KONGSBERG

Functional Design Specification

IAS System

KM –Drill 8

Project:		12345678			
Product		Integrated Control & Monitoring System			
Synopsis:		Operator documentation together with KM standard K-Chief Operator Manual.			
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1 ABOUT THIS DOCUMENT

1.1 Document history

Revision	*Description of Change*
A	Adjusted for Training Purposes

1.2 References

No	*Doc No*	*Description*
1		

1.3 Definitions / Abbreviations

ECR Engine Control Room

EAP External Alarm Panel

ESD Emergency Shutdown

FDS Functional design Specification

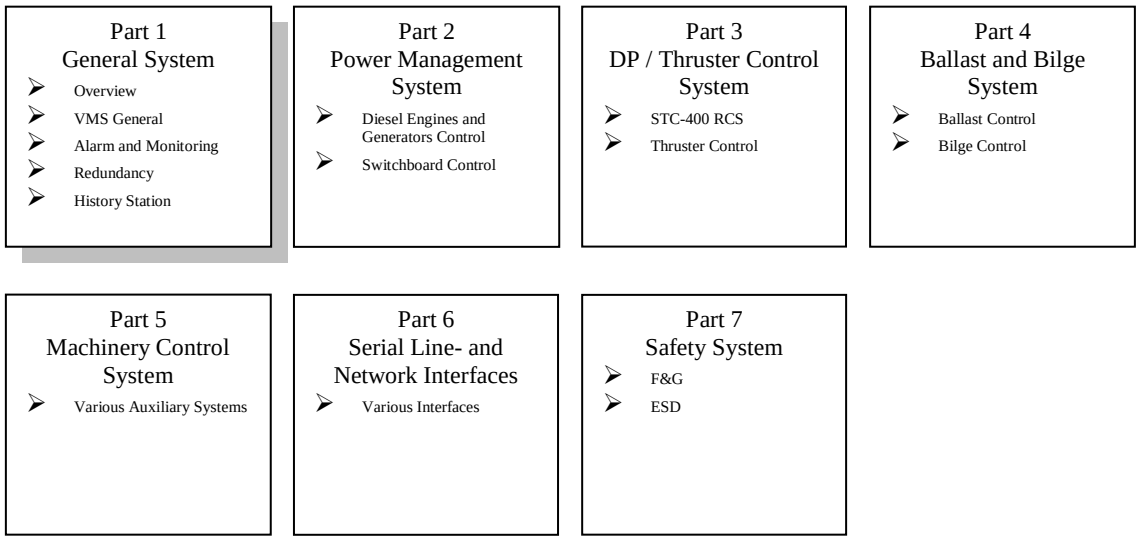
F&G	Fire and Gas
FS	Field Station (Cabinet with controller and/or RIO modules)
HS	History Station
HMI	Human Machine Interface
IAS	Integrated Automation System
I/O	Input / Output
ICS	Integrated Control System
KM	Kongsberg Maritime
KFDD	Kongsberg Functional Design Document
NDU	Net Distribution Unit
OS	Operator Station
PCU	Process Control Unit
PMS	Power Management System
PS	Process Station, Process Control Cabinet
RCA	Redundancy and Criticality Assessment
RCU	Remote Controller Unit
RCS	Remote Control System
RIO	Remote Input Output Unit
RPB	Remote Push Button
K-Pos	Kongsberg Dynamic Positioning
K-Pos OS	Operator Station intended for dynamic positioning
K-Thrust OS	Operator Station Thruster Control
K-Thrust-400	Operator Station intended for manual thruster control
K-Chief	KM Vessel Control (equal to IAS in SHI documents)
K-Chief OS	Operator Station for KM Vessel Control system
VDU	Video Display Unit
WBU	Watch Call Bridge Unit
WCU	Watch Call Cabin Unit
WCI	Watch Call Interface

2 INTRODUCTION

2.1 Purpose

This document describes the scope and functions of the Kongsberg Maritime Integrated Control System ICS as delivered to the specified vessel. Functions within other systems are not described in this document.

This document serves also as operator documentation together with KM standard operator manual.



2.2 Responsibilities

Kongsberg Maritime AS is responsible for this document.

3 SYSTEM OVERVIEW

3.1 Vessel Data

These IAS system is built for the following specified type of vessel.

Type of vessel:	S10000E Drill Ship (Dynamically Positioned)
Length, OA:	228,0 m
Length, bp:	219,4 m
Breadth (Moulded):	42,0 m
Depth (Moulded):	19,0 m
Scant Draught (MLD, Hull Scant):	13,0 m
Operating Draught (MLD):	12,0 m
Transit Draught, moulded:	8,5 m
Shipyard:	Samsung Heavy Industry, Geoje Island Korea
Build no.	
Vessel name:	
Owner:	
Classification:	ACCU and DP-3 notation of ABS

Propulsion plant:

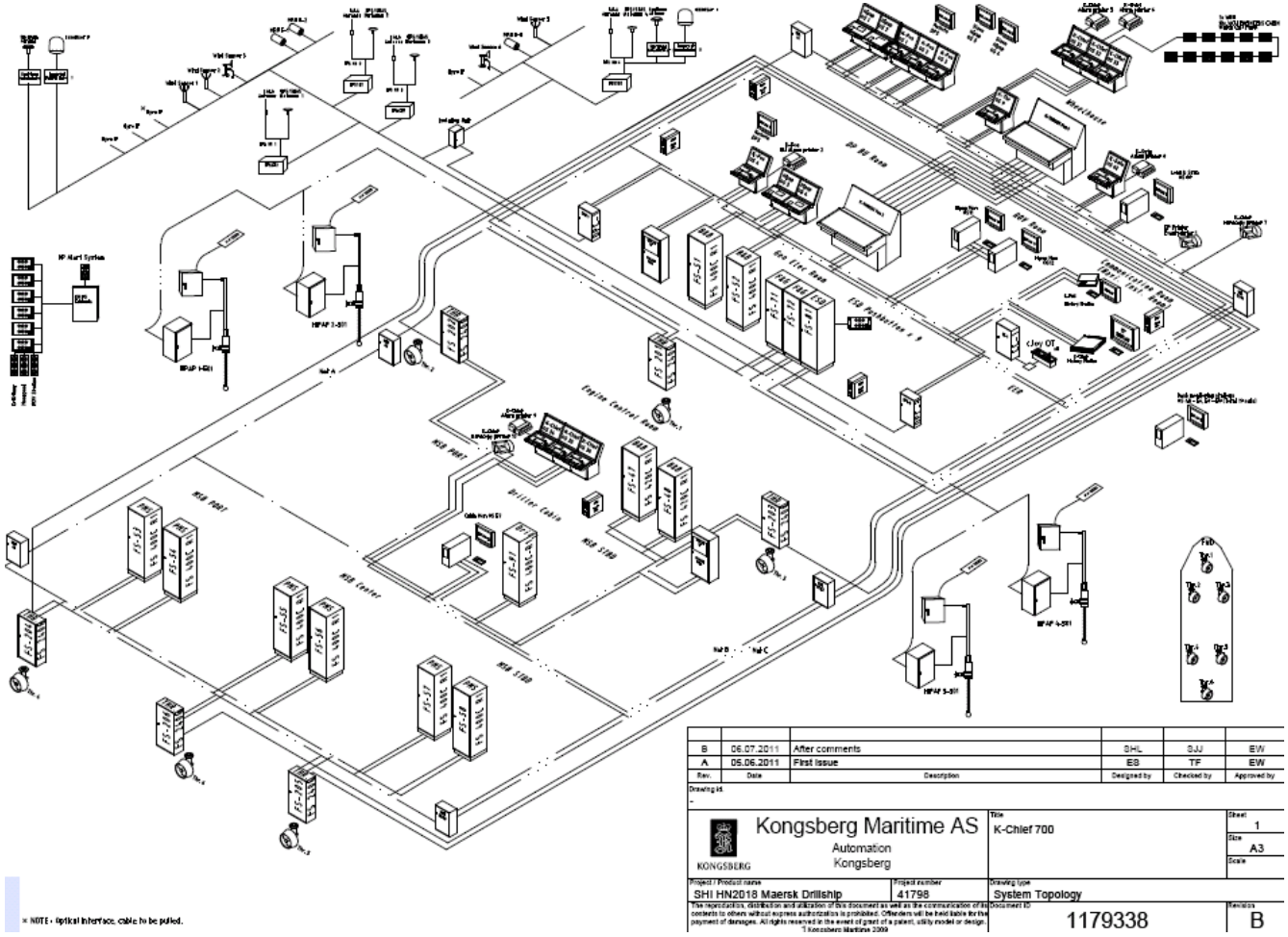
Main Engines:	Doosan, 7000 kW generator power
Thruster Drives:	ABB, ACS6000
Thrusters:	Wartsila, 5500kW

Electric power plant:

Hull Main Switchboards:	ABB,	11 kV, 60 Hz
Hull LV Switchboards:	Samsung,	220V/440 V, 60 Hz
Emergency LV switchboards:	Samsung	220V/440V, 60Hz
Drilling Switchboard for VFD:	ABB,	690V, 60 Hz
Drilling Switchboard for LV:	Samsung,	440V, 60 Hz

3.2 The Integrated Automation System

The system topology with all Field Stations, Operator Stations and auxiliary cabinets are shown in the figure below.



The integrated automation system (IAS) communicates by means of redundant high speed network.

Compared to conventional standalone controllers and alarm panels the Integrated Automation System concept offers several advantages such as:

Increased safety due to

- Redundant communication network
- Stand-alone operator stations
- Distributed process control stations
- No main computer
- Modular fail-safe hardware
- On-line diagnostic functions
- Supervision of sensor interfaces
- Supervision of machinery operation

Cost effective due to

- Reduction of sensor cabling
- Reduction of interface problems
- Eliminates conventional hard-wired consoles / mimics and reduces control room area requirements
- On-line configuration reduces dead time during installation
- Reduction in spare part requirement
- One supplier providing service for the entire control system
- Fuel optimizing by integration of dynamic positioning, thruster control and power management systems

Simple operation due to

- Process oriented man-machine communication
- Purpose-built keyboard
- Uniform operator stations

Flexibility due to

- Easy expansion of existing system
- Built-in on-line configuration tool
- Process simulation

3.3 IAS System description

Operator Stations:

The processes controlled are not dependent of the operator stations. The operator stations are used for monitoring and for operator input (manual commands) and for alarm indication / announcement. The operator stations have also the basic software and the application software for the controllers stored on the hard disc.

All configuration changes performed on the controllers will be logged and stored in a separate database. It is then possible to document the changes performed on a dedicated controller or the complete system.

The operator stations are running Windows XP as operating system.

This system includes the following operator stations:

9 Operator Stations (OS), 20 monitor OS and one (1) historical station is installed in the system.

OS	Location	Type	Screen	Printer	Remark
31	Wheel House	Console	Single	Alarm Printer 5	OPC Server for Load and Stability Calc.
32	Wheel House	Console	Single	Alarm Printer 6	
33	Wheel House	Console	Single		Version Source Safe
34	ECR	Console	Single	Alarm Printer 9	Watch call interface
35	ECR	Console	Single		Watch call interface
36	ECR	Console	Single		
40	Wheel House	Desk top	Single		Monitoring OS
41	Wheel House	Desk top	Single		Monitoring OS
42	Wheel House	Desk top	Single		Monitoring OS
43	OIM office	Desk top	Single		Monitoring OS
44	Acc. Main Eng. Office	Desk top	Single		Monitoring OS
45	Acc. Main Eng. Office	Desk top	Single		Monitoring OS
46	Open Office	Desk top	Single		Monitoring OS
47	DP Backup Room	Desk top	Single		Monitoring OS
48	ECR	Desk top	Single		Monitoring OS

OS	Location	Type	Screen	Printer	Remark
49	ECR	Desk top	Single		Monitoring OS
50	Electric Workshop	Desk top	Single		Monitoring OS
51	Electric Workshop	Desk top	Single		Monitoring OS
52	Port MSB Room	Desk top	Single		Monitoring OS
53	Center MSB Room	Desk top	Single		Monitoring OS
54	Stbd MSB Room	Desk top	Single		Monitoring OS
55	Topside LER	Desk top	Single		Monitoring OS + Clock master for NOV
56	Topside SWBD Room	Desk top	Single		Monitoring OS
57	Topside Driller Cabin	Desk top	Single		Monitoring OS
58	Port ROV Station	Desk top	Single		Monitoring OS
59	Stbd ROV Station	Desk top	Single		Monitoring OS
60	Wheel House	Console	Single	Alarm Printer 8	K-Safe
61	ECR	Cabinet OS	Single/Touch		
62	Gen. Elec. Room	Cabinet OS	Single/Touch		
69	Wheel House	Built In	Single		Load & Stability calculator
98	Communication Room	Tower	Single		History Station (HS5000)

Note: K-Chief OS 55 is set up with NTP clock server to NOV and the time sample will be GMT. Net-C will be used as a transfer to NOV. There will be a firewall at the NOV side.

Field Stations:

21 Field Stations (FS) are installed in the system. All logic with respect to safety, control and monitoring is located in the field stations. Refer table:

FS	S/Line	Location	Type FS	RCU	Redund.	Remark
053		Main SWBD Rm Port	FS 400C-R1	Double	Yes	Power Management Port
054		Main SWBD Rm Port	FS 400C-R1	Double	Yes	Power Management Port
055		Main SWBD Rm Center	FS 400C-R1	Double	Yes	Power Management Center
056		Main SWBD Rm Center	FS 400C-R1	Double	Yes	Power Management Center
057		Main SWBD Rm Stbd	FS 400C-R1	Double	Yes	Power Management Stbd
058		Main SWBD Rm Stbd	FS 400C-R1	Double	Yes	Power Management Stbd
047		Engine Control Room	FS 400C-R1	Double	Yes	Ballast / Bilge / Machinery
048		Engine Control Room	FS 400C-R1	Double	Yes	Ballast / Bilge / Machinery
051		General Elec. Room	FS 400C-R1	Double	Yes	Bilge / Machinery
052		General Elec. Room	FS 400C-R1	Double	Yes	Bilge / Machinery
071		General Elec. Room	FS 400C-R1	Double	Yes	F&G
072		General Elec. Room	FS 400C-R1	Double	Yes	F&G
073		General Elec. Room	FS 400C-R1	Double	Yes	ESD
091		Drill. SWBD Topside Room	FS 400C-R1	Double	Yes	Topside / Drilling
092		Drill. SWBD Topside Room	FS 240	NA	NA	Topside / Drilling
201		Thr1 Center Bow	FS 240C	Single	NA	Thruster 1 Field station
202		Thr2 Port Bow	FS 240C	Single	NA	Thruster 2 Field station
203		Thr3 Stbd Bow	FS 240C	Single	NA	Thruster 3 Field station
204		Thr4 Port Stern	FS 240C	Single	NA	Thruster 4 Field station
205		Thr5 Stbd Stern	FS 240C	Single	NA	Thruster 5 Field station
206		Thr6 Centre Stern	FS 240C	Single	NA	Thruster 6 Field station

Field Station Models	Description
FS240	Cabinet for approximately 240 IO's. This is a remote IO cabinet without any controller unit (RCU) and may house up to eight RIO 420 units, each of which caters for up to 32 IO.
FS 240C	Cabinet for approximately 240 IO's. Contains a single remote controller unit (RCU) and may additionally house up to eight RIO 420 units, each of which caters for up to 32 IO. The RCU controls the I/O bus and provides up to seven RS-232, RS422 or RS485 serial line interfaces and two profibus lines.
FS 400C-R1	Cabinet for approximately 400 IO's. Contains double remote controller units (RCU) that provides redundancy in computer processing and bus communication with remote I/O devices and may house up to 12 RIO 420 units, each of which caters for up to 32 IO. The RCU controls the I/O bus and provides up to seven RS-232, RS422 or RS485 serial line interfaces and two profibus lines.

3.3.1 Printers

Six printers are installed for the IAS system:

There are two different type of printers installed. Hard copy printer is an common printer for all the OS station in that room for printing screen and it is connected to net-C. The other type is matrix printers that are connected direct to the OS for printing alarm/event only.

Printer	Line	Location	Type printer	Color / Matrix	Function	Remark
5	OS31	Wheel House	OKI	Matrix	Alarm/Event	K-Chief
6	OS32	Wheel House	OKI	Matrix	Alarm/Event	K-Chief
7	Net	Wheel House	HP	Color	Hard Copy	
8	OS60	Wheel House	OKI	Matrix	Alarm/Event	K-Safe
9	OS34	ECR	OKI	Matrix	Alarm/Event	K-Chief
10	Net	ECR	HP	Color	Hard Copy	

4 KONGSBERG MARITIME VESSEL CONTROL SYSTEM

4.1 General Principles of the K-CHIEF System

The K-CHIEF System is a distributed monitoring and control system, which due to its flexibility and modular architecture can be extended to cover a wide range of applications and types of vessels.

The K-CHIEF system is built from a full range of hardware and software modules to form optimum solution to any requirement. Normal configuration of the K-CHIEF system includes machinery control and monitoring, propulsion / thruster control and monitoring as well as machinery and ballast control and monitoring integrated in the same equipment. All connected equipment can be controlled from any K-CHIEF operator station throughout the vessel.

All operator stations and field stations are self-contained units and independent of the other units, i.e. a failure in one station will not cause any other station to break down. All process logic including equipment safety and control functions are contained in the respective field station controller.

Each operator station contains a hard disc with all system configuration and acts as backup for each other during system start-up. System configuration / update can be done on-line without need of any additional equipment.

A sophisticated login / password system protects the system against mal operation.

The K-CHIEF system supports trend facilities and alarm / event recording. Process events and alarms are stored on hard discs and can be recalled on request.

Redundant network based on the Ethernet principle is installed as standard. The two nets are installed in different cable paths as far as possible. Each unit is interfaced to both nets and if a failure on one net is detected, the system will automatically use the healthy net.

4.2 IAS Main Tasks

The main tasks of the IAS system as delivered on this vessel are as follows:

- Alarm and monitoring
- Alarm and Event recording
- Trend function and history functions
- Login and access levels
- Command transfer
- Thruster control and Monitoring
- Power management system
- Diesel engine control system
- Auxiliary diesel engine control and monitoring
- Control of machinery auxiliary systems
- Ballast control and monitoring
- Bilge control and monitoring
- Fuel Oil control and monitoring
- Drilling control system monitoring
- HVAC system

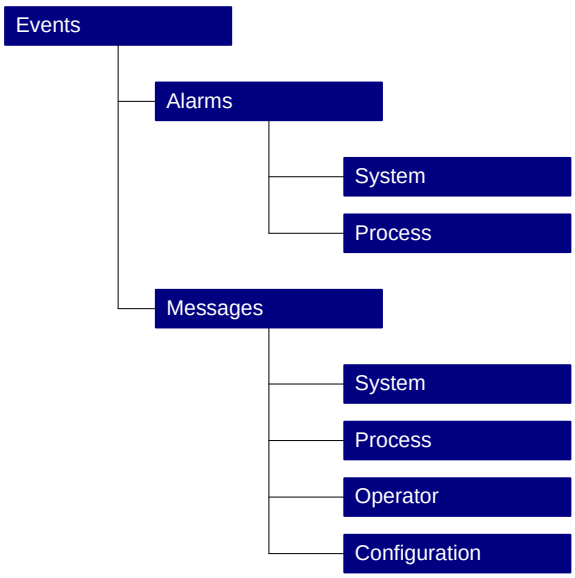
5 EVENT SYSTEM

The event system handles the notification of system and process alarms as well as messages.

5.1 Main Features

An event is a notification to the operator of some condition in the system or the controlled process that may need attention. Which events are to be notified to the operator, depends on which list is displayed and which filter is selected.

Events are classified as illustrated:



The Event Server in IAS maintains lists of the newest alarms while the state of all alarms in the system is kept by the RCU. In the different event views both dynamic and static presentations can be generated. Furthermore, the user can control the selection of what is displayed in the event views by means of 'filters'. System defined filters are associated with each list, but you can specify filters that suit specific needs. There is one list for each client connected to the event server.

The event system provides several notifications and presentation alternatives:

- Alarm line
- Event image
- Event popup
- Event decoration

- Audible alarm - a summary alarm indication
- Alarm indication by means of colour coding and flashing effect in the graphic presentation of modules in flow and process images.

5.2 Event Attributes

Systematic handling and notification and presentation of events require all events to be specified by means of a set of attributes. The text representation of these attributes is used in the alarm line and in the different views. Relevant event attributes are:

Event Type	Categorizing of events according to their cause
Time of origin	The time (local and UTC time) at which the reported condition occurred.
Originating station	Identification of the station that issued the event.
Priority	Each event is associated with a 'priority' level. The four priority levels are denoted, in increasing order, by the numbers 0 through 3
Event text	Description of the event or state that caused the event (reason).
Tag, terminal	Tag and Terminal denote the source of process events. The fields are used in case of system events too
Description	Optional attribute. The module description associated with the tag
Descriptive text	A description of the issuing module that can be understood by the operator. e.g. "pump", "generator" etc.
Value	Optional attribute. A value related to the event
Acknowledge state	Applicable for alarms only. The acknowledge state for alarms is 'Acknowledged' or 'Unacknowledged'
Alarm state	Applicable for alarms only. High, HighHigh, etc.
Command group	Optional attribute, applicable for alarms only. An identification of the command group related to the alarm.
Redundancy state	Possible values are: RP (redundant passive), RA (redundant active) or empty (no redundancy).
Origin	Area where the event occurred.

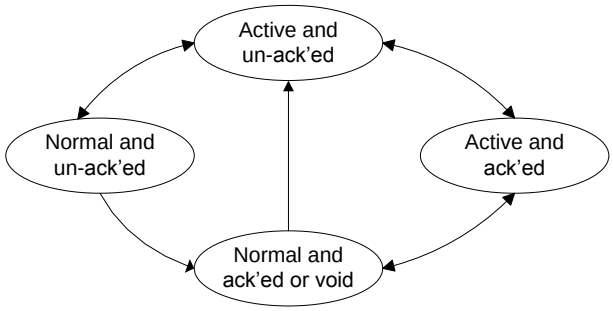
The exact event type names, used in event and alarm lists, are not necessarily identical to those used in the table above. The name associated with each event type is set in the system configuration database in section: Global/Event System/EventImage configuration parameter group *'Type Names'*.

5.3 'Alarm State' and 'Acknowledge State'

Alarms report the state of a condition. Three states are distinguished:

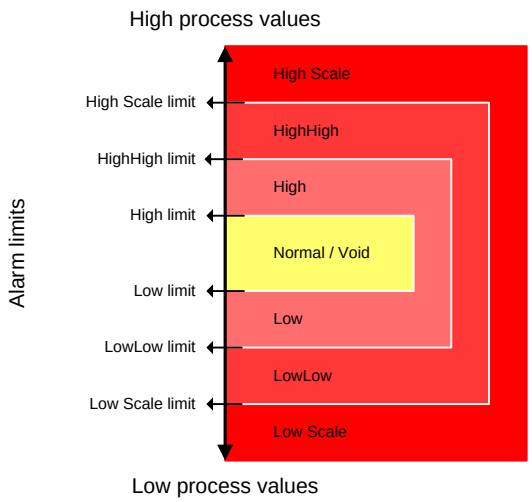
State of Condition	Description
Void	Indicating that the alarm condition does not exist, only shown in historical lists.
Active	Indicating that the alarm condition is present.
Normal	Indicating that the alarm condition is no longer present.

Furthermore, alarms in the 'active' or 'normal' state can be 'acknowledged' or 'unacknowledged'.
The combination of 'alarm state' and 'acknowledge state' determines the legal transitions from one state to another:



5.4 Alarm Limits

Digital alarms are either active or not (VOID and NORMAL). For alarms on analogue terminals, however, the active state is further refined by means of alarm limits as illustrated below:



As long as the terminal value is at least equal to the limit but does not reach the next limit, the corresponding alarm state is active.

E.g. On a scale from 0 to 100, the Low limit is set to 15 and the LowLow limit is set to 5. A Low alarm is activated as 15 ≥ terminal value > 5.

- An analogue alarm is in 'normal' or 'void' state as long as the terminal value remains within the High and Low alarm limits. In other words, the alarm is not active.
- The alarm becomes active when the terminal has reached the High or Low alarm limits but is within the HighHigh or LowLow alarm limits.
- When the terminal value has reached the HighHigh or LowLow alarm limits but is within the HighScale or Low Scale, a new limit is passed.
- The highest alarm limit is reached when the terminal value equals or exceeds the Scale High or ScaleLow limits.

5.5 Alarm Changes

Alarm changes are classified as 'major', 'minor' or 'value' changes.

Major changes are alarm state changes defined by the following rules:

S/N	Description
1	The alarm state changes from void to active.
2	The state of an acknowledged alarm increases to a worse alarms state.
3	The state of an unacknowledged alarm increases to a worse alarms state than reported earlier since the alarm became unacknowledged (only relevant for analogue alarms).
4	The state of an acknowledged alarm changes polarity, for example from *High* to *Low*.
5	An unacknowledged alarm changes from suppressed to not suppressed.

Value changes are changes in acknowledge state or suppression defined according to the following rules:

1 An acknowledged alarm changes its suppression state

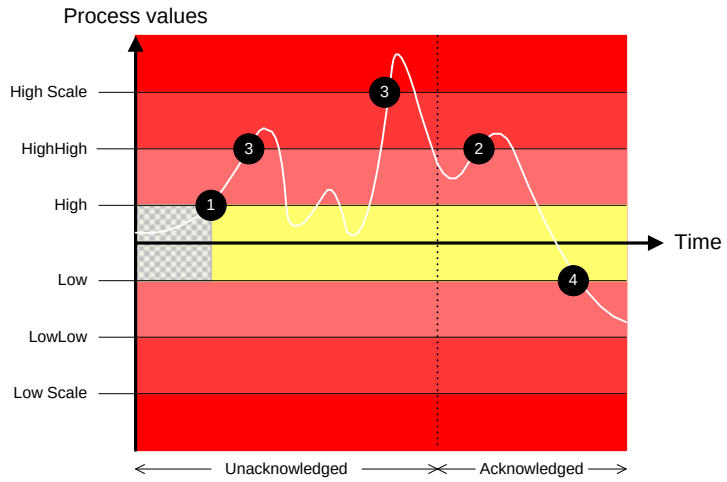
2 An un-acknowledged alarm becomes acknowledged.

All other changes are minor changes.

The rules are illustrated below. The arrows indicate major changes and the number refers to which of the above rules is applied. Other crossings of the process value with an alarm limit, illustrate points of minor changes. The acknowledging of the alarm is a value change.

Changes to the acknowledge state, and other changes to the alarm state, are minor changes.

These rules are illustrated in the figure:



All changes are reported, but major changes imply that the alarm timestamp is updated. Consequently, the alarm is moved to the top of the alarm list, thus calling for more attention from the operator.

5.6 Alarm Priorities

The alarm system supports three priority levels, which are indicated with different colours. The alarm priority / color coding is:

1 Low priority alarms ➔ Yellow colour

2 High priority alarms ➔ Red colour

3 Critical priority alarms ➔ Magenta colour

	Low Priority Alarms	High Priority Alarms	Critical Priority Alarms
Number ➔	1	2	3
Colour ➔	Yellow	Red	Magenta
Normally used for ➔	Alarms for auxiliary and machinery systems which will not lead to shutdown of main machinery systems. System alarms.	Alarms that will lead to shutdown of main machinery systems and other alarms of high severity. System alarms.	Fire and Gas alarms and ESD. System alarms.

5.7 Alarm Suppression

Alarm systems sometimes offer a feature called 'alarm suppression'. The intention of this feature is to reduce operator stress by holding back alarms that in some temporary system state are more or less unwanted. The alarm property 'suppressed' indicates that the alarm is normally not intended for operator attention. Some systems allow the operator to explicitly suppress unwanted alarms. Alarms suppressed by the operator are called 'disabled alarms'.

5.8 Alarm Acknowledgement

Whether an alarm needs acknowledgement depends on its priority level. The priority level that marks the limit is set in the Global/Event System configuration parameter: *'AckLimit'*. All events with a priority level at or above the *'AckLimit'* need to be acknowledged. There is one exception: At OS start-up, the ‘station availability’ alarms caused by missing response from some station do not require acknowledgement.

Acknowledgeable alarms must be acknowledged explicitly by the operator. Acknowledgeable alarms become unacknowledged upon major alarm changes.

The possible acknowledge states are 'Acknowledged' and 'Unacknowledged'.

5.8.1 Acknowledgement Authority

The authority to acknowledge alarms is built on commando control and access system configuration:

- An OS can only acknowledge those process alarms that are originated by the function modules controlled by that OS. This authority is exclusive: Process alarm can not be acknowledged from an OS that does not control the source function module.
- An OS can acknowledge system alarms originated by itself or by controlled RCU. A RCU is controlled by the OS when it contains a function module under a command group that is controlled by the OS in question.

- An OS can acknowledge system alarms for not-controlled RCU (if the Global/Event System/Privileges configuration parameter *'Ack Extended'* is set to 'TRUE' in the system configuration database).

5.8.2 Acknowledge Methods

Alarms can be acknowledged:

- Using the **ACK** option in the context menu of the dynamic and static alarm list and the last alarm line.
- Using the **ACK** button in the event image or event dialog toolbar.
- Using the **ACK** key on dedicated IAS operator panels.

5.8.3 Selection of Alarm for Acknowledgement

The authority to acknowledge alarms from the OS in question, is indicated in the left most column of the list.

The effect of these actions depends on whether unacknowledged alarms are selected:

- When one or several unacknowledged alarms are selected, the acknowledge action applies to selected alarms only.
- When no selection is made, the acknowledge action depends on the settings of the SysConf Global/Event System/EventView parameter 'AckAllVisibleIfNoneSelected':
  - If 'AckAllVisibleIfNoneSelected' is ‘TRUE’, all unacknowledged alarms in the current alarm page are acknowledged.
  - If 'AckAllVisibleIfNoneSelected' is ‘FALSE’, none of the unacknowledged alarms are acknowledged.

6 TIME SERIES SYSTEM

The time series system allows you to define and retrieve historical time series of logged process values for use in reports and **Trend** images.

6.1 Main Features

In short, a time series is a log of time-stamped values. It extracts data from a single variable as input, performs a mathematical transformation and stores resulting values according to the selected time series attributes.

- The time series system provides the functionality to:
- Select input variable
- Define, modify and delete time series definitions
- Store and distribute time series definitions.

Beside time series definition, data storage is an important aspect of the time series system: While short-term time series can be stored on the RCU, long-term time series require the storage capacity of a HS.

It is possible to define both permanent and temporary time series.

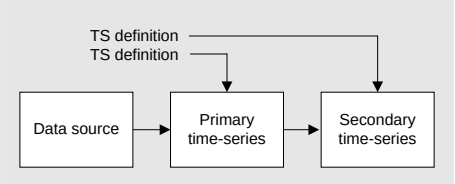
Data stored in time series are in turn input for trends and reports.

The time series system description covers the following main topics:

- Time series
- Transformations

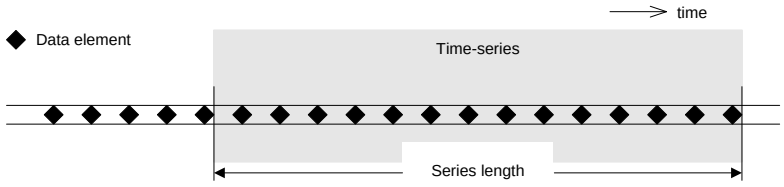
6.2 Time Series

A time series is a log of status- and time-stamped values: It receives data, manipulates them, and stores the results. Logically, a time series consists of a definition part and a data storage part. In the illustration below, the white boxes represent the data parts while the text without boxes represents the definition part.



The life span of time series can be defined as follows:

- **Permanent time series:** In principle, a permanent time series is not limited in time, but the number of data elements it can contain is limited. That means that new data elements are added and old ones are purged as time progresses.



- **Temporary time series:** Optionally, an absolute expiration date and time can be set, cancelling the data collection and deleting the time series definition automatically at expiration time. Defining temporary time series does not require RCU configuration privileges.

The obvious data source for time series is an IAS module variable - i.e. a terminal or a 'logable' parameter. However, time series can take input from other data sources too. The data source determines whether the time series definition is stored on the RCU or on a HS.

According to the data manipulation they perform, time series are classified as:

- **Primary time series** storing raw data: i.e. they fetch data and store them without further manipulation. Only one primary time series per variable can exist on a single station (RCU or HS).
- **Secondary time series** applying mathematical transformations to a set of data elements stored in another time series. The secondary time series contains the result of the transformation.

Short term time series, covering minutes or hours, can be stored on the RCU that owns the module providing the data input. However, time series with high resolution spanning over days, weeks, months or years require the storage capacity of a HS.

6.3 Data Sources

6.3.1 Input and Data Source

It is important to understand the difference between 'input' and 'data source': A time series takes input either from a data source or from another time series. Input from other time series is not a 'data source'. The data source refers always to the origin of the data. Consequently, a secondary time series takes input from another time series, but the data source for both is either an analogue or digital data source.

Among the data sources two main categories are distinguished:

- RCU resident data sources
- External data sources.

The data source determines where the time series definition is stored.

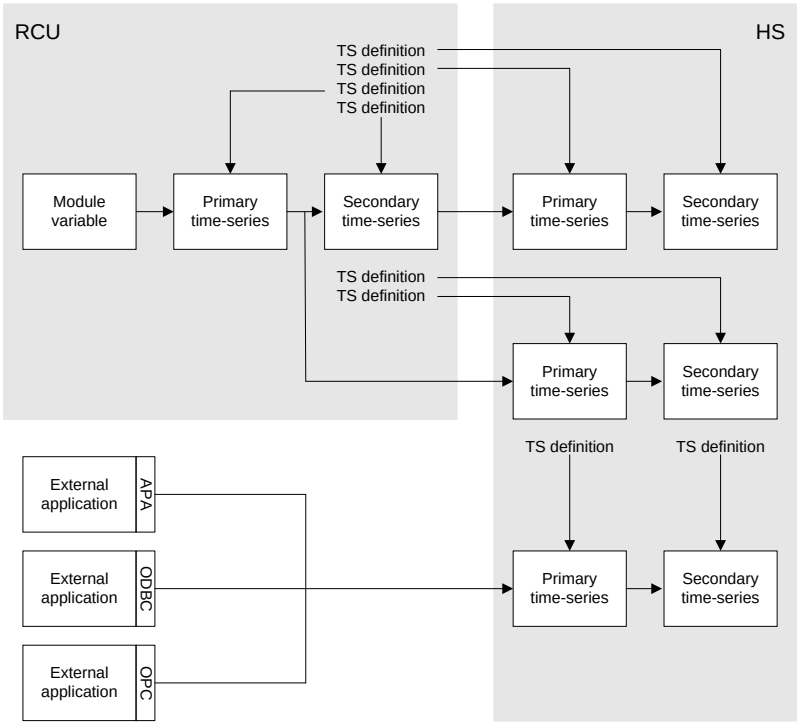
6.3.2 RCU Resident Data Sources

The most obvious data source for time series is a RCU resident module variable. Any module terminal and those module parameters that are exported for logging - i.e. module parameters of the data type LOGVAR can act as input for primary time series on the RCU.
The definition of time series that take input from a module variable are always stored on the RCU.

6.3.3 External Data Sources

Using the ODBC interface, external applications may act as data source for time series on the HS. The definition of the time series that take input from an external source is always stored on the HS.

6.4 Time Series Categories



The following time series categories are distinguished, based on the data source, the data manipulation they perform and the type of station where they are stored:

6.4.1 RCU Primary Time Series

The data source is a module variable that belongs to a tag owned by the RCU in question. The input data are not manipulated. The sampling rate for the time series is defined by the configured task. The time series definition is stored on the RCU in question. The time series data are stored on the RCU.

A RCU primary time series can be the parent of:

- RCU secondary time series
- HS primary time series.

6.4.2 RCU Secondary Time Series

Takes input from a primary or secondary time series on the same RCU. Input data are transformed according to a transformation template resident on the OS. The time series definition and data are stored on the RCU in question.

A RCU secondary time series can be the parent of:

- RCU secondary time series
- HS primary time series.

Note *Secondary time series are created through continuous calculation. This make it possible to create a 24 hours average based on a primary time series which is far shorter than 24 hours. The required length of the primary series is 15 second.*

6.4.3 HS Primary Time Series

HS primary time series can take input from either a RCU time series or an external data source.

Data Source	Transformation	TS Definition	TS Data Storage
RCU	None	On RCU	On HS
External source	None	On HS	On HS

A HS primary time series can be parent for HS secondary time series.

6.4.4 HS Secondary Time Series

Takes input from a primary or secondary time series on the HS. Again, the data source for the original variable, determines where the time series is stored.

Data Source	Transformation	TS Definition	TS Data Storage
RCU	Calculated on PCU	On RCU	On HS
External source	Calculated on HS	On HS	On HS

A HS secondary time series can be parent for other HS secondary time series.

6.5 Time Series Definition

A user's possibility to look up, create and manipulate time series definitions is determined by the combination of the following conditions:

- Whether the actual OS is in command of the command group to which the module belongs
- Whether the user is member of a user group that includes the TSConfigure security object
- Whether the OS runs in PCU configuration mode.

Time Series Definition	Command Control	TSConfigure Security Object	PCU Configuration Mode
Lock-up	Does not matter	Does not matter	Does not matter
Create new, modify or delete	Required	Required	Not required for temporary time series that expire on time. Required for permanent time series.

7 TREND SYSTEM

The Trend system is used for presentation of trends. It uses split window mechanisms to create and present one or several trends as separate panes in a trend image. Each trend may contain one or several trend curves.

The IAS Trend System contains functions for controlling the displaying, creation and appearance of trends.

7.1 Trends

A *trend* is a presentation of one or several *trend curves* in a scaled axis system. You can both configure the trend with its contents and operate on the displayed trend by using a dedicated *trend context menu*. This context menu applies to the trend from which it was launched (this is significant when two or more trends are displayed simultaneously).

7.1.1 Trend Presentations

There are two different types of trend presentation:

- Trend Image, which fills the main view area and may comprise several trends contained in separate panes. You can add, split or merge trend panes by using splitter window techniques.
- Trend Popup, which comprise a single trend in a re-sizeable popup window. The popup remains displayed irrespective of the view selected and can be positioned anywhere within the main view area.

Both trend presentations have a context menu that you can use to control their appearance.

7.1.2 Trend Types

There are two trend types:

- Time Trend, which shows the development of single process values with the progress of time.
- XY Trend, which shows the correlation between two process values within a defined time span.

7.1.3 Trend Data Sources

There are three types of data sources for trends:

- **Current value subscription**, which is a subscription of a process variable, i.e. the current value of module terminal or a 'logable' parameter.
- **RCU time series**, which is a time series stored on a RCU.

- **HS time series**, which is a time series stored on a HS.

Trend curves with a current value subscription as the only data source will initially be empty.

A trend curve will normally display data merged from several sources simultaneously. The part of the curve read from the HS will be displayed as a dashed line until the reading is complete.

7.1.4 Dynamic and Static Modes

There are two types of trend presentation modes:

- **Dynamic mode.** When a trend is launched, it is by default displayed in dynamic mode. The process value history is read from a RCU or a HS (if time series has been defined) and new values are automatically appended to the trend curves as they are produced.
- **Static mode.** The operator may choose to enter the static mode to be able to inspect the process value history more carefully. In this mode, new values will not be appended to the curves and the display will be frozen. If all curves in the trend have support from time series stored on a HS, the operator may now inspect the process value history by navigating along the time axis.

Database Location	**OS with remote net connection.**
OS98 History Station	OS31, OS32, OS33, OS34, OS35, OS36

8 REPORT SYSTEM

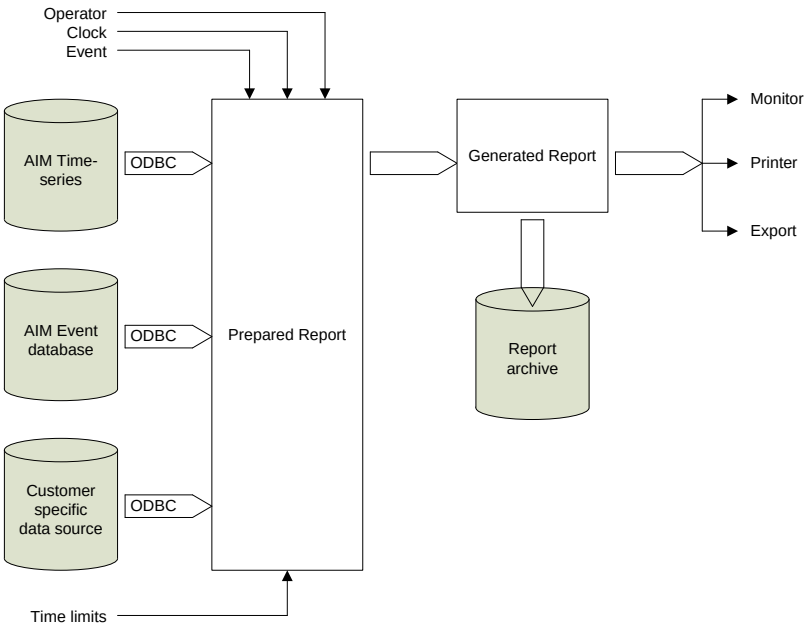
The report system lets you design and generate reports. It provides report management, including report scheduling, storage, printing and mailing.

This section contains the conceptual description of the report system. To fully understand all of the report system, you should have a good understanding of:

- Time-series
- Event system

8.1 Report Mechanism

8.1.1 Overview



The main purpose of the IAS report system is to generate reports where the data are:

- fetched from the IAS system through ODBC
- presented according to a suitable layout

8.1.2 Prepared Reports and Generated Reports

The basis for an IAS report is a 'prepared report' which is a description of the data source, conditional data selection and output format for a report. The prepared report does not contain data. Prepared reports must be stored under the base path for prepared reports, defined in the Configure Report Manager dialog box.

Prepared reports run on the OS, may prompt the user for a time span, adapting the report definition accordingly, before producing a 'generated report': i.e. a report that contains data.

Generated reports can be displayed, printed and stored in a file in different formats. The path for storage of generated reports is defined in the Configure Report Manager dialog box.

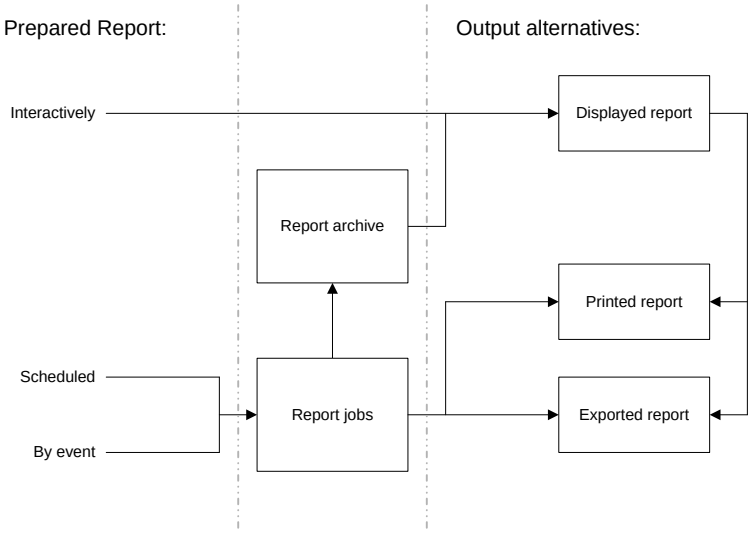
A prepared report is created online from one of the report templates that follow with the report system. When applying a template, it is sufficient to assign appropriate values to the report parameters in the prepared report.

8.1.3 Triggering Report Generation

Report generation can be initiated in different ways:

- Interactively by the user: I.e. you select a prepared report and run it. The result is a 'generated' report containing data fetched from the data source, and presented in a separate window on the OS.
- Scheduled by the OS according to the schedule parameter settings of a report job. I.e. the system clock triggers a prepared report to be run. A scheduled report is stored in the report archive, but not displayed, automatically.
- **Process event-triggered** reports: A configured IAS function module ***trig_rep*** can trigger a defined report job. The generated report is not displayed automatically.

8.1.4 Report Management



Depending of how the report generation was initiated, reports can be stored, displayed, printed, exported or mailed.

8.1.5 Displaying Reports

IAS displays reports in popup windows. The specific report popup window includes appropriate controls to browse, scroll, scale, print and store and mail the report. Each report is presented in a single window that pops up on top of the K-Chief OS application. Interactive reports are displayed automatically as they are run while historic reports are displayed upon request. Scheduled reports, generated according to the specifications of a report job are not displayed automatically.

8.1.6 Report Print-out

Generated reports can be printed on any printer available to the OS.

Printing of displayed reports can be initiated from the appropriate control in the report window. Scheduled report may be configured to print the report upon generation.

8.1.7 Report Storage

Reports can be converted to a large range of formats and stored in any destination that can be reached from the OS. Storage of displayed reports can be initiated from the appropriate control in the report window while scheduled reports may be configured to store the report upon generation.

8.1.8 Report Types

The report system has possibilities for the following types of reports:

- Daily Reports
  - This report uses data from the history station. By specifying a certain time window data from time series can be called and several mathematics functions can be used.
- Hour Count Report
  - This report is used to show the accumulated running hours on rotating equipment.
- Interactive Reports
  - This report uses dynamic process variables from the RCUs. It can be printed either cyclic or on request.

Only running hour report is delivered for this project. Following IAS tag will be reported:

IAS_Tag	**IAS_Description_1**
MI-011205A	PORT E/R NO.1 MGE PRE LUBE PUMP
MI-017601	PORT E/R NO.1 & 2 MGE JACKET PREHEATER PUMP
MI-011206A	PORT E/R NO.1 MGE CYL L.O PUMP
MI-012205A	PORT E/R NO.2 MGE PRE LUBE PUMP
MI-012206A	PORT E/R NO.2 MGE CYL L.O PUMP
MI-013205A	CENT E/R NO.1 MGE PRE LUBE PUMP
MI-017611	CENT E/R NO.1 & 2 MGE JACKET PREHEATER PUMP
MI-013206A	CENT E/R NO.1 MGE CYL L.O PUMP
MI-014205A	CENT E/R NO.2 MGE PRE LUBE PUMP
MI-014206A	CENT E/R NO.2 MGE CYL L.O PUMP
MI-015205A	STBD E/R NO.1 MGE PRE LUBE PUMP
MI-017621	STBD E/R NO.1 & 2 MGE JACKET PREHEATER PUMP
MI-015206A	STBD E/R NO.1 MGE CYL L.O PUMP
MI-016205A	STBD E/R NO.2 MGE PRE LUBE PUMP

MI-016206A	STBD E/R NO.2 MGE CYL L.O PUMP
MI-011407A	PORT E/R MGE D.O SUPPLY PP NO.1
MI-012407A	PORT E/R MGE D.O SUPPLY PP NO.2
MI-013407A	CENT E/R MGE DO SUPPLY PP NO.1
MI-014407A	CENT E/R MGE DO SUPPLY PP NO.2
MI-015407A	STBD E/R MGE DO SUPPLY PP NO.1
MI-016407A	STBD E/R MGE DO SUPPLY PP NO.2
MI-021301A	C B/TH LO PRIME. PP STOP/
MI-021301B	C B/TH LO SEC. PP STOP/
MI-021401A	C B/TH STEERNG PP1 STOP/
MI-021402A	C B/TH STEERNG PP2 STOP/
MI-021211A	C B/TH MOTOR COOL FAN
MI-021212A	C B/TH TR COOLING FAN 1
MI-021213A	C B/TH TR COOL FAN 2
MI-021604A	FWD A/M C.F.W PUMP NO.1
MI-021605A	FWD A/M C.F.W PUMP NO.2
MI-021606A	FWD A/M C.F.W PUMP NO.3
MI-021702A	FWD A/M CSW PUMP NO.1
MI-021703A	FWD A/M CSW PUMP NO.2
MI-021705A	TOP DRIVE CSW PUMP NO.1
MI-021706A	TOP DRIVE CSW PUMP NO.1
MI-022301A	P B/TH LO PRIME. PP STOP/
MI-022301B	P B/TH LO SEC. PP STOP/
MI-022401A	P B/TH STEERNG PP1 STOP/
MI-022402A	P B/TH STEERNG PP2 STOP/
MI-022211A	P B/TH MOTOR COOL FAN
MI-022212A	P B/TH TR COOL FAN 1

MI-022213A	P B/TH TR COOL FAN 2
MI-022604A	P B/TH C.F.W PUMP 1
MI-022605A	P B/TH C.F.W PUMP 2
MI-022702A	P B/TH C.S.W PUMP 1
MI-022703A	P B/TH C.S.W PUMP 2
MI-023301A	S B/TH LO PRIME. PP STOP/
MI-023301B	S B/TH LO SEC. PP STOP/
MI-023401A	S B/TH STEERNG PP1 STOP/
MI-023402A	S B/TH STEERNG PP2 STOP/
MI-023211A	S B/TH MOTOR COOL FAN
MI-023212A	S B/TH TR COOL FAN 1
MI-023213A	S B/TH TR COOL FAN 2
MI-023604A	S B/TH C.F.W PUMP 1
MI-023605A	S B/TH C.F.W PUMP 2
MI-023702A	S B/TH C.S.W PUMP 1
MI-023703A	S B/TH C.S.W PUMP 2
MI-024301A	P S/TH LO PRIME. PP STOP/
MI-024301B	P S/TH LO SEC. PP STOP/
MI-024401A	P S/TH STEERNG PP1 STOP/
MI-024402A	P S/TH STEERNG PP2 STOP/
MI-024211A	P S/TH MOTOR COOL FAN
MI-024212A	P S/TH TR COOL FAN 1
MI-024213A	P S/TH TR COOL FAN 2
MI-025301A	S S/TH LO PRIME. PP STOP/
MI-025301B	S S/TH LO SEC. PP STOP/
MI-025401A	S S/TH STEERNG PP1 STOP/
MI-025402A	S S/TH STEERNG PP2 STOP/

MI-025211A	S S/TH MOTOR COOL FAN
MI-025212A	S S/TH TR COOL FAN 1
MI-025213A	S S/TH TR COOL FAN 2
MI-026301A	C S/TH LO PRIME. PP STOP/
MI-026301B	C S/TH LO SEC. PP STOP/
MI-026401A	C S/TH STEERNG PP1 STOP/
MI-026402A	C S/TH STEERNG PP2 STOP/
MI-026211A	C S/TH MOTOR COOL FAN
MI-026212A	C S/TH TR COOL FAN 1
MI-026213A	C S/TH TR COOL FAN 2
MI-091811A	AFT FIRE PUMP (P)
MI-091821A	AFT FIRE PUMP (S)
MI-042101	PORT E/R FW GEN
MI-042102	CENT E/R FW GEN
MI-042103	STBD E/R FW GEN
MI-042110A	CENTER E/R FW TRANS PUMP
MI-042112A	AFT E/R F.W. HYD PP NO.1
MI-042113A	AFT E/R F.W. HYD PP NO.2
MI-042114A	STBD E/R F.W. TRANS PUMP
MI-042120A	FWD F.W HYD PUMP NO.1
MI-042121A	FWD F.W HYD PUMP NO.2
MI-042123A	FWD AUX F.W. TRANSFER PUMP
MI-042124A	FWD HOT CIRCULATION NO.1 PUMP
MI-042125A	FWD HOT CIRCULATION NO.2 PUMP
MI-042401A	DRILLING WATER PUMP NO.1
MI-042402A	DRILLING WATER PUMP NO.2
MI-064102	INCINERATOR

MI-051102	PORT E/R NO.1 DO PURIFIER
MI-051202	PORT E/R NO.2 DO PURIFIER
MI-051302	STBD E/R NO.1 DO PURIFIER
MI-051402	STBD E/R NO.2 DO PURIFIER
MI-052101	PORT E/R NO.1 L.O PURI FEED PP
MI-052104	PORT E/R NO.1 L.O PURI
MI-052111	PORT E/R NO.2 L.O PURI FEED PP N
MI-052114	PORT E/R NO.2 L.O PURI
MI-052151A	PORT E/R LO TRANSF. PUMP
MI-052201	CENT E/R NO.1 L.O PURI FEED PP
MI-052204	CENT E/R NO.1 L.O PURI
MI-052211	CENT E/R NO.2 L.O PURI FEED PP
MI-052214	CENT E/R NO.2 L.O PURI
MI-052301	STBD E/R NO.1 L.O PURI FEED PP
MI-052304	STBD E/R NO.1 L.O PURI
MI-052311	STBD E/R NO.2 L.O PURI FEED PP
MI-052314	STBD E/R NO.2 L.O PURI
MI-052351A	STBD E/R LO TRANSF. PUMP
MI-061101A	PORT E/R STARTING AIR COMP.
MI-061111A	CENT E/R STARTING AIR COMP.
MI-061121A	STBD E/R STARTING AIR COMP
MI-061201A	PORT E/R NO.1G/S & CNTL AIR COMP
MI-061202A	PORT E/R NO.2G/S & CNTL AIR COMP
MI-061221A	STBD E/R NO.1 G/S & CNTL AIR COMP
MI-061222A	STBD E/R NO.2 G/S & CNTL AIR COMP NIING
MI-062106	PROV REF SYST COMPRESSOR 1
MI-062107	PROV REF SYST COMPRESSOR 2

MI-062404A	HYD. PWR PACK PUMP 1
MI-062405A	HYD. PWR PACK PUMP 2
MI-062411	FWD DECK M/C HYD PUMP NO.1
MI-062412	FWD DECK M/C HYD PUMP NO.2
MI-062413	AFT DECK M/C HYD PUMP NO.1
MI-062414	AFT DECK M/C HYD PUMP NO.2
MI-062601AA	FWD AUX MACH SPLY FAN 1 HIGH SPEED
MI-062601AB	FWD AUX MACH SPLY FAN 1 LOW SPEED
MI-062602AA	FWD A/M SUPPLY FAN NO.2 HIGH SPEED
MI-062602AB	FWD A/M SUPPLY FAN NO.2 LOW SPEED
MI-062602CA	FWD A/M SUPPLY FAN NO.2 REV HIGH SPEED
MI-062602CB	FWD A/M SUPPLY FAN NO.2 REV LOW SPEED
MI-062603AA	C B/TH RM SUPPLY FAN HIGH SPEED
MI-062603AB	C B/TH RM SUPPLY FAN LOWSPEED
MI-062603CA	C B/TH RM SUPPLY FAN REV HIGH SPEED
MI-062603CB	C B/TH RM SUPPLY FAN REV LOW SPEED
MI-062604AA	P B/TH RM SUPPLY FAN HIGH SPEED
MI-062604AB	P B/TH RM SUPPLY FAN LOW SPEED
MI-062604CA	P B/TH RM SUPPLY FAN REV HIGH SPEED
MI-062604CB	P B/TH RM SUPPLY FAN REV LOW SPEED
MI-062605AA	S B/TH RM SUPPLY FAN HIGH SPEED
MI-062605AB	S B/TH RM SUPPLY FAN LOW SPEED
MI-062605CA	S B/TH RM SUPPLY FAN REV HIGH SPEED
MI-062605CB	S B/TH RM SUPPLY FAN REV LOW SPEED
MI-062606AA	PORT E/R SUPPLY FAN NO.1 HIGH SPEED
MI-062606AB	PORT E/R SUPPLY FAN NO.1 LOW SPEED
MI-062607AA	PORT E/R SUPPLY FAN NO.2 HIGH SPEED

MI-062607AB	PORT E/R SUPPLY FAN NO.2 LOW SPEED
MI-062607CA	PORT E/R SUPPLY FAN NO.2 REV HIGH SPEED
MI-062607CB	PORT E/R SUPPLY FAN NO.2 REV LOW SPEED
MI-062608A	PORT PURIFIER ROOM EXH FAN
MI-062609AA	P S/TH RM SUPPLY FAN HIGH SPEED
MI-062609AB	P S/TH RM SUPPLY FAN LOW SPEED
MI-062609CA	P S/TH RM SUPPLY FAN REV HIGH SPEED
MI-062609CB	P S/TH RM SUPPLY FAN REV LOW SPEED
MI-062610AA	CENT E/R SUPPLY FAN NO.1 HIGH SPEED
MI-062610AB	CENT E/R SUPPLY FAN NO.1 LOW SPEED
MI-062611AA	CENT E/R SUPPLY FAN NO.2 HIGH SPEED
MI-062611AB	CENT E/R SUPPLY FAN NO.2 LOW SPEED
MI-062611CA	CENT E/R SUPPLY FAN NO.2 REV HIGH SPEED
MI-062611CB	CENT E/R SUPPLY FAN NO.2 REV LOW SPEED
MI-062612AA	C S/TH RMSUPPLY FAN HIGH SPEED
MI-062612AB	C S/TH RMSUPPLY FAN LOW SPEED
MI-062612CA	C S/TH RMSUPPLY FAN REV HIGH SPEED
MI-062612CB	C S/TH RMSUPPLY FAN REV LOW SPEED
MI-062613AA	STBD E/R SUPPLY FAN NO.1 HIGH SPEED
MI-062613AB	STBD E/R SUPPLY FAN NO.1 LOW SPEED
MI-062614AA	STBD E/R SUPPLY FAN NO.2 HIGH SPEED
MI-062614AB	STBD E/R SUPPLY FAN NO.2 LOW SPEED
MI-062614CA	STBD E/R SUPPLY FAN NO.2 REV HIGH SPEED
MI-062614CB	STBD E/R SUPPLY FAN NO.2 REV LOW SPEED
MI-062615AA	S S/TH RM SUPPLY FAN
MI-062615AB	S S/TH RM SUPPLY FAN
MI-062615CA	S S/TH RM SUPPLY FAN REV

MI-062615CB	S S/TH RM SUPPLY FAN REV
MI-062616A	STBD PURIFIER ROOM EXH FAN
MI-062620A	BOSUN STORE SUPPLY FAN
MI-062621A	FWD HPR COMPART (P)SUPPLY FAN
MI-062622A	FWD HPR COMPART (S)SUPPLY FAN
MI-062623A	AGITATOR RM EXH FAN
MI-062624A	INCINERATOR RM SUPPLY FAN
MI-062624C	INCINERATOR RM SUPPLY FAN REV
MI-062625A	WELDING SPACE EXH FAN
MI-062626A	WATER MIST / INERGEN RM SUPPLY FAN
MI-062627A	HYD POWER PACK RM SUPPLY FAN NO.1
MI-062630A	HYD POWER PACK RM SUPPLY FAN NO.2
MI-062628A	DRY BULK TK RM EXH FAN NO.1
MI-062629A	DRY BULK TK RM EXH FAN NO.2
MI-062619A	BALLAST PP RM EXH.FAN NO.1
MI-062630A	BALLAST PP RM EXH.FAN NO.2
MI-062631	PAINT STORE EXH.FAN
MI-062636A	CONDENSING UNIT(WCCU) 1 COMPRESS 1-1
MI-062636B	CONDENSING UNIT(WCCU) 1 COMPRESS 1-2
MI-062636C	CONDENSING UNIT(WCCU) 1 COMPRESS 1-3
MI-062636D	CONDENSING UNIT(WCCU) 1 COMPRESS 1-4
MI-062637A	CONDENSING UNIT(WCCU) 2 COMPRESS 2-1
MI-062637B	CONDENSING UNIT(WCCU) 2 COMPRESS 2-2
MI-062637C	CONDENSING UNIT(WCCU) 2 COMPRESS 2-3
MI-062637D	CONDENSING UNIT(WCCU) 2 COMPRESS 2-4
MI-062638A	CONDENSING UNIT(WCCU) 3 COMPRESS 3-1
MI-062638B	CONDENSING UNIT(WCCU) 3 COMPRESS 3-2

MI-062638C	CONDENSING UNIT(WCCU) 3 COMPRESS 3-3
MI-062638D	CONDENSING UNIT(WCCU) 3 COMPRESS 3-4
MI-062655A	AFT (P) SECOND. ESCAPE WAY SUPPLY FAN
MI-062656A	AFT (P) HPR COMPARTMENT SUPPLY FAN
MI-062657A	AFT (S) SECOND. ESCAPE WAY SUPPLY FAN
MI-062658A	AFT (S) HPR COMPARTMENT SUPPLY FAN
MI-062659A	FWD (P) SECOND. ESCAPE WAY SUPPLY FAN
MI-062660A	FWD (S) SECOND. ESCAPE WAY SUPPLY FAN
MI-063106AA	PORT E/R MAIN C.S.W. PP NO.1 HIGH SPEED
MI-063106AB	PORT E/R MAIN C.S.W. PP NO.1 LOW SPEED
MI-063107AA	PORT E/R MAIN C.S.W. PP NO.2 HIGH SPEED
MI-063107AB	PORT E/R MAIN C.S.W. PP NO.2 LOW SPEED
MI-063109AA	CENT E/R MAIN C.S.W. PP NO.1 HIGH SPEED
MI-063109AB	CENT E/R MAIN C.S.W. PP NO.1 LOW SPEED
MI-063110AA	CENT E/R MAIN C.S.W. PP NO.2 HIGH SPEED
MI-063110AB	CENT E/R MAIN C.S.W. PP NO.2 LOW SPEED
MI-063112AA	STBD E/R MAIN C.S.W. PP NO.1 HIGH SPEED
MI-063112AB	STBD E/R MAIN C.S.W. PP NO.1 LOW SPEED
MI-063113AA	STBD E/R MAIN C.S.W. PP NO.2 HIGH SPEED
MI-063113AB	STBD E/R MAIN C.S.W. PP NO.2 LOW SPEED
MI-063243A	PORT E/R LT C.F.W PUMP NO.1
MI-063244A	PORT E/R LT C.F.W PUMP NO.2
MI-063263A	CENT E/R LT CFW PUMP NO.1
MI-063264A	CENT E/R LT CFW PUMP NO.2
MI-063253A	STBD E/R LT C.F.W PUMP NO.1
MI-063254A	STBD E/R LT C.F.W PUMP NO.2
MI-072102A	PORT E/R D.O. TRANSFER PP

MI-072104A	STBD E/R D.O. TRANSFER PP
MI-073201A	T/S D.O NO.1 TRANS PUMP
MI-073202A	STBD E/R MDO TRANS PUMP FOR TOPSIDE
MI-081201A	FWD BILGE & G/S PP NO.1
MI-081202A	FWD BILGE & G/S PP NO.2
MI-081203A	FWD A/M BILGE PUMP
MI-081204A	PORT E/R BLST BILGE & G/S PP
MI-081207A	CENT E/R BILGE PUMP
MI-081208A	STBD E/R BILGE BLST GS PP
MI-091801A	FWD FIRE PUMP
MI-091831A	FWD FIRE JOCKEY PP NO.1
MI-091832A	FWD FIRE JOCKEY PP NO.2
MI-081225A	NO.1 DRAIN PUMP
MI-081235A	NO.2 DRAIN PUMP
MI-091571	WATER MIST SPU1 M-1 PUMP MOTOR
MI-091572	WATER MIST SPU1 M-2 PUMP MOTOR
MI-091573	WATER MIST SPU1 M-3 PUMP MOTOR
MI-091574	WATER MIST SPU1 M-4 PUMP MOTOR
MI-091575	WATER MIST SPU1 M-5 PUMP MOTOR
MI-091576	WATER MIST SPU1 M-6 PUMP MOTOR
MI-091578	WATER MIST SPU1 M-8 PUMP MOTOR
MI-091579	WATER MIST SPU1 M-9 FEED WATER PUMP MOTOR
MI-091581	WATER MIST SPU2 M-1 PUMP MOTOR
MI-091582	WATER MIST SPU2 M-2 PUMP MOTOR
MI-091583	WATER MIST SPU2 M-3 PUMP MOTOR
MI-091584	WATER MIST SPU2 M-4 PUMP MOTOR
MI-091585	WATER MIST SPU2 M-5 PUMP MOTOR

MI-091586	WATER MIST SPU2 M-6 PUMP MOTOR
MI-091587	WATER MIST SPU2 M-7 PUMP MOTOR
MI-091589	WATER MIST SPU2 M-9 FEED WATER PUMP MOTOR
MI-091591	WATER MIST SPU3 M-1 PUMP MOTOR
MI-091592	WATER MIST SPU3 M-2 PUMP MOTOR
MI-091593	WATER MIST SPU3 M-3 PUMP MOTOR
MI-091594	WATER MIST SPU3 M-4 PUMP MOTOR
MI-091595	WATER MIST SPU3 M-5 PUMP MOTOR
MI-091596	WATER MIST SPU3 M-6 PUMP MOTOR
MI-091597	WATER MIST SPU3 M-7 PUMP MOTOR
MI-091598	WATER MIST SPU3 M-9 FEED WATER PUMP MOTOR
XA-103101	LIFEBOAT DAVIT NO.5 MOTOR AFT LIFE BOAT(P)
XA-103102	LIFEBOAT DAVIT NO.6 MOTOR AFT LIFE BOAT(S)
XA-103102	RESCUE BOAT MOTOR
XA-103102	LIFE BOAT DAVIT NO.1 MOTOR
XA-103102	LIFE BOAT DAVIT NO.2 MOTOR
XA-103102	LIFE BOAT DAVIT NO.3 MOTOR
XA-103102	LIFE BOAT DAVIT NO.4 MOTOR
MI-111101AA	NO.1 BALLAST PUMP HIGH SPEED
MI-111101AB	NO.1 BALLAST PUMP LOW SPEED
MI-111201AA	NO.2 BALLAST PUMP HIGH SPEED
MI-111201AB	NO.2 BALLAST PUMP LOW SPEED
MI-062661A	ACCOMMODATION NO.1 AHU FAN (VF-01A)
MI-062662A	ACCOMMODATION NO.2 AHU FAN (VF-02A)
MI-	ACCOMMODATION NO.3 AHU FAN (VF-03A)
MI-062669A	ACCOMMODATION NO.1 RECIRCULATION FAN (VF-01B)

MI-062670A	ACCOMMODATION NO.2 RECIRCULATION FAN (VF-02B)
MI-	ACCOMMODATION NO.3 RECIRCULATION FAN (VF-03B)
MI-062663A	GALLEY NO.1 AHU FAN (VF-03)
MI-062679A	GALLEY NO.2 AHU FAN (VF-04)
MI-062666A	GALLEY EXHAUST FAN (EF-06) LOW
MI-062666B	GALLEY EXHAUST FAN (EF-06) HIGH
MI-062665A	GALLEY SUPPLY FAN (SF-01)
MI-062671A	AIRCORN ROOM EXHAUST FAN (EF-01)
MI-062678A	EMERGENCY GENERATOR ROOM EXHAUST FAN (EF-02)
MI-062678A	LAUNDRY EXHAUST FAN (EF-03)
MI-062668A	DRY PROVISION STORE EXHAUST FAN (EF-04)
MI-062673A	HOSPITAL EXHAUST FAN (EF-05)
MI-062680A	WHEEL HOUSE NO.1 DEFROSTING FAN (SF-02)
MI-062681A	WHEEL HOUSE NO.2 DEFROSTING FAN (SF-03)
MI-062674A	LIFT PULLEY SPACE EXHAUST FAN (EF-07)
MI-062664A	SANITARY EXHAUST FAN NO.1 (EF-08)
MI-062675A	BATTERY ROOM NO.1 EXHAUST FAN
MI-062676A	BATTERY ROOM NO.2 EXHAUST FAN
MI-021104	CENTER BOW THRUSTER MOTOR
MI-022104	PORT BOW THRUSTER MOTOR
MI-023104	STBD BOW THRUSTER MOTOR
MI-024104	PORT STERN THRUSTER MOTOR
MI-025104	STBD STERN THRUSTER MOTOR
MI-026104	CENTER STERN THRUSTER MOTOR
MI-	HELI DECK SERVICE CRANE

	SANITARY EXHAUST FAN NO.2

8.2 Configuration Set-up

Report station is integrated in K-Chief-OS-31, 32, 33, 34, 35, 36, HS98.

Note *It is recommended to keep the same reports on both OSs as a backup solution.*

The following reports will be made:

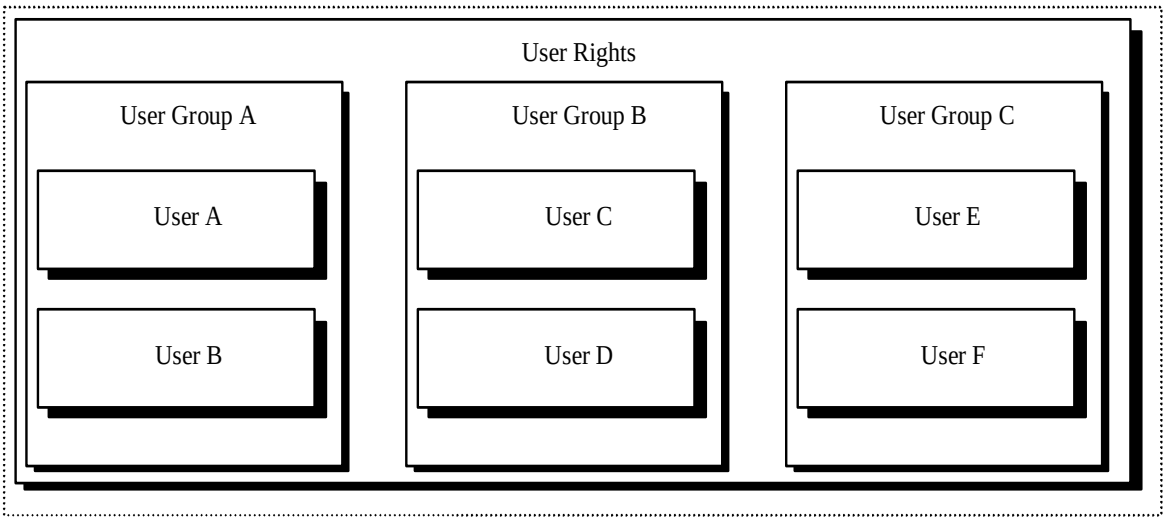
Report Name	Report Type
Running Hours	Hour Count Report, interfaced to C-net for motors above 5kW

9 LOGIN AND ACCESS SYSTEM

When logging on to the IAS operator stations, a user name and password must be entered in order to access the system. Each user is member of a user group, where access rights and user privileges are defined.

9.1.1 User groups

The figure below illustrates how users belong to user groups and the different user groups are part of the access and security system.



By default, the following user groups are defined;

User Group	Description
Guests	Members can only monitor the system
Users	Members can monitor and operate the system
Power Users	Members can monitor, operate and change parameters
Administrators	Members have full access to the system
System	For Kongsberg Maritime internal use only

9.1.2 Users

By default, the following users are created:

User	Member of user group
Guest	Guests
Monitoring	Guests
Operator	Users
Captain	Power Users
Chief	Power Users
Kongsberg	Administrators
System	Administrators
Owner	Administrators

Password is by default the same as user name. This can be changed by members of "Administrators", and additional users and user groups can be added (refer to the K-CHIEF operator manual).

Members of a specific user group are granted access to a set of security objects. The following security objects are defined for the different groups:

Security Groups	Description	User Groups			
		Guests	Users	Power Users	Administrators
AlarmLimits_EditAlarmConfig	Edit access to the Alarm Limit Dialog			X	X
AlarmLimits_ReadAlarmLimits	Permission to view the Alarm Limits dialog.			X	X
AlarmLimits_WriteAlarmLH	Permission to change LH Alarm Limits.			X	X
AlarmLimits_WriteAlarmLHH	Permission to change LHH Alarm Limits.			X	X
AlarmShelving_ProcessAlarms	Permission to shelve or unshelve process alarms.		X	X	X
AlarmShelving_SystemAlarms	Permission to shelve or unshelve system alarms.		X	X	X
HS_Operation	Enable HS Operation			X	X
IO_Operation	Operations on IO system that do not affect process control.			X	X
IO_Service	Service operations on IO system that may affect process control.			X	X
ModuleOperation_Operate	Write access to Module Operation dialogs.		X	X	X

Security Groups	Description	User Groups			
		Guests	Users	Power Users	Administrators
ModuleOperation_ReadParameterFree	Read free parameters in module parameter view.		X	X	X
ModuleOperation_ReadParameterLimited	Read limited parameters in module parameter view.		X	X	X
ModuleOperation_ReadParameterRestricted	Read restricted parameters in module parameter view.		X	X	X
ModuleOperation_ReadTerminalView	Permission to view module terminal view dialog.		X	X	X
ModuleOperation_WriteParameterFree	Write free parameters in module parameter view.			X	X
ModuleOperation_WriteParameterLimited	Write limited parameters in module parameter view.			X	X
ModuleOperation_WriteParameterRestricted	Write restricted parameters in module parameter view.			X	X
ModuleOperation_WriteTerminalView	Write terminal values in module terminal view dialog.			X	X
Module_ReadModuleMode	Permission to view the Module Modes dialog.		X	X	X
Module_WriteModuleMode	Permission to write changes from the Module Modes dialog.			X	X
OSKCmdCtrl_Acquire	Users without this permission cannot have command control. In the sense of Command Control the OS is regarded as dead.		X	X	X
OSKCmdCtrl_TakeForced	Users without this permission cannot take command controlled forced.		X	X	X
OSKEquipment_Configure	In order to configure equipmentsystem, the user must have this permision and the OS must be in configuration mode.			X	X
OSKOS_Configure	Needed to be allowed to set the OS in configure mode.			X	X
OSKOS_Exit	Users without this permission cannot exit the OS.			X	X
OSKOS_Test	Needed to be allow to set the OS in test mode.			X	X
OSKTrend_UserDefind	Users without this permission cannot create and edit User Defined Trend images.		X	X	X
OSKCmdCtrl_ManuallyOverrideCommandCtrl	Users with this permission may override Command Control.			X	X
OskAccess_ConfigureGates	Needed to add, modify and remove gates and which permissions they control.			X	X
OskAccess_ConfigureOSes	Needed to modify the local access control settings for each OS.			X	X
OskAccess_ConfigurePermissions	Needed to add, modify and remove permissions.			X	X
OskAccess_ConfigureUsergroups	Needed to add, modify and remove usergroups and their relationships to gates.			X	X

Security Groups	Description	User Groups			
		Guests	Users	Power Users	Administrators
OskAccess_ConfigureUsers	Needed to add, modify and remove users and their relationships to usergroups.X			X	X
OskAccess_ObserveConfiguration	Needed to inspect the access control configuration.			X	X
OskEvent_AckProcessAlarm	A user needs this permission in order to ack a process alarm.		X	X	X
OskEvent_AckSystemAlarm	A user needs this permission in order to ack a system alarm.		X	X	X
OskEvent_ChangeFilter	A user needs this permission in order to change a filter.			X	X
OskEvent_Configure	A user needs this permission in order to configure the event image grid.			X	X
OskEvent_SelectFilter	A user needs this permission in order to select a filter.		X	X	X
OSKEvent_UserlockFilter	A user needs this permission in order to change a filter.		X	X	X
PCU_Backup	Permission to backup PCU.			X	X
PCU_SetPCUConfigurationMode	Permission to set PCU configuration mode.			X	X
PCU_TogglePCUModes	Permission to toggle between the different exceptional modes in the PCU Operation dialog.			X	X
Redundancy_OverruleObjects	Permission to overrule error objects.			X	X
Redundancy_SwitchMaster	Permission to switch Master PCU in the Redundant Stations dialog.			X	X
TS_Configure **	Create Timeseries with limited life span.			X	X
TimeSystem_SetTime *	Needed to be allowed to change system time.			X	X
TimeSystem_SetTimeZone	Needed to be allowed to change timezone.			X	X
VersionControl_RestoreImport PCU	Restore and import files from the PCU onfiguration archive.			X	X
VersionControl_ViewConfigurationEvents	Permission to view configuration events dialog.		X	X	X
WatchCall_Configure	Permission to change attributes and qualifications of officers.			X	X
WatchCall_ManagePanels	Permission to add and delete panels, and allocate panels to officers.			X	X
WatchCall_Operate	Permission to operate the watch call system		X	X	X

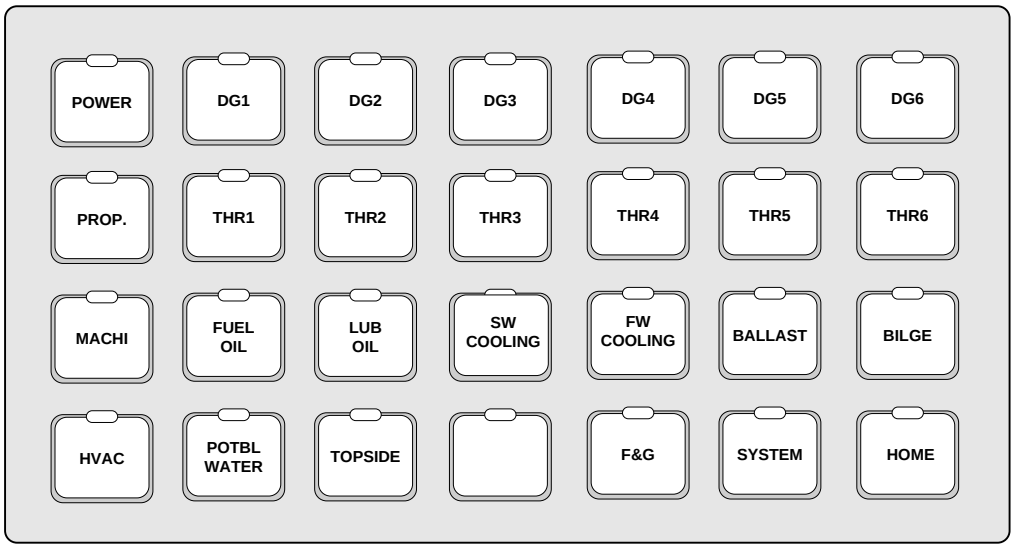
(*) "Set Time" function requires "OS configuration" mode enabled.

(**) "TS Configure" enables creation of time series which "Expire on time" (i.e. limited life time). Creation of permanent time series requires "PCU Configuration" mode enabled.

9.2 System Navigation

The operator panel comprises 28 navigation buttons for quick access to the most commonly used mimics. The mimic will normally have hotspots for further navigation to related views or sub-views. Each navigation button has an alarm indicator lamp. The lamp will start to blink if an alarm occurs at the mimic linked to the navigation button or to one of the related views. An acknowledged, but still active alarm will cause a steady light.

Navigation panel layout:



OS Groups / Command Groups

The operator stations are defined in operator station groups. For this system, three OS groups will be defined and they will be set up with command control rights. The OS groups are as follows:

OS Group	OS number
Bridge (Wheelhouse)	OS 31, 32, 33, 60
ECR	OS 34, 35, 36
Drillers Cabin	OS 57
Monitoring	OS 40-56, 58-59
Service	N/A

To form a sensible way of operating the different systems onboard, “command groups” are defined for giving the operators access to different systems where control is defined to be available. A command group can be controlled from one OS group exclusively or it can be shared between several OS groups. A command group can also be transferred between OS groups. Only the OS group in command are granted access to operate equipment and acknowledge alarms that might occur within a command group. This system will be set up with the following command groups:

Command Group	System
0	Common
1	Power
2	Thruster
3	Machinery
4	Ballast
5	Bilge
12	Drilling
14	Safety
15	System

Each OS group are defined with a set of command group rights. The following defines these rights:

9.2.1.1 D - Default Control

The Command Group will by default be given to this OS Group when powering on the system. If two operator stations are defined in an OS Group and one of the operator stations is powered off, the command control will be decided by the remaining operator station. I.e. if the command control is transferred to another location (OS Group) and the second operator station is powered on again, nothing will be done regarding control location of the transferred command group.

9.2.1.2 T - Take Able Control

The Command Group can be taken directly when this is initiated from an OS Group granted such privilege.

9.2.1.3 A - Acquirable Control

The Command Group is available for the actual OS Group, but not without acceptance from the OS Group in command.

9.2.1.4 O - Display Command Groups

The Command Group will be displayed in the command control overview dialog box.

9.2.1.5 Id

The Command Group will be given an internal identifier just to separate the different command groups. I.e. these identifiers are only for internal purpose and nothing to take in care when understanding this system.

9.2.1.6 Shared

The Command Group is available for several OS Groups at the same time.

When a command transfer is done, this will be indicated on all operator stations in the 'Message Manager' box.

Table showing relations between OS Groups and Command Groups:

OS GROUPS			ECR				Driller Cabin				Bridge				Monitoring			
Command Groups	**Id**	**Shared**	**D**	**T**	**A**	**O**	**D**	**T**	**A**	**O**	**D**	**T**	**A**	**O**	**D**	**T**	**A**	**O**
Common	0	True	X			X	X			X	X			X	X			X
Power	1	False	X		X	X				X			X	X				X
Thrusters	2	False	X		X	X				X			X	X				X
Machinery	3	False	X		X	X				X			X	X				X
Ballast	4	False			X	X				X	X		X	X				X
Bilge	5	False			X	X				X	X		X	X				X
Safety	14	False			X	X				X	X		X	X				X
System	15	True	X			X	X			X	X			X	X			X
Drilling	12	False			X	X	X		X	X			X	X				X

If all operator stations within an OS group are “offline”, i.e. stopped application or without net communication, the system will report an alarm specifying that a command group is without command control. The system will not automatically transfer the command control to a different OS group. This must be done manually by the operator by simply taking the control via the command control dialog boxes.

9.3 RCU Servers

When a RCU is powered up or reset, it will have to load a set of files before it’s able to start process control. First the RCU will load the basis file (operative system), and next the executable files (.ps and .io files). The std-file can be loaded from any OS available in the system. Executable files are loaded from operator stations set up as RCU servers. When doing online configuration changes on a RCU, changes are saved by saving the executable files on the same RCU server’s hard disk

RCU numbers	RCU servers	Std file load
All	OS 31	OS31-36
All	OS 32	OS31-36
All	OS 34	OS31-36

9.4 Registration of Configuration Event Store

The version control system is an integrated part of both the OSs and the RCUs. It works in close conjunction with the RCU backup and -restore system.

9.4.1 Event Logged in the Configuration Event DB(s)

Whenever a user performs a RCU configuration change/backup/restore, information on this event is stored in the configuration event database.

In the table below, all events, which are registered by the version control system, is defined in the column to the left. For each type of event, the logged legal actions are defined in the column to the right.

In addition, users can add a comment prior to starting the backup.

Event	Actions
Add and remove function module	Function module created Function module removed
Change in module general data	Scan task changed Scan multiplicity changed Trig module changed Command group changed Alarm panel group changed Tag name changed Visibility level changed Position changed
Change in function module status	Disable alarm mode changed Disable input mode changed Disable output mode changed Passive mode changed Simulation Algorithm mode changed Alternative Terminal Input mode changed
Change in specific parameter values	Parameter changed
Time-series configuration	Time-series created Time-series deleted Time-series changed
Alarm configuration	Alarm created Alarm deleted Alarm changed

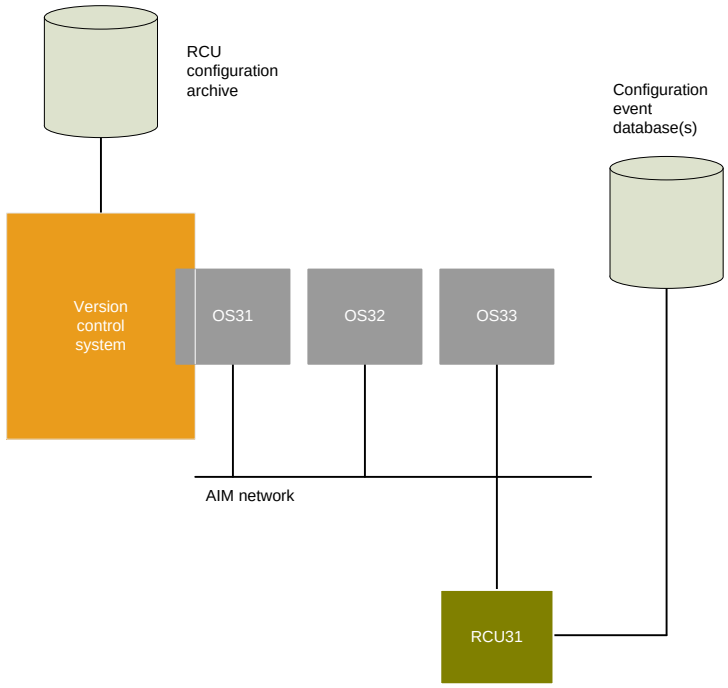
Event	Actions
Connection configuration	Connection created Connection deleted Connection changed
IO configuration	Slot changed Address changed Task changed Card deleted
IO interface (Profibus)	IO connection created IO connection deleted
Change of RCU mode	RCU mode changed
Backup of RCU	Backup succeeded Distribution succeeded
Restore of RCU	RCU configuration files restored
Boot of RCU	Started

In addition, users can add a comment prior to starting the backup.

Database Location	**OS with remote net connection**
OS98(HS)	All

9.5 Version Control System and Environment

The illustration below shows the version control system and its environment. OS numbering is just for the illustration.



The **version control system** is installed on one or more OSs of the configuration.

All **operator stations (OSs)** can, however, utilize functionality provided by the version control system as follows:

- OSs with enabled version control system can initiate both backup and restore of the RCU configurations
- OSs with no enabled version control system can only initiate backup.

The **RCU configuration archive** contains all previous backups of the RCU configuration files (.ps, .io etc.). The **RCU servers**, which are housed in the **OSs**, contain only the last backup of the RCU configuration files.

The **RCUs** contain information on the events concerning the RCU configuration changes. These events are also copied to the **configuration event database** (DB) as they occur, and can be viewed by the user.

The **import** function lets you import RCU configuration files from external sources.

Database Location	Comment
OS32	OS32 is setup with the MS Visual Source Safe software for version control of the RCU-files.

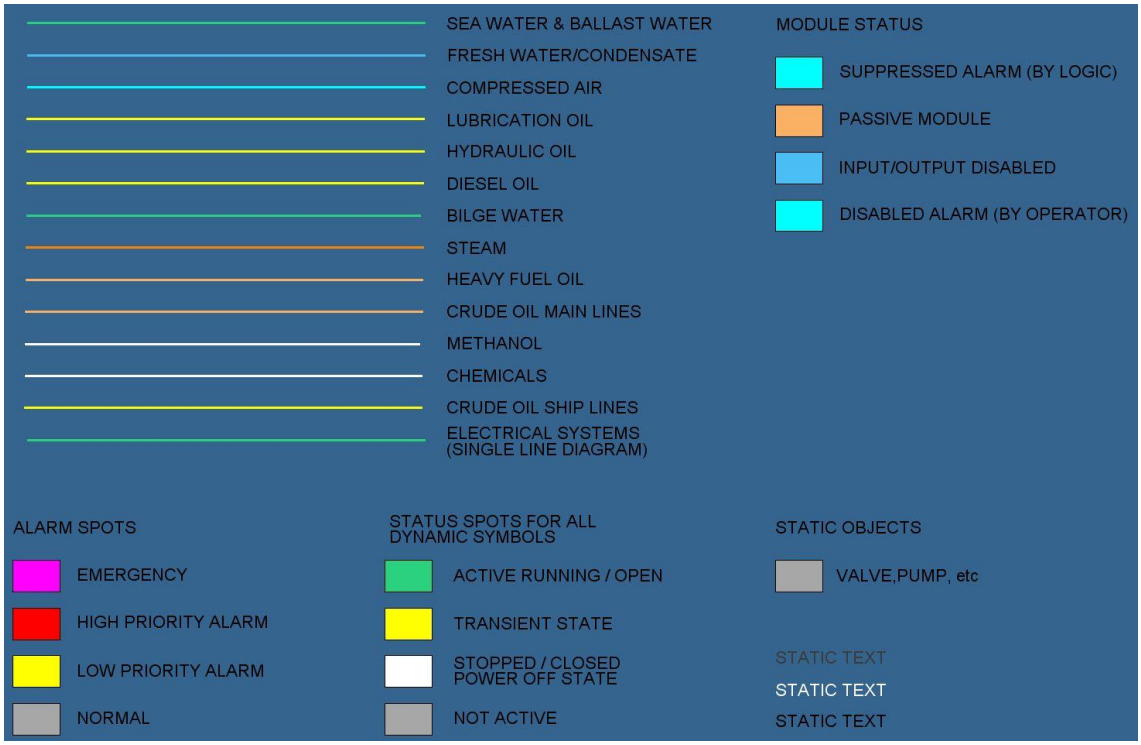
9.6 Time Series Database

The time series database receives time series data from the function modules that are configured on RCUs. The time series that come from the RCUs can be primary or secondary time series. These stored time series are utilized by other IAS applications like trend images and reports. The time series database has an Open Database Connectivity (ODBC) interface. A separate export function is also incorporated in the History Station (HS).

Database Location	Comment
History Station OS98	The Station (HS) provides facilities for long-term storage of Time series. The Rapid-HS, is a HS with high performance and high capacity, which provides facilities for long-term storage and to restore the backup data. The architecture in the Rapid-HS is designed so that it makes is possible to select Rapid or another OPC compatible database as database engine.

9.7 MMI Colour Convention

The HMI background color is KM standard **Grey** and regarding the process system and equipment state color on the HMI the following KM standard color codes are used for this project.

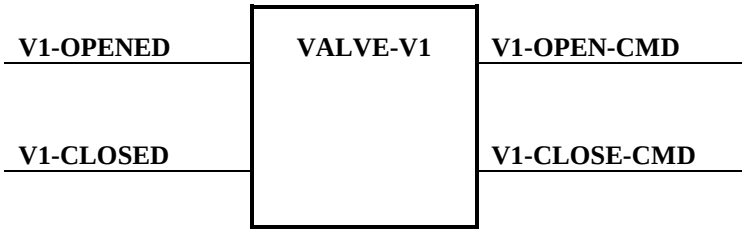


Note: This illustration is from the old view and will be updated.

9.8 Tag Numbering Philosophy

9.8.1 The Difference between Instrument Tag and IAS Tag

The instrument tag is a unique tag identifying each individual instrument and will be found in the IO-database. The instrument tag must be unique within the whole IO database. The IAStag is an object tag collected by one or several instrument tags. If the instruments have only one signal, like a pressure transmitter, the IAS tag is normally identical to the instrument tag. In the example bellow is VALVE-V1 the IAS tag and V1-OPENED, V1-CLOSED, V1-OPEN-CMD and V1-CLOSE-CMD Instrument tags. Four records in the IO Database will describe the valve VALVE-V1.



Instrument tags are not used by AIM. The tag is “translated” to AIMTAG/TerminalName. Every instrument tag will be connected to an IO channel.

IAS Tag is the Tagname used in the IAS System and will be found in the software and popup on the mimics when the mouse pointers is moved over a dynamic symbol related to the software.

9.8.2 Tag Name Restrictions

All tag names starts with a letter (“A” to “Z”) or a number (“0” to “9”).

In addition to letters (both upper and lower case) and numbers the following signs are allowed:

“ - “ minus

“ _ “ underscore

“ . “ point

Note that a space (“ ”) is not allowed

The maximum number of characters is 15.

9.8.3 IAS Tag Structure for this project

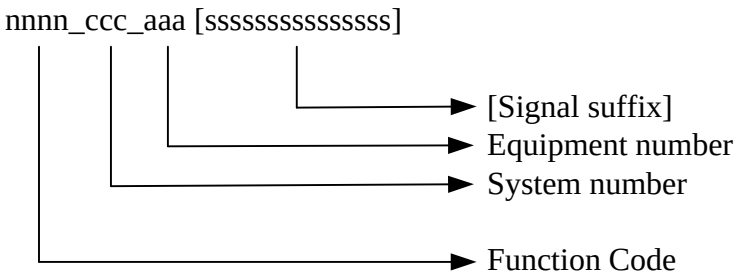
The tag itself contains of several segments as described below:

- Tag (≤ 15 char) :

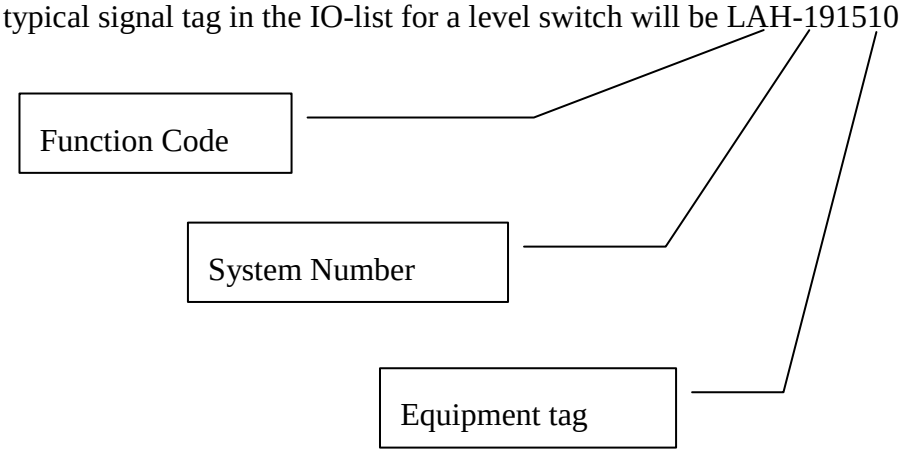
Function code:	Based on SHI tag alpha overview.
System number:	Based on SHI Overview Library for IO tag.
Sequential number:	A sequential number from 0 to 9999.
Signal suffix:	For field devices that have several IO-tags i.e. running, failure, remote etc.

- A typical IO-tag (≤ 31 char) will be as described below:

(c and a is numerical, n and [s] is alphanumerical).



A typical signal tag in the IO-list for a level switch will be LAH-191510



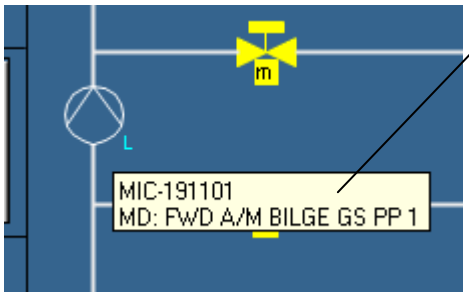
9.8.4 IAS Tag Example for this project

9.8.4.1 Pump/Motor/Ship IAS Tag Example

The function code for Pump/Motor/Fan is **MIC**

IO-list tag (Inst. Tag)	Description
MA-191101	FWD A/M BILGE GS PP 1 FAIL
MI-191101A	FWD A/M BILGE GS PP 1 RUN
MI-191101B	FWD A/M BILGE GS PP 1 LOC/R
MC-191101A	FWD A/M BILGE GS PP 1 START
MC-191101B	FWD A/M BILGE GS PP 1 STOP

The IAS Tag for this motor will be as follows: **MIC-191101**



This is a popup box and will be displayed when the mouse pointer is placed on the damper symbol.

MD is the abbreviation for Module Description

9.8.4.2 Valve IAS Tag Example

The function codes for valves in mimic are as follows:

VC: Hydraulic valve

XV: Pneumatic Valve

QCV: Quick Closing Valve

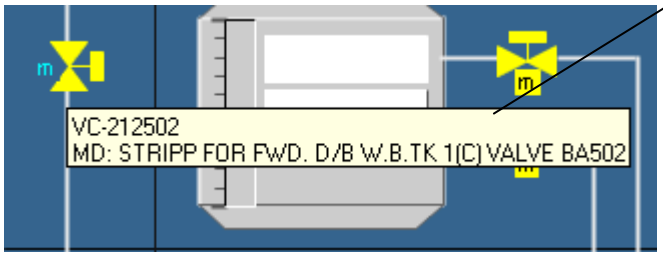
MOV: Motor Valve

SOV: Solenoid Valve

The function code for Valves is **VC**

IO-list tag (Inst. Tag)	Description
ZC-212502	STRIPPING FOR FWD. D/B W.B.TK 1(C) VALVE CLOSED
ZO-212502	STRIPPING FOR FWD. D/B W.B.TK 1(C) VALVE OPENED
VCO-212502A	STRIPPING FOR FWD. D/B W.B.TK 1(C) VALVE OPEN
VCC-212502B	STRIPPING FOR FWD. D/B W.B.TK 1(C) VALVE CLOSE

The IAS Tag for this valve can be as follows: **VC-212502**



This is a popup box and will be displayed when the mouse pointer is placed on the damper symbol.

MD is the abbreviation for Module Description

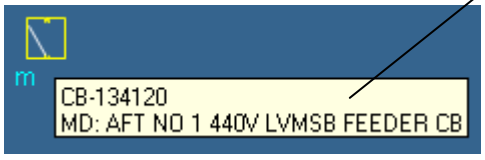
9.8.4.3 Circuit Breaker IAS Tag Example

The function code a circuit breaker is **CB**

IO-list tag (Inst. Tag)	Description
XI-134121	AFT NO 1 440 V LVMSB FEEDER CB STATUS (CLOSED)
XC-134122	AFT NO 1 440 V LVMSB FEEDER CB OPEN
XC-134123	AFT NO 1 440 V LVMSB FEEDER CB CLOSE

For a circuit breaker the last three digits from the closed feedback instrument tag will be used in the IAS Tag i.e. for this circuit breaker the IAS Tag will be as follows:

CB-134120



This is a popup box and will be displayed when the mouse pointer is placed on the damper symbol.

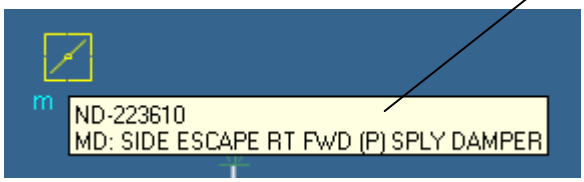
MD is the abbreviation for Module Description

9.8.4.4 Damper IAS Tag Example

The function code a circuit breaker is **ND**

IO-list tag (Inst. Tag)	Description
XC-223610	SIDE ESCAPE RT FWD (P) SPLY DAMPER
XI-223610	SIDE ESCAPE RT FWD (P) SPLY DAMPER(M16) CLOSE STATUS

The IAS Tag for this damper will be as follows: **ND-223610**

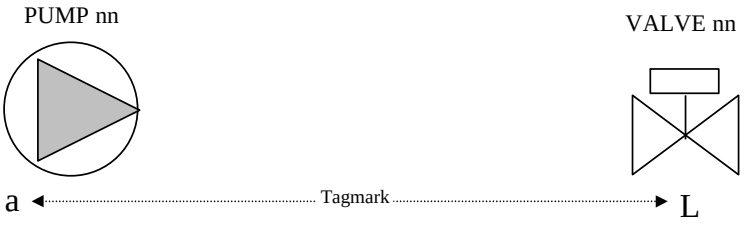


This is a popup box and will be displayed when the mouse pointer is placed on the damper symbol.

MD is the abbreviation for Module Description

9.9 MMI Tag Mark Indication

The purpose with the “tag mark” is to give the operator a clear indication of the mode status of the software module controlling the different ship equipment. The “tag mark” will also be used for alarm indication in case a ‘Failure’ signal is included for the controlled equipment. Also timeout and inconsistency alarm will be done by the “tag mark” (typically for pumps and valves). Below you will see the different “tag mark” indications, the meaning of them and typically software modules they will appear together with. “tag mark” indications used two times will be with different colours.



Tag Mark Indication:

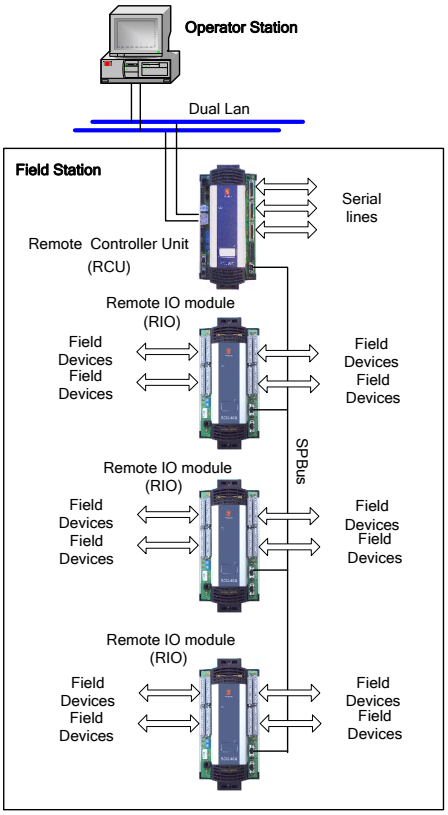
Number	Tag Mark	Meaning	Used by (AIM SW Modules)	Colour
01	" "	Detached	PID, Motor, Valve, Circuit Breaker	Cyan
02	"L"	Local	Motor, Valve, Circuit Breaker	Cyan
03	"!"	Error	Motor, Valve, Circuit Breaker	Red
04	"S"	Shutdown	Motor, Valve, etc.	Magenta
05	"O"	Override	PID, Motor, Valve, etc.	Cyan
06	"i"	Inhibit	PID, Motor, Valve, etc.	Cyan
07	"!"	Override Interlock	PID, Motor, Valve, etc.	Cyan
08	"I"	Interlock	Motor, Valve, Circuit Breaker, etc.	Cyan
09	"F"	Follow & Freeze	PID	Cyan
10	"e"	External	PID	Green
11	"m"	Manual	PID, Motor, Valve, etc.	Cyan
12	"a"	Auto	Motor, Valve, etc.	Green
13	"i"	Internal	PID	Cyan
14	" "	Not Mark	-	-

10 PROCESS CONTROLLERS (RCU)

10.1 Remote Control Units – RCU's

Each RCU are independent of the other RCU's in the system and the operator stations. A failure of one RCU will only affect the part that this RCU is controlling.

The RCU's are running VxWorks as operating system.



RCU and RIO units

10.2 Self Diagnostic

All units in the systems provide an extended self diagnostic feature. In case a failure is detected a system alarm will be generated. If a main unit (controller or Operator Station) is not operational (i.e. loss of power supply) all other units will report this failure.

All controllers have a watchdog function. In case one or more critical tasks don't update the watchdog timer, the watchdog output will be activated and the controller and its applications will stop.

10.3 RCU Redundancy

All the Field stations have redundant set of RCU's (R1) accept for the Thruster Field stations. The R1 has one main controller (master) and one hot backup controller (Slave).

Each RCU has double net interface. One single failure of the network will not affect the network for the RCU pair.

Master / Slave pairs

Field Station	Master RCU	Slave RCU	Remark
047	047	147	FS 400C-R1
048	048	148	FS 400C-R1
051	051	151	FS 400C-R1
052	052	152	FS 400C-R1
053	053	153	FS 400C-R1
054	054	154	FS 400C-R1
055	055	155	FS 400C-R1
056	056	156	FS 400C-R1
057	057	157	FS 400C-R1
058	058	158	FS 400C-R1
071	071	171	FS 400C-R1
072	072	172	FS 400C-R1
073	073	173	FS 400C-R1
091	091	191	FS 400C-R1
201	201	NA	FS 240C
202	202	NA	FS 240C
203	203	NA	FS 240C
204	204	NA	FS 240C
205	205	NA	FS 240C
206	206	NA	FS 240C

11 REDUNDANCY

11.1 Network

Redundant network based on the Ethernet principle is installed as standard. The two nets should be installed in different cable paths as far as possible. Each unit is interfaced to both nets and if a failure on one net is detected, the system will automatically use the healthy net.

The network consists of six (6) Network Distribution Units (NDU). Each of these units contains one or several network switch(s).

Name	Location	Comments
NDU A1	Communication Room	
NDU A2	General Equip. Room 1	
NDU A3	Port SWBD Room	
NDU B1/C1	DP Backup Room	
NDU B2/C2	General Equip. Room 2	
NDU B3/C3	Stbd SWBD Room	

11.1.1 Design Parameters

Power Supply:

Power supply to the NDU's are fed from a UPS and two networks are fed from two different UPS'es.

Physical location:

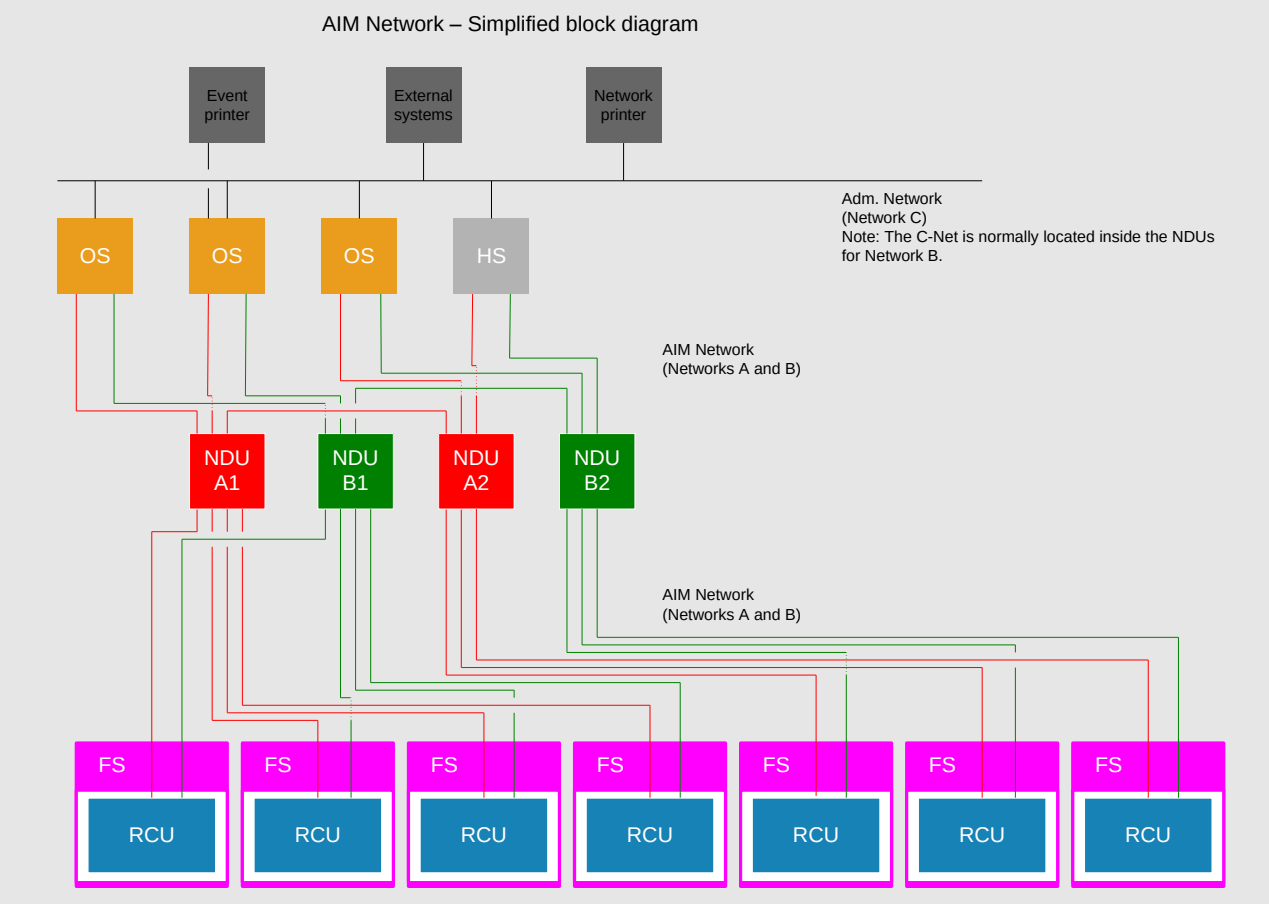
The NDU's are located in different rooms and this ship is a class III vessel so the NDU's are also separated by A60.

Third network (Net C) interface:

It is also a third network onboard and this is basically for administration communication between the different systems e.g. printers. In case the third network is interfaced to the vessel LAN or other external parties, a router shall be installed and set up to give limited access to the IAS system.

11.1.2 Topology

As any LAN, the IAS network can be designed and implemented in many ways. Normally the IAS applies a network topology with netswitch. A possible topology is shown below.



11.2 Operator Stations

Each operator station is independent of the other operator stations. Redundancy is implemented by two or more operator stations.

Operator station in a standard console

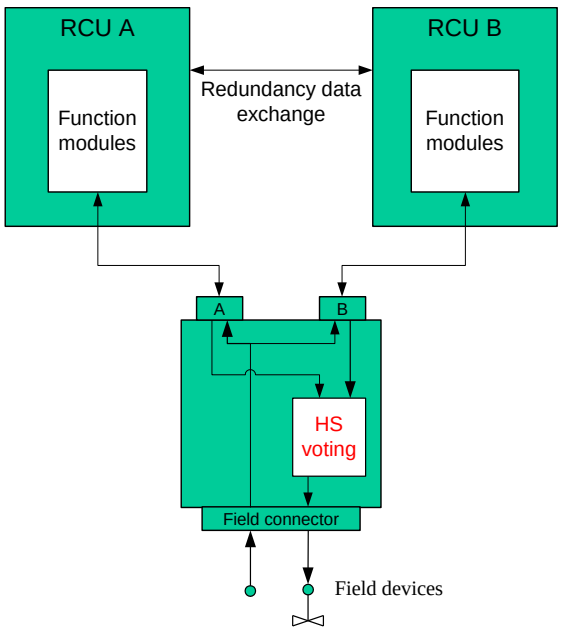
11.2.1 Design Parameters

Power Supply:

Power supply to an operator station is fed from a UPS. If there are two operator stations in one location (room) these are fed from two different UPS's.

11.3 Field Stations

Some Field Stations have a redundant set of RCU (FS-400C-R1). There is one main controller (master) with a hot backup controller (Slave). Both computers read the same input from the I/O cards, but only the active one can set output signals. The slave controller is continuously updated with the same data as the master controller (I/O, network, operation and parameter changes). If the master controller fails, the slave controller will automatically take over as the active controller without any disturbance of the process.



Hot Standby Shared RIO

All redundant field stations have dual power supply. Two 230 V feeds (from UPS) are fed to two (100 %) 24 V DC power supplies. During normal conditions, the power supply units shares the load. In case one of the UPS supplies or a power supply fails, the remaining power supply will take the whole load. The status of the power supplies and the 230 V UPS supply is monitored and the alarm is read by digital input RIO modules.

Each RCU has double net interface. One single failure of the network will not affect the network for the RCU pair.

11.3.1 Fail Safe settings:

All RIO units with output channels (DO / AO) have provisions for fail safe settings. The fail safe settings are normally set to keep the output (freeze). In case the system or process controlled cannot be left with a frozen output, the fail safe settings must be set to the safe value according to the process controlled (i.e. for a pump this would normally be fail safe stop). The fail safe settings will be activated in case the communication with the controller fails. In case the communication timer is not updated according to the settings (default setting ~ 6 seconds), the fail safe values will be set out.

12 WATCH CALL SYSTEM

The Watch Call system is an extended alarm system for vessels. The system monitors the cargo and engine machinery alarms. Using this system, it is possible to keep the engine control room unmanned during normal operation. Dedicated alarm panels, which may be located in various places throughout the vessel, display the alarms and information about the alarm conditions. The system is basically an extension of the Event system combined with an officer call facility.

12.1 Main Functions and Features

The Watch Call has two main functions:

- **Alarm Extension**
  This is a group alarm status with a built-in facility for the officer on-duty to acknowledge the alarm, and with fault indication and test facilities.
- **Officer Call**
  This is an individual and general calling facility for officers that can be activated from selected vessel control locations.

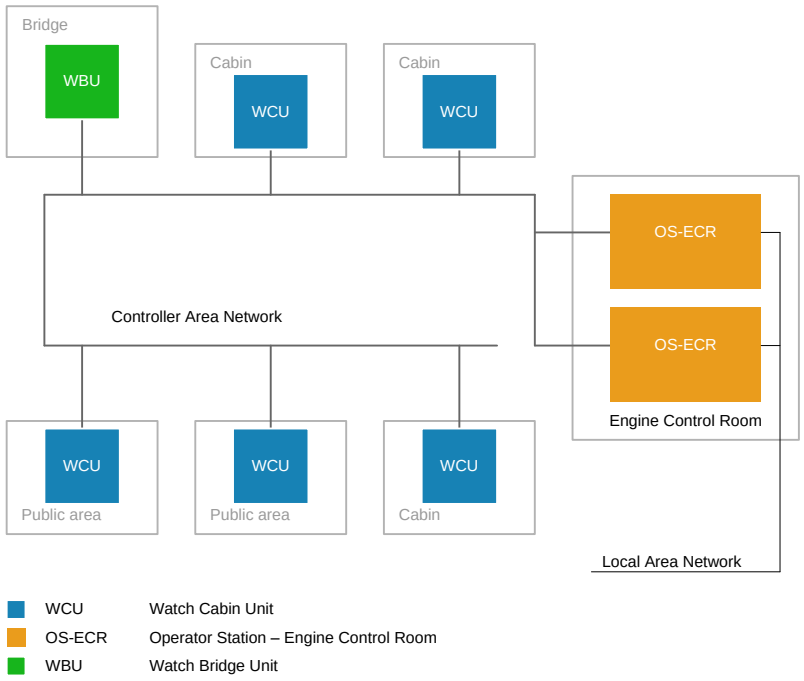
The main features are the following:

- On-duty officers need no longer to stay on their control locations while they are on-duty, as the Watch Call system's alarm panels are distributed throughout the vessel.
- Alarms from IAS Event system are relayed to the on-duty officer via the Watch Call panels. Applicable alarm information is displayed, and the officer acknowledges the alarm in a two-step operation.
- The design of the Watch Call system is such that rest of the crew can observe the progress in the acknowledgement process.
- Bridge and engine control room can make calls for one or more officers.
- The watch responsible control location can be swapped between bridge and engine control room.
- Reconfiguration of officer profiles and duty cycles are performed on-line.

Dead Man system, which checks if the officer is alive, is a part of the alarm and monitoring system. It may be activated automatically by the Watch Call system when in Bridge Watch (i.e. unmanned engine room and watch transferred to the Bridge) and an engine alarm is given. IAS will receive one common alarm from the ships “Dead Man System” delivered by the yard.

12.2 System Topology

The figure below shows a typical Watch Call system layout.



Unit in Topology	Description
WCU	Panels for displaying of alarms (only silence, no acknowledge on the WCU). Typically located in cabins of all applicable officers and in public areas.
OS-ECR	A redundancy pair of OSs is located in the engine control room. Used to configure the duty cycles and to control the Watch Call system.
WBU	Panel that provides information on alarms and officers on-duty and watch responsible officers. This panel is located on the vessel bridge.
Controller Area Network	Connects all units of the Watch Call system.
Local Area Network	Provides the connection to the rest of the vessel control system, from which alarm information is transferred.

12.3 Alarm Function

12.3.1 General

The Watch Call system receives alarms from the IAS Event system indicating an alarm condition in a defined part of the process area. These alarms are displayed on the WBU and WCU panels and on the OS-ECRs Watch Call dialogs.

Panels with LCD screens provide alphanumerical information on the alarm and the applicable points of time.

The watch responsible control location may be either the engine control room or the bridge.

The Panels will have unique sound for Fire Alarms.

12.3.2 Alarm Acknowledgement

Acknowledgement of an alarm is a two-step operation.

- First step is to acknowledge the alarm on the applicable Watch Call panel, which will silence the audible alarm.
- Second step, which terminates all alarm indications, is finished when the on-duty officer acknowledges the alarm on the Event system of the applicable K-Chief OS in the Engine Control Room.

12.3.3 Repeat-alarm Function

- If an alarm is not acknowledged at an K-Chief OS within a pre-defined time period (default 3 minutes), a **1st repeat alarm** is generated.
- If further pre-defined time period (default 3 minutes) elapses, a **2nd repeat alarm** is generated.

An alarm that is repeated is indicated on the Repeat Alarm Indicator on the Watch Call dialog box.

12.4 Panels and Dialog Functionality

The functionality provided by the Watch Call panels and dialog (box) is described below:

12.4.1 Watch Call Dialog on OS-ECRs

This dialog is used to operate and configure the configurable parts of the system.

Operation

Indicators / Buttons	Description
On duty indicators	All officers on duty are indicated.
Alarms	All applicable watch call alarms are present. Process areas with active alarms are indicated.
Call officers buttons	Calling on-duty officers respective all officers for engine or cargo.
Watch responsibility	Watch responsibility control location may be transferred between bridge and engine control room.
Other indicators	System related indicators.

Configuration of officer profiles

For each chief officer, qualifications and off-duty mode may be configured.

Configuration of panel group membership

Serial numbers and operational status for each panel is displayed. The group membership for each panel may be configured.

12.4.2 Watch Bridge Unit

Indicators / Buttons	Description
On duty indicators	All officers on duty are indicated.
Alarms	All applicable watch call alarms are present. Process areas with active alarms are indicated.
Call on-duty officers buttons	Buttons for calling on-duty officers for engine or cargo.
Watch responsibility	Watch responsibility control location may be transferred between bridge and engine control room. Acknowledged only on WBU.
Other indicators	Dead Man System Is Active. System related indicators.

12.4.3 Watch Cabin Unit

Indicators / Buttons	Description
On duty indicators	All officers on duty are indicated.
Alarms	All applicable watch call alarms are present. Process areas with active alarms are indicated.
Call buttons	Buttons indicating calls from watch responsible areas.
Other indicators	System related indicators.

12.5 Panel Groups

Each Watch Call panel belongs to a group and the maximum officer groups defined are eight.

The following table displays an example of groups:

Group	Panel Features
Captain	This is the WBU panel, located in the CCR. All alarms for all officers are displayed here.
Chief Engineer	Located in chief engineer's cabin. All alarms applicable to the chief engineer (Qualifications: Engine) are routed to the WCU panel.
1st Engineer	Located in 1st engineer's cabin All alarms applicable to the 1st engineer (Qualifications: Engine) are routed to the WCU panel.
2nd Engineer	Located in cargo officer's room. All alarms applicable to the cargo officer (Qualifications: Cargo) are routed to the WCU panel.
Public	Located in a public area. All alarms for all applicable duty officers are displayed on the WCU panel.

Note *The Bridge- and Public- groups are always present. The other groups (i.e. officers) may vary both in title and qualifications.*

12.6 Watch Bridge Unit

The Watch Bridge Unit (WBU) panel is located on the ship's bridge, can be defined as **Watch responsible**, and are used to relay alarm information and communication from the remote Operator Station to personnel on the bridge.

There are two versions of the WBU panel, one panel with LCD screen and LEDs (most commonly used) and the other panel with only LEDs.

The WBU interacts with the Watch Call System (WCS) and its main functions are to:

- indicate who has Watch Responsibility
- indicate who is On Duty
- indicate the current Alarm Status
- sound an audible alarm whenever a new alarm condition occurs and someone is on-duty
- allow the bridge watch to contact/call duty personnel
- accept watch responsible transfer.

12.7 Watch Cabin Unit

The Watch Cabin Unit (WCU) panels are placed at various locations throughout the ship, i.e. the officer cabins and in public recreation areas such as the mess room, TV room etc.

The WCU interacts with the Watch Call System (WCS) and its main functions are to:

- indicate who is **On Duty**
- indicate when the **On Duty officers** are being called and who is calling
- indicate the current **Alarm Status**
- sound an audible alarm whenever a new alarm condition occurs, i.e.:
  - for WCU panels in cabin locations: only when defined on duty
  - for WCU panels in public area locations: only when someone is defined as on duty.

12.8 Watch Responsibility

The watch responsible control location is a location that can make calls for on-duty officers. The control location can be either: the engine control room or the bridge. All requests for transfer between these two locations must be made from an OS-ECR.

12.9 Extension Alarm Panels:

11 Extension Alarm Panels (E0), for unmanned engine room applications, are installed in the system. Refer table:

WCP	Can Bus	Location	Type WCP	LCD Type	Managing Group	Remark
1	Yes	Bridge Console	Watch Bridge	Yes	-	Main Panel
2	Yes	Office 705	Watch Cabin	Yes	-	Public panel type setup
3	Yes	Cabin 604	Watch Cabin	Yes	-	Cabin panel type setup
4	Yes	Cabin 605	Watch Cabin	Yes	-	Cabin panel type setup
5	Yes	Cabin 610	Watch Cabin	Yes	-	Cabin panel type setup
6	Yes	Cabin 611	Watch Cabin	Yes	-	Cabin panel type setup
7	Yes	Room 622	Watch Cabin	Yes	-	Cabin panel type setup
8	Yes	Room 617	Watch Cabin	Yes	-	Cabin panel type setup
9	Yes	Mess Room 107	Watch Cabin	Yes	-	Public panel type setup
10	Yes	Em'cy Generator Room	Watch Cabin	Yes	-	Public panel type setup
11	Yes	Engine Work Shop	Watch Cabin	Yes	-	Public panel type setup

The system is set up with 8 watch call groups as indicated in table below:

WC no.	Name	Description
1	Shutdown DG Alarms	Shutdown on engines or thrusters
2	Propulsion Alarms	Failure on thrusters
3	Ballast / Bilge / Drilling Alarms	Bilge well level alarms
4	F&G Alarms	Fire alarms
5	Power / Machinery / Common / System Alarms	All non critical alarms
6	Dead man Alarms	Dead man alarms
7	Repeat Alarms	Default
8	Unit Fail	Default

Watch call system function description:

12.10 Panel Operation

1. **Alarm acknowledge during wheelhouse watch mode**
   - Initially alarm will sound on bridge panel, on duty engineer panel and on public panels.
   - Pressing the “SOUND OFF” button on a public panel will turn off the sound only on the panel operated. Alarm indicator will continue to flicker until alarm is acknowledged, and then change to a steady light. Indicator will be turned off when alarm condition is no longer present.
   - Pressing the “SOUND OFF” button on the bridge panel will turn off the sound only on bridge panel. Alarm indicator will continue to flicker until alarm is acknowledged, and then change to a steady light. Indicator will be turned off when alarm condition is no longer present.
   - Pressing the “SOUND OFF” button on the duty engineer panel will turn off the sound on duty panel and public panels (Bridge panel must be silenced separately). Alarm indicator will continue to flicker until alarm is acknowledged, and then change to a steady light. Indicator will be turned off when alarm condition is no longer present.
   - Operating the “Ack” function on OS in, will silence all panels and give a steady alarm indication. Indicators will be turned off when alarm condition is no longer present.

2. **Alarm acknowledge during ECR watch mode**
   - With No duty selection, Extension panels will only show alarm status. No sound device will be set off.

1. **Duty engineer/officer selection**
   - To transfer machinery responsibility to bridge (bridge watch mode), the operator must first select a duty engineer on duty from software panel on VDU with all alarms acknowledge condition. The duty lamp is activated on all panels. Then the “Bridge watch” button is selected and buzzer/lamp is activated at bridge panel. Pressing the “Bridge watch” button on bridge panel will accept the watch transfer and a lamp indicator will indicate bridge watch mode. A transfer from bridge to ECR must be initiated from ECR; buzzer/lamp is activated at bridge panel. Upon acceptance from bridge, watch responsibility is transferred to ECR.
   - If a duty engineer is selected from software panel on VDU, without transferring the watch responsibility to the bridge (Harbour mode), alarms will be routed to duty engineer panel as well as public panels. Repeat alarms and dead man alarms will be activated as normal during this condition.

2. **Engineer/Officer call from ECR**
   - Two types of call functions are supported, “Call Duty” or “Call all”.

- The “Call Duty” operation will activate buzzer/lamps on the designated duty engineer panel and on public panels. The “Call Duty” button will not work unless a duty engineer is selected.
- Acknowledging the call on the designated duty engineer panel will silence all panels.
- Acknowledging the call on a public panel will silence that specific panel only. Indicator lamps will continue to flicker on all panels.
- The “Call all” function is more of an emergency operation. Pressing the “Call all” button will activate buzzer/lamp on all panels. Acknowledging the call on one engineer/officer panel will silence that specific panel only. Acknowledging the call on a public panel will silence that specific panel only.

3. Duty Engineer/Officer call from Wheelhouse

- Operating the “Call Duty” from bridge panel will activate buzzer/lamp on the selected duty engineer panel and on public panels. Again, the “Call Duty” function requires that an engineer/officer actually has been set on duty.
- Acknowledge functions are the same as calls initiated from ECR.

4. Repeat Alarm

- The system has two repeat alarms. Repeat alarm one will be triggered when an active watch call group alarm has not been acknowledged from an operator station within a predefined time. This predefined time is normally set to three minutes. Repeat alarm one will be given at bridge panel, duty engineer/officer panel and at public panels.
- Repeat alarm two is set off if the active alarm still is not acknowledged from an operator station within a predefined time after repeat alarm one. Repeat alarm two will be given at bridge panel, all engineer/officer panels and at public panels. Time limits should be considered to. 1) Allow duty engineer to take action before repeat one. 2) Notify all engineers (repeat two) within time limits specified by class requirements.

5. Dead man alarm

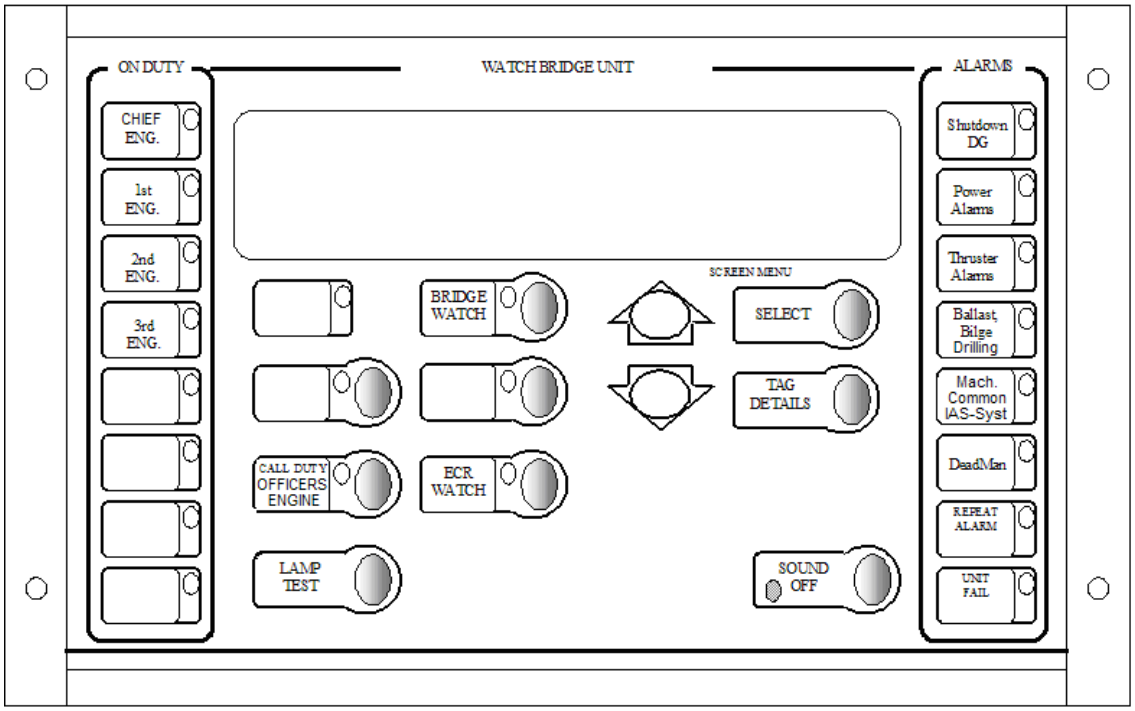
- When a “Dead Man Alarm” is activated all officers with machinery qualification are called. The public area panels will also call these officers.

12.11 Panel Overview

Bridge Unit:

Unit Location: Bridge

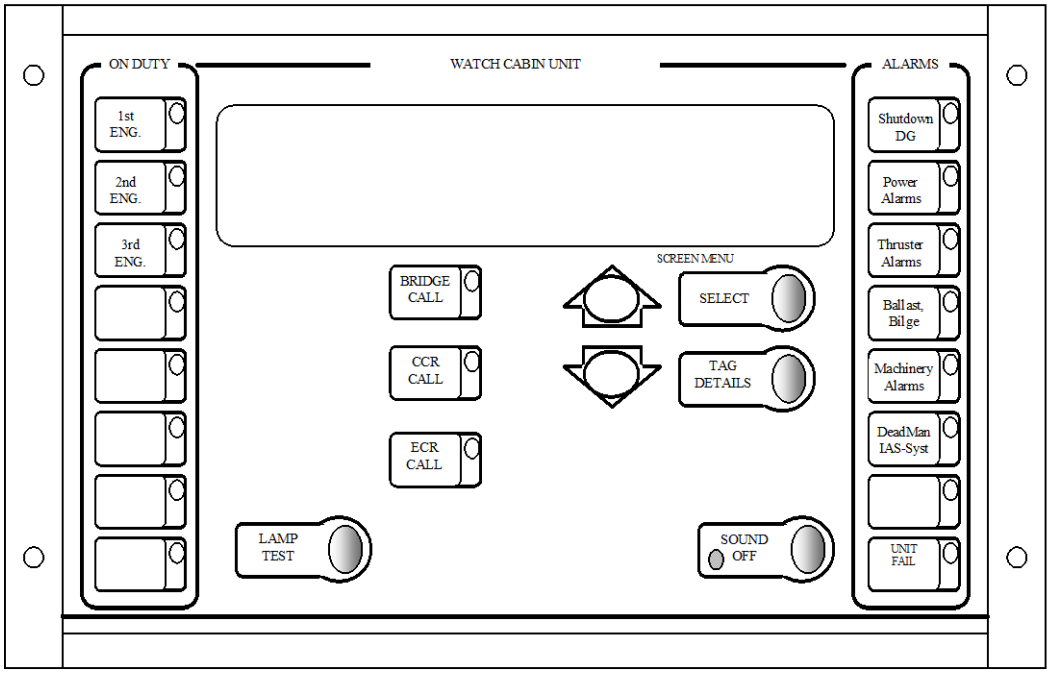
Number of Units: 1



Cabin Unit for engineers/officers and public areas:

Unit Location: Refer table above.

Number of Units: 10



13 HISTORY STATION

13.1 Main Features

The Rapid-History Station (Rapid-HS) provides facilities for long-term storage of Time series, Alarms and Events. A Rapid-HS may be a separate station, or it may be integrated with an OS. The integrated unit is designated OSHS.

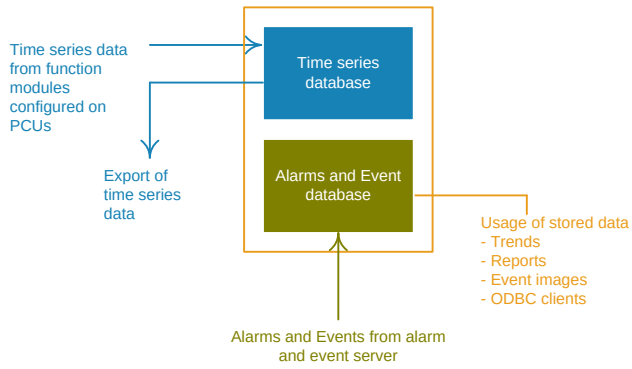
The Rapid-HS is a HS with high performance and high capacity, which provides facilities for long-term storage and to restore the backup data.

The Rapid-HS consists of two databases:

- Time series database
    4 Primary time series, which are process values as they are logged in the PCU
    5 Secondary time series, which are processed primary series, for example mean values for a process value for a given period of time.
- Alarms and Events database.

The architecture in the Rapid-HS is designed so that it makes is possible to select Rapid or another OPC compatible database as database engine.

The illustration below shows a HS database and its interfaces.

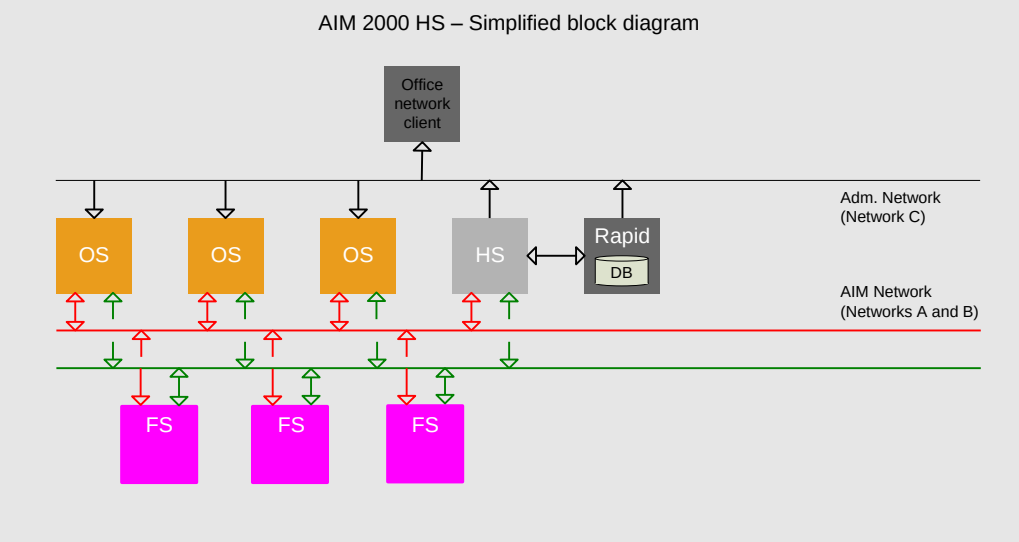


The **Time series database** receives time series data from the function modules that are configured on RCUs. The time series that come from the RCUs can be primary or secondary time series. These stored time series are utilized by other IAS applications like Trend images and reports. The time series database has an Open Database Connectivity (ODBC) interface. A separate export function is also incorporated in the HS.

The **Alarm and Event database** receives event data from the event server. Alarms and events are generated by the function modules running on the RCUs, or by the surrounding system. These alarms and events are stored in the database and are subsequently utilized by Event images, where they are displayed as alarms and messages. The alarms and events database also has an ODBC interface.

Note

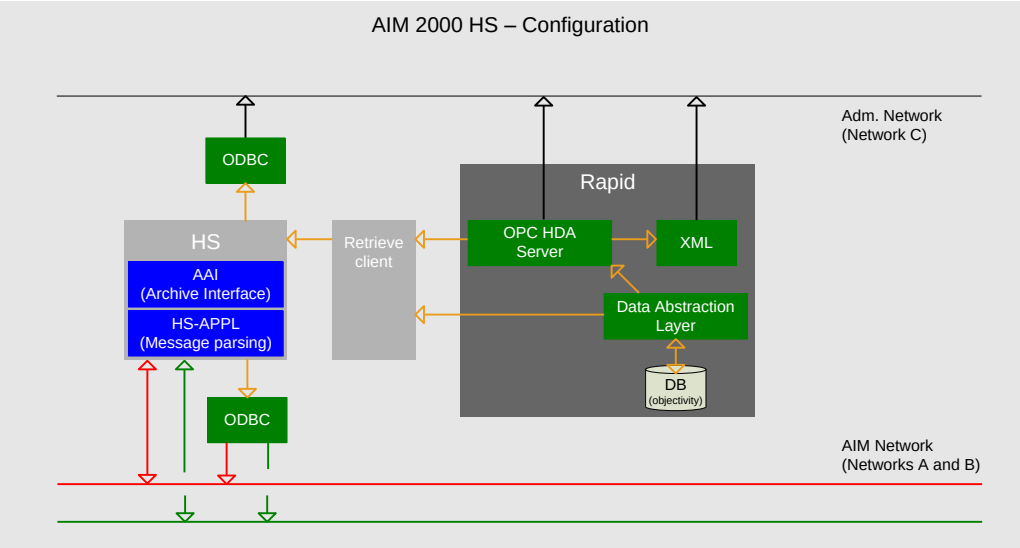
The Rapid database is currently used for storage of Time series only. The alarms and events are currently stored in a separate database. The 2 databases may be consolidated into one rapid database in the future.



13.2 HS Model Description

13.2.1 HS Configuration

The HS configuration messages, sent from the RCU to the HS-Application (HS-APPL), are transferred to the **Rapid database** and the **Storage Server**. The Rapid has a Configuration interface. Both the Rapid Data Abstraction Layer (DAL) and the Configuration interface may be accessed.



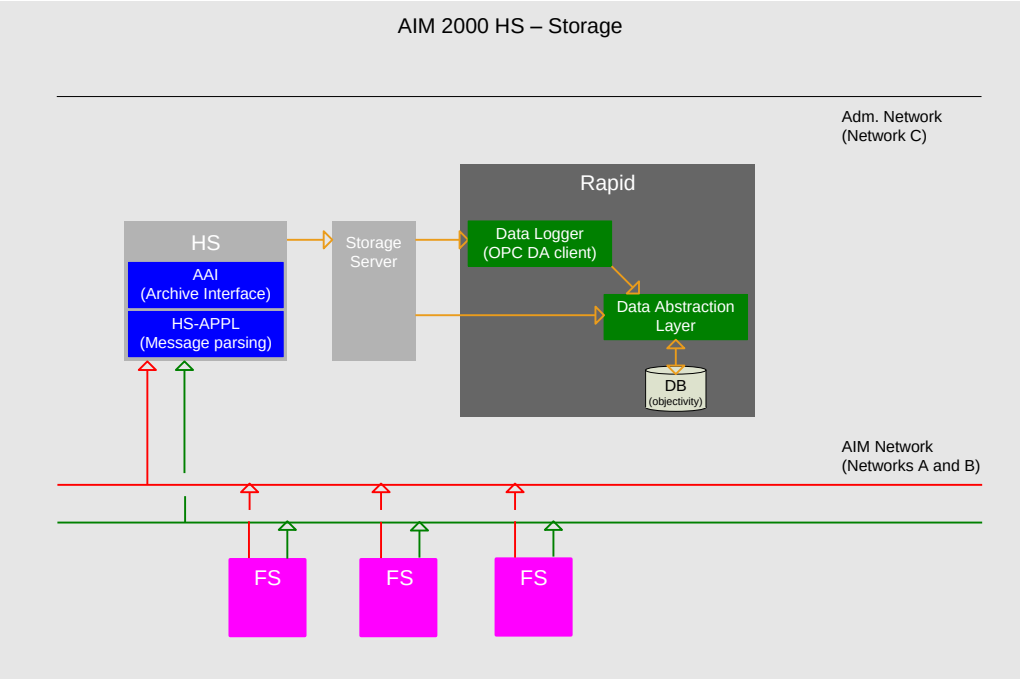
13.2.2 HS Storage

The Time series data, sent from the RCU to the HS-APPL for storage, are transferred to the **Rapid database** by the **Storage Server**.

The Rapid database has two possible interfaces:

- Data Logger
- Data Abstraction Layer.

The Data Logger is based on the OPC standard, and is preferred if complexity and speed is acceptable, compared to the DAL.



Storing of time series data do not lock any process on HS machine more than a few seconds.

The HS is able to receive these amounts of data from the IAS system and transfers them to the Rapid database without data loss. This happens when the only applications running are the Rapid Server and the HS, when both the RCUs and the Rapid system are set up with zero hysteresis.

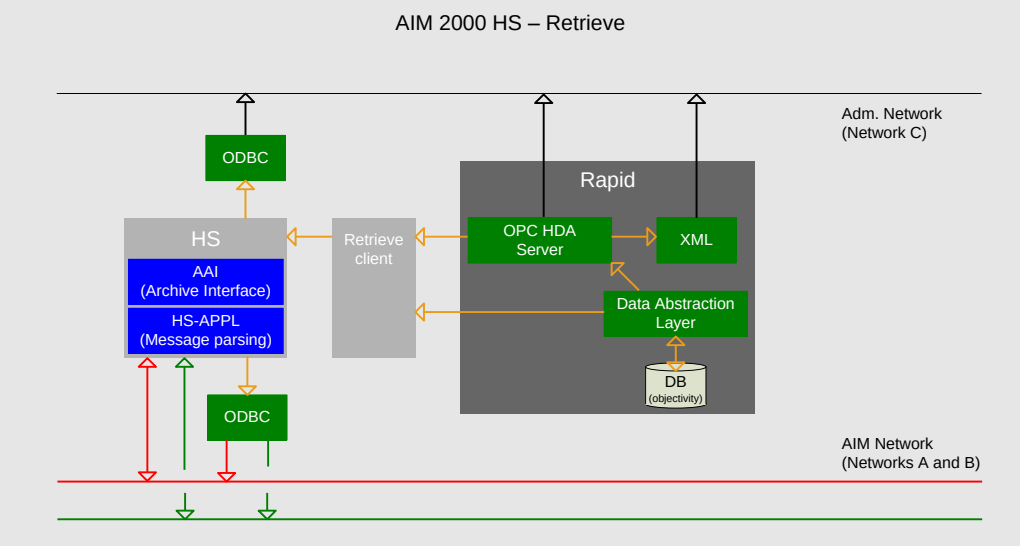
This project has included storage of up to 5000 time series / signals.

13.2.3 HS Retrieve

The HS retrieve messages, sent from the OS to the HS-APPL, handled by the **Retrieve client**. This client is implemented using the OPC HDA Server or direct to the DAL. The interface to choose is dependent on design details, about how to handle aggregations. The OPC HDA has strong support for aggregations; the DAL will only return raw data. The HS-APPL will return the data using the existing HS message format or ODBC.

On the administrative network, ODBC, HDA and XML are available.

An OS connected to the administrative network by a 3rd net card, may use these protocols directly, and may include a Web-view for displaying the data.



13.3 Filtering of Time Series

In configurations that are equipped with more than one HS, the persistent time series storage may be distributed among the HSs. This is accomplished by using a filter for a selected HS and creates the set of RCUs, which time series are to be included in the HS time series database.

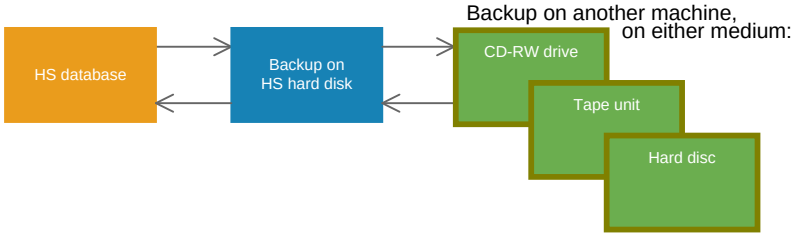
13.4 Backup of HS Databases

13.4.1 Scope of the Backup

By default the Alarms and Events databases, from all the RCUs of your configuration are included in the HS database backup.

The Time series database, due to the size, is not available to back up. The alternative is to use background replication which can run while the Time series database is opened. The replication can be done to a server onboard the vessel or to an office via satellite.

13.4.2 Backup Concept



The backup of the databases are initially stored on the HS hard disc. When the database backup is finished, a batch script may transfer the backup files onto a long term storage medium. This may be a CD-RW drive, a tape unit or a hard disc on another machine. The storage medium will depend on the size of the database which depends on the number of stored Events and the time horizon for the storage.

The HS will be equipped with a backup medium for storage of compressed backups. Thus, when a backup medium is configured, the backup stored on the HS hard disc is automatically compressed and transferred to the backup medium, where it is appended after the previous (last) backup.

The backup is performed sequentially as described below.

Backup of Event Database

When the backup of the time series database is finished, the backup of the event database is started. During this operation, the event database is closed, but the time series database is open.

Data in Temporary Files

Temporary files are created for buffer data that is generated during backup. The data stored in these temporary files is automatically added to the databases when they are reopened after completion of the backup.

Note — *Historical trends - and reports that include such data - are not available while backup to hard disc is performed. They are, however, available when the backup is transferred from the hard disc to the CD-RW drive, the tape unit or the hard-disk. Thus, the time of the backup must be planned taking this into consideration.*

Note — *The sizes of these temporary files are designed to store received data for the duration of a backup. If for some reason the maximum size of a temporary file is reached, data will be lost.*

Note *The Rapid database is currently used for storage of Time series only. The alarms and events are currently stored in a separate database. The 2 databases may be consolidated into one rapid database in the future.*

13.4.3 Restore of Backup

The databases of a HS can be re-stored by Kongsberg personnel. When doing so, all data currently contained in the database on the selected HS is deleted. A backup stored on the CD-RW drive, the tape unit or the hard-disk must first be transferred to the HS hard disc before it can be restored to the HS database.

Note *The restore is not supported at this stage. Normally a restore of the database is only needed after a fatal breakdown on the HS machine, and restore is considered a system manager task described in the Rapid database users guide.*

13.5 Initializing of HS Databases

The databases of a HS can be re-initialized by Kongsberg personnel. When doing so, all data currently contained in the database on the selected HS is deleted.

13.6 User Interface

The HS operation user interface is provided by a command on the main menu and associated dialog boxes, which are available in all views. Refer to the operator manual for more information.

13.7 Configuration Set-up

Table showing history station details:

OS Name	Location	OS Type	Flat Screen	Extras	
K-Chief-HS-98	Communication Room	Tower	17”	Event printer: Watch call i/f: Alarm kit: Touch screen:	No No No No

14 DP ALERT SYSTEM

The DP Alert System is used during drilling or other critical operation to give a general warning of any degradation of the DP system or of the rig's ability to continue the operation.
The DP operator uses a DP Alert Control Panel to indicate the alert status and this status is repeated as visual and audible signals at DP Alert Panels and Light Columns distributed in appropriate positions on the rig:

- Steady green light to indicate vessel is under automatic DP control, normal operation, status and confirming the alarm system is functional
- Steady clear light to indicate vessel is under DP advisory condition
- Flashing amber light to indicate vessel is under degraded DP control
- Flashing red light to indicate vessel is under DP emergency condition

Example of statuses:

Status	Drilling
Green (Steady)	The vessel is under automatic DP control, normal operation, status and confirming the alarm system is functional
Clear (Steady)	The vessel is under DP advisory condition
Yellow (Flashing)	The vessel is under degraded DP control
Red (Flashing)	The vessel is under DP emergency condition

An Emergency Disconnect Sequence (EDS) can be initiated to disconnect the riser from the BOP. The EDS is typically activated when the vessel is not capable of maintaining the wanted position and/or when DP Alert status is red.

14.1 SYSTEM UNITS and operation

The DP Alert System consists of:

- DP Alert Control Panel located in the DP console
- DP Alert Panels
- DP Alert Status Light Column
- Main DP control system
- IAS system (FS cabinets)

The location of the alarm column and cabin panels

No	DP alert equipment	Location
1	DP Alert Panel	Driller cabin
2	DP Alert Column	Moon pool area (Ex)
3	DP Alert Column	Moon pool area (Ex)
4	DP Alert Column	Drill Floor (Ex)
5	DP Alert Column	Drill Floor (Ex)

DP Alert units

In the IAS system there will be a light test software button for testing all the DP Alert Column. The DP alert panel has it one test button on the panel.

DP Alert Control Panel

The DP Alert Control Panel is located in the DP console and within easy reach of the DP operator.

DP Alert Control Panel

The panel has a switch with four positions with four related lamps confirming the switch position:

- Normal operation Green lamp lit
- Advisory Clear lamp lit
- Degraded Yellow lamp lit
- Emergency Red lamp lit

In addition the panel has a button for lamp test and a dimmer.

The switch position is passed to the DP Control Cabinet to define the DP Alert status.

Note *In case the main DP control system should fail, this panel will not work.*

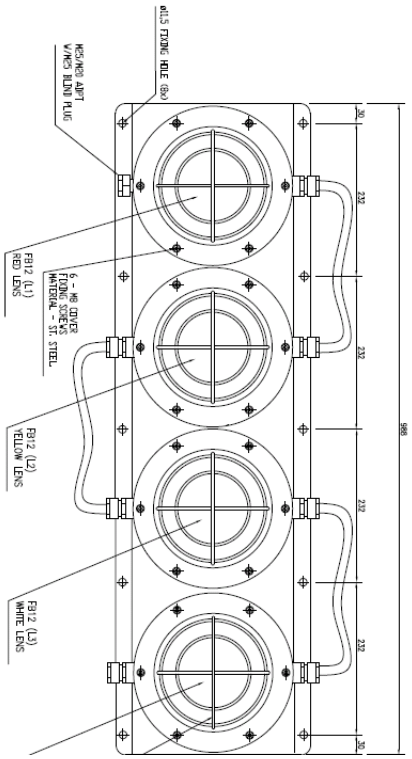
14.1.1 Turning on/off the DP Alert System

The DP Alert system is turned off by selecting the Off position with the DP Alert Control switch. All other positions will activate the DP Alert system.

14.2 DP Alert Status Light Column

Light Column

These high output certified beacons have been designed for use in potentially explosive atmospheres and harsh environmental conditions (Zone 1/2). On the Column it will be Green, Yellow and Red beacon.



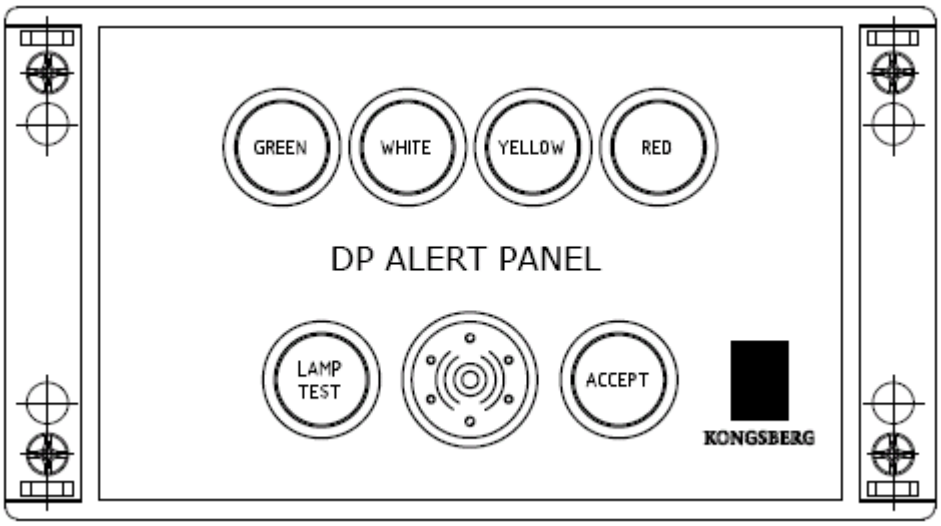
A column with four lights; Green, Clear, Yellow, and Red from top and down. To the left is a illustrated picture of a single light.

14.3 DP Alert Panel

Green, Yellow and Red alert lamps are provided together with a **LAMP TEST** button, audible alarm and **ACCEPT** button.

• Pressing the **ACCEPT** button at a the panel cancels the

audible alarm on all DP Alert Panels.
To test that all the lamps are working, press the **LAMP TEST** button.



DP Alert Panel

14.4 DP Alert system

All outputs to DP alert columns are connected to the closest FS cabinet for the IAS system. “Relays” are mounted inside the FS cabinet to distribute outputs to the 230VAC light columns. The DP Alert Panels are connected straight to the RIO card in the FS cabinet.

Setting of the lights is done from the DP system, by manual from the DP Alert Control Panel interfaced to the main DP controller. Green, clear, yellow and red statuses are sent on the dual process network from the main DP controller to the IAS system. IAS system then set the lights according to this status.

The DP Alert tasks of the IAS system are to:

- Activate DP Alert Light Columns based on status sent by the DP control system on the process network.
- Handle the acknowledge logic from DP Alert Panels