Falcon Eye BNA501

Bridge **N**avigational **W**atch **A**larm **S**ystem

User Guide

rev A 8/2011

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Safety Notices

WARNING

Dangerous voltages inside the Main Unit. Always disconnect mains supply before servicing the unit. No user serviceable parts inside. Servicing only by qualified personnel.

WARNING

Mains supply indicators are warning devices and do not warranty the absence of mains voltage inside the unit. Always disconnect mains supply before servicing the unit.

WARNING

Master Control Unit must be connected to protective earth.

NOTICE !

Compass safety distance=1m

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List of used Abbreviations

BNWAS: Bridge Navigational Watch Alarm System.

MCU: Main Control Unit.

CP: Control Panel.

BRU: Bridge Reset and Alarm Unit.

CAU: Cabin Alarm Unit.

MAU: Messroom Alarm Unit.

GPS: Global Positioning System.

SOG: Speed Over Ground.

PIR/MW: Passive Infrared/Microwave.

PLC: Programmable Logic Controller.

LED: Light Emitting Diode.

NMEA: National Marine Electronics Association.

VDR: Voyage Data Recorder

NO/NC: Normally Open/ Normally Closed

1. Introduction

The ever growing need for safety in maritime operations has led to specification of a Bridge Navigational Watch Alarm System (BNWAS).

IMO resolution (128/A1) states:

"*The purpose of a bridge navigational watch alarm system (BNWAS) is to monitor bridge activity and detect operator disability which could lead to marine accidents. The system monitors the awareness of the Officer of the Watch (OOW) and automatically alerts the Master or another qualified OOW if for any reason the OOW becomes incapable of performing the OOW's duties. This purpose is achieved by a series of indications and alarms to alert first the OOW and, if he is not responding, then to alert the Master or another qualified OOW. Additionally, the BNWAS may provide the OOW with a means of calling for immediate assistance, if required. The BNWAS should be operational whenever the ship is underway at sea (SOLAS V/19.2.2.3)*.

Hydel's BNA501 FalconEye is a full featured BNWA system, fully compliant with IMO res.128/A1 and IEC 62616-1 with simple installation and straightforward user interface.

1.1 Principle of operation.

Once operational the system remains dormant for a period between 3 and 12 seconds (user selectable). If any reset input is not activated during this period a flashing visual indication is initiated at the bridge. After 15 seconds, If the system is still not reset by any means, a first stage audible alarm is initiated at the bridge. If still not reset, after 15 seconds a second stage audible alarm is sounded in the back-up officer's and/or Master's location.

If even then no reset action is taken after 90 to 180 seconds (installation selectable) a third stage audible alarm is sounded at the locations of further crew members capable of taking corrective actions.

Dormant period reset can be done through button pressing, PIR movement detection at the bridge and input from other bridge equipment capable of registering crew activity.

BNWAS Incorporates three operational modes:

Automatic (Automatically brought into operation whenever the ship's heading or track control system is activated and/or SOG is higher than 3 knots and inhibited otherwise.)

Manual ON (In operation constantly)

Manual OFF (Does not operate under any circumstances)

An **Emergency Call** push button is also incorporated that immediately activates the second and third stage alarm. Emergency call function can also be initiated by other equipment through an unacknowledged alarm transfer.

Fig. 1 Block Diagram

Control Panel

PIR/MW Detectors

GPS
AUTOPILOT
OTHER EQ.
NMEA 0183

VDR
NMEA 0183

Mains AC Input

24 VDC Input

Main Control Unit

AUTOPILOT IN

Other Bridge EQ. Reset

Unacknowledged Alarm

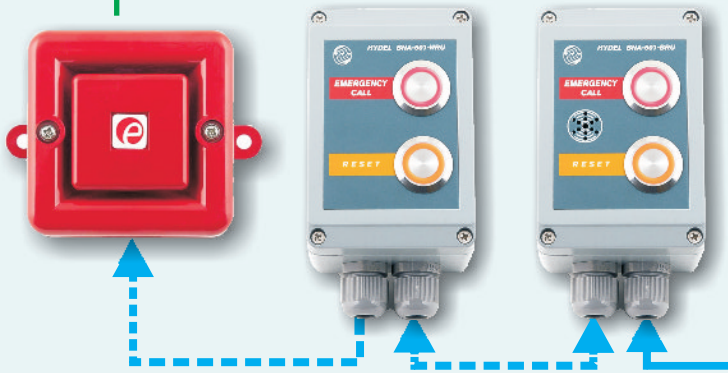
AC Fail

System Fail

Central Alarm Panel

Dry Contacts

Optional



Bridge and Wings Reset and Alarm Units

MASTER

CHIEF OFFICER

2nd MATE

3rd MATE

Cabin Alarm Units

Public Alarm Units

2. System description

FalconEye's block diagram is shown in fig. 1

A detailed description of systems components is following. For installation and system interconnection details refer to installation and commissioning manual.

2.1 Main Control Unit (MCU)

Main Control Unit is the heart of BNA501 system. It contains a field proven Siemens PLC, power supplies, NMEA Interface, and all necessary interconnection hardware.

Fig. 2 Main Control Unit (MCU) front panel.

1 Mains Supply On Indicator

2 Battery Suply On Indicator

WARNING

Mains supply indicators are warning devices and do not warranty the absence of mains voltage inside the unit. Always disconnect mains supply before servicing the unit.

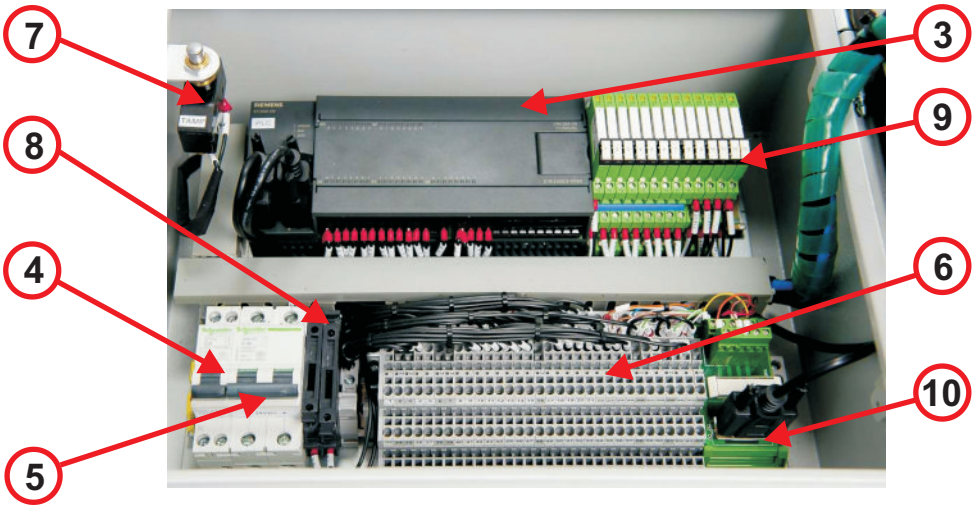


Fig.3 Main Control Unit (MCU) main panel

3 Main PLC	4 Mains Switch-Fuse
5 Battery Supply Switch-Fuse	6 Interconnection Terminals
7 Anti-Tamper Switch	8 Fuses
9 Output Relays	10 NMEA Programing Junction

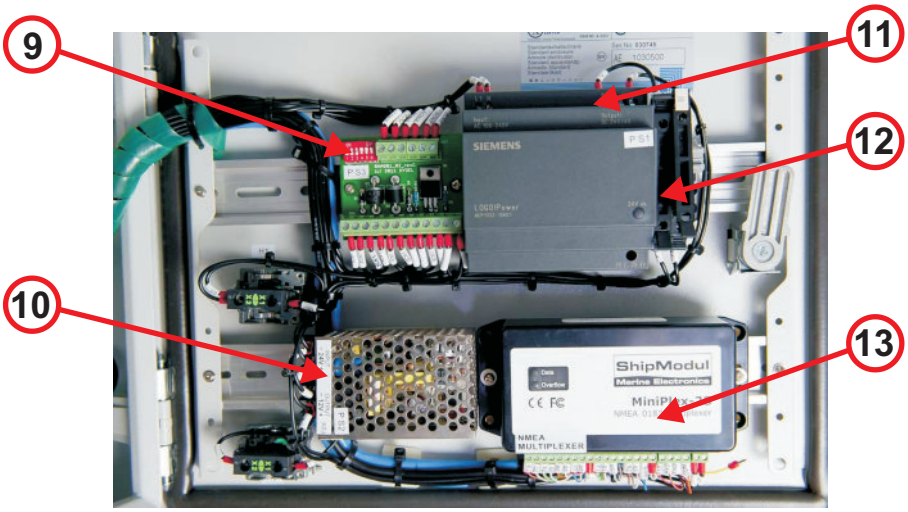


fig. 4

Fig.4 Main Control Unit (MCU) door panel

9 DIP Switch settings.	10 12 VDC Power Supply Unit
11 24 VDC Power Supply Unit	12 Fuses.
13 NMEA Interface	

2.2 Control Panel (CP)

Control Panel allows complete control and display of systems status and settings. Settings include dormant time, mode of operation and backup officer selection. Currently active alarms and system failures are also displayed. The panel incorporates also illuminated Reset and Emergency Call buttons. Reset button functions also as a first stage visual alarm and along with the integrated buzzer, makes a complete bridge alarm system, especially suited to ship's with restricted bridge space.

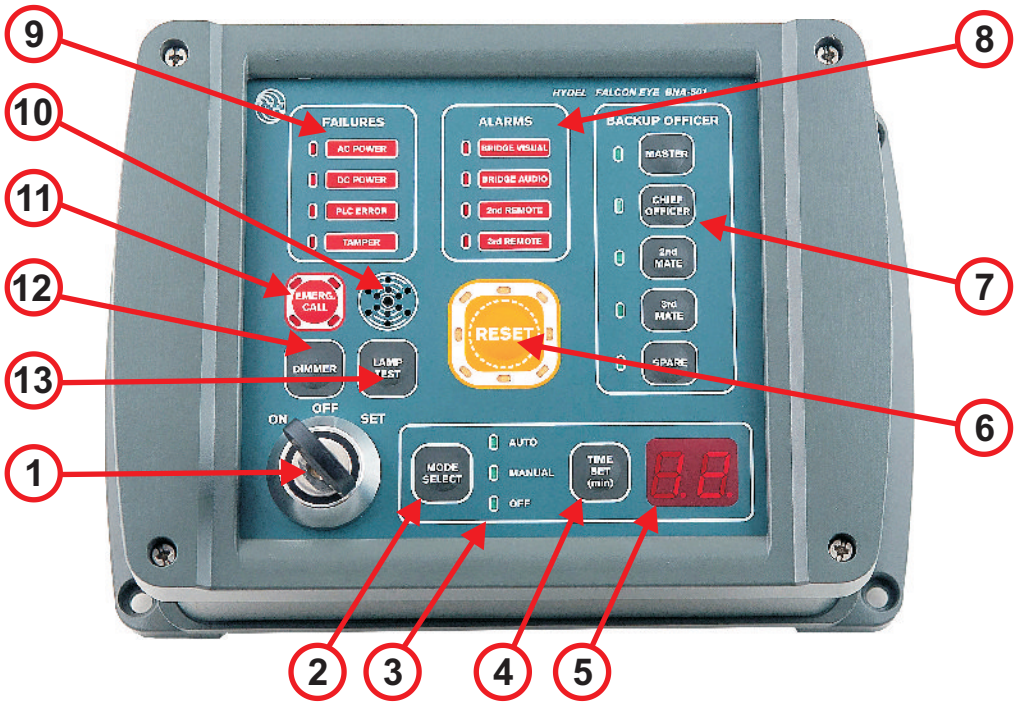


Fig.5 Control Panel

(1) **Keylock selector switch.** When in **OFF** position system is inactive. When in **SET** position mode and dormant time settings are made. When in **ON** position the currently selected mode of operation is engaged.

(2) **Mode selection button.** Selects between **AUTO** and **MANUAL** mode. Active only when the keylock switch is in **SET** position.

(3) **Mode LED indicators.** Display the current mode of operation. For AUTO Led functionality refer to § 3.2

(4) **Dormant time selection button.** Selects first dormant time in 1 minute intervals between 3 and 12 minutes.

(5) **Dormant time display.** When system is inactive, displays selected dormant time. When system is active, displays remaining dormant time.

(6) **Reset Button.** Pressing this button resets all alarms and returns dormant time to its preselected value. When no alarm is activated it is steadily lit. When bridge visual alarm is activated it flashes with 1 second period.

(7) **Backup Officer toggle selection buttons.** The officers that will be alerted when the second stage alarm is initiated are selected here. At least one officer must be selected but multiple selections can be made.

(8) **Alarm LED indicators.** They flash with 1 second period according to activated alarms.

(9) **Failure led indicators.** They flash with 1 second period when a power supply shortage, system malfunction or tamper exists. Additionally the CP buzzer sounds whenever a new failure is detected. The buzzer can be stopped by pressing any button.

(10) **Buzzer.** Sounds when the first dormant period has expired and the Bridge Audio alarm is activated or any Failure exists.

(11) **Emergency Call button.** Pressing this button initiates the emergency call function (see § 3.4). When Emergency Call function is not activated it is steadily lit. When Emergency Call function is active it flashes with 1 second period.

(12) **Dimmer button.** Selects between 4 levels of indicator illumination. Dimming applies to all indicators whether on CP or elsewhere.

(13) **Lamp test button.** Illuminates all indicators on CP.

2.3 Bridge Reset and Alarm Unit (BRU), Cabin Alarm Unit (CAU) and Messroom Alarm Unit (MAU).

Bridge Reset and Alarm Unit combines the bridge audio and visual alarm with illuminated Reset and Emergency call buttons. The buttons are steadily illuminated when no alarm is present and flashing when Bridge Visual alarm or Emergency Call are activated. The illumination is dimmed according to dimmer selection on CP.

Cabin Alarm Units and Mesroom Alarm Units are installed in Backup Officers/crew cabins and messroom area to alert the corresponding officers and/or crew members when the second and third stage alarms have been activated. All units are tamper proof and if attempted open a failure is displayed at the CP and Central Alarm Panel of the ship.

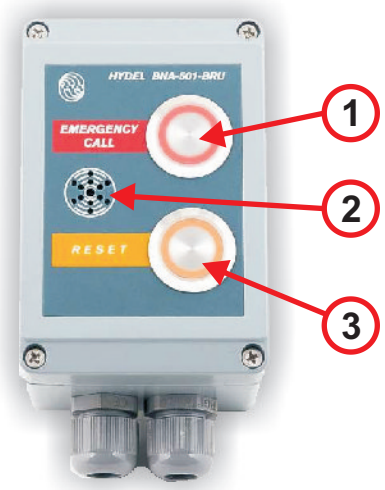


Fig.6. Bridge Reset and Alarm Unit (BRU)

Fig.7 Cabin Alarm Unit (CAU)

Fig.8 Messroom Alarm Unit (MAU)

(1) **Emergency Call button.** Pressing this button initiates the emergency call function (see § 3.4). When Emergency Call function is not activated it is steadily lit. When Emergency Call function is active it flashes with 1 second period.

(2) **Reset Button.** Pressing this button resets all alarms and returns dormant time to its preselected value. When no alarm is activated it is steadily lit. When bridge visual alarm is activated it flashes with 1 second period.

(3) **Bridge Audio Alarm Buzzer.** Sounds when the first dormant period has expired and the Bridge Audio alarm is activated.

(4) **Main Alarm Buzzer.** Sounds when the second or third stage alarm has been activated.

2.4 Passive Infrared/Microwave Movement Detectors (PIR).

PIR/MW sensors are placed at strategic locations of the Bridge to allow the detection of crew activity. Both unidirectional and omnidirectional types can be used according to specific installation. Refer to Installation and commissioning manual for more details. PIR/MWs are also tamper proof and if attempted open a failure is displayed at the CP and Central Alarm Panel of the ship.

3. System Operation

3.1 System Power Up and initial settings .

Turn the keylock selector on the CP to **OFF** position (fig. 5 [1]). Open the Master Control Unit front panel (security locked) (fig. 2). Turn ON the mains and backup switches (fig. 3 [4],[5]). The power indicators on the MCU front panel must turn ON. (fig. 2 [1],[2]).
Press the LAMP TEST button on CP (fig. 5 [13]). Check that all indicators are ON. Release the LAMP TEST button.
Check the CP for any displayed failures (fig. 5 [9]). Refer to § 3.6 if any failures are displayed.

The default startup indicator status (with the key lock selector in OFF position) is as follows:

FAILURES : **OFF**
ALARMS : **OFF**
RESET : **Steadily ON**
EMERGENCY CALL : **Steadily ON**
BACKUP OFFICER : **2nd MATE ON**
MODE :**OFF**
DORMANT TIME :**12 minutes**

3.1.2 Dimmer Level selection.

An appropriate illumination level can be selected according to ambient light conditions to preserve crews night vision. There are four illumination levels available. Dimming applies to all indicators on CP, MCU and BRU.

To select the dimmer level: press the **DIMMER** button on CP.

3.1.3 Mode of Operation selection.

BNA 501 has three modes of operation: AUTO, MANUAL, OFF

In AUTO mode the system is controlled by inputs from ship's GPS and/or autopilot.
System is active if any of the following is true:

Ship's speed > 3 Knots (sensed by NMEA $GPVTG sentence)
Ship's heading control is engaged. (sensed by NMEA $HCHTD sentence or Autopilot contacts)

In MANUAL mode the system is always active (provided the keylock selector switch is in ON position).

In OFF mode, system is inactive i.e. the dormant period timer is not running. Only the Emergency Call function can be activated.

To select MANUAL or AUTO mode of operation:
Turn the keylock selector switch to **SET** position. The selected mode LED is flashing (MANUAL or AUTO).
Press the **MODE SELECT** button (fig. 5 [2]) to select the desired mode. The corresponding LED is flashing.

To select OFF mode of operation:
Turn the keylock selector switch to **OFF** position.

3.1.4 First Dormant Time selection.

When system becomes active it remains dormant for a period between 3-12 minutes. First dormant time must be selected as low as practicable to achieve the maximum level of safety.

To select first dormant time:
Turn the keylock selector switch to **SET** position. The dormant time display is flashing (fig. 5 [5]).
Press the **TIME SET** button (fig. 5 [4]) to select a time between 3-12 minutes in 1 minute increments.

3.1.5 Backup Officer Selection.

When second stage alarm is activated (see § 3.2.3) the Cabin Alarm Units of the selected Officer/Officers are sounded. At least one officer must be selected but multiple selections can be made. When third stage alarm is activated (see § 3.2.4) all CAUs either selected or not will be sounded.

To select Backup Officer/Officers: press the **BACKUP OFFICER** toggle buttons (fig. 5 [7]). The corresponding LEDs are turned On.

3.2 Normal Operation

Turn the keylock selector to **ON** position. If manual mode is selected the **MANUAL** led must be steadily on. If auto mode is selected the **AUTO** led has the following functionality:

SYSTEM	AUTO LED
Active (ie Speed>3 Knots or/and heading control engaged)	On
Inactive (ie Speed<3 Knots and heading control **not** engaged)	Lazy flashing.
NMEA **not** present	Quick flashing.

When the system becomes active the first dormant time countdown starts. The countdown is displayed on the Dormant Time Display (fig. 5 [5]). If no reset occurs it reaches zero and the alarm sequence starts. Every alarm activated is displayed on the CP **ALARMS** Leds (fig. 5 [8]).

3.2.1 Bridge Visual Alarm.

At the end of first dormant time Bridge Visual Alarm is activated. **RESET** buttons on CP and BRUs are flashing with 1 second period.

3.2.2 Bridge Audio Alarm.

If no reset occurs within 15 seconds the Bridge Audio Alarm buzzers on CP and BRUs are activated.

3.2.3 Second stage Audio Alarm

If still no reset occurs within 15 seconds the second stage Audio Alarm is activated and the CAUs of the officers selected are sounded.

3.2.4 Third stage Audio Alarm

If even then no reset action is taken after 90 to 180 seconds (installation selectable, see Installation manual) the third stage Audio Alarm is sounded at all CAUs and MAUs either selected or not.
The third stage audio alarm can be inhibited at the commissioning of the system (see Installation manual).

3.3 System Resetting.

Resetting inhibits all activated alarms and restarts the first dormant time countdown. In case of continuous activation of any reset means the system will **not** reset.
System resetting when Emergency Call has **not** been activated can be done in three ways:

3.3.1 Manual Reset.

Manual reset can be done by pressing the **RESET** button on Control Panel or BRU (fig. 3 [6]), (fig. 6 [3]).

3.3.2 PIR/Microwave Reset.

PIR/Microwave motion sensors are used to detect crew activity in the bridge and reset the system.

3.3.3 Other Bridge Equipment Reset.

Other bridge equipment capable of registering crew actions can provide a reset signal through contact closure

3.4 Emergency Call Function.

Emergency Call Function allows bridge crew to call for assistance by activating the second and subsequently third stage alarm. Emergency Call can be activated in any mode of operation even when the keylock selector switch is in OFF position.
To activate Emergency Call press **EMERGENCY CALL** button on CP or BRU (fig. 3 [11]) (fig. 6 [1]). The **EMERGENCY CALL** button illumination on CP and BRU should flash with 1 second period to indicate the emergency call activation.

If Emergency Call has been activated, resetting can be done **only** by pressing the **RESET** button on CP or BRU (fig. 3 [6]), (fig. 6 [3]).

3.5 Unacknowledged Alarm Transfer

If an unacknowledged alarm is transferred to BNA501 through NMEA $--ALR sentence or contact closure, the system activates the Emergency Call function. See Appendix A for NMEA sentence details. When an Unacknowledged Alarm Transfer occurs the system can be reset only by manual reset.

3.6 System Failures

A number of system failures are displayed on the CP Failures LEDs. When a new failure is detected, the corresponding led flashes and the CP buzzer sounds. Pressing any key mutes the buzzer, but the led continues flashing until the failure is serviced.

3.6.1 AC Power Fail.

Loss of Mains power supply voltage or blown system fuse.

3.6.2 DC Power Fail.

Loss of backup 24VDC power supply voltage or blown system fuse.

AC Power Fail and DC Power Fail are relayed to the ship's central alarm panel through "Power Supply Fail" NO/NC output contacts.

3.6.3 PLC and/or communication error.

Internal PLC error or communication error between PLC and CP. In case of a communication error the dormant time display displays the letter "E".

3.6.4 Tamper.

All system units ie MCU, CP, CAU, MAU, PIRs, are tamper protected through a series loop. Should any tamper attempt occurs, a tamper failure is displayed.

PLC/Communication and Tamper failures are relayed to the ship's central alarm panel through "System Fail" NO/NC output contacts.

Appendix A

NMEA Interface sentences.

BNA501 uses a number of NMEA sentences to communicate with ship's GPS,VDR ,Autopilot and Other bridge equipment. Below is a description of the used sentences.

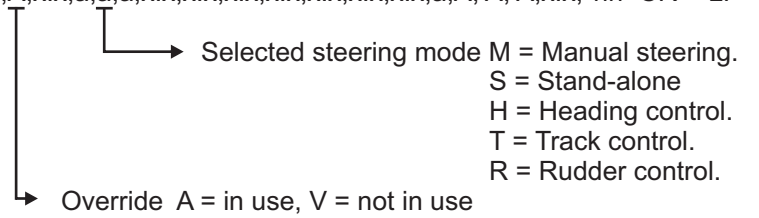
Speed over ground (SOG) from GPS.

$--VTG,x.x,T,x.x,M,x.x,N,x.x,K

System uses the N,x.x field to obtain ship's speed over ground

Heading control status from Autopilot.

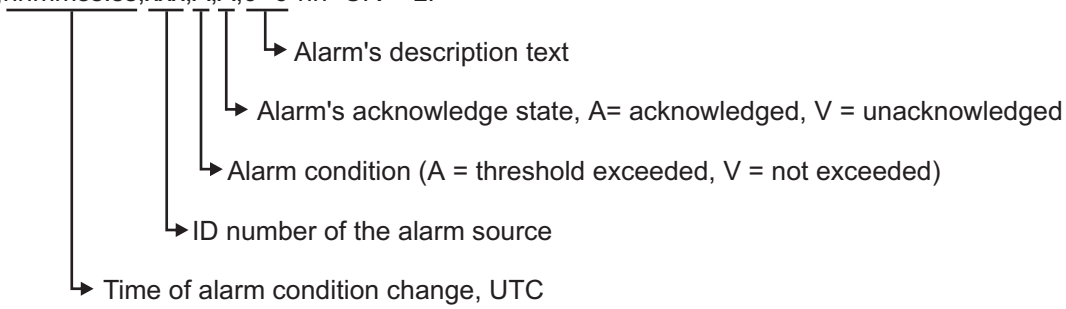
$--HTC,A,x.x,a,a,a,x.x,x.x,x.x,x.x,x.x,x.x,x.x,a,a*hh<CR><LF>
$--HTD,A,x.x,a,a,a,x.x,x.x,x.x,x.x,x.x,x.x,x.x,a,A, A, A,x.x,*hh<CR><LF>



For the Heading control to be active Override=V and steering mode anyone except M (Manual).

Unacknowledged Alarm transfer from other bridge equipment.

$--ALR,hhmmss.ss,xxx,A,A,c--c*hh<CR><LF>



On receiving an $--ALR sentence with a "V" at Alarm's acknowledge state field, BNWAS initiates the Emergency Call function.

BNWAS status to ship's VDR.

$BNALR,,000,A,A,C1=xxx;C2=xx;C3=x*hh<CR><LF>

– A: A = Dormant period exceeded
V = Dormant period not exceeded
– A: A = Alarm acknowledged
V = Alarm unacknowledged

c1 = AUT or MAN or OFF
c2 = Dormant period in min, (03 – 12)
c3 = Alarm stage: 1, 2 or 3.

Example

$BNALR,,000,A,V,C1=AUT;C2=03;C3=1*hh<CR><LF>

The alarm message is sent with any change of the BNWAS settings for mode or dormant period, and with any activated and reset alarm.

Appendix B

Specifications.

Power supply:	Primary: 100-240 VAC 50/60 Hz Backup: 24 VDC
Dormant Time selection :	3-12 minutes in 1 minute intervals.
Modes of operation:	Manual, Off, Auto
Bridge audible alarm level:	80 dB
Cabin audible alarm level:	80 dB
Messroom audible alarm level:	80 dB
Inputs:	PIR/MW sensors Reset buttons (active low) Emergency call buttons (active low) Bridge Equipment reset (active low) Auto pilot (active low) Unacknowledged Alarm transfer (active low)
Outputs:	Bridge Audio Alarm 24VDC Bridge Visual Alarm 24VDC Backup Officers cabin audio alarms 24VDC Public audio alarm 24VDC PIR/MW supply 12VDC System Fail to central alarm panel (NO or NC dry contact) Power Supply Fail to central Alarm panel (NO or NC dry contact)
NMEA Inputs:	NMEA0183 / 4800 bps Auto pilot ($--HTD, $--HTC), GPS ($GPVTG), Unacknowledged Alarm ($--ALR)
NMEA Output:	NMEA0183 / 4800 bps $BNALR to ship's VDR
Failure Indicators:	AC Power Fail DC Power Fail PLC Error Tamper
Main Control Unit dimensions:	380x300x155mm
Control Panel dimensions:	214x161x80mm
Alarm and reset boxes dimensions:	80x120x65mm
Compass safe distance:	1m
Operating temperature range:	+5 to +55 °C

Appendix C

Implementation deadlines of BNWAS

Construction Date	Ship type	Deadline
On or after 1st July 2011	All passenger ships. Ships of 150 GT and upwards	All shall be equipped with BNWAS
Before 1st July 2011	All passenger ships. Ships of 3000 GT and upwards	Not later than the first survey, after 1st July 2012
	Ships over 500 and under 3000 GT.	Not later than the first survey, after 1st July 2013
	Ships over 150 and under 500 GT.	Not later than the first survey, after 1st July 2014

Revision History

Revision	Date	Description
rev. A	08/2011	Initial document release.

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