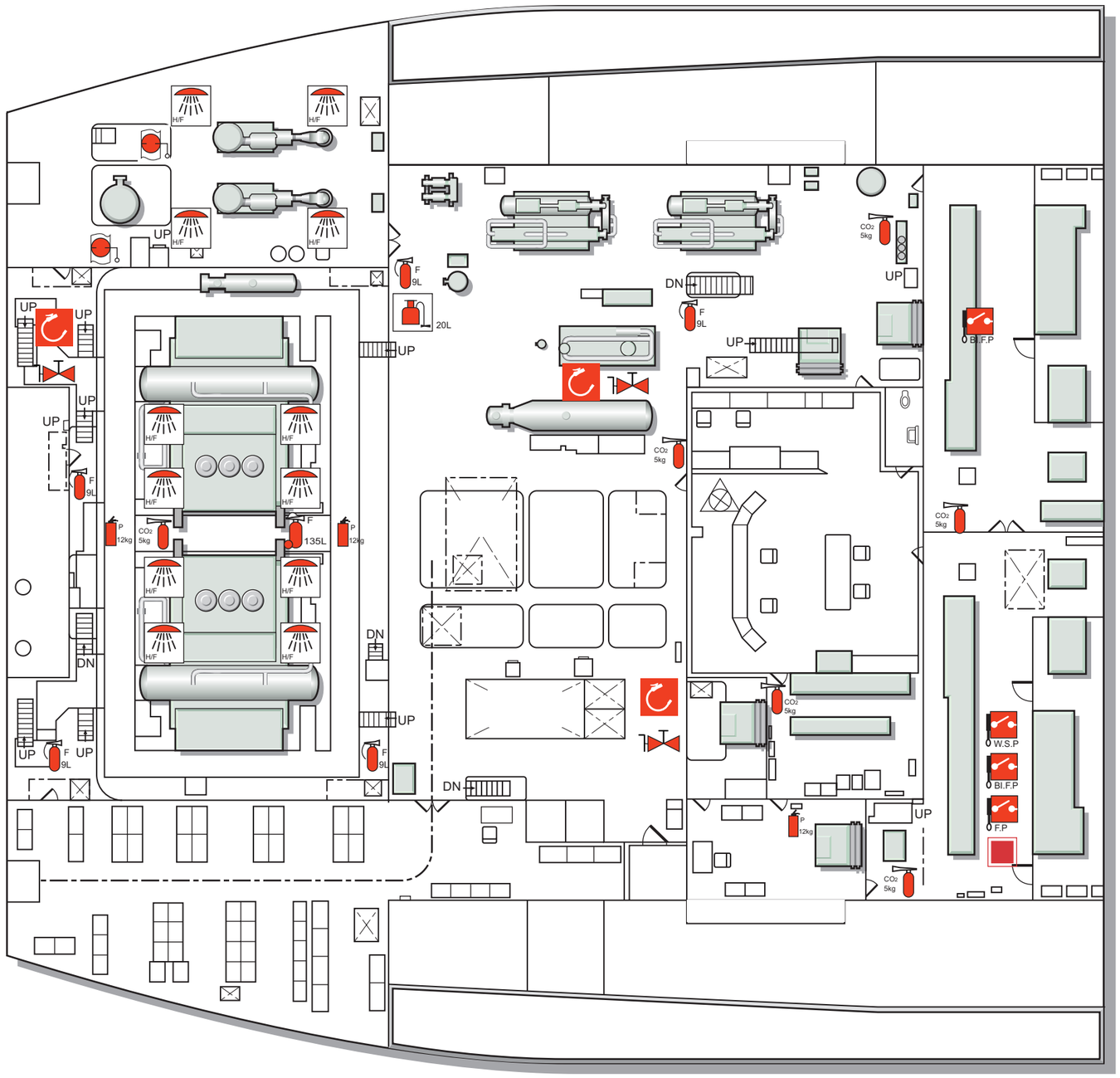
Key

- Portable Fire Extinguishers (6kg Powder)
- Portable Fire Extinguishers (12kg Powder)
- 'A' Class Fire Door Self-Closing
- Fire Damper
- Closing Appliance for Exterior Vent Inlet/Outlet
- Sea Water Nozzle
- CO_2 Nozzle
- E/R Bilge,Sludge, HFO Transfer, P/R HFO Transfer, LO Transfer, Pumps, Vacuum Toilet, Sewage System Start/Stop

Key

- Fireman's Outfitting Locker
- Emergency Stop Switch For Engine Room Oil Pumps and Vent Fans
- Fire Control Plan
- Hose Reel
- Fire Hose Box With Hose
- Fixed CO_2 System
- Fire Main With Valves
- Portable Fire Extinguishers (5kg CO_2)
- Remote Control for Emergency Fire Pump
- Fire Pump Start/Stop
- Emergency Fire Pump

Illustration 3.4.8a (6) Fire Fighting Equipment on Engine Room 2nd Deck



Key

- F 135L — Fixed Foam Fire Extinguisher
- Portable Foam Applicator (20L)
- Fire Hose Box With Hose
- Fire Main With Valves
- BI.F.P — Bilge and GS Fire Pump Start/Stop
- CO_2 5kg — Portable Fire Extinguishers (5kg CO_2)
- W.S.P — Water Spray Pump Start/Stop
- F.P — Fire Pump Start/Stop
- Muster and Emergency Instructions
- P 12kg — Portable Fire Extinguishers (12kg Powder)
- Emergency Stop Button For LO Pumps, Vent Fans, and Accommodation Fans
- F 9L — Portable Foam Fire Extinguisher
- P 12kg — Portable Fire Extinguishers (12kg Powder)
- H/F — High-Fog Spray Head
- Fire Damper

Illustration 3.4.8a (7) Fire Fighting Equipment on Engine Room 3rd Deck

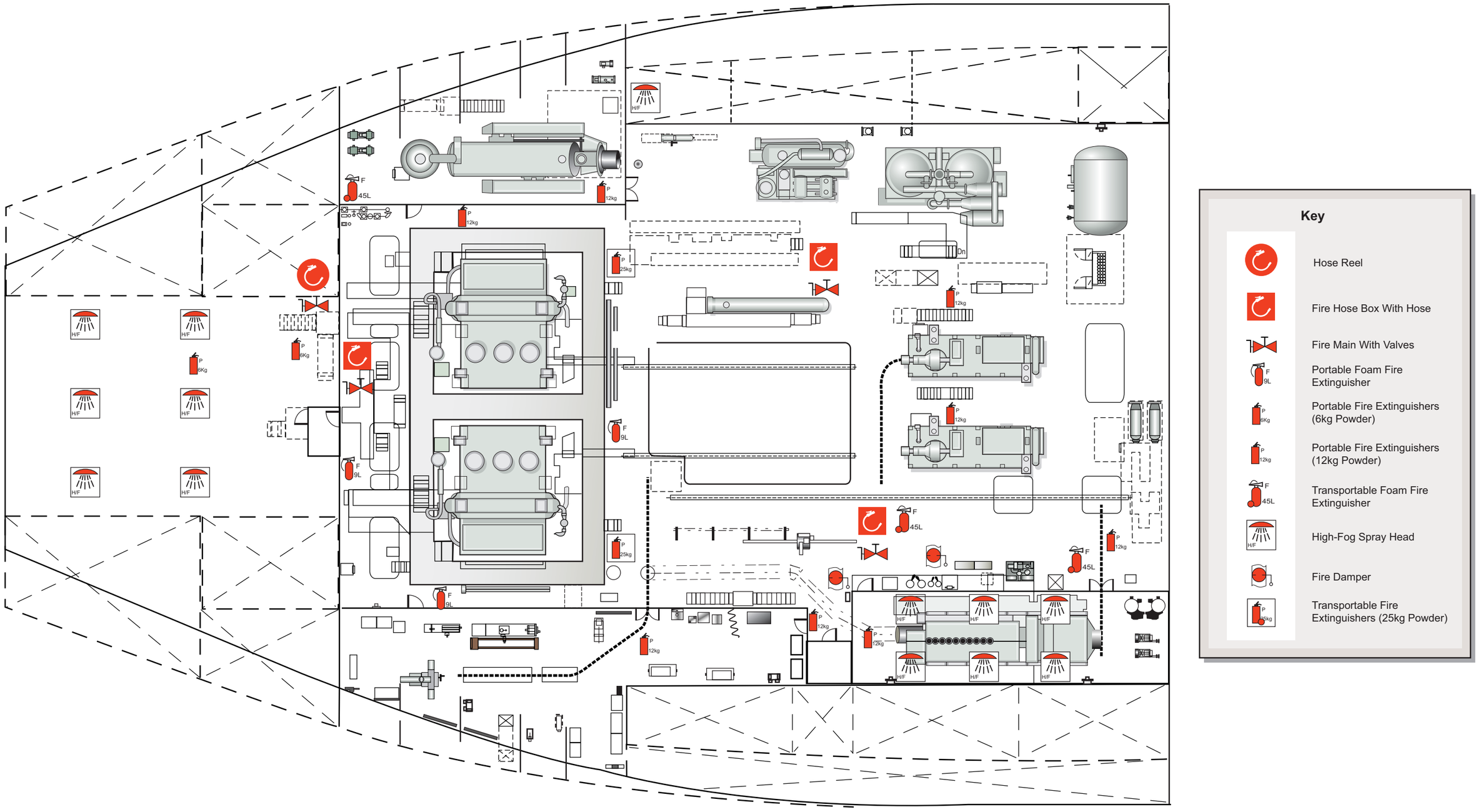
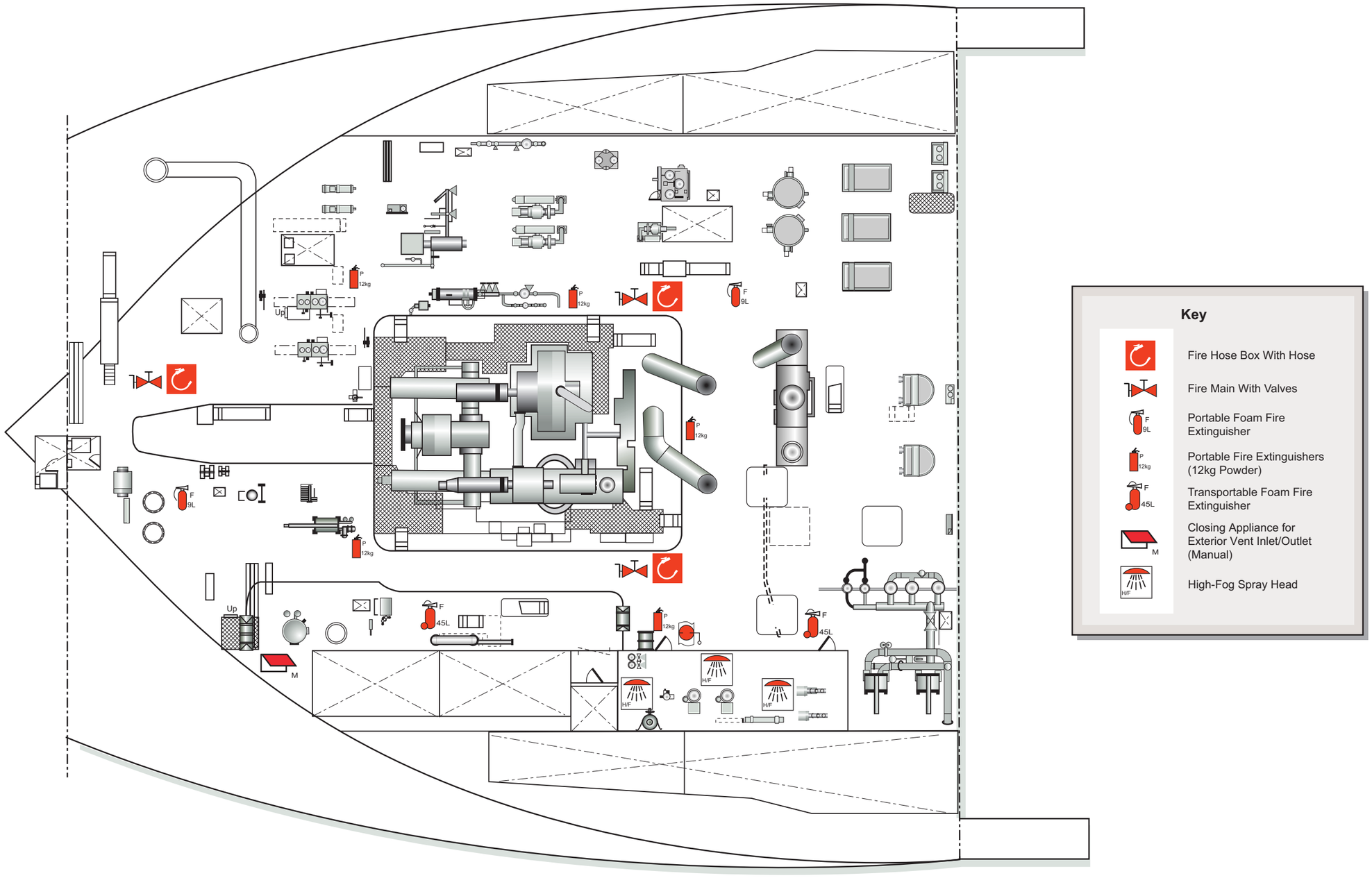
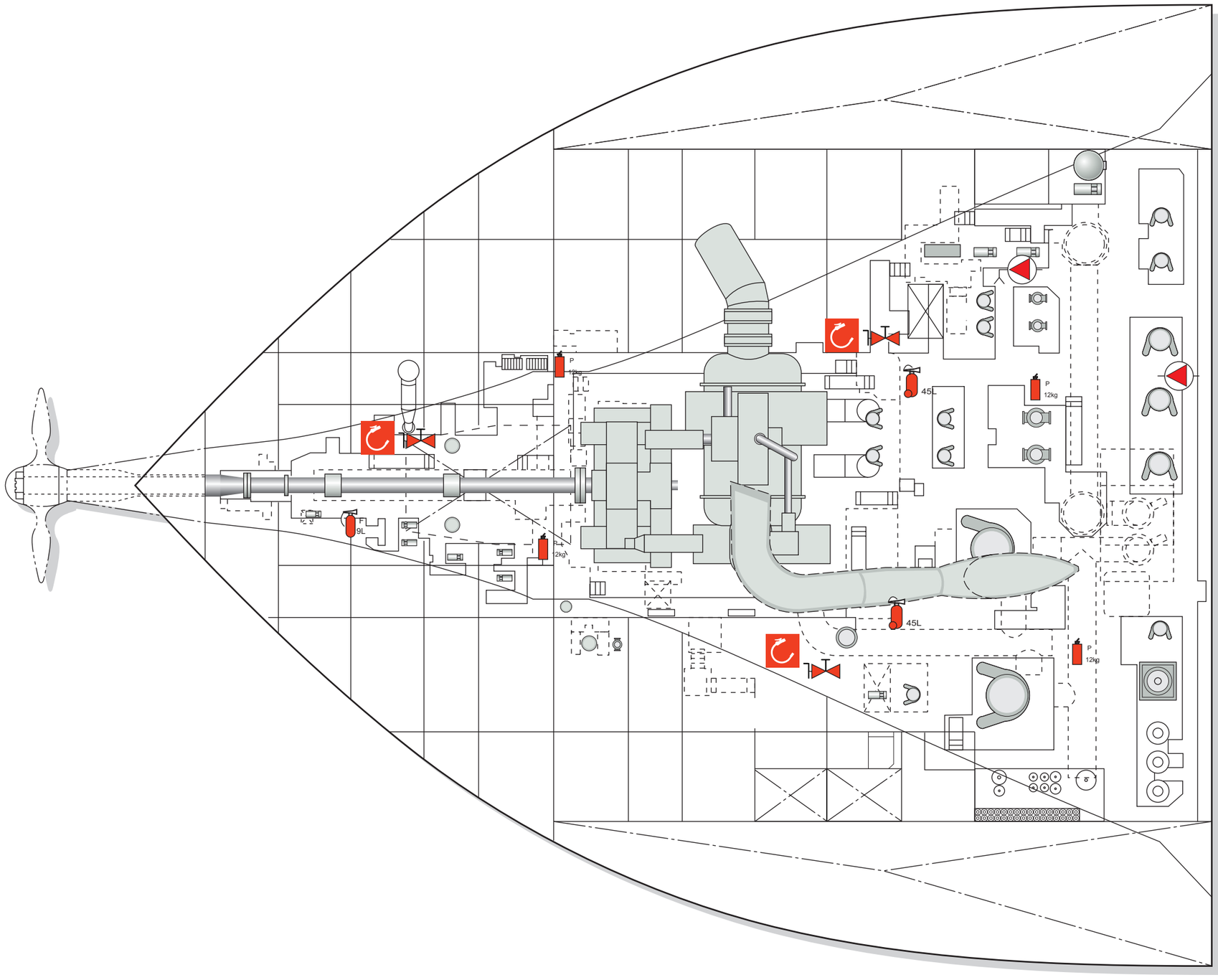


Illustration 3.4.8a (8) Fire Fighting Equipment on Engine Room 4th Deck



Engine Room 4th Deck

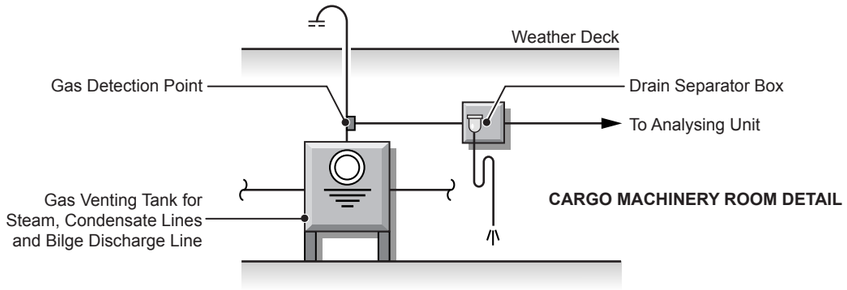
Illustration 3.4.8a (9) Fire Fighting Equipment on Engine Room Floor

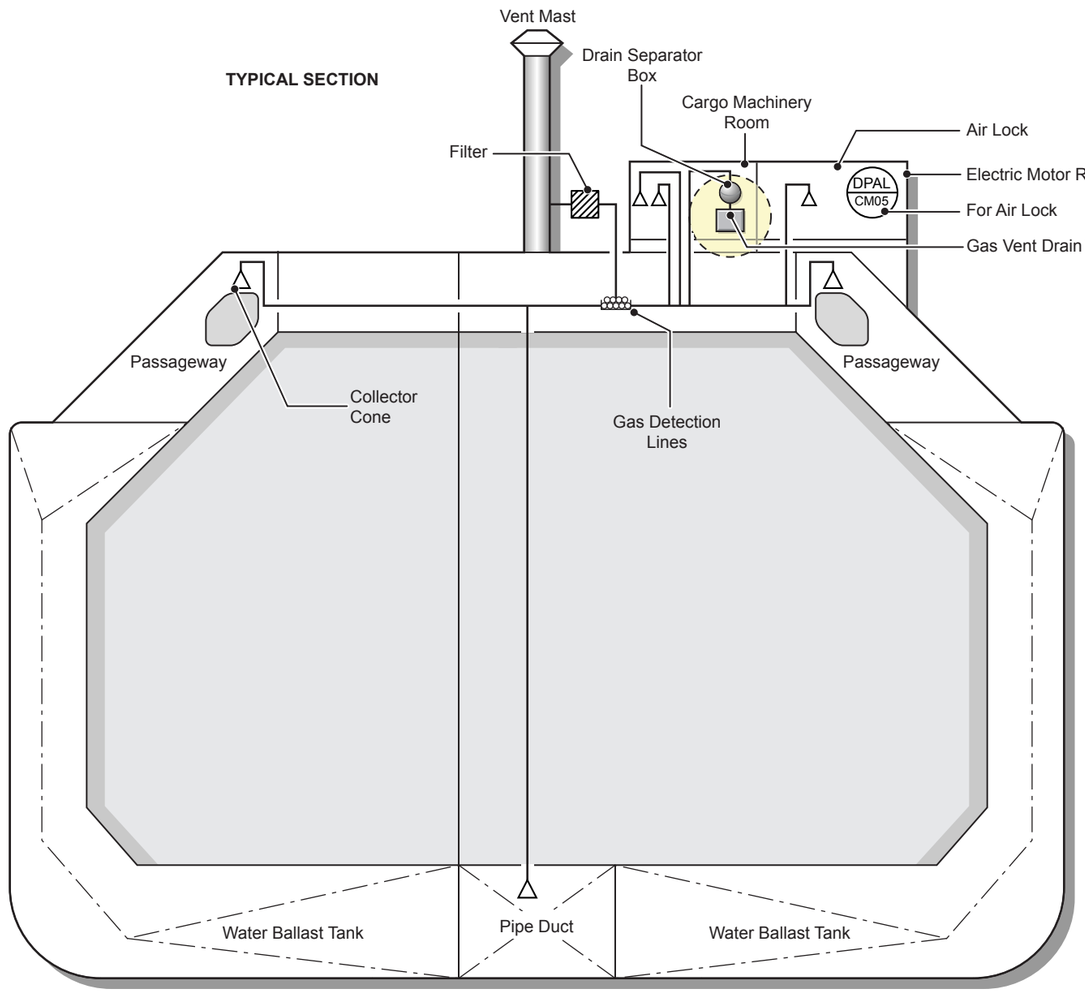


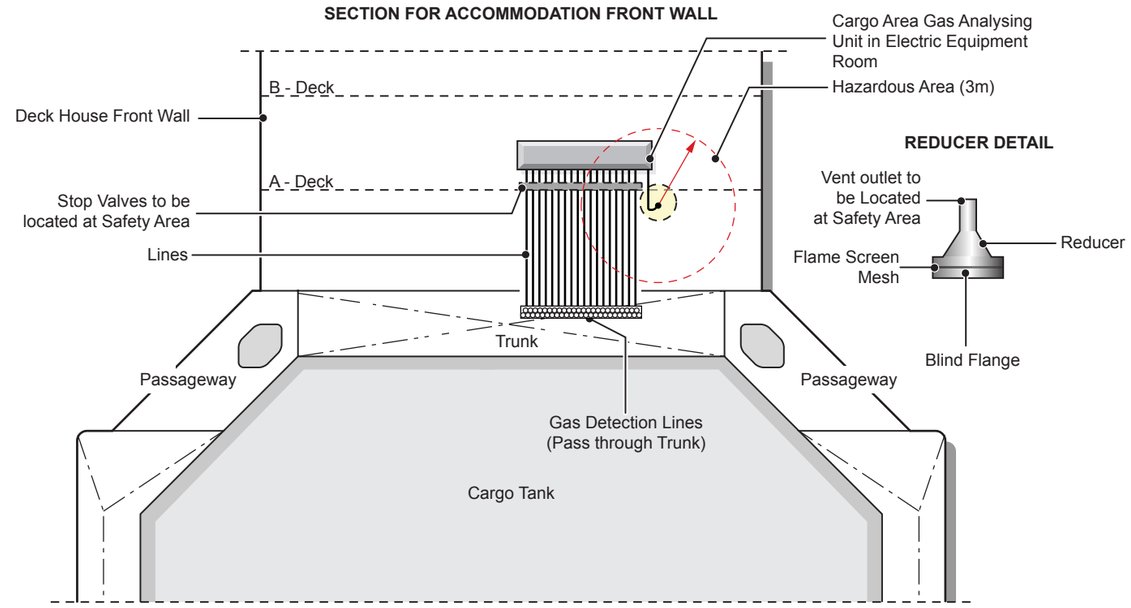
Key

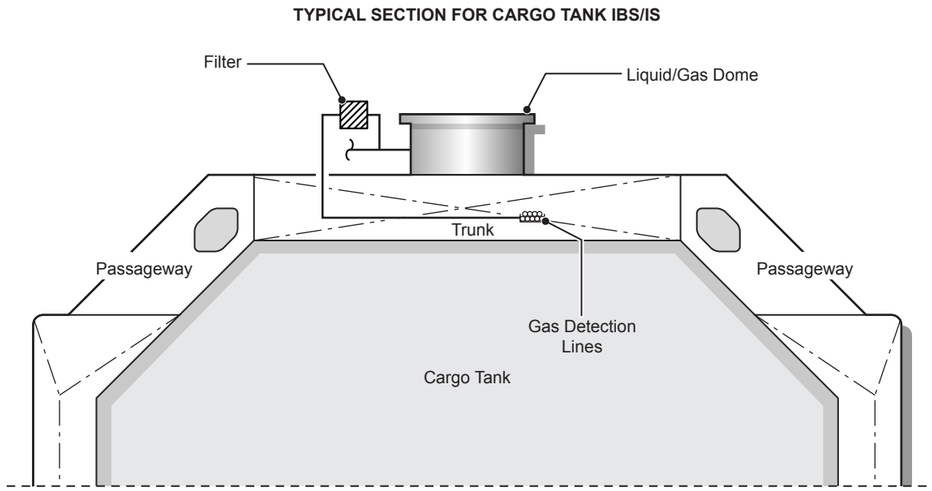
- Portable Foam Fire Extinguisher (F 9L)
- Transportable Foam Fire Extinguisher (45L)
- Portable Fire Extinguishers (12kg Powder) (P 12kg)
- Fire Hose Box With Hose
- Fire Main With Valves
- Bilge, Fire and G/S Pump ($245/150m^3/h$ x $5/120kg/cm^2$)
- Engine Room Bilge Pump ($10m^3/h$ x $4kg/cm^2$)

Illustration 3.4.9a Fixed Gas Sampling System









3.4.9 FIXED GAS SAMPLING SYSTEM

Maker:	Consilium Marine AB
System:	Salwico
	Gas sampling SW2020
	Gas alarm GS3000
	Fire alarm CS3000
Sampler:	GD10
Sampling range:	0-100%LEL (0-5% vol.) methane
Start-up time:	<60 seconds
Self test:	Continuous

Introduction

The GD10 gas sampler is based on the measurement of infrared radiation passing through a volume of gas. The GD10 employs a dual beam, dual wavelength measuring principle with separate optical samplers.

Different types of gas have unique absorption spectra and can be easily identified by proper selection of the infrared wavelength at which absorption is measured. Radiation at another wavelength measures the overall transmission through the optical system and in the air volume.

By comparing the transmission of the two wavelengths, the gas concentration in the air is determined. Selecting a wavelength with the unique characteristic of a particular gas prevents other types of gas present in the sample activating the sampler and giving false alarms

Radiation from two infrared sources passes through two narrow banded filters selecting a measuring wavelength and a reference wavelength. Radiation is divided by a beamsplitter into an external and internal path. The external path is viewed by the measuring (main) sampler which detects if the selected gas is present. The internal path is viewed by the compensation sampler, this monitors and compensates for any drift in the infrared source or samplers.

The four signals, two from each of the samplers, are amplified, digitised and fed into a microprocessor. The microprocessor calculates the gas concentration and the results are presented as either a voltage, a current or a digital output signal. Internal signals are compared with test limits to monitor the electronics and optical parts, if values outside the test limits are detected specific error messages are displayed.

The system is situated in the electrical equipment room on A deck and the sampling sequence is automatically controlled by solenoid selection valves, with the sampled gas being drawn into the panel by pumps, before passing over the infrared gas analyser.

The SW2020 system draws samples from the following locations:

- No.1 cargo tank IBS gas dome
- No.1 cargo tank IBS liquid dome
- No.1 cargo tank IBS
- No.2 cargo tank IBS gas dome
- No.2 cargo tank IBS liquid dome
- No.2 cargo tank IBS
- No.3 cargo tank IBS gas dome
- No.3 cargo tank IBS liquid dome
- No.3 cargo tank IBS
- No.4 cargo tank IBS gas dome
- No.4 cargo tank IBS liquid dome
- No.4 cargo tank IBS
- No.1 cofferdam
- No.2 cofferdam
- No.3 cofferdam
- No.4 cofferdam
- No.5 cofferdam
- Duct keel forward
- Duct keel aft
- Gas vent drain tank for condensate
- Cargo machinery room forward
- Cargo machinery room aft
- Cargo motor room air lock
- Bosun’s store
- Forward pump room
- Passageway port forward
- Passageway port aft
- Passageway starboard forward
- Passageway starboard aft
- No.1 cargo tank vent mast
- No.2 cargo tank vent mast
- No.3 cargo tank vent mast
- No.4 cargo tank vent mast
- Gas vent drain tank from bilge

Gas Sampling Panel

If the methane concentration of any sample point reaches 30% LEL, an audible alarm is sounded and the corresponding indicator lamp is lit on the panel. Additionally, a gas sampling alarm is activated on the IAS on the extension alarm panel in the fire control station.

A 60% LEL reading at any of the following locations activates a shut down of the compressors, vaporisers etc within the machinery room.

- Cargo machinery room forward
- Cargo machinery room aft
- Cargo motor room air lock

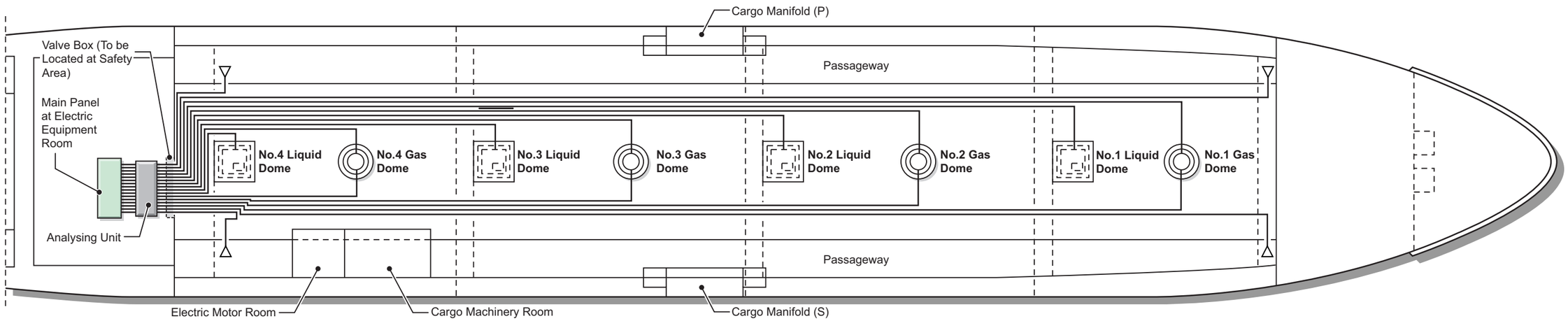
The system also contains an internal gas sensor to detect the flammable gas level inside the panel. The unit will shut off the power supply if an internal gas leak is detected and provide failure alarms, which are transmitted to the IAS and the extension alarm panel situated in the fire control station.

The IAS will record the last sample value of each point as it is transmitted by the gas sampling system. This recorded value will continue to be displayed on the graphic screen until it is next updated in rotation.

Fixed Gas Sampling System

The gas sampling system is an automatic scanning, permanently installed gas sampling system, with one common sampler for all sampling points. The automatic scanning function ensures that the sampler is connected to the different sampling points in a predetermined sequence.

Illustration 3.4.9b Fixed Gas Sampling System



An actual test sample from the sampling point connection is obtained through the sampling pipe being pre-evacuated before the sampler is connected. Pre-evacuation takes place only in the sampling pipe which is next to be connected for sampling. This avoids unnecessary quantities of dust, dirt, salt and moisture being sucked into the filters, which are fitted to every individual pipe in the system.

The entire internal pipe system in the analysing unit is purged automatically with clean air between the pre-suction and sampling phase.

In order to avoid water or any other liquid being sucked into the pipe system and reaching the sampler, an automatic pump stop function is included.

A gas cylinder, with a gas mixture of known composition, is connected to the system for regular calibration of the gas alarm instrument, as well as checks on the operation of the system.

The gas sampling system consists of four primary units:

1. Control Unit

The control unit contains all control and checking functions of the system and is located in the cargo control room.

2. Analysing Unit

The analysing unit contains all functions for gas sampling and transportation of the test samples. A measuring point for internal monitoring of leakage is also installed in the analysing unit.

3. Repeater Unit

The function of this panel is to indicate alarms/faults visually and audibly to the duty watch on the bridge.

4. Pipe System

The pipe system transports the test samples from sampling points to the analysing unit. The pipe system includes filters, shut off valves and flame traps.

Procedure for the Operation of the Gas Sampling System

Control Unit

The control unit of the GS3000 Gas Sampling System is divided into two separate parts.

The left-hand side consists of only three keys: ALARM MUTE, ALARM RESET and ALARM IN QUEUE. The ALARM IN QUEUE key is used to find a gas alarm in the gas alarm list and the two other keys to either mute or to reset an alarm. The gas level is measured again to see if the alarm condition has disappeared.

The right-hand side is used for operation of the system. Press one of the six LIST and SET UP keys to operate and monitor the system. All six keys will open a list of items (sampling points, alarms etc.).

Use the four arrow keys to find the item required and use the function keys to select an action to perform.

For example, it is possible to make a manual measurement on sampling point number 5 (SP5) by first pressing LIST SAMPLING POINTS, then choose SP5 with the arrow keys and finally press F3 (Measure) to start measuring on SP5. The sampling point details will be shown on the display.

Some menus require a numerical input; manual measurement is one of them. Enter a new value with the numerical keyboard. Press ENTER to change the new value into the current value and press F1 to start measuring.

Press F1 to start measuring using the default value (5 per minute).

Standby

The control unit is in standby mode most of the time. The display shows that the measurement sequence is running. The system always displays the last measurement.

The standby menu displays the system status. The standby mode can be identified by the clock in the upper right corner and can be reached by pressing the HOME key. The control unit will automatically return to standby mode 30 minutes after the last keyboard entry.

Lists

All manipulations required by the average user can be performed from the four lists in the system.

Alarm List

The left hand side of the control unit always displays the sampling point in alarm and the alarm level (high or low).

Mute any gas alarms by pressing ALARM MUTE and reset gas alarms by pressing ALARM RESET. Press ALARM IN QUEUE to display the next gas alarm (if any).

When more detailed information about an alarm is required, press LIST ALARMS on the right hand side of the control unit. This list is opened automatically when a new gas alarm is detected. Use the arrow keys to display the next and previous alarms.

Fault List

Press LIST FAULTS, on the right hand side of the control unit, to display the faults in the system. This list is automatically opened when the system detects a fault.

Mute faults by pressing the FAULT MUTE key and reset faults by pressing the FAULT RESET key.

Sampling Point List

Press LIST SAMPLING POINTS to enter the sampling point list.

Select a sampling point with the arrow keys and use the function keys to perform an action.

The following actions can be performed on a sampling point:

Value - Display the value of the last gas measurement.

Measure - Start measuring the gas concentration. With this function it is possible to make a prompt check of the actual gas concentration of the selected sampling point. The sampling time can be set in minutes though never below the set up time. The gas value is updated and continuously shown in the display. The possible alarm (low or high) will be decided when the gas reading is stable. The remaining measurement time is continuously shown.

Purge - Clean the pipe for that particular sampling point for 30 seconds. Before connection to the analysing flow an automatic decompression is made through the internal sampling point for 10 seconds in order to protect the pressure switch and pump membrane.

Actions such as ‘purge’ and ‘manual measure’ cannot be performed on disconnected sampling points. The only allowed action on a disconnected sampling point is Reconnect.

After a measure or purge manoeuvre, the normal measurement sequence starts at the sampling point that was interrupted.

Disconnection List

Press LIST DISCONNECTION to open the disconnection list.

Disconnected sampling points are displayed one by one by using the arrow keys. Reconnect a sampling point by pressing Fl (Reconnect).

Set up - General Settings

The system changes the access level and enters Configuration Mode when the correct access code for level 2, 3 or 4 is entered. The system will not start until the user chooses to start the system again (the access level is automatically changed back to 1) or the user time-out expires after 30 minutes.

Choose a menu with the arrow keys. The menu numbers in this document are shown between brackets in each header.

Actions in the Event of an Alarms

Gas Alarm

1) When the ALARM MUTE button is pressed, the audible alarm stops and all alarm outputs with mute functionality are deactivated. The scanning cycle continues and will give new alarms for each sampling point exceeding the alarm level. The alarms are stored in the alarm list and the sampling point of the last occurred alarm is shown as well as the alarm level low or high.

2) Activation of the ALARM RESET button starts a revaluation of the sampling point in alarm. An alarm reset request will stop the sampling sequence and make a new measurement. This re-evaluation is to be able to accept an alarm reset on the sampling point if the level is now below the alarm level. If the ALARM IN QUEUE button is pushed and a RESET is made of all sampling points in alarm, the system will start re-evaluating these sampling points one by one. It may therefore take a while to complete alarm reset for several sampling points.

The re-evaluation sequence can be interrupted by manual measurement or purge. (See the Sampling Point List).

Fault Alarm

1) An analysing pump fault is caused by a pressure switch and stops the pump and scanning sequence if the system does not have the pump redundancy option. The pressure switch is detecting that the pump pressure is too low. The cause is probably a membrane leakage of the pump or a fault of the pressure switch itself. Service is needed if the fault cannot be reset.

2) A bypass pump fault is caused by a pressure switch. The scanning cycle continues. The bypass pump stops. The cause for this fault is the same as described for the analysing pump.

3) Internal leakage in the analysing unit is indicated when the automatic leakage control fails. This control is automatically initiated every 24 hours by closing all the sampling valves, running the analysing pump and checking that the vacuum switch is activated. If the vacuum switch is not activated the cause is a leakage at the vacuum side of the pump from pipes, solenoid valves, pipe coupling or the vacuum switch itself.

4) Calibration: This fault indicates that zero or span calibration is not completed due to a value that is out of range, either due to a gas sampler fault or a test gas fault. The bottle might be empty or the test gas mixture is not corresponding to the value that is set for span calibration.

5-8) Gas Sampler 1-4. Indicates a fault depending on which type of sampler that is in use. There might be a loss of power, a dirty mirror in an internal radiation sampler or a sensor failure etc.

9) Moisture fault (Option). Indicates that water is sucked into the pipe system of the analysing unit.

10) High temperature in the analysing unit (Option).

11) Power fault (Option). As indicated if there are two independent power supplies and one fails.

12) Flow fault on sample point #. Indicates a flow fault on the sample point listed. Before indication of a flow fault the automatic pipe cleaning function first attempts to remove the cause of the flow fault by flushing the sampling pipe for 15 seconds and then tries to obtain a new sample. If the flow fault still remains the sampling point is automatically disconnected and a flow fault alarm is generated and listed in the fault list. The scanning cycle continues to the next sampling point. As long as the flow fault for a certain sampling point is listed in the fault list the fault remains.

Other fault alarms monitor the internal condition of the gas sampling system.

Repeater Unit

Gas alarms are shown on the Mini Repeater.

The previous and next alarms (if any) can be listed with the arrow keys. Faults are shown when there are no non-muted gas alarms in the system.

The previous and next faults (if any) can be listed with the arrow keys.

The clock is shown when there are no alarms or faults in the system.

Sensor Locations

Electronic semsor units are located in the following areas and if a gas reading is detected in any of these spaces it activates a gas alarm on the IAS system. The location is shown on the IAS screen under Fire Group.

Location	No. of Sensors
1. Cargo motor room	3
2. Engine room	9
3. Accommodation	21
4. BOG pipe/duct	5
5. IGS room	1

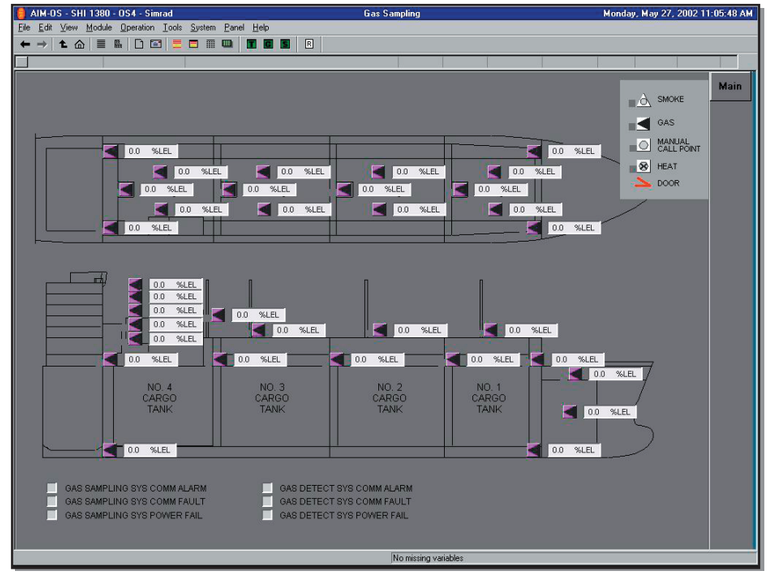
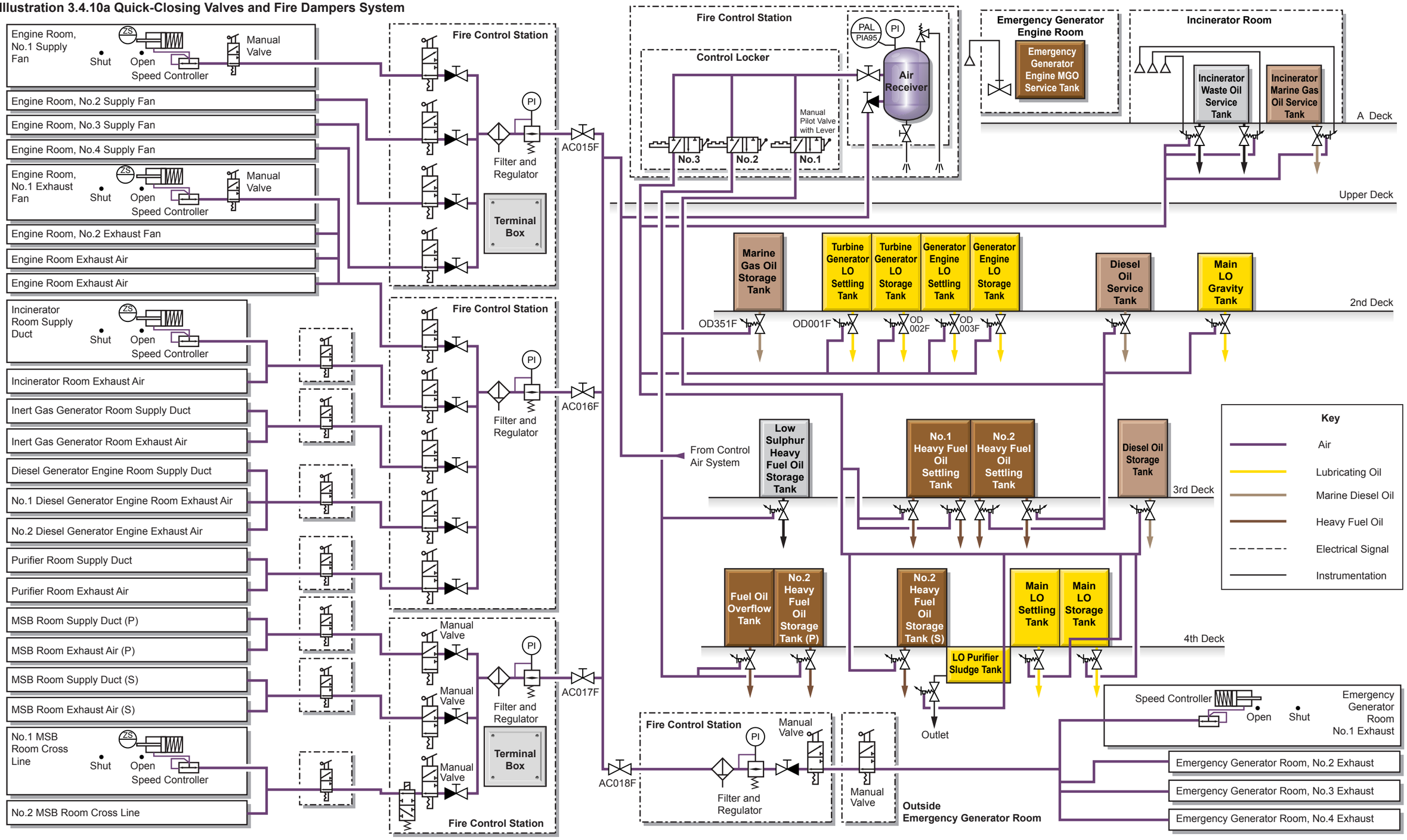


Illustration 3.4.10a Quick-Closing Valves and Fire Dampers System



3.4.10 QUICK-CLOSING VALVES AND FIRE DAMPERS SYSTEM

INTRODUCTION

All the outlet valves from the fuel oil and lubricating oil tanks, from which oil could flow to feed a fire, are equipped with air operated quick-closing valves, which are controlled from the fire control station. They are supplied from the quick-closing valve air reservoir situated in the emergency shut-off device control box located in the fire control station. The reservoir is supplied, at a pressure of 9.0kg/cm^2, from the control air system. The air supply is direct from the No.1 control air manifold after the dryer and oil filters but there is an inlet valve on the quick-closing valve air reservoir. This valve is locked open. A branch pipe on the supply line to the reservoir supplies air directly to the engine room ventilation fire dampers.

The quick-closing valve air reservoir is fitted with a low pressure alarm transmitter and the pressure in the reservoir is displayed on the IAS compressed air system graphic. The oil tank quick-closing valves' actuator lines are grouped into three systems, each with a manual pilot valve and operating lever. In normal operation the supply line to each group of tank valves is vented to atmosphere, but when the pilot valve is actuated air is supplied to pistons which collapse the bridge of each valve in that group, thus causing the valve to close. Operation of a pilot valve will close all valves in that part of the system.

The valves are reset by venting the air supply and operating the valve hand wheel in a closed direction to reset the bridge mechanism and then opening the valve in the normal way.

The emergency generator marine gas oil tank quick-closing valve OD380F is operated by a directly connected wire from outside the emergency generator room. The incinerator waste oil service tank and incinerator MGO service tank quick-closing outlet valves may be operated by directly connected wires from outside of the incinerator room or from the fire control station via pilot valve No.3.

Engine room fire dampers are arranged in four groups, each with an air supply from an air line supplying the quick-closing valve air reservoir. Air is normally supplied to the damper air cylinder and that keeps the damper open against the action of a counterweight. When the damper cylinder is vented the damper is closed by means of a gravity acting on the counterweight. Damper cylinders may be vented by means of the pilot valve located in the fire control station in the accommodation or by means of a pilot valve located close to each damper. Some damper pilot valves operate a single damper and others operate two or more dampers.

Oil Tank Quick-Closing Valves

CAUTION

Some tanks such as lubricating oil tanks do not have quick-closing apparatus fitted. This is because they are normally closed and only opened for short periods when required. It is important to ensure that these are always closed when not in use.

Tank	Valve
Group 1	
DO service tank	OD060F
Main LO gravity tank	OL215F
No.2 HFO settling tank	OF203F OF204F
Group 2	
MGO storage tank	OD351F
Low sulphur HFO storage tank	OF002F
FO overflow tank	OF024F
No.2 HFO storage tank port	OF003F
Group 3	
Incinerator waste oil service tank	OF364F OF364F
Incinerator DO service tank	OD362F
No.2 HFO storage tank starboard	OF001F
No.1 HFO settling tank	OF201F OF202F
DO storage tank	OD001F
Turbine generator LO settling tank	OL001F
Turbine generator LO storage tank	OL002F
Diesel generator LO settling tank	OL003F
Diesel generator LO storage tank	OL004F
Main LO settling tank	OL008F
Main LO storage tank	OL007F

Procedure for Operating the Quick-Closing Valve System

a) At the emergency shut off control locker check the quick-closing valve group in which the valve(s) to be closed is/are located.

b) Operate lever of the shut off pilot valve for the valve group concerned in order to supply air to the quick-closing valves.

The quick-closing valves in the selected group will be closed when the air pressure acts on the valve piston. When it is desired to open the valve again the pilot valve lever should be released so that the air supply line to the valves is vented. The tripped valves must then be closed by turning the valve handle and then opened again in order to reset the trip mechanism.

Fire Dampers

Engine room fire dampers operate to close ventilation openings in the event of a fire. The dampers are kept open against a closing force (gravity acting on a counterweight) by means of air pressure acting on the damper cylinder piston. When air pressure is vented the damper or dampers will close. The fire damper pipework is supplied directly from the working air system main pipe and air pressure is constantly applied to the system.

Activation of the pilot control valve at the fire control station control panel will vent the damper air line and cause fire dampers associated with the pilot valve to close. Operation of individual local damper valves will vent each individual damper as required and allow that damper to close.

Fire dampers in group 1 are for engine room supply and exhaust fans. These do not normally have local control pilot valves but do have solenoid valves associated with the fan starters. When the fan is started the solenoid valve allows air to the damper in order to open it and when the fan is stopped the solenoid valve vents the damper air line causing the damper to close.

Fire dampers are fitted as follows:

Item	Fire Control Station Valve	Local Valve
Group 1	Air supply valve AC015F	
Three-way manual valve	N/P1	
No.1 engine room supply fan	N/P2	
No.2 engine room supply fan	N/P3	
No.3 engine room supply fan	N/P4	
No.4 engine room supply fan	N/P5	
Group 2	Air supply valve AC016F	
Manual valve	N/P6	
No.1 engine room exhaust fan	N/P7	
No.2 engine room exhaust fan	N/P7	
No.3 engine room exhaust fan	N/P7	
No.4 engine room exhaust fan	N/P7	
Incinerator room supply duct	N/P8	N/P16
Incinerator room exhaust air	N/P8	N/P16
IGG room supply duct	N/P9	N/P17
IGG room exhaust air	N/P9	N/P17
Generator room supply duct	N/P10	N/P18
Generator room exhaust air	N/P10	N/P18
Purifier room supply duct	N/P11	N/P19
Purifier room exhaust air	N/P11	N/P19
Group 3	Air supply valve AC017F	
Manual valve	N/P12	
MSB room port supply duct	N/P13	N/P20
MSB room port exhaust air	N/P13	N/P20
MSB room starboard supply duct	N/P14	N/P21
MSB room starboard exhaust air	N/P14	N/P21
No.1 MSB room cross line	N/P15	N/P22
No.2 MSB room cross line	N/P15	N/P22
Group 4	Air supply valve AC018F	
Manual valve	N/P23	
Emergency generator room	N/P24 (located outside of room)	

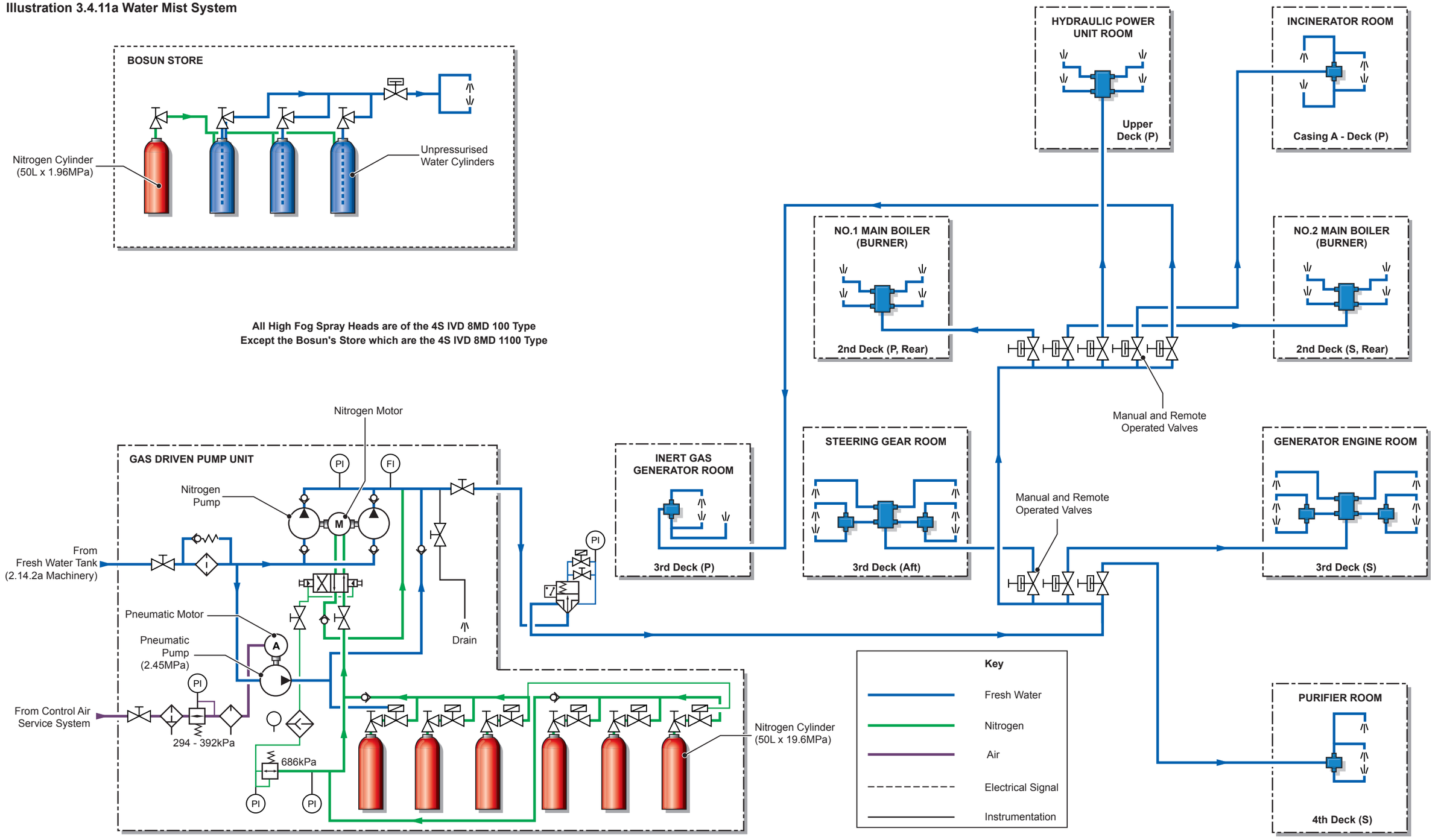
Procedure for Operating the Fire Control Dampers

a) In order to actuate fire dampers the main fire damper pilot valve, located at the emergency shut off cabinet in the fire control station, must be operated by pressing the valve lever in order to vent the air line. Dampers will close under the action of their counterweights when air is vented from their cylinders. Operation of the local pilot valves has the same effect.

b) To open fire dampers the pilot valve lever must be returned to the open position and the dampers will open under the action of compressed air on the cylinder pistons.

Quick-Closing Valves Air Cylinder and Operating Valve Cabinet in Fire Control Station

Illustration 3.4.11a Water Mist System



3.4.11 WATER MIST SYSTEM

Maker: Marioff Hi-fog
Type: GPU pump unit
No. of sets: 1

Introduction

The water mist system provides fire protection in a number of machinery space areas. The basic principle of the water mist system is that the very fine droplets of water tend to exclude oxygen from the area of the fire thereby starving the burning material of oxygen. When the fine water droplets come into contact with the flames they are rapidly evaporated because of their large surface area for a small mass and this has a rapid cooling effect on the fire. The steam produced by the evaporation acts to further reduce the space available for oxygen. Because the water is in mist form the system is effective for oil fires.

Water at high pressure is injected into the protected space through special spray heads which break down the water stream into very fine mist like particles. The positioning of the spray heads is such that the desired area is protected by the spray.

Engine Room System

Water mist protection is provided for the following engine room areas:

Deck	Area	No. of Spray Heads
A	Incinerator room	4
Upper	Hydraulic power pack room	4
2nd	Port boiler burner platform	4
2nd	Starboard boiler burner platform	4
3rd	Inert gas generator burner	3
3rd	Steering gear room	6
3rd	Diesel generator room	6
4th	Purifier room	3

Each area is covered by a control valve which connects the spray heads to the pressurised water spray main.

The water mist pump unit, situated on the engine room 4th deck starboard, near the fresh water hydrophore system, contains the following:

- Fresh water pump driven by an air motor, supplied by the control air system, which takes suction from the fresh water tanks and maintains the system pressure at 2.45MPa up to the control valves.
- A set of piston type pumps driven by pressurised N_2 cylinders, which supply fresh water at a rate of 11 litres/minute through each of the spray heads.
- Two sets of N_2 cylinders pressurised to 200kg/cm^2, 19.6MPa each set containing three cylinders.

No electric power is required to operate the discharge pumps and the control valves can be activated locally. The control valve can be closed by operating the pushbutton a second time.

When a remote release pushbutton is pressed a lamp under the pushbutton will illuminate to indicate a fresh water flow through the control valve.

The remote panel also contains LAMP TEST and audible alarm RESET pushbuttons.

Procedure for Operating the Water Mist System

a) When a fire is detected in a protected area the control valve for that area is activated and pressurised water is allowed to flow to the spray heads covered by that control valve.

b) Fresh water is delivered to the spray head by the air motor driven pump at an initial pressure of 2.45MPa.

c) When a drop in the system pressure is detected because of the water flow, the N_2 cylinder primary valve opens and releases the gas from 3 cylinders which drives the piston type pumps to raise the fresh water discharge rate to 11 litres/minute per spray head, ie. steering gear total is 66 litres/minute.

d) The first three N_2 cylinders' discharge pressure will gradually drop to approximately 7.84MPa when the primary valve will open on the 2nd set of N_2 cylinders.

The system has the capacity to discharge fresh water for approximately 20 minutes.

Bosun's Store System

Water mist protection is provided for the emergency fire pump diesel-hydraulic plant on the port side of the bosun's store.

The system consists of a MAU (Machinery space Accumulator Unit) which is connected to 2 spray heads positioned above the emergency fire pump diesel-hydraulic plant.

The unit has no moving parts and consists of three unpressurised fresh water cylinders and one N_2 cylinder. The N_2 cylinder pressurises the fresh water cylinders and the fresh water is directed to the spray heads above the emergency fire pump diesel-hydraulic plant.

The control valve on the N_2 cylinder is activated locally. The control valve can be closed by operating the pushbutton a second time.

Water Mist Unit in Bosun's Store

SECTION 4: ROUTINE PROCEDURES

4.1 Passage Planning Including Checklists

Illustrations

4.1 PASSAGE PLANNING INCLUDING CHECKLISTS

General

A plan for the intended passage is to be prepared prior to sailing.

Procedure

a) It is customary for the Master to delegate the initial responsibility for preparation of a passage to a designated officer, who is responsible for navigational equipment and publications.

b) The designated officer has the task of preparing the detailed passage plan to the Master's requirements. The plan is to be approved by the Master prior to the vessel sailing.

c) All bridge team members should carefully study, understand and finally sign at the bottom of the last page of the prepared passage plan.

d) The junior team members should not hesitate to question a decision, if they consider that such a decision is not in the best interest of the ship.

Voyages, of whatever length, can be broken down into two major stages:

1. Preparation which consists of:
   Appraisal
   Planning

2. Execution which consists of:
   Organisation
   Monitoring

Checklist Passage Planning Appraisal

Paper charts corrected up to date and assembled in sequential order.	☐
ARCS charts corrected with latest CD and loaded into MFD Chart Table.	☐
Port information guide(s) to hand.	☐
Sailing Directions to hand.	☐
Tide tables and current atlas (if appropriate) to hand.	☐
Notices to Mariners to hand, temporary and preliminary Notices applied where necessary.	☐
Traffic Separation and Routing schedules (IMO Ships Routing) to hand.	☐
Meteorological information sources known and latest information to hand.	☐
Position-fixing methods ready (including corrections for radio aids and up to date Nautical Almanac).	☐
Admiralty List of Lights corrected and to hand.	☐
Admiralty List of Radio Signals corrected and to hand.	☐
Vessel's draught known.	☐
Safe minimum water depth decided.	☐
Safe minimum distance off decided, taking into account: Expected weather, Visibility, Traffic density, Identified danger areas and the Vessel's handling characteristics.	☐

4.1a Checklist - Passage Planning - Appraisal

LIST OF CHARTS AND PUBLICATIONS

Ship's Name BRITISH INNOVATOR					Voyage No.		
From		To			Via		
PUBLICATIONS		ROUTEING CHARTS			NAVIGATION CHARTS (Continued)		
Name	No.	Chart	Folio	Cons. No.	Chart No.	Folio	Cons. No.
Mariners Handbook	NP 100	1			14		
Ocean Passages	NP 136	2			15		
Pilot no.		3			16		
Pilot no.		4			17		
Pilot no.		5			18		
Pilot no.		GENERAL CHARTS			19		
Pilot no.		Chart	Folio	Cons. No.	20		
ATT Volume no.(s)		1			21		
ALL Volume no.(s)		2			22		
ALRS Volume no.(s)		3			23		
Guide To Tanker Ports		4			24		
ITU Vol. no.(s)		5			25		
Port Information Guide		NAVIGATION / SEAMAP CHARTS			26		
IMO Ships Routing		Chart	Folio	Cons. No.	27		
		1			28		
		2			29		
STANDARD CHARTS		3			30		
Chart	Folio Cons. No.	4			31		
Load Lines		5			32		
Depth Con		6			33		
IALA Buoy		7			34		
Sym/Abbr		8			35		
Variation		9			36		
		10			37		
		11			38		
		12			39		
		13			40		
Charts to be ordered by urgent indent?		Yes	No	→	Received	Yes	a

Remarks

APPRAISAL INFORMATION REQUIRED TO ASSIST IN APPRAISIING THE PASSAGE

Ship's Name BRITISH INNOVATOR		Voyage No	
Departing From		Estimated Date of Departure	
Destination		Estimated Date of Arrival	
DATA TO BE SUPPLIED BY MASTER			
ETA Required: Date		Weather Routed YES / NO	
Charter Speed Knots	Ordered Steaming Condition	Estimated Speed	Knots
Limitations			
Requirements			
DATA TO BE SUPPLIED BY THE CHIEF OFFICER			
Maximum draft at	Departure	Passage	Arrival
ADDITIONAL INFORMATION REQUIRED			
Other			
DATA TO BE SUPPLIED BY CHIEF ENGINEER			
Any limitations on use of main propulsion plant? Yes / No Details			
Any steering gear problems? Yes / No Details			
Any other limitations or requirements? Yes / No Details			
DATA TO BE SUPPLIED BY THE NAVIGATOR			
Departure Port Lt = UTC +/- Hrs		Destination Port Lt=UTC +/- Hrs	
Any limitations caused by defective navigation equipment? Yes / No Details			

APPENDICES TO THIS PASSAGE PLAN

1. List of Charts and Publications Form	6. Vessel's Particulars, Information for Pilot
2. Information for inclusion in the Planning Stage	7.
3. Table of Courses, Distances and ETA's	8.
4. Passage Plan Monitoring Form	9.
5. Weather Map and or Information	10.

FINAL PLAN APPROVAL

Originator	Name	Sign	Date
Approval Master	Name	Sign	Date

4.1.1 PASSAGE PLANNING - APPRAISAL

Before any voyage can be embarked upon or indeed, any project undertaken, those controlling the venture must have an understanding of the risks involved.

The appraisal stage of passage planning examines these risks. If alternatives are available, these risks are evaluated and a compromise solution is reached, whereby the level of risk is balanced against commercial expediency. The appraisal should be considered as the most important part of passage planning, as it is at this stage that all pertinent information is gathered and a firm foundation for the plan is laid. The urge to commence planning as soon as possible should be resisted, as time allocated to appraisal will pay dividends later.

Information Sources

The Master's decision on the overall conduct of the passage will be based upon an appraisal of the available information. This appraisal will be made by considering the information from sources including:

- Chart catalogue
- Navigational charts
- Ocean Passage for the World
- Routing charts or pilot charts
- Sailing directions and pilot books
- Light lists
- Tide tables
- Tidal stream atlases
- Notices to Mariners
- Routing information
- Radio signal information (including vts and pilot service)
- Climatic information
- Load line charts
- Distance tables
- Electronic navigational systems information
- Radio and local warnings
- Owner's and other unpublished sources
- Draught of vessel
- Personal experience
- Mariner's hand book

Having collected together all the relevant information, the Master, in consultation with his officers, will be able to make an overall appraisal of the passage, which may be one of, or a combination of, the following:

Ocean Passage

The passage may be a trans-ocean route, in which case the first consideration will need to be the distance between ports, followed by the bunker and stores requirements and availability en route, in case of emergency and at the load discharge ports. A great circle is the shortest distance, but other considerations will need to be taken into account.

Meteorological conditions will need to be considered, even if the recommended route is longer in distance, as it may well prove shorter in time and the ship less liable to suffer damage.

Ocean currents may be used to advantage and weather systems also need to be considered, i.e. tropical revolving storm.

Coastal Passage

The main consideration at the appraisal stage will be to determine the distance.

The courses should be laid off, staying well clear of coastlines and dangers, and whilst in soundings, due attention must be given to the vessel's draught and minimum under-keel clearance.

When the ship is passing through areas where IMO adopted traffic separation and routing schemes are in operation, such routing is to be complied with.

Appraisal completed

Having made an appraisal of the intended voyage, the Master will determine his strategy and then delegate to the second officer the planning of the voyage. Irrespective of who actually does the planning, it is to be based on the Master's requirements, as it is the Master who carries the final responsibility for the plan.

4.1.2 PASSAGE PLANNING - PLANNING

Passage Planning

Passage plans should be made from berth to berth, not from pilot station to pilot station. This requirement is justified by referring to the IMO resolution, which states that despite the duties and obligations of a pilot, his presence on board does not relieve the officer in charge of the watch from his duties and obligations for the safety of the ship. This makes it quite clear that it is necessary to plan from berth to berth, even though it is anticipated that there will be a pilot conducting the vessel at certain stages of the voyage. The plan also needs to include all eventualities and contingencies.

Planning may be considered in two stages though, at times, they will merge and overlap.

1. Ocean and open waters
2. Coastal and estuarial

Planning Sequence

Charts

Collect together all the charts for the intended voyage, putting them into the correct order. Ensure that all charts and publications have been corrected to the latest Notices to Mariners available.

No Go Areas

Coastal and estuarial charts should be examined, and all areas where the ship cannot go, carefully shown by highlighting or cross-hatching.

Margins of Safety

Before tracks are marked on the chart, the clearing distance from any no go area needs to be considered. Among the factors which will be taken into account when deciding the size of the margin of safety are:

- The dimensions of the ship
- The accuracy of the navigational systems to be used
- Tidal stream
- The manoeuvring characteristics of the ship
- The draught and under-keel clearance

Margins of safety will show how far the ship can deviate from track, yet still remain in safe water.

Safe water can be defined as areas where the ship may safely deviate.

Tracks should be drawn on the small scale charts, according to the decisions made at the appraisal stage, regarding the route to be taken.

Chart changeover points should be quite clearly shown on all charts.

Track considerations: The ship at all times must be in safe water and remain sufficiently far off a danger to minimise the possibility of grounding in the event of machinery breakdown or navigational error.

Distance from navigational hazards or grounding line will depend on following:

- The draught of the ship relative to the depth of water
- The weather conditions
- The direction and rate of the tidal streams or current
- The volume of traffic
- The age and reliability of the survey
- The availability of safe water

Regulations, both company and national, regarding off shore distances must also be observed.

Deviation from the planned track may be necessary, e.g. having to alter for another ship. However, such deviation from track should be limited, so that the ship does not enter areas where it may be at risk or closely approach the margins of safety.

Under-keel clearance: It is important that the reduced under-keel clearance has been planned for and clearly shown.

In tidal areas, adequate under-keel clearance may only be attainable during the period that the tide has achieved a given height. Outside that period, the area must be considered no go. Such a safe period is called the tidal window, and must be clearly shown, so that the OOW is in no doubt as to whether or not it is safe for the ship to proceed.

Stream and current information is often available on the chart, though more detailed information is given in Ocean Passage for the World, routing charts, and pilot books. Tidal information is available from charts, tide tables, with further local information being available in pilot books.

In confined waters, when navigating on large scale charts, the margins of safety may require the ship to commence altering course at the wheel over position, some distance before the track intersection in order to achieve the new planned track. These points are to be marked on the chart along with information on the planned rate of turn and speed that it is calculated for.

Parallel Indexing

The parallel index is a useful method of monitoring cross-track tendency in both poor and good visibility, and is a simple and effective method of continuously monitoring a ship's progress.

ARPA mapping may be used in addition, to but not to the exclusion of, other systems.

Waypoints

A waypoint is a position, shown on the chart, where a planned change of status will occur. It will often be a change of course but may also be an event such as:

- End or beginning of sea passage
- Change of speed
- Pilot embarkation point
- Anchor station etc.

Aborts and Contingencies

No matter how well planned and conducted a passage may be, there may come the time when, due to a change in circumstances, the planned passage will have to be abandoned.

Aborts

When approaching constrained waters, the ship may be in a position beyond which it will not be possible to do anything other than proceed. This is termed the point of no return, and is the position where the ship enters water so narrow that there is no room to turn, or where it is not possible to retrace the track, due to a falling tide and insufficient under keel clearance.

A position needs to be drawn on the chart showing the last point at which the passage can be aborted. The position of the abort point will vary with the circumstances prevailing, eg., water availability, speed, turning circle, etc., but it must be clearly shown, as must a subsequent planned track to safe water.

The reasons for not proceeding and deciding to abort will vary according to the circumstances but may include:

- Deviation from approach line
- Machinery failure or malfunction
- Instrument failure or malfunction
- Non-availability of tugs or berth
- Dangerous situation ashore or in harbour
- Any situation where it is deemed unsafe to proceed

Contingencies

Having passed the abort position and point of no return, one still needs to be aware that events may not go as planned and that the ship may have to take emergency action. Contingency planning will include:

- Alternative routes
- Safe anchorage
- Waiting areas
- Emergency berth

Contingency plans will have been made at the planning stage and clearly shown on the chart.

The following should be clearly stated and included in the passage planning:

- Various methods of position fixing
- Primary and secondary position fixing
- Radar conspicuous objects, visual and navaids
- Landfall lights
- Radar targets
- Buoyage
- Fix frequency
- Fix regularity

Additional information including:

- Reporting points
- Anchor clearance
- Pilot boarding area
- Tug management
- Traffic areas
- Transits (ranges)
- Compass error
- Leading lines
- Clearing marks
- Head mark
- Clearing bearing
- Range of lights
- Geographical range
- Luminous range
- Normal range
- Landfall lights
- Extreme range
- Echo sounder
- Chart overcrowding

Planning Book

In addition to the information on the charts, the whole of the passage plan should be written into a planning book for reference.

Depending upon the length and complexity of the passage, or certain parts of it, it is good practice for an abbreviated edition of the plan to be copied into a note book. This allows the person having the con, other than a pilot, to update himself as and when required, without having to leave the conning position to look at the chart.

Master's Approval

On completion, the plan must be submitted to the Master for his approval.

Plan Change

All members of the bridge will be aware that even the most thorough plan may be subject to change during the passage. It is the responsibility of the person in charge to ensure that changes are made with the agreement of the Master, and that all other members of the bridge team are advised of such change.

4.1b Checklist - Departure

ss BRITISH INNOVATOR **Departure Checklist**

Port: ..... **Date:** .....

☐ Prepare movement / bridge logbook.

☐ Give 1 hours notice to engine room. Noted in movement book.

☐ Test telegraph:

- Check who follows who
- All positions
- Noted in movement book

☐ Test Steering:

- No.1/ No.2 motor hard over to hard over (28secs)
- Test tiller
- Observe rudder angle repeaters
- Observe rudder angle repeaters
- Compare gyro in steering flat with master
- Noted in movement book

☐ Synchronise clocks with engine room:

- Noted in movement book

☐ Write date, place, time and sign:

- Course recorder
- Echo sounder
- Engine recorder

☐ Switch on echo sounder:

- Check running
- Enough power

☐ Compare master gyros with repeaters.

☐ Set up MFD:

- Select route
- Place appropriate chart on chart table

☐ **ONCE PERMISSION IS GIVEN** set up radars:

- Select appropriate range scale
- Enter nav data

☐ Check anchors cleared and ready for use.

☐ Test navigation lights.

☐ Test ship's whistle (unless port regs do not allow).

☐ Pilot card filled in.

☐ Check navtex:

- Switched on
- Recent print-outs
- Paper supply

☐ Check GMDSS station:

- MF / HF self-test
- VHF self-test
- VHF test between stations
- Recent print outs
- Paper supply
- AMVER SP sent

☐ Check ancillary equipment:

- Binoculars
- Aldis lamps
- Stationery

☐ Check communication with:

- Engine room
- VHF
- UHF
- Ensure VHFs are on appropriate channels

☐ Confirm pilot boarding time / boarding arrangements (if applicable):

Time of Pilot: .....

Pilot Ladder Type: .....

Side: .....

Height Above Water: .....

☐ Ensure appropriate signals are exhibited / prepared:

- Bravo flag
- National Ensign
- Hotel/Golf flag
- House flag
- Courtesy flag
- Constrained by draught/shapes/lights
- Local port shapes/lights

☐ Check recent warnings:

- Weather reports
- Nav reports

☐ When at stations switch on the duty fire pump.

☐ Update board with sailing information.

☐ Crew called for stations.

☐ Inform Master bridge is ready for departure:

Signed OOW: .....

Date / Time: .....

Signed Master: .....

Date / Time: .....

4.1.3 PASSAGE PLANNING - EXECUTING THE PLAN

Executing the Plan

Organisation

The plan having been made, discussed and approved, now requires its method of execution to be organised. This includes the methods used to carry out the plan and the best use of available resources. Final details will have to be confirmed when the actual timing of the passage can be ascertained.

The tactics to be used to accomplish the plan can then be agreed and should include:

- ETA at critical points to take advantage of favourable tidal streams.
- ETA at critical points, where it is preferable to make a daylight passage, or with the sun behind the ship.
- Traffic conditions at focal points.
- ETA at destination, particularly where there may be no advantage gained by early arrival.

Tidal stream information, obtained from the chart or tidal stream atlases, can be included in the planned passage when the time of transit of the relevant area is known. Ideally, the course to steer should be calculated prior to making the transit, though in fact, strict adherence to the planned track will actually compensate for tidal streams. Current information can also be obtained and shown on the chart.

It must always be borne in mind that safe execution of the passage may only be achieved by modifying the plan, in cases of navigational equipment becoming unreliable, inaccurate or time changes having to be made or delayed departure.

The officer of the watch shall have full knowledge of all safety and navigational equipment on board the ship, and shall be aware and take account of the operating limitations of such equipment. The Master is to ensure that all bridge team personnel, including newly joined navigating officers, are familiar with all navigational equipment and they are capable of undertaking the navigational watch. If found necessary, a newly joined officer should be accompanied by a competent navigating officer.

In order to achieve safe execution of the plan, it may be necessary to manage the risks by utilising additional deck or engine personnel. This will include an awareness of positions at which it will be necessary, such as:

- To call the Master to the bridge for routine situations such as approaching the coast, passing through constrained waters, approaching the pilot station, etc.
- To change from unattended to manned machinery space.
- To call an extra certificated officer to the bridge.
- To make personnel, in addition to the watch keeper, available for bridge duties such as manning the wheel, keeping lookout, etc.
- To make personnel, in addition to the watch keeper, available for deck duties such as preparing pilot ladders, clearing and standing by anchors, preparing berthing equipment, engaging tugs, etc.

Before commencing the voyage there is considerable advantage to be gained by briefing all concerned. This may take place over a considerable period of time. As the actual commencement of the voyage approaches, certain specific personnel will have to be briefed so that work schedules and requirements can be planned. In particular, any variation from the routine running of the ship e.g. doubling of watches, anchor party requirements, etc. must be specifically advised to involved personnel, either by the Master or the navigator. Such briefings will require frequent updating, and at different stages of the voyage there will have to be re-briefing. Briefing will make individuals aware of their own part in the overall plan and contribute to their work satisfaction.

Prior to the commencement of the passage, and in certain cases during the passage, it may be necessary for the Master to ensure that rested personnel are available. This could include such times as leaving port, entering very heavy traffic areas, bad weather conditions or high risk situations such as transiting a narrow strait, etc. This can be achieved, within the limits of the total number of persons available, by ensuring that watch keepers of all description are relieved of their duties well in advance of being required on watch, in order that they may be rested prior to taking up their duties.

Voyage Preparation

This will normally be the task of a junior officer who will prepare the bridge for sea. Such routine tasks are best achieved by the use of a checklist, but care has to be taken to ensure that this does not just mean that the checklist is ticked without the actual task being done.

Bridge Preparation

As and when directed by the Master, the officer responsible should prepare the bridge by:

a) Ensuring that the passage plan and supporting information is available and to hand.

b) Charts should be in order in the chart drawer, and the current chart available on the chart table.

c) Checking that chart table equipment is in order and to hand, eg., pens, pencils, parallel rules, compasses, dividers, note pads etc.

d) Checking that ancillary watch keeping equipment is in order and to hand, eg., binoculars, azimuth rings, aldis lamps etc.

e) Confirming that monitoring and recording equipment, eg., course recorder, engine movement recorder, is operational and recording paper replaced if necessary.

f) Confirming that the master gyrocompass is fully operational and follow-ups aligned. The magnetic compass should be checked.

g) Check that all instrument illumination lamps are operational.

h) Check navigation and signal lights.

i) Switch on any electronic navigational equipment that has been shut down and ensure operating mode and position confirmed.

j) Switch on and confirm the read outs of echo sounders and logs, and confirm associated recording equipment is operational with adequate paper.

k) After ensuring that the scanners are clear, switch on and tune radars and set appropriate ranges and modes.

l) Switch on and test control equipment, ie., telegraphs, steering gear as appropriate. Switch on and test communications equipment both internal and external (VHF and MF radios, Navtex, Inmarsat and GMDSS system as appropriate).

m) Test both whistles.

n) Ensure that clear view screens and wipers are operational also that the windows are clean.

o) Confirm that all clocks and recording equipment are synchronised.

p) After ensuring that there is no relevant new information on the telex, fax or Navtex, advise the Master that the bridge is ready for sea.

4.1c Checklist - Arrival

ss BRITISH INNOVATOR Arrival Checklist

Port: ..... **Date:** .....

- ☐ Prepare movement / bridge logbook.
- ☐ Give 1 hours notice to engine room. Note in movement book.
- ☐ Synchronise clocks with engine room:
  - Noted in movement book
- ☐ Write date, place, time and sign:
  - Course recorder
  - Echo sounder
  - Engine recorder
- ☐ Switch on echo sounder:
  - Check running
  - Enough power
- ☐ Check anchors are cleared and ready for use.
- ☐ Test ship's whistle.
- ☐ Check GMDSS station:
  - GMDSS station to be grounded
  - VHF Radios to low power
  - AMVER Final Report to be sent
- ☐ Check additional equipment:
  - Binoculars
  - Aldis lamp
  - Pens, pencils, rubbers, etc.
- ☐ Switch on CCTV:
  - Ensure covers are off all camaras
  - Test each camara
  - Leave on appropriate view
- ☐ Check communication to:
  - Steering flat
  - ECR
  - VHF
  - UHF
  - Ensure VHFs are on appropriate channel
- ☐ Confirm pilot boarding time/boarding arrangements (if applicable):

  Time of Pilot: .....
  Pilot Ladder Type: .....
  Side: .....
  Height Above Water: .....

- ☐ Ensure appropriate signals are exhibited / prepared:
  - Bravo flag
  - National ensign
  - Hotel/Golf flag
  - House flag
  - Courtesy flag
  - Constrained by draught/shapes/lights
  - Local port shapes/lights
- ☐ Check recent warnings:
  - Weather reports
  - Nav reports
- ☐ Before mooring switch on duty fire pump
- ☐ Pilot Card filled in.
- ☐ Crew called for stations.
- ☐ Inform the Master of readiness and any new relevant arrival information:

Signed OOW: .....
Date / Time: .....
Signed Master: .....
Date / Time: .....

4.1.4 PASSAGE PLANNING - MONITORING

Monitoring the Ship's Progress

Monitoring is ensuring that the ship is following the pre-determined passage plan, and is a primary function of the officer of the watch. The OOW may be alone, assisted by other ship's personnel, or acting as back-up and information source to another officer having the con.

Monitoring consists of following a series of functions, analysing the results and taking action based upon such analysis.

Fixing Method

The first requirement of monitoring is to establish the position of the ship. This may be done by a variety of methods, ranging from the very basic three bearing lines, through a more technical use of radar ranges / bearings, to instant read out of one of the electronic position fixing systems, eg., Decca, Loran or GPS.

The result in the previous paragraph, is always the same. However the fix has been derived, the end result is no more than a position. It is how this information is used that is important.

Visual Bearings

As stated above, fixing methods vary. Basic fixing consists of more than one position line obtained from taking bearings using an azimuth ring on a compass.

Gyrocompass or magnetic compass, the bearings are corrected to true, drawn on the chart and the position shown. Three position lines are the minimum required to ensure accuracy.

Poor visibility or lack of definable visual objects, may prevent a three-bearing fix being made. In this case radar driven ranges may be included in the fix and under some circumstances make up the whole of the fix.

In any case, a mixture of visual or radar bearing and radar ranges is acceptable. Electronic position fixing may also be used, particularly where there are no shore-based objects to be observed and the radar coastline is not distinct.

Frequency

Fix frequency may have been determined at the planning stage. Even so this may have to be revised, always bearing in mind the minimum frequency is such that the ship cannot be allowed to get into danger between fixes.

Regularity

Fixing not only needs be accurate and sufficiently frequent, it also needs to be regular.

Estimated Position

Regular fixing also allows a fix to be additionally checked. Each time a position has been fixed, it is good practice to estimate the position that the ship should have reached at the next fix.

It is a good practice to observe the echo sounder reading at the same time when taking a fix, and writing this reading on the chart beside the fix. The echo sounder recording should also be marked with the time and date of the fix, when tested and when switched on/off. If the observed reading is not the same as indicated on the chart then the OOW should realise that something is wrong. It may be that the chart is wrong and that the ship is heading into danger.

Cross Track Error

Having fixed the position, the OOW will be aware of whether or not the ship is following the planned track, and whether or not the ship will be at the next waypoint at the expected time. If the ship is deviating from the planned track, the OOW must determine whether or not such deviation will cause the ship to sail in to danger and what action should be taken to remedy the situation. Apart from deviating from the track to avoid an unplanned hazard such as an approaching ship, there is no justification not to correct the deviation and get the ship back on to the planned track.

The OOW must use his judgement as to how much he needs to alter course to return to track, bearing in mind that even when he has returned to the planned track, he will need to leave some of the course correction on, in order to compensate the cause of earlier deviation.

To Observe the International Regulations for Prevention of Collisions at Sea

Irrespective of the planned passage, no ship can avoid conforming to the requirements of the 'rule of the road' as these rules are quite clear and are internationally accepted and understood by all OOWs.

Rule 16 States: Every vessel which is directed to keep out of the way of another vessel shall, so far as possible, take early and substantial action to keep well clear.

Despite the requirement to maintain track, rule 8 makes it quite clear that the give-way ship must keep clear, either by altering course or if this is impossible, then by reducing speed, or a combination of both these factors. Proper planning will ensure that the ship will never be in a situation where such action cannot be taken.

In areas of heavy traffic and proximity of dangers, the person having the con will have to hold a delicate balance of other ship avoidance and planned track maintenance. The priority will be to avoid collision, but not at the expense of grounding.

Non-Navigational Emergencies

The planning should have allowed for contingencies, but even the best plan cannot allow for every conceivable situation. Situation awareness and careful assessment of the situation, coupled with the principles of bridge team management, will help to prevent a bad situation becoming worse.

Time Management

In the event that the ship is ahead of or behind the planned ETA at the next waypoint, the OOW must use his judgement as to whether the speed is adjusted or not. In some instances, as for example when it is imperative that the ship's ETA is critical to make a tide, then ETAs have to be adhered to.

Lookout

Rule 5 of the international regulations for preventing collisions at sea states every vessel shall, at all times, maintain a proper lookout by sight and hearing, as well as by all available means appropriate, in the prevailing circumstances and conditions, so as to make a full appraisal of the situation and of the risk of collision.

The keeping of an efficient lookout needs to be interpreted in its fullest sense, with the OOW being aware that lookout includes the following items.

A constant and continuous all-round visual lookout enabling a full understanding of the current situation and the proximity of dangers, other ships and navigation marks.

Visual observation will also give an instant update of environmental changes, particularly visibility and wind.

Visual observation of the compass bearing of an approaching ship will quickly show whether or not it is changing and whether or not it needs to be considered a danger.

Visual observation of characteristics of lights is the only way of positively identifying them, and this increases the OOW situational awareness.

The lookout will also include the routine monitoring of ship control and alarm systems, eg., regularly comparing standard and gyrocompasses and that the correct course is being steered.

Electronic aids should not be overlooked or ignored under any circumstances, but it should be remembered that echo sounders, radars, etc., are aids to navigation, not merely single means of navigation.

Also included in the concept of lookout should be the advantageous use of the VHF on the appropriate channels, which allows the ship to become aware of situations arising long before it is actually in the affected area.

Under Keel Clearance

Routine observation of the echo sounder should become one of the watch procedures.

Waypoints

Waypoints are good indicators of whether the ship is on time or not. If not, then something has occurred or is occurring which has affected the passage and the OOW will take steps to correct this occurrence.

Transits (ranges)

Transits can be used as a wheel-over point, also to confirm that the ship is on schedule.

Leading Lines

The transit of two readily identifiable land-based marks on the extension of the required ground track, usually shown on the chart, are used to ensure that the ship is safely on the required track.

Natural Leading Lines

Sometimes the OOW may be able to pick up a navigation mark in line with an end of land, thus confirming that the vessel is on track.

Clearing Marks and Bearings

Clearing marks and clearing bearings, whilst not being considered to be a definitive fix, will indicate to the OOW that the ship is remaining in safe water.

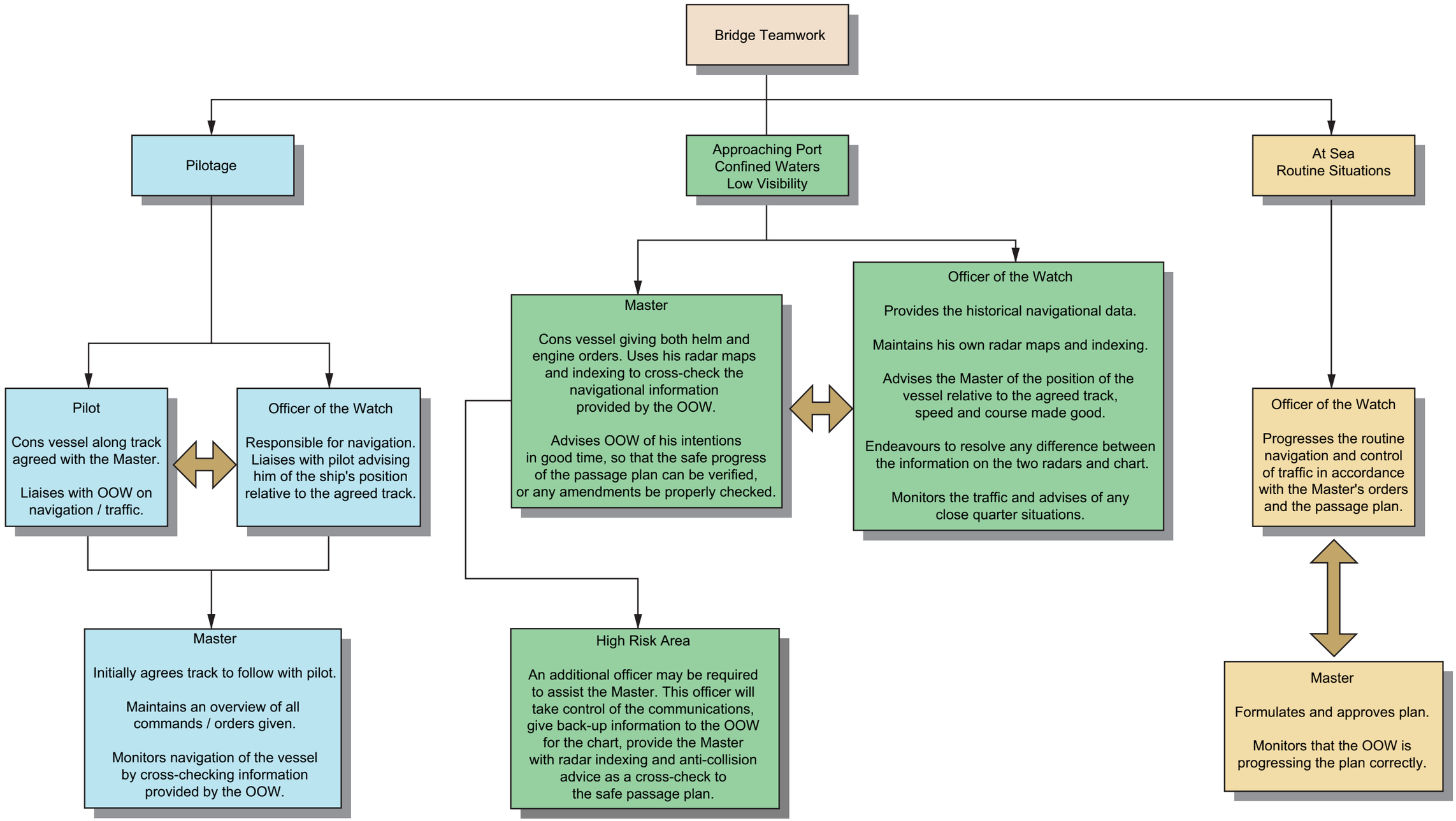
Light Sectors

The changing colours of sectored lights can also be used to advantage by the OOW who, being very aware of it, will realise that the ship is sailing into danger.

4.2 Operational Procedures

Illustrations

Illustration 4.2.1a Bridge Teamwork



4.2 OPERATIONAL PROCEDURES INCLUDING CHECKLISTS

4.2.1 BRIDGE TEAMWORK

Safe navigation is the most fundamental attribute of good seamanship. Sophisticated navigational aids can complement the the basic skills of the navigator, but sophistication can bring its own dangers and there is a need for precautionary measures against undue reliance on technology. Experience has shown that that bridge teamwork and properly formulated procedures are critical in maintaining a safe navigational watch.

In determining the composition of the bridge team the Master should take into consideration:

- The state of visibility
- The anticipated traffic density
- The proximity of navigational dangers or other routing measures such as traffic separation schemes
- The additional workload that may be caused by nature of the vessel's immediate operating requirements and anticipated manoeuvres
- The professional competence of the bridge personnel and their familiarity with the vessel's equipment and characteristics
- The operational status of the bridge equipment and controls
- The fitness of the members of the bridge team and the need to ensure that all members of the bridge team have had the rest periods as required by the STCW Code
- The need to ensure that the bridge is at no time left unattended

All members of the ship's complement that have bridge navigational duties will be part of the bridge team. The OOW is in charge of the bridge team for that watch until such time as they are relieved.

It is most important that the bridge team work together closely, both within and across the watches, as decisions made during one watch can, and will, have an impact on another watch. All non-essential activity on the bridge should be avoided.

The members of the bridge team should have a clear and unambiguous understanding of the information that should be routinely reported to the Master of the vessel, and the circumstances under which the Master should be called.

The OOW will continue to be responsible for the conduct of the watch, despite the presence of the Master on the bridge, until informed specifically that the Master has assumed responsibility for the watch. The Master's decision to take over the watch must be clear and unambiguous and the fact recorded in the Deck Log Book.

It is important for a ship's complement to co-ordinate their activities, communicate effectively and work effectively as a team. During emergency situations this is vital.

A bridge team that has a plan that is understood and is well briefed, with all members working together as a team, will have good situation awareness and will be able to anticipate potentially dangerous situations. They will recognise the development of a chain of errors and will be able to take early and positive action to break the sequence and avoid a possible disaster.

4.2.2 TAKING OVER THE WATCH

The officer of the watch should not hand over responsibility for the watch if there is any doubt whatsoever, as to the ability or fitness of the relieving officer to carry out their duties effectively. When in any doubt, the Master should be informed.

Before accepting responsibility for the watch the relieving officer must be satisfied with:

- The contents of any standing and night orders or special instructions relating to the safe navigation of the vessel
- The position, course, speed and draught of the vessel
- The operational status of all navigational and safety equipment that is in use or may be required to be used during the course of the watch
- Prevailing environmental conditions, including the state of visibility, wind, sea and current and the effect of these factors on the course and speed of the vessel
- The procedures for use of the main engines their status and the watchkeeping arrangements for the engine room
- The errors of the gyro and magnetic compasses
- The presence and movements of any vessel in sight or known to be in the vicinity
- Any conditions or hazards that are likely to be encountered during the course of the watch
- The effect of trim list, water density or squat on under-keel clearance
- Any other circumstance that may be of concern during the watch

4.2.3 WATCHKEEPING

The officer of the watch (OOW) is the Master's representative and is in charge of the bridge team.

The watchkeeping duties of the OOW include, but are not restricted to:

- The maintenance of a proper all round lookout
- Collision avoidance and compliance with the collision regulations
- The plotting of the vessel's position at regular intervals and monitoring the vessel's progress
- Periodic checks on the navigational equipment in use, including the gyro and magnetic compasses
- The keeping of records appertaining to the safe navigation of the vessel

The OOW needs to maintain a high general awareness about the vessel and its day to day operation including a general watch over the vessel's decks to monitor people working on deck.

Routine tests of the bridge equipment should be undertaken to ensure that it is functioning correctly and communicating with other systems to which it may be connected. Care should be exercised when using electronic means for plotting the position of the vessel and these should be cross referenced with visual means at every opportunity.

Manual steering should be tested at least once a watch when the automatic pilot is in operation.

The gyro and magnetic compass errors should be checked and the magnetic deviation obtained at least once a watch and after every major course alteration. The errors and deviations obtained should be recorded in the Compass Error book and in the bridge log book.

It is most important that the OOW keeps to the passage plan as prepared, and monitors the progress of the vessel in relation to that plan. Should a deviation from the plan be required for any reason, the OOW should return to the plan as soon as it is safe to do so.

Radar parallel indexing techniques are invaluable in monitoring the vessel's progress in relation to the prepared passage plan. However, when using radar for position fixing or monitoring, the OOW should check the accuracy of the Variable Range Marker and Electronic Bearing Lines, as well as the overall performance of the radar.

Sufficient information should be recorded in the bridge log book, for the actual track that the vessel followed to be reconstructed at a later date, including the vessel's position course and speed, the times of passing significant navigational marks and any other information that may be considered relevant. All positions marked on navigational charts should be retained at least for the duration of the voyage. Paper records from course recorders, echo sounders and any other relevant recording device should be suitably marked and retained. It is better to record too much information rather than too little.

The OOW should be aware of the effects of operational and accidental pollution on the marine environment, and should be familiar with MARPOL and the Shipboard Oil Pollution Emergency Plan (SOPEP).

When any cargo venting is taking place or is likely to take place, the OOW should take careful note of the prevailing weather conditions. Vented cargo must not endanger either the ship or any other installation with the danger of explosion. Prevailing winds must not be allowed to blow vented cargo towards any other vessel or shore installation. Also, the danger of ignition from lighting must be considered.

Illustration 4.2.4a Pilot Information Card

PILOT INFORMATION CARD

Ship's Name: BRITISH INNOVATOR Call Sign:

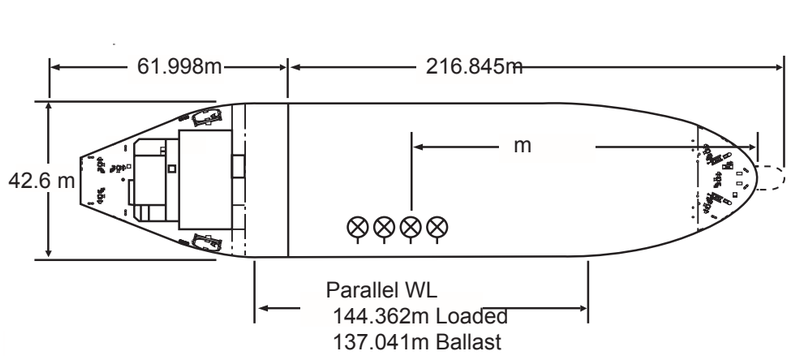
Port: Date:

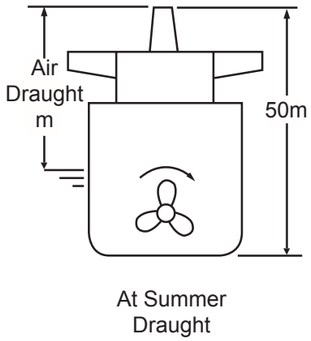
Draught: Forward m Aft:: m Year Built:

Air Draught: 50 m Deadweight: 67,659.7mt Displacement: 75,108.6mt

SHIP'S PARTICULARS

Length OA:	278.8m	Anchor Chain - Port:	14 Shackles	Starboard:	14 Shackles
Breadth:	42.6m	Stern:	N/A		
Bulbous Bow:	Yes	(1 Shackle = 27.5m / 15 Fathoms)			





Engine Type: Direct Drive, Steam Turbine Maximum Power: 39,500 PS			
Manoeuvring Engine Order	RPM	Speed (knots)	
		Loaded	Ballast
Full Ahead	53	12.61	12.37
Half Ahead	45	10.83	10.64
Slow Ahead	35	8.44	8.24
Dead Slow Ahead	25	5.38	5.18
Dead Slow Astern	25	Time Limit Astern:	30 min
Slow Astern	35	Full Ahead to Full Astern:	525 Seconds
Half Astern	45		
Full Astern	53	Minimum rpm:	
		Astern Power:	70% ahead

STEERING PARTICULARS

Type of Rudder:	Semi Balanced
Maximum Angle:	35°
Rudder Area:	m^3
Hard Over to Hard Over:	25.6 Seconds
Rudder Angle for Neutral Effect:	0°
Thruster:	Bow Electric C/P

CHECKED IF ABOARD AND READY

Anchors				Indicators:	
Whistle				Rudder	
Radar		cm	cm	RPM	
ARPA				Rate of Turn	
Speed Log		Doppler: Yes/No		Compass System	
Water Speed				Constant Gyro Error	± °
Ground Speed				VHF	
Dual - Axis				Elec. Pos. Fix. System	
Engine Telegraphs				Type	
Steering Gear					
Number of Power Units Operating					

OTHER INFORMATION

4.2.4 PILOT PROCEDURES

Pilots are engaged to provide local knowledge of a port or area through which the vessel is passing.

When they have embarked and arrived on the bridge, the pilot becomes a member of the bridge team. The Master may either delegate the conduct of the vessel to the pilot, in close co-operation with the Master and OOW, or he may keep the con himself with the pilot giving advice. Either way, it is important that the Master/pilot relationship is agreed and clearly understood.

The presence of a pilot does not relieve the Master or OOW of their duties and obligations with regard to the safety of the vessel. Should the Master, or OOW, in the absence of the Master, be in any doubt as to the pilot's competence or actions then they must not hesitate in informing the pilot accordingly and take over the con of the vessel.

The Master will, under normal circumstances, remain on the bridge during the pilotage. However, in the event of a long pilotage, it may not be practical for the Master to remain on the bridge throughout. In such cases he must delegate his authority to a responsible officer, probably the OOW, exactly as he would do at sea.

Master/Pilot Information Exchange

It is often the case that the Master of the vessel is not familiar with the pilotage area and that the pilot is not familiar with the handling characteristics of the vessel.

When the pilot arrives on the bridge it is normal practice for the Master to make time for a brief discussion with him. This will include such items as the pilot's planned route, his anticipated speeds and ETAs, both en route and at the destination and also what assistance he expects from the shore, such as tugs and VTS information.

The Master should advise the pilot of the:

- Ship's particulars
- Speeds at various engine rpm
- State of readiness of relevant equipment
- Manoeuvring characteristics
- Mode of propulsion and direction of rotation of propeller
- Any other information that he feels is relevant

Much of this information can be be made readily available on the Pilot Information Card, a copy of which should be handed to the pilot as he arrives on the bridge of the vessel.

The pilot will need to be acquainted with the bridge and to agree how his instructions are to be executed. Some pilots prefer to operate the controls themselves, while others will leave that to the ship's staff. On large vessels, such as this, it is usual for the ship's staff to operate the controls, so that the pilot remains free to move about the bridge. He will need to know where the VHF is situated and how to change channels. He may also require a radar to be made available for his use. Care must be taken to alter the mode of operation and range of the radar from that set by the pilot.

The time available for the Master/Pilot exchange depends upon several factors, including :

- The position of the pilot boarding area. Often this is such that there will be little time between the pilot actually entering the bridge and taking over the con of the vessel.
- The speed of the ship at the pilot boarding area.
- Environmental conditions such as poor visibility, strong winds, rough seas, strong tides or heavy traffic may inhibit the handover of the con to the pilot.
- Where circumstances do not permit a full Master/pilot exchange to take place then the bare essentials should be covered immediately and the rest of the discussion held as soon as is safe and practicable.

Many ports use helicopters for the embarkation and disembarkation of pilots. This can usually be achieved away from areas of heavy traffic or constrained waters and without the need to reduce speed. See section 4.3.1 for advice on helicopter operations.

Planning

A properly planned passage does not stop at the pilot boarding area.

The passage plan continues from sea to berth, or vice versa, the boarding of the pilot, and the areas where a pilot has the con, being part of the passage plan. This enables the Master and OOW to compare the progress of the ship with the planned track and also familiarises them with the constraints and other details of the pilotage. Abort and contingency planning will assist, should the ship experience navigational or other problems.

The Master and the bridge team should, as far as is possible, be aware of the pilot's intentions and be in a position to query his actions at any stage of the passage. This can only be effectively brought about by the members of the bridge team consulting all the available sources of information prior to entering the pilotage area and being aware of its difficulties and constraints.

Monitoring

The vessel's position must be plotted and progress monitored in exactly the same manner when the pilot has the con, as it is under normal conditions. Such monitoring must be carried out by the OOW, and any deviations from the planned track or speed observed and communicated to the Master. From such information the Master will be in a position to question the pilot's decisions with confidence, should the need arise.

Pilot Embarkation/Disembarkation Procedure

a) Give the required ETAs to the pilot station and agree a time and position for the embarkation or disembarkation of the pilot. Also establish on which side the pilot ladder is required.

b) Give the engine room the required notice.

c) The pilot ladder or the accommodation ladder should be suitably rigged, with a lifebuoy and heaving line ready for immediate use.

d) An officer and assistant are assigned to ensure that the pilot is safely embarked or disembarked.

e) A suitable communication link should be established between the bridge and the deck party.

f) Ensure that the embarkation area is clear of oil or grease and any unnecessary objects.

g) Provide adequate illumination, if dark.

h) The engines should be on standby and the steering in manual.

i) The time and place of pilot embarkation and disembarkation should be recorded in the Bridge Movement Book and Deck Log Book.

4.2.5a Checklist - Low Visibility

ss BRITISH INNOVATOR **Low Visibility Checklist**

Port: ..... **Date:** .....

To be completed in the event of low visibility:

- ☐ Comply with the requirements of the International Collision Regulations.
- ☐ Sound fog signals.
- ☐ Engine ready for immediate manoeuvring.
- ☐ Proceed at safe speed.
- ☐ Inform Master.
- ☐ Post lookouts.
- ☐ In congested waters revert to hand steering immediately and start second steering motor.
- ☐ Check both radars are running and ARPA operational, commencing plotting targets.
- ☐ Exhibit navigation lights.
- ☐ Confirm VHF monitoring the appropriate channels.
- ☐ Echo sounder operational.
- ☐ Bridge and engine room clocks to be compared.

Signed OOW: .....
Date / Time: .....
Signed Master: .....
Date / Time: .....

Note!

1. The degree of reliance placed on radar in reduced visibility is a matter for an individual officer's judgment, based on the circumstances and operating parameters of the equipment.
   Use of the radar does not relieve the officer of complying with the Collision Regulations.

2. Where possible full speed is to be reduced to a safe speed prior to entering an area of low visibility.
   Any subsequent variations in speed should be made as early as possible to comply fully with the Collision Regulations and where necessary to avoid a close quarter situation developing.

3. If near land consideration may be given to clearing the anchors ready for use in an emergency.

4.2.5b Checklist - Heavy Weather

ss BRITISH INNOVATOR **Heavy Weather Checklist**

Port: ..... **Date:** .....

On receipt of adverse weather warning or at onset:

- ☐ Officer of the watch (OOW) to inform Master and Heads of Department.
- ☐ OOW to make public address (PA) announcement advising of weather deterioration and restricted access to weather decks. Also no working aloft without permission of the Master.
- ☐ Heads of Department to prepare and secure the vessel against heavy rolling, shipping seas, etc. Advise OOW on completion of preparations.
- ☐ Start hourly recordings of barometric pressure, sea state, wind force and direction.
- ☐ Extra vigilance and care must be taken in the completion of end of watch rounds.
- ☐ Warning of large alterations in course or speed to be given over the PA. This must be given in adequate time for personnel to prepare for changes in pitch and roll.
- ☐ Advise Master if the period of the waves is in synchronisation with the ship's motion.
- ☐ Utilise weather fax, Navtex and other weather reports to construct vessel's own weather forecast.
- ☐ Confirmation received by OOW from Heads of Department that vessel is secure and prepared for heavy weather.

Signed OOW: .....
Date / Time: .....
Signed Master: .....
Date / Time: .....

Note!

1. In the event of synchronous motion being encountered small alterations to course and/or speed may alleviate this.
2. In heavy weather, should emergency work require to be carried out on deck, the consent of the Master must be obtained. The OOW must ensure that all personnel going on deck are wearing life jackets, properly tended with lifelines, and are constantly kept in view.
3. At any time that men are working on the weather deck or in exposed positions, full account must be taken in the daily work planning by Heads of Department that the OOW may not fully appreciate the effect of altering course either into or across a long swell. These situations are most likely to occur when rounding a headland, leaving harbour or after a prolonged period of calm weather.

4.2.5 WEATHER REPORTING

Weather reports from voluntary observing ships are sent via the Inmarsat system using the two digit (41) abbreviated dialling codes or by using the HF radio telex service. Reports should be sent to the nearest coast radio station as shown on the diagram in the Admiralty List of Radio Signals Volume 1. In certain areas of the world the number of meteorological reports (OBS) from ships is inadequate. ALRS Volume 1 shows these areas on a diagram. When in these areas all ships are requested to send in OBS reports. These reports will be free of charge to the vessel. The synoptic hours of 0000, 0600, 1200 and 1800 UTC (GMT) are where possible used for recording the OBS. Transmission is to be as soon after the designated time as possible to a suitable coast earth station (CES) within the WMO zone as depicted in the ALRS. In the event of there being no CES within the zone, then transmit the OBS to the nearest available CES or coast station.

The weather reporting code FM13 X should be used to encode the reports. Precise details of the code can be found in the ALRS. Auxiliary ships and ships which are making non-instrumental observations should use the following format of the code:

BBXX	Identifier for ship report from a sea station.
D.....D	Ship's call sign consisting of three or more alphanumeric characters.
YYGGiw	YY = day of month, GG = the nearest whole hour GMT, iw= wind indicator.
99LaLaLa	Latitude in degrees and tenths of a degree.
QcLoLoLo	Quadrant of the globe and longitude in degrees and tenths of a degree.
iRix/VV	Precipitation data, wind indicator and horizontal visibility.
Nddff	Cloud cover, wind direction and wind speed.
1snTT/	Sign of temperature and the temperature in whole degrees.
4PPPP	Pressure in hectopascal at mean sea level.
7wwW1W2	Present weather, past weather.
222Dsvs	True course and speed of the ship over the last three hours.
6IsEsEsRs ICE	Thickness and rate of ice accretion.
ciSibiDizi	Various ice reports.

Code pages are provided in the ALRS for all the above sections with a full description. Should it be impractical to send the OBS in coded format it should be sent in plain language.

In addition to the above, the International Convention on the Safety of Life at Sea also requires vessels to send weather reports where dangers to navigation exist, such as icebergs, sea ice and abnormal weather systems such as tropical revolving storms, or when the wind force is in excess of force 10 and no warning has been received. In addition to the preceding situations this OBS is to be sent to all ships in the vicinity and to the nearest coast station or competent authority. Messages sent are to be prefixed with the Safety Signal 'SECURITE'.

4.3 Helicopter Procedures

4.3.1 Helicopter Operations

4.3.2 Winching

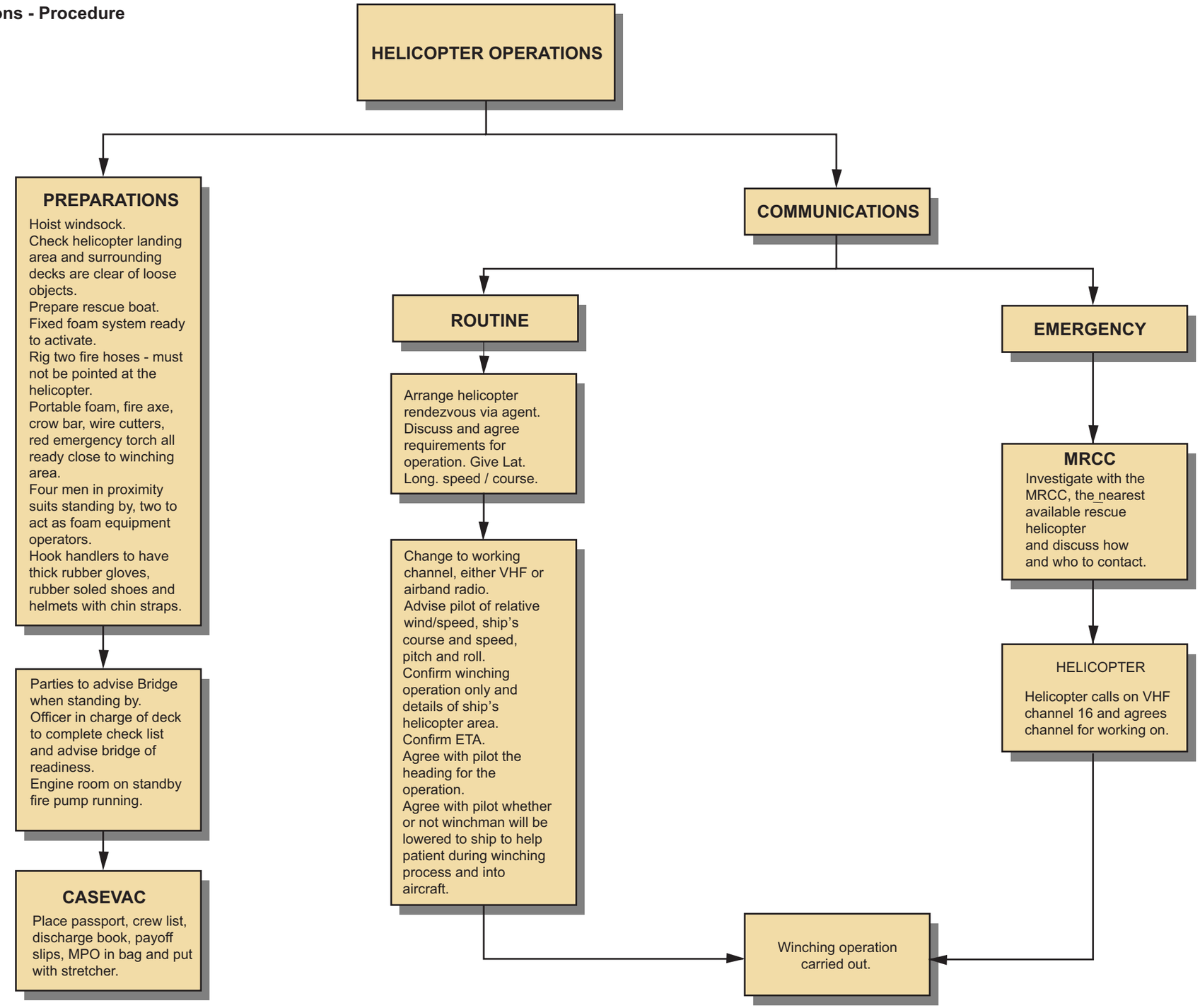
Illustrations

4.3.1a Helicopter Operations - Procedures

4.3.1b Helicopter Operations - Checklist

4.3.2a Helicopter Winching

Illustration 4.3.1a Helicopter Operations - Procedure



4.3 HELICOPTER OPERATIONS INCLUDING CHECKLISTS

4.3.1 HELICOPTER OPERATIONS

The IMO publication 'Guide to Helicopter Operations' gives comprehensive instructions and requirements for helicopter operations.

Helicopter operations are carried out in many areas for the transport of personnel, stores and increasingly embarkation of pilots.

Depending on the size, structure and type of the vessel, helicopter operations are carried out either by the helicopter landing on the vessel deck or hovering and a winching transfer being used. On this vessel, helicopters are not permitted to land.

Twin engined helicopters are always preferred for marine operations. Single engined helicopters may be used under certain conditions but only if landing on deck.

CAUTION

Single engine helicopters must not be used for hovering operations.

Winching Area

The winching area shall be situated so that it enables the helicopter pilot, hovering over the clear zone, to have an unobstructed view of the ship and be in a position which will minimise the effect of air turbulance and flue gases.

The winching height should be kept to a minimum and operations where the height is greater than 12m should be avoided.

A clear zone (minimum 5m diameter) should be clear of all obstructions and clearly marked. This area shall be marked WINCH ONLY in large white letters.

In the manoeuvring zone there should be no obstructions more than 3m high in an area 1.5 times the diameter of the clear zone, or 6m high in an area 2 times the diameter of the clear zone.

The following minimum equipment shall be in place and ready for use prior to any helicopter operations:

- Wind pennant flown to indicate relative wind direction across the ship's deck (To be illuminated at night).
- At least two dry powder fire extinguishers with aggregate capacity of not less than 45kg.
- A suitable foam application system (fixed or portable) capable of supplying foam solution at a rate of not less than 6 litres/minute for each square metre of clear zone for at least 5 minutes
- Carbon dioxide (CO_2) extinguishers with an aggregate capacity of not less than 18kg.
- Deck water system, under pressure, capable of delivering at least two jets of water to any part of the helicopter.
- At least two fire hose nozzles of the dual purpose type (jet/fog).
- Fire resistant blanket and gloves.
- Sufficient fire proximity suits.

(**Note:** In many cases the above requirements will be covered by regulations issued by the flag state.)

As well as the fire fighting equipment the following should be at hand:

Equipment

- Large axe
- Crowbar
- Wire cutters
- Red emergency signal/torch
- Marshalling battons (at night)
- First aid equipment

Manning

The deck party shall consist of one leader carrying a portable radio transceiver (walkie talkie) for communicating with the bridge, and four more persons wearing fire protective suits. Normally two will be the fire party and two the rescue party. If there are remote controlled foam monitors the number may be reduced to three provided an equivalent level of protection can be safely assured.

A vessel restricted in its ability to manoeuvre is required, by the regulations for preventing collisions at sea, to display the following signals:

- At night three all round lights in a vertical line, where they can best be seen. The highest and lowest of these lights shall be red, and the middle light shall be white.
- By day, three shapes in a vertical line where they can best be seen. The highest and lowest of these shapes shall be balls and the middle one a diamond. All these shapes shall be black in colour.

Illustration 4.3.1b Helicopter Operations Checklist

SHIPBOARD SAFETY CHECK LIST

Ref : HSE18J

APPENDIX B

For use with ICS Guide to Helicopter / Ship Operations

To be checked by the officer in charge	
1.General.	
(A) Have all loose objects within and adjacent to the operating area been secured or removed?	☐
(B) Have all aerials, standing or running gear above and in the vacinity of the operating area been lowered or secured?	☐
(C) Has a pennant or windsock been hoisted where it can be clearly seen by the helicopter?	☐
(D) Has the officer of the watch been consulted about the ship's readiness?	☐
(E) Does the leader of the deck party have a portable radio transceiver (walkie talkie) for communicating with the bridge?	☐
(F) Are the fire pumps running and is there adaquate pressure on deck?	☐
(G) Are fire hoses ready (hoses should be near to but clear of the operating area)?	☐
(H) Are foam hoses, monitore and portable foam equipment ready?	☐
(I) Are dry powder fire extinguishers available and ready for use?	☐
(J) Is the deck party complete, correctly dressed and in position?	☐
(K) Are the fire hoses and foam nozzles pointing away from the operating area in case of inadvertent discharge?	☐
(L) Has a rescue party been detailed?	☐
(M) Is a man overboard rescue boat ready for lowering?	☐
(N) Are the following items of equipment to hand?	☐
(i) Large axe	☐
(ii) Crowbar	☐
(iii) Wire cutters	☐
(iv) Red Emergency signal torch	☐
(v) Marshalling batons (at night)	☐
(vi) First aid equipment	☐
(O) Has the correct lighting (including special navigation lights) been switched on prior to night operastions?	☐
P) Is the deck party ready, wearing brightly coloured tabards (waistcoats) and protective helmets, and are all passengers clear of the operating area?	☐
(Q) Has the hook handler been equipped with helmet, strong rubber gloves and rubber soled shoes to avoid the danger of static discharge?	☐
(R) Is access to and egress from the operating area clear?	☐
2.Landing On.	☐
(A) Is the deck party aware that a landing is to be made?	☐
(B) Is the operating area free of heavy spray or seas on deck?	☐
(C) Have side rails, where necessary, awnings, stanchions and other obstructions been lowered or removed?	☐
(D) Where applicable, have portable pipes been removed and have the remaining apex ends been blanked off?	☐
(E) Are rope messangers to hand for securing the helicopter, if necessary? (Note: only the helicopter pilot may decide whether or not to secure the helicopter).	☐
(F) Have all personnel been warned to warned to keep clear of rotors and exhausts?	☐
3.Tankers:Additional Items For Check List.	☐
(A) Ship's not fitted with inert gas system: has pressure been released from the tanks within 30 minutes of commencement of helicopter operations?	☐
(B) Ship's fitted with an inert gas system: has pressure in cargo tanks been reduced to slight positive pressure?	☐
(C) All tankers: have all tank openings been secured following venting operations?	☐
4. Bulk Carriers And Combination Carriers: Additional Items For Check List.	☐
(A) Has surface ventilation to dry bulk cargoes ceased, and have all hatch opening been fully battened down prior to helicopter operations?	☐
5. Gas Carriers: Additional Items For Check List.	☐
(A) Have all precautions been taken to prevent emissions on deck?	☐

Master		**OOW**	
Date			

4.3.2 WINCHING

Only the hook handler may touch the winch line hook, as he is protected from static electricity by the rubber gloves and rubber soled shoes that he is wearing. Where possible the helicopter will dip the hook before hovering, to release any static electricity, but this cannot always be carried out. Do not under any circumstances tie the winch line to the ship.

Preparations are basically the same as for landing on board and the helicopter procedure checklist must be completed.

The hook handler on deck and the winchman in the helicopter play the most important part in these operations. When passengers are ascending, the hook handler should ensure that the strop is being worn correctly and should steady them as they are lifted off the deck.

When winching nets of stores or freight the hook handler should steady each load as it lands on the deck and then disengage it from the hook. Members of the deck party do not need to assist in this. The hook handler should ensure that freight being returned to the helicopter is properly stowed and that the load is properly hooked on and the safety hook shut. Only the hook handler should unhook or hook on loads. A thumbs up sign indicates that the hook has been secured or released from the load, and the hook should be hand held until it is hoisted clear of the deck. If more than one load has been delivered the empty winch nets should be placed inside one net to make up the final hoist from the ship.

Embarking - Guidance To Passengers

This will only be carried out in an emergency, providing the helicopter is twin engined.

a) Personnel to be embarked should be dressed in tight fitting clothes and wearing a safety helmet with the chin strap fastened.

b) Place yourself vertically under the helicopter winch and fit the lifting strop around your body ensuring that it is well under the armpits.

c) Pull the toggle on the lifting strop as close to the chest as possible.

d) Grip the lifting strop at face level with both hands and keep the elbows firmly against the body.

e) Give the the thumbs up signal when you are ready.

f) At the helicopter doorway the winchman will turn you to face outboard and will assist you into the helicopter. Do not try to help him, he has a set routine to follow.

g) Do not remove the strop until instructed to do so.

h) Sit where the winchman directs you, fasten your seat belt and study the in flight safety regulation.

Disembarking - Guidance To Passengers

a) Do not leave your seat until instructed to do so.

b) The winchman will check that the strop is correctly fitted.

c) Sit in the doorway when the winchman orders you to do so and give the thumbs up signal when ready.

d) When you reach the deck, let the strop fall to your feet and step clear of it.

e) Leave the operating area briskly, keeping your head down.

Rescue by Helicopter

Rescue by helicopter is used both when rescuing badly injured personnel and when rescuing a whole crew from a ship or survival craft.

The helicopter can use several types of lift as follows:

Single Lift

Single lift refers to using a single sling and being winched up into the helicopter.

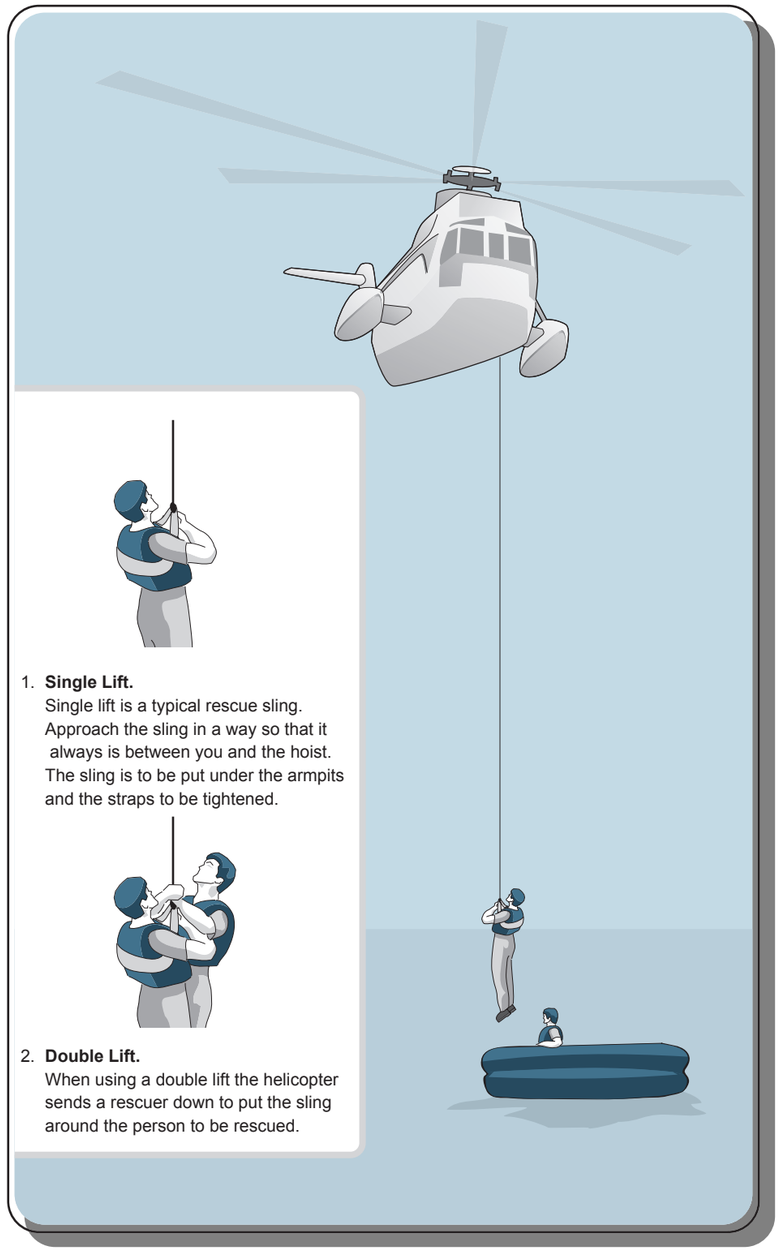
a) Place yourself vertically under the helicopter winch and fit the lifting strop around your body ensuring that it is well under the armpits.

b) Pull the toggle on the lifting strop as close to the chest as possible.

c) Grip the lifting strop at face level with both hands and keep the elbows firmly against the body.

d) Give the the thumbs up signal when you are ready.

Illustration 4.3 2a Helicopter Winching



e) At the helicopter doorway the winchman will turn you to face outboard and will assist you into the helicopter. Do not try to help him, he has a set routine to follow.

f) Do not remove the strop until instructed to do so.

g) Sit where the winchman directs you, fasten your seat belt and study the in flight safety regulation.

Double Lift

When a double lift is used the helicopter sends down a rescuer to assist and put the sling onto the person to be rescued.

As with the single lift place the sling as directed, both the rescuer and person being rescued will be winched up to the helicopter.

Basket Lift

When using a basket the person being rescued has to sit down with arms and legs inside the basket. The head is to be bent towards the knees and the hands placed around the knees.

The basket will be hoisted up and the rescued person assisted by the winchman to enter the helicopter.

Stretcher Lift

When rescuing badly injured persons a stretcher is used. The person to be lifted is strapped into the stretcher and winched up to the helicopter. This may be carried out from the deck of a large vessel.

If from a liferaft the roof of the liferaft must be deflated and all other persons seated on the deflated roof.

SECTION 5: EMERGENCY PROCEDURES

Illustrations

Illustration 5.1a Steering Gear Emergency Operation Valve Positioning Plan

Mode of Operation				Positioning of Valves									Actuating system
Description	Pump units in operation			Automatic pump isolating valves			'Safematic' Automatic system isolation valves		Hand operation of system isolation valves (V) and by-pass valves (B)				
	No.1	No.2	No.3	P1	P2	P3	Y1	Y2	V1	V2	B1	B2	Actuator
Normal operation	●	○	○	●	○	○	○	○	○	○	●	●	Actuator 1 and 2
	○	●	○	○	●	○	○	○	○	○	●	●	
	○	○	●	○	○	●	○	○	○	○	●	●	
	●	●	○	●	●	○	○	○	○	○	●	●	
	●	○	●	●	○	●	○	○	○	○	●	●	
	○	●	●	○	●	●	○	○	○	○	●	●	
	●	●	●	●	●	●	○	○	○	○	●	●	
Emergency auto isolation	●	○	○	●	○	○	●	○	○	○	●	●	Actuator 1
	○	●	○	○	●	○	○	●	○	○	●	●	Actuator 2
Emergency manual isolation	●	○	○	●	○	○	○	○	●	●	●	○	Actuator 1
	○	●	○	○	●	○	○	○	●	●	○	●	Actuator 2
	○	○	●	○	○	●	○	○	●	●	○	●	Actuator 2
Legend; ● ○	on off			energised not energised					closed open				

5.1 STEERING GEAR FAILURE

The following actions to be carried out following a failure of the steering gear:

a) Inform the Master.

b) Inform the engine room.

c) Attempt to engage the emergency steering. This procedure is posted in the steering gear room.

d) If steering cannot be re-established, 'Not Under Command' shapes or lights are to be exhibited.

e) Commence sound signalling.

f) Prepare engines for manoeuvring.

g) Take the way off the ship.

h) Prepare for anchoring if in shallow waters.

i) Evaluate the need for tug escort / assistance.

j) Evaluate the need for salvage.

k) Broadcast an URGENCY message to ships in the vicinity.

Emergency Steering

The Samsung-Hatlapa steering gear is a Rapson Slide type and consists of 2 rams, 4 cylinders, 3 pump units driven by electric motors and 1 expansion tank fitted with level switches. The expansion tank has a division plate, which will effectively separate the tank into two and thus operate as two totally isolated steering systems. Pump No.1 takes its supply from one side of the division plate whilst No.2 and 3 are from the other side. Each pump unit is capable of generating a rudder laying speed of 56 seconds. Two pump units running will take 28 seconds and with all three running the rudder will travel through 70° in 21 seconds.

Eight electrical switches, four fitted at an angle of 35° and four more at 45°, limit the rudder angle. Should these fail, mechanical stoppers are fitted at 47°.

In accordance with IMO regulations the pumps, hydraulic power circuits and vanes can operate as two isolated systems. Two separate hydraulic systems are available to allow for operation of the steering gear in the event of a vane failure or a stopper failure. This reduces the capacity of the steering gear by 50% and so the speed at which the rudder can turn is also reduced. The speed of the ship must be reduced to 70% under such conditions in order to maintain manoeuvrability.

In accordance with IMO regulations, the hydraulic pumps used in the steering gear are supplied with power from two independent sources. In the event of power failure from the main switchboard, one pump can be supplied from the emergency switchboard.

A third pump unit is provided so that, should a pump unit fail, there will still be two pumps available for use. The third pump is not connected to the SAFEMATIC system and should only be used in an emergency situation.

The third pump unit should, however, be tested on a regular basis.

Automatic Isolation System

The automatic isolation system or SAFEMATIC system is a design which covers the Single Failure Criteria Steering System required by law for tankers and passenger ships. The system consists of automatic actuator isolation valves on pump No.1 and 2 only which are operated by the level switches fitted in the expansion tank. These level switches activate the alarm and implement the division of the system should a loss of hydraulic fluid occur by energising the automatic isolation valves and so isolating the defective system.

Actions on Receipt of Steering Gear Alarms on the Bridge

Pump Unit Alarm

- Stop the pump unit in alarm
- Start the standby pump unit
- Establish and rectify the cause of the alarm

SAFEMATIC Alarm

WARNING
THE SHIP HAS LOST ITS STEERING CAPABILITY

- Immediately reduce the ship's speed to at most 70% of maximum speed
- After 45 seconds steering capability will be restored
- Use the steering gear carefully as only 50% of the torque is available
- Change the steering gear to manual emergency steering as per the outlines on the mode of operation/valve positioning plan available in the steering flat (see illustration 5.1a)
- Switch off the SAFEMATIC controls
- Repair the fault
- Switch the SAFEMATIC controls back on

Operation of Steering Gear on Loss of Bridge Control

Steering must be controlled from the steering compartment with signals transmitted to the steering compartment by means of the telephone system.

The steering gear pump must be set to local operation by means of the switch for that pump in the steering compartment. Only one pump unit may be operated when on local emergency control. The steering gear is controlled locally using the emergency manual controls on the solenoid valves. The emergency controls are actuated by direct operation of the emergency solenoid pushbuttons.

An emergency steering drill should be carried out at least once every three months when traffic and navigational restrictions permit.

The drill is to consist of the direct operation of the main steering gear by using the manual control within the steering flat. This operation is to be directed from the navigation bridge. After each drill, details and the date it was carried out are to be entered in the Official Log Book and Particulars and Records Book.

5.2 COLLISION AND GROUNDING

Minimising Damage

If a collision is inevitable, damage can be minimised by striking a glancing blow.

Collision amidships of either ship must be avoided whenever possible and a bow to bow, quarter to quarter or bow to quarter situation is preferable.

Imminent Collision/Collision

a) Sound the General Emergency Alarm.

b) Manoeuvre the ship so as to minimise the effects of collision.

c) Close all watertight doors.

d) Switch on deck lighting at night.

e) Switch VHF to channel 16 and if appropriate to channel 13.

f) Make the ship's position available to the radio room, satellite terminal and other automatic distress transmitters. Update as necessary.

g) Sound bilges and tanks after collision.

h) Check for fire/damage.

i) Prepare the lifeboats and firefighting equipment.

j) Check stability/damage stability and manoeuvring capability of the vessel.

k) Offer assistance to the other vessel as appropriate.

l) Broadcast a distress alert and message if the ship is in grave and imminent danger and immediate assistance is required, otherwise broadcast an urgency message.

m) Evalute if any unignited cargo gas is escaping. Assess the danger of ignition and issue warnings as appropriate. Minimise the danger by manoeuvring the vessel, if practical.

Stranding or Grounding

a) Stop the engine.

b) Sound the General Emergency Alarm.

c) Close all watertight doors and non-essential air intakes.

d) Maintain VHF watch on channel 16 and if appropriate on channel 13.

e) Switch on deck lighting at night.

f) Exhibit light/shapes and make appropriate sound signals.

g) Check the hull for damage and check for oil pollution.

h) Sound the bilges and tanks and compare the results against departure soundings.

i) Visually inspect compartments such as the forward store, pump room and engine room if possible.

j) Sound around the ship and determine which way deep water lies and the nature of the seabed.

k) Consider the following:

- Reducing IG pressure
- Isolating damaged tanks
- Advantages/risks in case of refloating
- Potential effect of the sea
- Potential for pollution
- Risk of ignition to escaping gas cloud
- Potential drift to a perilous location
- Setting of anchors or taking ballast in empty tanks to stabilise the vessel pending assistance
- Potential for further damage to the hull or machinery

l) Obtain information on local currents and tides, particularly details of the rise and fall of the tide and the weather forecast.

m) Isolate damaged tanks to ensure an intact hydrostatic head and integrity.

n) Reduce the draught of the ship by the transfer of cargo, ballast or fuel internally, after considering the effects of transfer on stability.

o) Make the ship's position available to the radio room, satellite terminal and other automatic distress transmitters. Update as necessary.

p) Evaluate the need for salvage assistance.

q) Make ready for lightering or towing.

r) Communicate with the Casualty Committee and owners/ operators.

s) Broadcast a distress alert and message if the ship is in grave and imminent danger and immediate assistance is required, otherwise broadcast an urgency message to ships in the vicinity.

5.3 SEARCH AND RESCUE

5.3.1 MISSING PERSONS

In the event of a person being suspected missing, the officer of the watch should be informed and steps put in place to determine if they are actually missing or just not readily available.

- Determine where and when the person was last seen
- Organise a search of the vessel including decks, engine room and all accessible spaces
- Prepare to turn the vessel round and retrace the track to where and when there was a last sighting of the person
- Post additional lookouts
- Prepare the rescue boat for immediate use and have the crew standing by

Should the on board search not find the person, then use the VHF to call to other vessels in the area asking them to keep a good lookout as they transit the area.

Other vessels may join in the search.

On arrival at the last known position, a search of the area will be required. This may involve only your own vessel or possibly others who have come to assist.

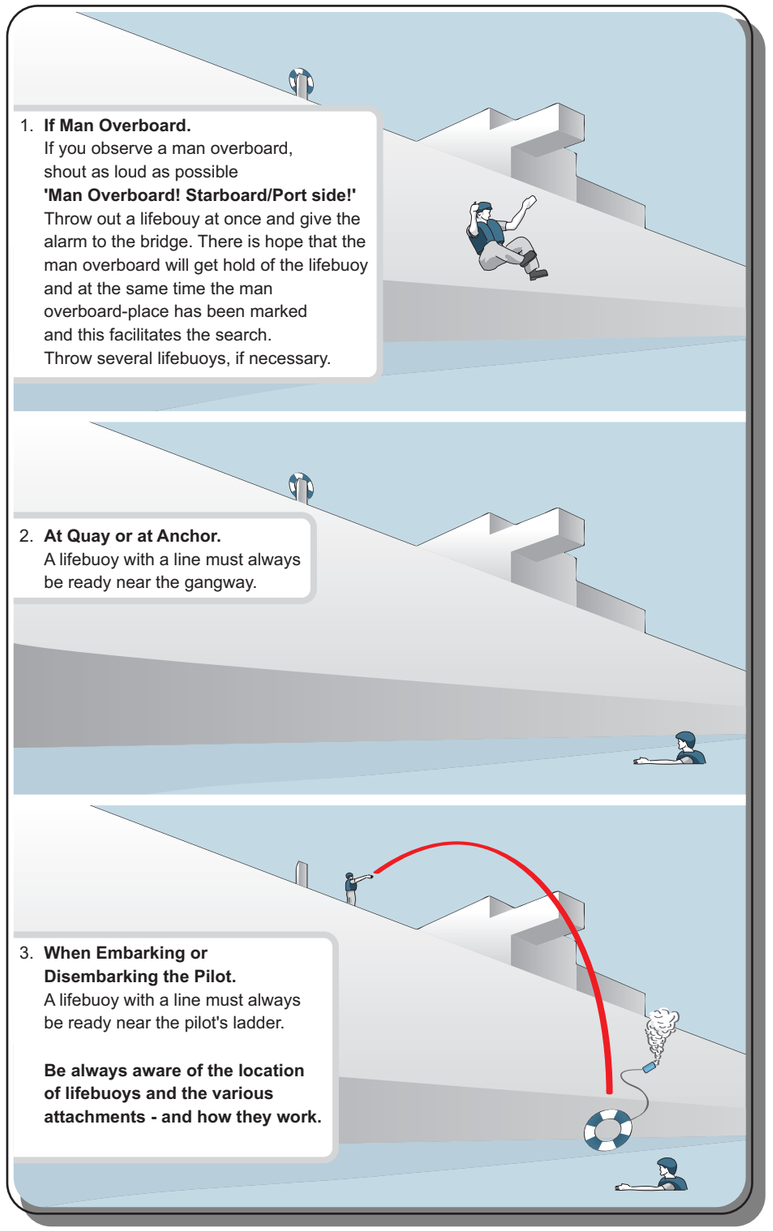
There are several search patterns that can be used and these are set out in Section 5.3.3

5.3.2 MAN OVERBOARD

In the event of a man overboard the following steps should be implemented.

- Shout ‘man overboard’ - indicating port or starboard.
- Throw the nearest lifebuoy overboard - try and maintain visual contact.
- Raise the alarm and inform the bridge.
- The officer of the watch will instigate man overboard procedures including releasing a combined light and smoke lifebuoy to assist in marking the area and sound the general alarm.
- Activate MOB on the GPS and radar if fitted.
- Turn the vessel away from the side that the person went overboard and carry out either a Williamson Turn or some other manoeuvre that brings the vessel back on its reciprocal track, heading back towards the target.
- Post additional lookouts.
- Prepare the engine room for manoeuvring.
- Advise any other vessels in the area.
- Prepare the rescue boat for immediate use and have the crew standing by.
- Manoeuvre the vessel as close as possible to the target.
- Launch the rescue boat.
- Effect a rescue and retrieve the rescue boat.
- Administer first aid and, if necessary, obtain medical assistance.

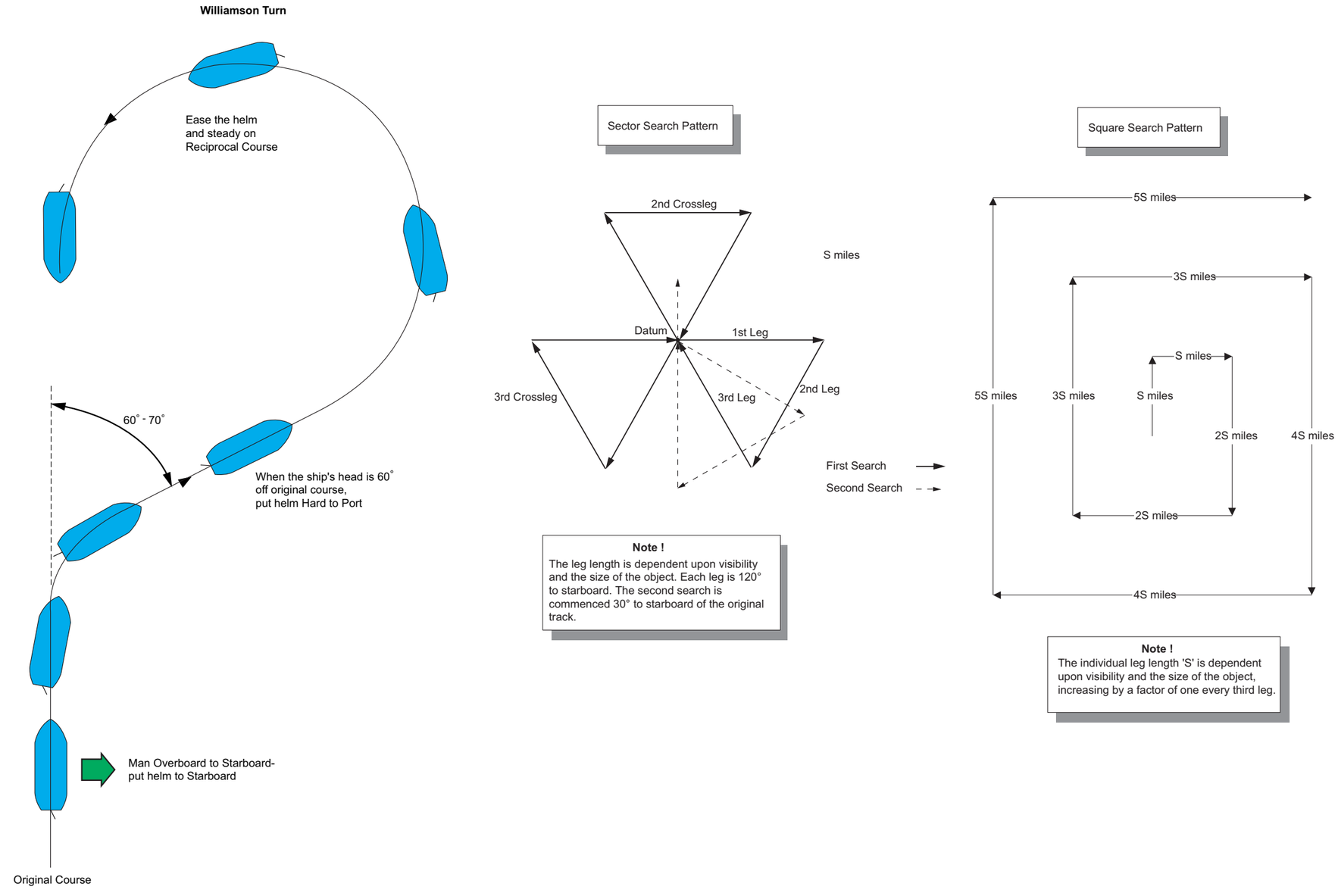
Illustration 5.3.2a Man Overboard



5.3.3 SEARCH PATTERNS

Search patterns are based on the principle that the vessel works outwards from a starting point, this can be in the form of squares circles or triangles. One or more vessels can be involved and the search area can be expanded if aircraft are involved.

Illustration 5.3.3a Search Patterns



5.3.4 BOMB SEARCH

If it is suspected that a bomb has been placed on board, the local port authority is to be informed so that they can organise a bomb disposal team.

If the vessel is at sea then the ship's personnel will have to attempt to locate the device.

The ship's crew should be divided up into small teams of two or three men and in such a way that those familiar with certain areas seach that area.

The most likely area for placing bombs is where they can cause the most damage i.e engine rooms or control rooms, but other areas will also have to be checked.

With modern technical advances it is possible the bomb could be activated by remote control. With this in mind the use of ship's portable radios should be avoided.

During any search great care should be taken to avoid disturbing any device as again movement may be the trigger for detonation.

In the event of a device being found, all personnel should be moved away to an area of safety and the immediate area sealed off as far as practicable.

Firefighting gear should be made ready so that in the event of detonation damage control can be activated very quickly.

Advice and assistance should be requested from the owners/local port authorities on how to deal with the situation and where the vessel can go to get this help.

Survival craft should be made ready in case the situation demands the abandonment of the vessel.

Individual Responsibilities when Conducting a Bomb Search

The following muster list shows the areas to be searched by each crew member in the event of a bomb search.

Each vessel will organise and produce its own plan of action for stowaway and bomb searches. The attached check list is a possible plan.

STOWAWAY - BOMB SEARCH

Master to manage search from bridge and instruct teams to search specific areas. Once area has been confirmed clear, Master then instructs team to search another area.			
Ship's Name BRITISH TRADER		Voyage No	
Location		Date /Time	
CONTROL TEAM			
	MONKEY ISLAND		
	BRIDGE INTERNAL AND EXTERNAL		
	GYRO ROOM		
	FUNNEL DECK INTERNAL AND EXTERNAL		
	ACCOMMODATION DECKS A~D - INTERNAL AND EXTERNAL - ALL SPACES.		
	SUPPORT CONTROL TEAM		
	LIASE WITH TEAM 2 AND ORGINISE ENGINE ROOM SEARCH		
	EMERGENCY TEAM 1		
	UPPER DECK INTERNAL AND EXTERNAL INCLUDING POOP DECK		
	BOTH LIFEBOATS		
	MANIFOLDS : CRANES: MAINDECK CO2 LOCKER: DECK STORE		
	DRY POWDER HOUSES		
	FOC'SLE AND FOC'SLE STORE		
	FORWARD PUMPROOM AND BOW THRUSTER ROOM		
	CARGO MACHINERY AND MOTOR ROOMS		
	UNDERDECK PASSAGEWAYS - PORT AND STARBOARD		
	DUCK KEEL - WITH ENTRY CONTROL .		
	EMERGENCY TEAM 2		
	ENGINE ROOM (FAN ROOMS TO TANK TOP)		
	STEERING GEAR FLAT		
	INERT GAS GENERATOR ROOM		
	EMERGENCY GENERATOR ROOM AND SWITCHBOARD ROOMS		
	CO2 LOCKER		
	FINAL PLAN APPROVAL		
Originator	Name	Sign	Date
Approval Master	Name	Sign	Date

5.4 EMERGENCY TOWING AND BEING TOWED

The vessel is fitted with a specially designed Emergency Towing Apparatus (ETA). Forward there is a custom built Panama fairlead, a section of towing chain and a towing bracket. On the poop is situated the automated equipment which allows the towing wire to be released and deployed by one man.

Being Towed

Stern System

To deploy this, open the flap on the box containing the orange float and messenger lines. The orange float is dropped to the waterline through the fairlead, pulling out the messenger line. The messenger line is now ready for the towing vessel to pick up and secure. Once the tug has secured the messenger line, it can haul on it, which in turn pulls out the towing pennant from the storage box. This system can be used when the vessel has lost all power and is dead in the water. (See Section 3.1.3)

Bow System

Using the bow system will require considerable manpower, time to rig and the availability of the deck machinery.

It is most likely to be used in conjunction with a salvage tug and for a pre-planned tow with the vessel in no immediate danger. To rig the system it will be necessary first to place the section of towing chain in the towing bracket, then using light lines and messengers, finally heaving on board the tug's towing wire which is then secured to the vessel's towing chain with the purpose designed shackle. Ensure that the towing chain, when slackened back, passes through the Panama fairlead. This will prevent the towing wire from unnecessary chafing. Where the ship is totally without power but towage from the bow is still necessary, a messenger can be led from the ocean going tug through the vessel's towing fairlead and returned to the tug. The tug's winch is then used to heave round the towing wire for connection to the ship's chain.

Towing Another Ship

There are many factors which determine the most suitable method of taking another vessel in tow. Type and size of the ship to be towed, the urgency of the situation, the duration of the tow and route to be taken. Taking into account the size of the vessel, and the equipment fitted, it is extremely unlikely that the towing of another vessel will be undertaken except in the case of extreme emergency. For example, preventing a vessel from grounding when neither a tug nor more suitable vessel is available, the following should be considered:

The initial information required:

- Urgency of the situation, time available before grounding
- Size of the other vessel
- Type of towing equipment available
- Is power available for deck equipment?
- Available manpower

Connecting the Tow

- Decision made by Master as to equipment usage
- Use towing vessel's emergency towing arrangement (preferred due to poop configuration)
- Use towed vessel's emergency towing arrangement
- Establish continuous radio communication between the vessels
- Pass a light line between the vessels
- Connect to emergency towing arrangement buoy line and deploy when other vessel ready
- Tow wire connected to other vessel

If picking up other the vessel's tow wire, rig a bridle between two of the poop winches using their wires and connect to the tow wire using a suitable shackle.

(**Note:** The designed brake load on each winch is 80% of the wire breaking strain but this could vary depending on the brake linings.)

Commencing Tow

a) The towing vessel to make way very gradually, using her engines in short bursts of minimum revolutions.

b) Increase speed in stages of five revolutions per minute. Do not alter course until both vessels are moving steadily.

c) When altering course do so in stages of 5°.

d) The towing vessel should use its steering gear in conjunction with the towed vessel.

e) If the towed vessel's steering is not available her rudder should be placed amidships and locked.

f) The towed vessel should not use her engines unless requested to do so.

Steering Problems

If towing by the stern and the rudder is not locked, the rudder may assume the hardover position.

If towing by the bow and the disabled vessel's engines are used, the propeller race can cause the rudder to assume a hardover position.

The disabled vessel's trim if possible should be as follows:

- Towed by the bow trim should be one in one hundred by the stern
- Towed by the stern trim should be one in eighty by the head
- Steer directly into wind to minimise yaw
- Some larger vessels yaw the least on a heading 20° to 30° off the wind

Passing Tow Line Alternatives

Use line throwing apparatus to pass an initial light line followed by heavier lines.

A helicopter with a lift capacity of two to three tons could be used to facilitate the connection.

It should be remembered that speed and yaw have a considerable effect on the forces acting against a tow. In the case of speed, the forces vary directly as the speed squared.

5.5 OIL SPILL AND POLLUTION PREVENTION

Refer to the Ship's Oil Pollution Emergency Plan (SOPEP), Vessel Response Plan (VRP).

The avoidance of pollution is of paramount importance. The company regulations must be consulted and the procedures and response plans contained must be well known to all officers.

(**Note:** Where action is taken to prevent or minimise oil spillage, no action must be undertaken that could jeopardise the safety of personnel on board and on shore.)

Checklists

Company and terminal checklists must be completed prior to commencement of any operation that may involve a risk of pollution. It is the responsibility of the Chief Engineer to ensure that these checklists are properly completed, with shore representatives in attendance, as appropriate.

Prior to loading or discharging, a terminal representative will contact the Chief Engineer to discuss safety procedures and complete the ship/shore safety checklist. If it is not possible to comply with all the provisions of the ship/shore checklist a reason should be given and agreement reached upon appropriate precautions to be taken between the vessel and the terminal. Where a question is considered to be not applicable, then a note to that effect should be inserted in the remarks column.

The Chief Engineer should take personal charge of all bunkering operations to ensure that frequent ullage/sounding checks are made and that bunker loading rates are reduced when topping off oil tanks. Similarly, when transferring fuel oil from main tanks to settling/ready use tanks, the ullages/soundings must be frequently checked. Do not rely on high level alarms and automatic pump cut-offs as these can malfunction.

Scupper Plugs

Many pollution incidents in ports are due to improperly sealed scuppers. For this reason, it is most important that the Chief Engineer and responsible watchkeeping officers check all scupper plugs routinely during oil transfer operations. Where scuppers are plugged using wooden blocks, these must be cemented into place.

CAUTION
Scupper plugs are not to be removed during bunkering operations.

Do not forget to plug the scuppers by the accommodation sides and in the areas adjacent to the oil tanks (poop deck, focsle). There are many fuel oil ventilator pipes in these areas, all of which are potential sources of oil pollution.

Where ships are fitted with spill containers around bunker tank vents and save-alls around bunker and cargo manifold connections, the plugs should be suitably secured to the save-all and fitted when in any port.

The sea water alongside the vessel must be inspected for traces of oil a few minutes after operations have begun and periodically while operations continue.

A supply of absorbent granules should be kept near the hose connections when in port. Sawdust should not be used to soak up oil as this presents a fire hazard.

If, despite the adherence to proper procedures, an oil spill does occur, all bunker operations should be stopped by the quickest means possible and should not be restarted until the source of the leak has been identified and cured and hazards from the released oil have been eliminated. In most cases, the cause of the leak will be obvious but, in some instances, such as spillages resulting from a slight hull leakage, the source may be difficult to locate, requiring the services of a diver.

Tank Overflow

Tank overflows should be avoided at all times. Correct use of the ship's ullaging equipment and testing of the high level alarms prior to commencing oil transfer operations, will help prevent this. Remember that when topping-off oil tanks, the loading rate must be reduced. If an oil tank overflows, the level within the tank must be lowered by dropping back to an empty, or partially empty tank. It must not be allowed to fill the overflow tank. If all of the other oil tanks are full, then the operation should be stopped immediately.

Precautions to be Observed Prior to and During the Loading of Oil Bunkers

(**Note:** Tanks must only be filled to 95% of capacity, permission must be obtained from BP Shipping to fill to a maximum of 98%.)

Before and during bunkering, the following steps should be complied with:

a) All engineers and other personnel involved in the bunkering process should know exactly what role they are to play and what their duties are to be. Personnel involved should know the location of all valves and gauges and be able to operate the valves both remotely and locally if required. A bunker plan should be drawn up prior to bunkering and all personnel involved in bunkering must be fully aware of the contents of the plan and understand the entire operational procedure. Company rules regarding the taking of bunkers and transfer of fuel oil within the ship must be understood by all involved in the bunkering or fuel oil transfer procedure.

b) As far as possible new bunkers should be segregated from existing bunkers on board. This should be noted in the bunkering plan and precautions taken as appropriate.

c) No internal transferring of bunkers should take place during bunker loading operations, unless permission has been obtained from the Chief Engineer.

d) The Chief Engineer should calculate the estimated finishing ullages/dips, prior to the starting of loading.

e) Bunker tanks should not exceed 95% full.

f) Any bunker barges attending the vessel are to be safely moored alongside before any part of the bunker loading operation begins. Frequent checks must be made of the mooring arrangements as the bunker barge draught will change during bunkering.

g) Level alarms fitted to bunker tanks should be tested prior to any bunker loading operations.

h) The soundness of all lines should be verified by visual inspection.

i) The pre-bunkering checklist should be completed.

j) The Chief Engineer is responsible for bunker loading operations, assisted at all times by a sufficient number of officers and ratings to ensure that the operation is carried out safely.

k) A watch should be kept at the manifold during loading.

l) All personnel involved in the bunkering operation should be in radio contact.

m) The maximum pressure in the bunker line should be below 5.0kg/cm^2. The relief valve discharges oil to No.2 port HFO tank.

n) Safe means of access to barges/shore shall be used at all times.

o) Scuppers and save-alls, including those around bunker tank vents, should be effectively plugged.

p) Drip trays are to be provided at bunker hose connections and means of containing any oil spills must be in place.

q) The initial loading rate must be agreed with the barge or shore station and bunkering commenced at an agreed signal. Only upon confirmation of there being no leakage and fuel only going into the nominated tank, should the loading rate be increased to the agreed maximum.

r) When the tank being filled reaches 90% full, the filling rate should be reduced by diverting some of the flow to another bunker tank; if the final tank is being filled the pumping rate must be reduced. Filling of the tank must be stopped when the tank reaches 95% full. When topping off the final tank the filling rate must be reduced at the barge or shore station and not by throttling the filling valve.

CAUTION

At least one bunker tank filling valve must be fully open at all times during the bunkering operation.

HFO bunker tanks are fitted with high level alarms.

All relevant information regarding the bunkering operation is to be entered in the Oil Record Book on completion of loading. The information required to be entered includes date, time, quantity transferred, tanks used and personnel involved.

Pollution Responses

Emergency Plans

The MARPOL 73/78 Regulations require that oil tankers of 150 GRT and above must be provided with a Shipboard Oil Pollution Emergency Plan, (SOPEP).

Alongside During Cargo Operations

Sound fire alarm. Make a PA announcement 'Pollution incident, all parties muster and report in' and 'No smoking on board until further notice.'

Stop the cause of pollution as quickly as possible if it is within the ship's power to do so. Utilise all available manpower to commence an immediate containment operation.

CAUTION

In some ports when loading it is forbidden to close ship valves until shore/ barge pumps have stopped. CHECK CAREFULLY, as doing that could worsen the situation by rupturing a line if flow is continuing at pressure. This detail should have been advised to the vessel as part of the pre-bunkering meeting.

Actions to be Taken

Consider floating a mooring rope to contain the spill within the confines of the ship and jetty.

Check that all personnel are present and accounted for, check and confirm who is ashore. Designate one person to look for persons not immediately accounted for on board. Record all events.

Use all possible means to prevent oil going over the side with the vessel's anti-pollution teams and equipment.

Treat any casualties - further assistance can be requested via the terminal, agents or VHF.

Restrict movement in the polluted area to necessary staff only. Depending on the nature of the occurrence, and the type/position of berth, consider readying a lifeboat for possible evacuation if fire should break out.

Send a casualty telex (initial short version).

On VHF channel 16, inform the port captain or authority of the spillage or use an alternative channel for the particular port.

If in the USA, inform the USCG. Details are in the SOPEP and Emergency Response Plan.

If in California, see additional notes on Californian Oil Spill Contingency Plans and Vessel Response Plan.

Inform the agent and get him to contact the local P + I club representative.

Breath test all watch keepers and key personnel on duty if the incident appears to have been caused by some on board factor involving them.

Other Action to Consider

Is a local contractor required to assist in the clean up? If so, liaise with agents and head office to arrange this.

Make the engines ready as soon as possible in case it is necessary to move.

Will it be necessary to disconnect the cargo hoses?

If necessary, vacate the berth. However, this may spread the pollution. If it is safe to stay (not floating in too much oil) then do not vacate.

Oil dispersant - permission must be obtained and approval gained from the local port authority before introducing any chemicals or oil dispersant into the water. Permission will probably not be given.

Recommended Pollution Equipment

- Scupper plugs
- Wilden air-driven portable pump
- Squeegees - rubber blade deck wiper
- Scoops, buckets and brushes
- 2 x 200 litre empty drums
- Absorbent granules
- Oil dispersant in portable drums
- Oil dispersant portable sprayer
- Cotton waste/rags
- Oil absorbent materials
- Protective clothing - rubber gloves, sea boots
- Sausage booms
- Patay, hand driven pump

In the event of a considerable amount of clean up equipment being used, careful consideration must be given to the disposal of oil soaked materials if these are to be disposed of by incineration.

5.6 EMERGENCY REPORTING

The Company requirements with regard to what and when to report are clearly laid down in the Company Quality Assurance Policy and Procedures.

5.6.1 AMVER

The principle of any ship reporting system is to tap the resources of the numerous merchant vessels that are at sea at the time of a marine incident. One or more vessels may offer the earliest possible response if located near the casualty. The purpose of AMVER is to maximise the effectiveness of response to a marine emergency by co-ordinating and controlling the assisting ships.

AMVER (Automated Mutual-Assistance Vessel Rescue) is operated by the United States Coastguard for all merchant vessels of more than 1,000 grt, on voyages in excess of 24 hours, regardless of nationality. AMVER centres located in New York and San Francisco are capable of processing data automatically and in the event of a marine incident co-ordinate the vessels most suitable to respond. The data is received through a vessel reporting system, these reports may be made free of charge through participating stations.

The reports are made in the following format:

Sailing Plan

This report may be made well in advance of departure from a port. The report includes the ship's name and call sign, the ports of departure and destination, and the navigational route to be followed between them, along with estimated departure and arrival times. Any special resources such as advanced communication systems should also be included in the report.

Departure Report

This report is transmitted as soon as possible after departure. It should include the ship's name, call sign, and time of departure and either confirm that the original sailing plan remains valid or update the changes instigated.

Position Report

This report is transmitted within 24 hours of departure and continues to be transmitted within 48 hour intervals during the course of the voyage. It should include the ship's name, time and position, together with the destination and latest ETA.

Arrival Report

This report takes the form of a simple statement that the vessel has reached her intended destination. It should be transmitted as soon as practicable upon arrival.

Deviation Report

This report is used to notify AMVER of any changes to the original sailing plan that take place in the course of a voyage. Should the vessel receive a change of orders the sailing plan should be reviewed and any changes that may apply advised in the form of a deviation report.

Pro-forma messages are printed in the Admiralty List of Radio Signals.

Vessels participating in the scheme also receive a comprehensive guide in the form of the AMVER users manual.

Full details of the scheme can be obtained from:

The Commander Atlantic Area,
U.S. Coastguard
Governors Island
New York
NY 1004 - 5099
USA

or

The Commander Pacific Coast Area,
US. Coastguard
Government Island
Almeda
California
94501 - 5100.

5.6.2 AUSREP

A similar system is in existence on the Australian coast under the name AUSREP. Participation in this scheme is compulsory for all vessels navigating between Australian ports. The scheme follows a similar reporting format to AMVER, and full details are listed in the Admiralty List of Radio Signals.