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Technical Documentation

BNWAS 3000

1.5. System description of Bridge Navigation Watch Alarm System (BNWAS 3000)



WATCH ALARM MAIN UNIT

REPEATER UNIT

SELECTOR UNIT

RESET UNIT

Revisions

Version	Date	Author	Checked	Remark
1.0	10/01/13	JB	TM	Derived from draft 0.8
1.1	30/05/13	JB	ТМ	Autopilot deleted, restart system deleted, RESET UNIT WT insert, Labelling

Created

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BNWAS 3000 Units and peripheral connections

General description of system

A Bridge Navigation Watch Alarm System (BNWAS) ensures that the bridge is not operated unmanned.

The officer of the watch (OOW) has to reset this system within a certain time (watch alarm time). In case of injury or illness affecting this person, who has complete control of the ship, various signals automatically alarm other crew members.

The BNWAS 3000 has an accumulator, which is charged and monitored by the system. If there is a failure of the power supply, the BNWAS 3000 is powered by the accumulator.

1. Units

The BNWAS 3000 consists of a number of units: WATCH ALARM MAIN UNIT, REPEATER UNIT, SELECTOR UNIT, RESET UNIT and BOOSTER UNIT.

1.1. WATCH ALARM MAIN UNIT (BNWAS 3000 MU-E)

The main component of the BNWAS 3000 is the WATCH ALARM MAIN UNIT.

The WATCH ALARM MAIN UNIT determines the individual alarm modes. The UNIT also coordinates the power supply including the emergency power supply (charging and monitoring the accumulator, switching to accumulator operation). It provides the communication with any connected REPEATER UNITs as master, any connected Global Positioning System (GPS) and/or reset sensor equipment and a serial output for the Voyage Data Recorder (VDR) for example.

As a display and operation element, the WATCH ALARM MAIN UNIT has a display with operating keys for all settings and information (see 3.5 Display), and a press palm button to reset the watch alarm time (see 3.3 Alarm mode).

1.2. REPEATER UNIT (BNWAS 3000 RPU-E)

The REPEATER UNIT informs and alarms persons who are not in the immediate vicinity of the WATCH ALARM MAIN UNIT. For this purpose it is separated, for example installed in a cabin and supplied with the necessary data and information over a connection to the WATCH ALAMR MAIN UNIT.

As a display and operation element, the REPEATER UNIT has a display with operating keys for all settings and information (see 3.5. Display).

The display of the REPEATER UNIT shows the type of operation or the alarm mode (see 3 Operation of the BNWAS 3000 and 3.5 Display menu). Errors are also displayed when they occur. It is also pos-





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sible to adjust the brightness (see 3.5.1.1 Dimming the background lighting of the keys and palm button and 3.5.1.2 Dimming the background lighting of the display).

The same software runs on the REPEATER UNIT as on the WATCH ALARM MAIN UNIT. The operation of the display menus of both units is therefore the same with some limitations (see 9 Menu structure of the BNWAS 3000).

1.2.1. Setting the bus number

The REPEATER UNIT works as a slave in a bus system, through which it receives all relevant data. Since up to four REPEATER UNITs can be connected to the BNWAS 3000, each UNIT requires its own bus number. The bus number is set by connecting pins 6 or/and 7 of the connection plug JR1 (connection WATCH ALARM MAIN UNIT) at the REPEATER UNIT to the chassis.

Pin 6	Pin 7	Bus number
-	-	1
Chassis	-	2
-	Chassis	3
Chassis	Chassis	4

The bus numbers must be assigned consecutively. Example: if only three REPEATER UNITs are to be connected, bus numbers 1 to 3 must be assigned. The BNWAS 3000 must also be configured for three UNITs (see 3.5.3.1 Changing the configuration). If the bus numbers do not agree with the system configuration, an error will be reported.

1.3. SELECTOR UNIT (BNWAS 3000 SU-E)

The SELECTOR UNIT can be used to switch between various REPEATER UNITs (with the same bus number). It is possible to switch between four cables with up to four REPEATER UNITs by turning the key switch. The chosen cable lights up on the display. Using the SELECTOR UNIT, it is possible to switch between various locations (captain's cabin, first officer's cabin) where the alarm is intended to be displayed and initiated.

The knob can be turned to dim the display of the SELECTOR UNIT.

It is possible to connect a dedicated 24 V DC power supply to the SELECTOR UNIT, which then supplies electrical power to the connected REPEATER UNITs.

1.4. RESET UNIT (BNWAS 3000 RSU-E)

The RESET UNIT is an external press palm button with an LED. When the palm button is pressed, the alarm is terminated and the watch alarm time is reset. According to the configuration of the overall system, up to three additional RESET UNITs can be connected. For further RESET UNITs, a BOOSTER UNIT is required. The colour of the LED in the palm palm button can be changed with the lighting switch SQ1 (rear side) to red or orange and thus matched to the colour of the press palm button. The degree of dimming is set using the WATCH ALARM MAIN UNIT.



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1.5. RESET UNIT WT (BNWAS 3000 RSU-E)

The RESET UNIT WT (watertight) is technical identical to the RESET UNIT (open frame). Certainly the RESET UNIT WT is in a closed box and it has the IP Code IP67.

1.6. BOOSTER UNIT (BNWAS 3000 BU-E)

The optional BOOSTER UNIT enables the connection of further (up to 40) RESET UNITs. The box requires an additional 24 V DC power supply, from which the RESET UNITs are then supplied.

2. Connections

Separate connections are provided on the WATCH ALARM MAIN UNIT to extend and supplement the BNWAS 3000:

- SERIAL IN 1 (JG1) for resetting, reading in time and date, emergency call
- SERIAL IN 2 (JA1) for resetting, reading in time and date, emergency call
- SERIAL OUT 1 (JV1) for event and alarm messages
- SERIAL OUT 2 (JV2) for event and alarm messages, service menu
- RESET SENSOR (JE1)
- Relay output (JK1) (error, alarm 2 and alarm 3 relays)
- AUTO MODE ON/OFF; ext. signal generator (JPI1)
- Power supply 100-240 V AC (JM2)
- Power supply 24 V DC (JM1)
- Accumulator 24 V (JB1)
- RESET UNIT (JQ1) (see 1.4 RESET UNIT (BNWAS 3000 RSU-E))
- REPEAT UNIT (JR1, JR2) (see 1.2 REPEATER UNIT (BNWAS 3000 RPU-E))

2.1. SERIAL IN 1 (JG1) and SERIAL IN 2 (JA1)

SERIAL IN 1 (JG1) and SERIAL IN 2 (JA1) are two independent serial inputs, through which the BNWAS 3000 can be reset, the emergency call imitated or time and date set. Both inputs have the same function.

External systems can be connected through RS485 or RS232. The transfer rate is 4,800 Baud. 8 Data bits, no parity bit and one stop bit are transmitted (8n1). NMEA 0183 is used as protocol.

The data is received, filtered and interpreted by the slave microcontroller of the WATCH ALARM MAIN UNIT and forwarded to the master microcontroller.

2.1.1. Serial reset

A serial reset by an external system, like for example an autopilot, can reset the watch alarm time and the alarm but not the emergency call.

The serial reset must be activated (see 3.5.2.4 Activate external reset) and configured (see 3.5.3.1 Changing the configuration) in the display menu. By default, it is deactivated.



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For a reset, the "general event message" (EVE) has to be interpreted.

\$--EVE, hhmmss.ss, BNWAS, Operator activity*hh<CR><LF>

If no sign is received during one minute and serial reset is active, an error message is produced. If no relevant message is received during the watch alarm time, the alarm is activated.

2.1.2. Emergency Call

If the following message reaches the WATCH ALARM MAIN UNIT:

\$--EVE, hhmmss.ss, BNWAS, Emergency Call activ* hh<CR><LF>

an emergency call is initiated. An event and an ALR message are also outputted through SERIAL OUT 1 (JV1) and SERIAL OUT 2 (JV2) for, e.g. an "emergency call" system (see 2.2 SERIAL OUT 1 (JV1) and SERIAL OUT 2 (JV2)). In addition, the emergency call can also be initiated with the palm button (see 3.4 Emergency Call).

2.1.3. Read time and date

The time and date can also be read in from an external system, e.g. a GPS (Global Positioning System). In this case the time and date are filtered out of the "Recommended Minimum Sentence C (RMC)" message and the system time and date are newly set.

\$GPRMC,135754.600,V,5301.6117,N,00904.1929,E,0.00,171.81,110911,,,N*7A

In order that the time and date can be read in, this function has to be configured (see 3.5.3.1 Changing the configuration). By default, it is deactivated.

If the WATCH ALARM MAIN UNIT receives no suitable message for one minute and it has been configured for the reception of time and date, an error message is outputted.

Note: according to IMO Resolution A.861(20), the time must be set in UTC (GMT).

2.2. SERIAL OUT 1 (JV1) and SERIAL OUT 2 (JV2)

Through SERIAL OUT 1 (JV1) and SERIAL OUT 2 (JV2), event and alarm messages or the service menu are outputted.

Event and alarm messages are outputted with 4,800 Baud. 8 Data bits, no parity bit and one stop bit are transmitted (8n1). The service menu is described in Chapter 5 Service.

The event and alarm messages can be saved by, for example, a VDR (Voyage Data Recorder) and/or interpreted by another external system.

An alarm message (ALR) is outputted in case of:

- changed alarm mode
- reset
- initiated alarm
- changed operation type
- changed watch alarm time
- each minute in the "off" operation type or if the "auto" operation type is switched-off.



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• initiation of an emergency call

\$BNALR,054436.00,001,V,A,C1=MAN;C2=03;C3=0*48

If an error occurs, an error is remedied or the emergency call is initiated, then an event message is produced:

\$BNEVE,071928.00,,Emergency Call End*79
\$BNEVE,hhmmss.ss,Ziel,Message* hh<CR><LF>

2.3. RESET SENSOR (JE1)

The BNWAS 3000 can also be reset by sensor equipment.

Sensor equipment can reset the watch alarm time and the alarm, but not the emergency call.

The interface JE1 (RESET SENSOR) has a reset and sabotage cable with a 12 V power supply (max. 100 mA). If the sabotage cable is broken, the alarm and the watch alarm time cannot be reset by the sensor equipment and an error message is produced. If the correct connection (12V) of the sabotage cable is reconnected and the sabotage has been acknowledged (see 3.5.2.5 Acknowledgement of sabotage of the external reset), then normal functionality is restored.

The reset equipment has to be activated in the display menu (see 3.5.2.4 Activate external reset) and configured (see 3.5.3.1 Changing the configuration). By default, it is deactivated.

2.4. Relay output (JK1)

The WATCH ALARM MAIN UNIT has three relays:

- 2nd alarm relay (K1)
- 3rd alarm relay (K2)
- Error relay (K3)

The relays are galvanically isolated switches. They are activated by an alarm (see 3.3 Alarm mode) or errors (see 4 Errors). Acoustic or visual signals, a VDR or a general alarm system, for example, can be connected to the relay. In this case it should ensured that a characteristic tone sequence is chosen for the BNWAS.

2.5. AUTO MODE ON/OFF, ext. signal generator (JPI1)

Through the input JPI1 (AUTO MODE ON/OFF; ext. signal generator), it is possible to activate or deactivate the BNWAS 3000 externally.

If there is a 24 V DC voltage between Pin 4 (+24V) and Pin 5 (GND), the watch alarm time remains in the operation type "Auto" (see 3 Operation of the BNWAS 3000).

An external signal generator (max. 50 mA) can be cnnected to the WATCH ALARM MAIN UNIT. Its bahaviour is the same as that of the internal acoustic signal generator, for example two short sounds for errors (see 4.1 General description).



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The external signal generator can be used, for example, if the volume of the internal signal generator is no9t adequate in a particular installation case. It is also possible to connect a visual signal generator, a relay or general alarm system.

2.6. Power supply 100-240 V AC (JM2) and Power supply 24 V DC (JM1)

The BNWAS 3000 can be supplied with 100 to 240 V AC (max. 0.45 A) or with 24 V DC (max. 1.2 A) as required.

2.7. Accumulator 24 V (JB1)

The accumulator provides power to the BNWAS 3000 when the mains voltage reduces or fails. It is charged and monitored by the WATCH ALARM MAIN UNIT. According to the equipment of the system, a lead accumulator according to the table or an equivalent type is to be used.

Model	Capacity in Ah	VdS Number
pbq 2.3-12 VdS	2.3	G104103
pbq 3.2-12 VdS	3.2	G104104
pbq 7-12 VdS	7	G104049

2.7.1. Mains power failure

The supply voltage of the BNWAS 3000 can be 100 to 240 V AC (multi-voltage power supply) or 24 V DC. In order to bridge power failures, a lead accumulator with a nominal voltage of 24 V can be connected. This is charged and its condition is monitored by the system.

If the power supply fails, the BNWAS 3000 switches to accumulator operation. If the power comes back on, the BNWAS 3000 switches back to mains operation after about 15 seconds and sends a report over SERIAL OUT 1 (JV1) and SERIAL OUT 2 (JV2).

If the accumulator voltage falls below the end-point voltage (19.9V), the BNWAS 3000 switches to mains operation in order to preserve the accumulator. If only a low mains voltage is available, then the BNWAS 3000 switches to a "safe" state, in which it only monitors the mains voltage and switches to normal operation when it recovers. If no mains voltage is available, the BNWAS 3000 switches itself off.

2.7.2. Accumulator charging

The accumulator is charged at a controlled current. The current can be set through the resistance between PINs 3 and 4 at the connected 24 V accumulator (JB1).

Resistance	Current
0 - 500 Ω	200 mA
0.800 – 1.200 ΚΩ	150 mA
1.500 - 3 ΚΩ	100 mA
no resistance - open	50 mA



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If no accumulator is connected, the charging circuit is deactivated. If an accumulator with a voltage of less than 19 V is connected, it is charged with only 50 mA. If the voltage increases to over 19 V, the accumulator is charged with the current set by the resistance.

If the charging voltage exceeds 27.8 V for about 1.5 minutes, the accumulator is full and accumulator charging is switched off. The accumulator charged again after an accumulator test (see 2.7.3. Accumulator test).

If the voltage at the accumulator exceeds 28.8 V, the charging circuit is switched off for safety reasons.

The WATCH ALARM MAIN UNIT monitors the current required for the total system. If a total current is determined exceeding 80 % of the maximum permissible current, an error is shown and the accumulator charging current is reduced so that the system does not fail. In this case, the peripheral equipment must be equipped with its own power supply (BOOSTER UNIT, SELECTOR UNIT) in order to ensure safe operation. Alternatively, the charging current for the accumulator can be set lower.

2.7.3. Accumulator test

Every 10 minutes, the accumulator is tested. This is done by loading the accumulator through a resistor and measuring the accumulator voltage. The accumulator resistance is categorised into three classes:

> 22 V	Accumulator OK
< 22 V; > 20 V	Accumulator weak
< 20 V; > 3 V	Accumulator defective
< 3 V	No accumulator

After each test, the result is outputted through SERIAL OUT 1 (JV1) and SERIAL OUT 2 (JV2). If the accumulator is not "OK", an error message is outputted.

If an error is displayed after replacing an accumulator, the accumulator may have to be charged for a certain time.



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3. Operation of the BNWAS 3000

3.1. Operation types

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The BNWAS 3000 operates in three operation types:

- 1. "WATCH off": Watch alarm is permanently switched off.
 - "Auto": Watch alarm is switched on or off through the connection JPI1 (AUTO MODE ON/OFF; ext. signal generator).
- 3. "Manual": Watch alarm is permanently switched on.

When the BNWAS 3000 is switched on, the display shows the current operation type. In the "automatic" operation type and switched on (no voltage at JPI1) and also in the "manual" operation type, the watch alarm time is also displayed (time until the next required reset). If there is a voltage at JPI1, the watch alarm is deactivated and the status "Auto off" is displayed.

After the application of the operating voltage, the BNWAS 3000 assumes the last selected operation type.

3.2. Resetting

The watch alarm time expires automatically and can be reset at any time by pressing the palm button (WATCH ALARM MAIN UNIT/RESET UNIT). Resetting can also be performed through the input RE-SET SENSOR (see 2.3 RESET SENSOR) or the inputs SERIAL IN 1 (JG1) and SERIAL IN 2 (JA1) (see 2.1.1 Serial).

If the configured watch alarm time (see 3.5.3.2 Changing the watch alarm time) expires without resetting, the BNWAS 3000 switches to "Alarm" mode (see 3.3 Alarm mode).

If the alarm is reset by pressing the palm button or through one of the inputs (SERIAL IN 1, SERIAL IN 2, RESET SOSOR), the watch alarm time restarts and the BNWAS 3000 switches from alarm to watch alarm mode.

This procedure repeats itself until the device is switched to "off" or there is a voltage at JPI1 (AUTO MODE ON/OFF; ext. signal generator) in "Auto" mode. In these operation types, no resetting is required from the operator.

3.3. Alarm mode

The BNWAS 3000 has four alarm modes. If an alarm mode is not reset, the BNWAS 3000 switches to the next higher alarm mode.

1st Mode: PreAlarm

After the expiry of the configured watch alarm time, the palm button of the WATCH ALARM MAIN UNIT and the additionally connected palm buttons of the RESET UNITs start to blink. "PreAlarm" appears on the display and also the alarm time, which counts upwards after the expiry of the watch alarm time.





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2nd Mode: 1stAlarm

If the device is not reset, the characteristic signal sound (alternating peeping and pause) of the internal and any external signal generator 15 seconds after the start of the "PreAlarm" and the display shows:



3rd Mode: 2ndAlarm

If the device is still not reset after a further 15 seconds, the 2nd alarm relay (K1) is also closed and the display shows:

2n	dA	larm
ХХ	: X	Xmin



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4th Mode: 3rdAlarm

If the device is not reset 90-180 seconds after the start of the 2ndAlarm (see 3.5.3.2 Setting the 3rd alarm time), the 3rd alarm relay (K2) is also closed and the display changes to:

∃rdAlarm XX:XXmin

During the watch alarm time	After expiry of the watch alarm time	Td + 15 Sec.	Td + 30 Sec.	Td + 120-210 Sec.	
	Prealarm	1st Alarm	2nd Alarm	3rd Alarm	
	Х	Х	Х	Х	Palm button blinks (WATCH ALARM MAIN UNIT/RESET UNIT)
		Х	Х	Х	Internal signal generator (WATCH ALARM MAIN UNIT/REPEATER UNIT)
		Х	Х	Х	Contact for external signal genera- tor
			Х	Х	2nd alarm relay
				Х	3rd alarm relay

3.4. Emergency Call

In case of emergency, an emergency call can be activated. This is done by pressing the palm button for at least 5 seconds. It is also possible to activate the alarm through the inputs SERIAL IN 1 (JG1) or SERIAL IN 2 (JA1) (see 2.1.2 Emergency Call).

When an emergency call is activated, the palm button blinks (WATCH ALARM MAIN UNIT/RESET UNIT), the internal and any external signal generators sound and the contact for the 2nd alarm relay is closed. In addition, an event and an ALR message are outputted through SERIAL OUT 1 (JV1) and SERIAL OUT 2 (JV2) (see 2.2 SERIAL OUT 1 (JV1) and SERIAL OUT 2 (JV2)). After the configured 3rd alarm time (see 3.5.3.2 Setting the 3rd alarm time) has expired, the 3rd alarm relay is also closed.

In order to end the emergency call, the palm button of the WATCH ALARM MAIN UNIT or one of the additionally connected palm buttons of the RESET UNIT has to be pressed.



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3.5. Display menu

The display menu is shown in the display of the WATCH ALARM MAIN UNIT, and also with limitations in the display of the REPEATER UNIT (see 9 Menu structure of the BNWAS 3000).

All settings are undertaken with the three keys ("UNLOCK", ↑ ("Up"), ↓ ("Down")).



After the device is switched on, the main menu appears in the display and the operation type is shown. The three operating keys light up green.



When the "UNLOCK" key is pressed, the settings of the WATCH ALARM MAIN UNIT or the RE-PEATER UNIT are released and the key lights up orange.

The "UNLOCK" key is used to navigate through the display menu (see 9 Menu structure of the BNWAS 3000). The arrow keys ("Up", "Down) are used to make changes.

If the "UNLOCK" key is pressed many times or no key is pressed for 20 seconds, the BNWAS 3000 changes back to the main menu and the keys light green again.

3.5.1. General settings

3.5.1.1 Dimming the background lighting of the keys and palm button

The menu item "Dimmer" is used to set the background lighting of the keys ("UNLOCK", "Up", "Down") and the palm button (WATCH ALARM MAIN UNIT/RESET UNIT). The dimming is set using the arrow keys.

Di	mmer
ХO	%

In case an alarm has been activated, the palm button of the WATCH ALARM MAIN UNIT and additionally connected palm buttons of the RESET UNIT blink with maximum brightness – in this case they are not dimmed.

3.5.1.2 Dimming the background lighting of the display

The menu item "Bright" can be used to set the brightness of the background lighting of the display using the arrow keys.





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The range of settings has been chosen so that discernible brightness is always ensured at a minimum value.



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3.5.2. Secured settings

3.5.2.1 Enter password

It is necessary to enter a password for all safety-relevant settings. The password consists of four numbers (default setting **0 0 0 0**).



The four-digit password is entered using the arrow keys. Each digit must be confirmed by pressing the "UNLOCK" key. If the entry is incorrect, "Password wrong" appears on the display. If the "UNLOCK" key is pressed twice without entering a number, the BNWAS 3000 changes to the next menu item.



3.5.2.2 Change the operation type

In order to change the operation type, the correct password has to be entered (see 3.5.2.1 Enter password).

The operation type is selected with the arrow keys and saved with the "UNLOCK" key.





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3.5.2.3 Changing the watch alarm time

In order to change the watch alarm time, the correct password has to be entered (see 3.5.2.1 Enter password).

The watch alarm time can be set using the arrow keys and saved with the "UNLOCK" key. The time can be selected between 3 and 12 minutes.



3.5.2.4 Activate external reset

The activation of external resetting makes it possible to reset the BNWAS 3000 through the inputs SERIAL IN 1 (JG1), SERIAL IN 2 (JA1) and RESET SENSOR (JE1). An alteration of this setting has no effect on the RESET UNIT. Resetting using the RESET UNIT is always possible and cannot be deactivated.

It is only possible to activate external resetting after this has first been configured (see 3.5.3.1 Changing the configuration) and after entering the correct password (see 3.5.2.1 Enter password). Depending to the configuration, both the serial reset and the reset sensor equipment can be activated/deactivated.

The external resetting can be activated and deactivated using the arrow keys and saved with the "UNLOCK" key.



3.5.2.5 Acknowledgement of sabotage of the external reset

If the reset sensor equipment is sabotaged, the BNWAS 3000 detects it, outputs an error and prevents resetting with the reset sensor equipment. In order to be able to reset again with the reset sensor equipment, the error has to be acknowledged. This is performed after entering the correct password with the menu item "RES SE C2" and selecting (acknowl.) using the arrow keys, and confirming with the "UNLOCK" key.





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3.5.2.6 Changing the date

In order to change the date, it is necessary to enter the correct password (see 3.5.2.1 Enter password).

In order to change the date, an arrow key is pressed in the menu item "Date set". If the "UNLOCK" key is pressed before an arrow key, then the next menu item is reached without changing the date.

To enter the date, each digit is entered individually. The "UNLOCK" key is used to select the next digit and it is then changed using the arrow keys. The last pressing of the "UNLOCK" key saves the date.



The date can also be set by an external system, e.g. GPS. If such a system is connected and configured, it has precedence over manual entries.

3.5.2.7 Changing the time

In order to change the time, it is necessary to enter the correct password (see 3.5.2.1 Enter password).

In order to change the time, an arrow key must be pressed in the menu item "Clock st". If the "UNLOCK" key is pressed before an arrow key, then the next menu item is reached without changing the time.

To enter the time, each digit is entered individually. The "UNLOCK" key is used to select the next digit and it is then changed using the arrow keys. The last pressing of the "UNLOCK" key saves the time.

Note: according to IMO Resolution A.861(20), the time must be set to in UTC (GMT).



The time can also be set by an external system, e.g. GPS. If such a system is connected and configured, it has precedence over manual entries.



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3.5.2.8 Displaying the version

After entering the correct password (see 3.5.2.1 Enter password), the software version number is displayed. The arrow keys can be used to select between the two microcontroller version numbers.



3.5.2.9 Changing the password

After entering the correct password, "password" appears for a second time in the display menu but with stars beneath.



As already described under "3.5.2.1 Enter password", a new password can now be entered. After entering the password, the arrow keys are used to select between "Yes" and "No" whether the password is to be saved and this is confirmed with the "UNLOCK" key.





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3.5.3. Service settings

3.5.3.1 Changing the configuration

The configuration menu can be used to enter the configuration password. The configuration password cannot be changed and may only be known to the service personnel. It is entered in the password menu (see 3.5.2.1 Enter password) and is "**1 1 1 2**". In addition, the "UNLOCK" key must be pressed for the fourth time with the palm button being pressed simultaneously (the palm button must be pressed first).



The configuration menu is divided into two menu items: Configuration 1 and Configuration 2. Using the arrow keys in menu item "RU", the number of connected REPEATER UNITs can be changed. "No" UNIT or up to four can be set and confirmed using the "UNLOCK" key. If fewer Units are connected than are configured, then the WATCH ALARM MAIN UNIT outputs an error message. If more UNITs are connected than are configured, then the UNITs, which are not configured output an error message.

Under "CLK", the arrow keys can be used to switch on and off the serial reading-in of time and date through SERIAL IN 1 (JG1) or SERIAL IN 2 (JA1) (1 = on; 0 = off). The setting is confirmed and saved with the "UNLOCK" key.

Config	
RSX¬RCX	

Under "RS", serial resetting through SERIAL IN 1 (JG1) or SERIAL IN 2 (JA1) can be switched on or off (Configuration 2).

Under "RC", resetting through the input RESET SENSOR (JE1) (reset sensor equipment) can be switched on or off (Configuration 2). The setting is confirmed and saved with the "UNLOCK" key.



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3.5.3.2 Setting the 3rd alarm time

The menu item "Changing the configuration" is followed in the special password-protected zone by the menu item for the setting the 3rd alarm time. This sets the time between the 3th alarm (2nd Alarm) and the activation of the 4th alarm mode (3rd Alarm). The arrow keys can be used to set the time in 30-second steps between 90-180 seconds. The setting is confirmed with the "UNLOCK" key, the display then leaves the Configuration and jumps to the menu item "Changing the operation type".



3.5.3.3 Changing the light colour of the palm button

The palm button has a two-colour LED and can light up in red or orange.

Selection orange: The keys "UNLOCK" and "up" must be pressed together while the device is switched off. The device is then switched on.

Selection red: The keys "UNLOCK" and "down" must be pressed together while the device is switched off. The device is then switched on.

The setting remains permanently saved.



The light colour of the RESET UNIT is selected with the switch SW1 (rear side).

3.5.3.4 Return password to default

In order to restore the password to the default (**0 0 0 0**), all three keys of the WATCH ALARM MAIN UNIT are pressed simultaneously and the UNIT then switched on.

Password
Reset



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4. Errors

4.1. General description

If at any time the WATCH ALARM MAIN UNIT detects an error, a corresponding message appears in the display for one second every 10 seconds. In addition, a message is outputted through SERIAL OUT 1 (JV1) and SERIAL OUT 2 (JV2) and the isolated-contact switch opens. Two short signals sound every minute at fatal errors (missing accumulator, missing mains) and every 15 minutes at normal errors (REPEATER UNIT bus, clock, serial communication, accumulator bad, RESET SEN-SOR manipulates). Functions, which are not affected by the error, continue to work.

When the error has been rectified, the message is no longer shown in the display. A message (error remedied) is outputted through SERIAL OUT 1 (JV1) and SERIAL OUT 2 (JV2).

A disturbance must occur repeatedly for an error to be displayed. A temporary disturbance is not displayed and longer lasting errors are only outputted after a delay. The same procedure applies when errors are rectified.

If one of the arrow keys is pressed while the main menu is being displayed, the "UNLOCK" key lights up orange and it is possible to change between the error messages. If the "UNLOCK" key is pressed or nothing is pressed for 20 seconds, the main menu is displayed. If there is no error, the main menu is still displayed.

4.2. Internal communication for error monitoring

The two microcontrollers in the WATCH ALARM MAIN UNIT communicate with each other through a SPI (Serial Peripheral Interface). This means they control each other reciprocally. The slave microcontroller switches the error relay while the master microcontroller can report error messages on the display and output them through SERIAL OUT 1 (JV1) and SERIAL OUT 2 (JV2).



If the slave microcontroller receives no message from the master microcontroller for one second, it opens the error relay.

If the master microcontroller receives no answer or a defective answer, it outputs an error message.

The slave microcontroller sets the relays at the command of the master microcontroller and informs the master microcontroller about the setting of the relays. If these do not agree with the current status, the master microcontroller gives a command to set the relays again and outputs an error message.



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4.3. Real Time Clock (RTC)

4.3.1. Battery

If the buffer battery of the RTC is discharged, an error is outputted. The condition of the battery can only be checked with a repeated restart due to the hardware. If the battery has been replaced, the device must be disconnected twice from the power supply (including emergency accumulator) in order that the error is not displayed again.



4.3.2. Real Time Clock error

The RTC is also connected in the WATCH ALARM MAIN UNIT through the internal bus system and is regularly questioned by the master microcontroller. It the RTC does not answer repeatedly, an error is outputted.

RTC	Com
Erro	or

4.4. Error with serial reading-in of the time

The date and time can be read in through SERIAL IN 1 (JG1) and SERIAL IN 2 (JA1). If this function is activated and a defective or false date arrives, an error message is shown.



4.5. Emergency accumulator

After an accumulator test, the result is outputted through the outputs SERIAL OUT 1 (JV1) and SE-RIAL OUT 2 (JV2) (see 2.2 SERIAL OUT 1 (JV1) and SERIAL OUT 2 (JV2)). If the accumulator is not "OK", an error message is shown in the display.





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If the accumulator is shown as faulty despite having been replaced, the accumulator must first be charged for a time.

4.6. Mains power failure

If the power supply from the mains fails, the BNWAS 3000 switches to accumulator operation and outputs an error message. If the supply voltage is restored, the BNWAS 3000 switches back to mains power after a short time.



4.7. Current

The WATCH ALARM MAIN UNIT supplies electricity for the accumulator charging, RESET, RE-PEATER und die SELECTOR UNIT. If a total current flows, which exceeds 80% of the maximum permissible current, an error message is outputted.



The current can be reduced with a BOOSTER UNIT, a SELECTOR UNIT with external power supply or a reduction of the charging current (see 2.7. Accumulator 24 V).

4.8. **REPEATER UNIT** – communication error

In the Configuration (see 3.5.3.1 Changing the configuration), it is laid down how many REPEATER UNITs are connected. If the WATCH ALARM MAIN UNIT receives no data or defective data from a REPEATER UNIT, an error message is outputted.

RA	ΡE	rr	or
Х٦	۲	Х¬	Х

If the REPEATER UNIT receives no data or defective data from the WATCH ALARM MAIN UNIT, an error message is outputted.







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4.9. Serial resetting

The data from the inputs SERIAL IN 1 (JG1) and SERIAL IN 2 (JA1) are monitored by the microcontroller. If the BNWAS 3000 receives no data although serial resetting has been configured and also activated, an error is displayed.

RES	SE	Ζ
Erro	or	

4.10. Reset sensor equipment

If the reset sensor equipment has been sabotaged while active (see 2.3 RESET SENSOR), this is reported by the BNWAS 3000. There is no resetting by the reset sensor equipment until the error (see 3.5.2.5 Acknowledgement of sabotage of the external reset) has been rectified.



5. Service menu

In the service menu, values and properties of the BNWAS 3000 can be seen and some additional functions can be operated. To do this, the BNWAS 3000 is connected to a PC through SERIAL OUT 2 (JV2) (RS232 interface). Using a terminal program, texts from the BNWAS 3000 can be displayed on the PC and commands can be sent from the PC (by operating keys in the terminal programme) to the BNWAS 3000 in the form of letters or numbers.

5.1. Interface

The service menu and also the event and alarm messages are outputted through the interface JV2 (SERIAL OUT 2) (RS232). The outputting of event and alarm messages is activated by default. Pressing key SM1 (on the WATCH ALARM MAIN UNIT directly next to the D-Sub plug) changes to the service menu.

When this is switched, the Baud rate is changed in addition to the text output. The service menu is then operated at 115,200 Baud and the event and alarm messages are outputted at 4,800 Baud.

During the service menu, a "*" must be sent from the PC (terminal program) to the system at least every minute. If this does not occur, the WATCH ALARM MAIN UNIT automatically changes to event and alarm message output (precedence). In order that the service menu works again, the key SM1 must be pressed again.



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5.2. Main menu

"H", "h" or "?" from PC – the main menu is displayed. This lists all functions.

Deckma GmbH BNWA	S 3000
Firmw 9.0.16	2012-09-11
Serial number:	1127002
Serial 1 terminal	:A
Serial 2 terminal	:a
Accu charge termi	:B
Accu check	:c
Clock set	:C
Error list	:e
Memory read	:r
Power	:g
Overview modules	:m
Status/Config	:s

SAMPLE

5.3. Messages

If an error occurs or an error is remedied, a message is outputted once.

5.4. Serial 1 terminal

"A" from PC – the data, which comes from SERIAL IN 1 (JG1), is passed through and outputted. The output stops automatically after 10 lines. In order to interrupt this function, "h", "H" or "?" must be sent, or no "*" for one minute. During the terminal output, no other errors (e.g. error messages) are displayed.

5.5. Serial 2 terminal

"a" from PC – the data, which comes from SERIAL IN 2 (JA1), is passed through and outputted. The output stops automatically after 10 lines. In order to interrupt this function, "h", "H" or "?" must be sent, or no "*" for one minute. During the terminal output, no other errors (e.g. error messages) are displayed.

5.6. Accu charge termi. (Acumulator charge terminal)

"B" from PC – the accumulator voltage, the charging current and the PWM signal are displayed every 10 seconds. The data is divided by a "tab" so that it can be recorded and simply pasted into a spreadsheet file. Repeated "B" from PC or when no "*" is sent for one minute causes the function to deactivate.



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5.7. Accu check (Accumulator test)

"c" from PC – an accumulator test is performed (see 4.5. Emergency accumulator). The test can be repeated every 30 seconds.

5.8. Clock set (set the time and date)

"C" from PC – the time and date are set. Day, month, year, hour, minute and second are entered using the number keys. Any letter from the PC cancels the procedure. After the data has been successfully entered, it is confirmed with "Y".

Note: according to IMO Resolution A.861(20), the time must be set in UTC (GMT).

Warning: the plausibility of the entered time is not checked.

5.9. Error list (error messages)

"e" from PC – the error status of each device is displayed. For devices, which are not activated, "N.A." is displayed.

Error Messages:	
Accu	:OK
Accu charge	:Not charge
SN	:OK
RTC	:OK (only after restart)
SPI	:OK
REPEATER UNIT	:RAP Nr 2 Error;
RESET SENSOR Seri.	:N.A.
RESET SENSOR Cont.	:N.A.
Clock and Date Com	:N.A.
Relay	:OK
Current	:OK
Power	:OK

SAMPLE

5.10. Memory read (display EEPROM)

"r" from PC – part of the EEPROM is read and displayed. Repeated "r" from the PC causes further parts of the memory to be displayed. At the start of each line is the address of the first byte in the line. The settings are saved at the start of the memory.

Byte	Content
0x00-0x03	Number of errors REPEATER UNIT 1-4
0x04-0x05	Password
0x06-0x07	Last address of configuration memory
0x08-0x09	Last address of error memory
0x0A	Reset sensor equipment active
0x0B	Palm button colour
0x0C	Number of installed REPEATER UNITs



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0x0D	Reading of time and date active
0x0E	Serial resetting active
0x0F	Alarm mode
0x10	Signal generator active
0x11	Brightness
0x12	Dimmer
0x13	Maximum watch alarm time
0x14	Signal sound

Bytes 32 to 39 store the software version of the first REPEATER UNIT, Bytes 40 to 47 that of the second, Bytes 48 to 55 of the third and Bytes 56 to 63 of the fourth.

From the 64th Byte to the 2,000th Byte, status reports are written. These contain date, time, status code and "0xFE" as conclusion.

0040: 15 10 11 17 39 17 1D FE

Starting Byte: DD MM YY HH MM SS status code 0xFE

A status report, which reports an error, is saved when the error occurs for the first time or repeatedly after "rectification". The rectification of the error is also saved.

Status number	Status number Hex	Status description
1- 4	0x01-0x04	REPEATER UNIT OK
5-9	0x05-0x09	REPEATER UNIT error
10	0x0A	RTC error
11	0x0B	RTC OK
12	0x0C	Serial resetting error
13	0x0D	Serial resetting OK
14	OxOE	Error reading time and date
15	OxOF	Reading time and date OK
16	0x10	Relay position error
17	0x11	Relay position OK
18	0x12	SPI/internal communication error
19	0x13	SPI/internal communication OK
20	0x14	Switch to accumulator operation
21	0x15	Switch to mains operation
22	0x16	Accumulator total discharge protec-
23	0x17	Accumulator not connected
24	0x18	Accumulator defective
25	0x19	Accumulator weak
26	0x1A	Accumulator OK
27	0x1B	Reset sensor equipment sabotaged
28	0x1C	Reset sensor equipment OK
29	0x1D	Restart



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From 2,064th Byte to the 4,000th Byte, configuration changes are stored. These data also contain date, time, a code Byte and "0xFE" as conclusion. The first three bits of the code Byte contain the number of active REPEATER UNITs. The third bit is set when serial resetting is active, the fourth when the reset sensor equipment is active and the fifth bit is set when the serial reading-in of time and date is active.

5.11. Power (mains)

"g" from PC – opens the mains menu. This displays all voltages and currents measured by the BNWAS 3000 The PWM signal, which is responsible for current regulation through the step-up circuit, is displayed.

Voltages:		
U ISELECT: 03	3.93	V
Accu Voltage: 24	4.86	V
Accu Voltage2: 24	4.34	V
Accu Current: 00	0.00	A
External Current: 00	0.00	A
Voltage 24V supply: 00	0.00	V
Voltage 230V supply:00	0.00	V
PWM: 02	2.54	

SAMPLE

5.12. Overview of modules

"m" from PC – an overview of the software versions and the frequency of errors occurring in the individual REPEATER UNITs is displayed. If an "error" is displayed instead of the software version, there is an error in the UNIT.

Number of active	modules: 5	
MAIN UNIT master	: software version : 9.0.11	
MAIN UNIT slave	: software version : 9.0.11	
REPEATER UNIT1.	: software version : 9.0.11	errors: 000
REPEATER UNIT2.	: error	errors : 001
REPEATER UNIT3.	: software version : 9.0.11	errors: 000
REPEATER UNIT4.	: software version : 9.0.11	errors: 000

SAMPLE



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5.13. Status/Config (status and configuration)

"s" from PC – displays the software version of the master microcontroller and slave microcontroller, the serial number, the date, the current alarm status, the number of configured REPEATER UNITs and the configuration of serial reading-in of time and date, serial resetting, reset sensor equipment and signal sound.

```
Deckma GmbH
              BNWAS 3000
Firmw 9.0.16 2012-09-11
Serial number: 1127002
Firm Slave
              9.0.9
Date:
              05.10.11 19:39:16
              Manual running: 00:03:30
Status:
Config:
Number of REPEATER UNITS: 0
GPS: OFF
RESET SENSOR Serial: OFF
RESET SENSOR Contact: OFF
Signal Sound: 1
```

SAMPLE

5.14. Bus terminal (REPEATER UNIT bus monitor)

"t" from PC – outputs the bus traffic between the WATCH ALARM MAIN UNIT and the REPATER UNITs. At the start of the line, the messages sent by the WATCH ALARM MAIN UNIT are displayed. After a tabulator follows the answer of the REPEATER UNIT.

 88C300181001000B05830000000000000000010001C352
 8800C3095F010C1941

 88C100181001000B05BC00000000000000000010001DE24
 8800C1095F010CD938

5.15. SPI terminal

"T" from PC – outputs the internal bus traffic between the two processors of the WATCH ALARM MAIN UNIT.

At the start, the message sent by the master microcontroller is displayed (hex). After a tabulator follows the answer of the slave microcontroller (binary).

1C 10000010 09 00000000 7F 00000000

5.16. Signal Sound

The pause-tone relationship of the internal acoustic signal generator can be altered in the service menu. This alteration than applies for all alarm modes.



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"I" from PC – the tone sequence of the characteristic acoustic signal generator can be changed. "1", "2" or "3" from PC can select a tone sequence.

- 1st tone sequence: long pause, longer tone
- 2nd tone sequence: long pause, shorter tone
- 3rd tone sequence: short pause, longer tone

6. EEPROM

In the EEPROM, the settings, error messages and configuration changes are stored (see 5.10. Memory read (display EEPROM)).

7. Error rectification

Error message dis-	Error description	Rectification
MCU Com Error	Error in the communication between the microcontrollers	Restart; reprogram; if it occurs repeat- edly, send it in
RAPError X ₁ X ₁ X ₁ X	REPEATER UNIT error master;	Check bus number; check cable and connection; check UNIT; exchange UNIT
BUS Error	BUS Error between WATCH ALARM MAIN UNIT and REPEATER UNIT	Check bus number; check cable and connection; check UNITS
Power Error	Drop in supply voltage	Check supply voltage
Intern Error	Internal error	Restart; if it occurs repeatedly, send it in
Battery Error	Error with the accumulator (not connected, not charged, defective)	Check, exchange or charge the accumu- lator



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RTC Bat. Emty	RTC batteries empty	Exchange palm button batteries and re- start MU twice
RTC Com Error	Error in the i2c bus and thus in the RTC	If it occurs repeatedly, send it in
CLK Com Error	Error reading-in time and date through SERIAL IN 1 (JG1) or SERIAL IN 2 (JA1).	Check cable and connection; check con- nected device; check protocol; check con- figuration
RES SE S Error	Error in serial resetting through SERIAL IN 1 (JG1) or SERIAL IN 2 (JA1). No character is being received.	Check cable and connection; check con- nected device; check protocol; check con- figuration
RES SE C Error	The reset sensor equipment has been sabotaged or is defective.	Check cable and connection; check con- nected device; check configuration; rectify sabotage; bridge sabotage pin in JE1 (RESET SENSOR)
Current to high	Current too high	Use a SELECTOR UNIT with power sup- ply and/or BOOSTER UNIT; connect less devices to the MU; lower the charging current



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8. Glossary

8.1. Alarm

After the expiry of the watch alarm time, an alarm is activated. This alarms the various members on the ship depending on its alarm mode.

8.2. Alarm mode

There are four alarm modes, which are activated consecutively depending on the alarm time:

- 1. PreAlarm
- 2. First Alarm (1stAlarm)
- 3. Second Alarm (2ndAlarm)
- 4. Third Alarm (3rdAlarm)

Depending on the alarm mode, the other crew members are alarmed.

8.3. Alarm time

After the expiry of the watch alarm time (without reset), the alarm time is counted upward. It shows how long the alarm has already been active. The alarm time is dependent on the alarm mode.

8.4. AUTO MODE ON/OFF

Through the input at connection JPI1 (AUTO MODE ON/OFF; ext. signal generator), it is possible to switch the watch alarm on and off when the BNWAS 3000 is in operation type "Auto".

8.5. Operation type

There are three operation types, which can be configured by the user:

- 1. "WATCH Off": The watch alarm is switched off permanently.
- 2. "Auto": The watch alarm is switched on or off through the external interface
- JPI1 (AUTO MODE ON/OFF; ext. signal generator).
- 3. "Manual": The watch alarm is switched on permanently.

8.6. BNWAS

Bridge Navigation Watch Alarm System. Overall system with all its components.



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8.7. External signal generator

The external signal generator can be used, for example, when the internal signal generator is too quiet. It is connected to the interface JPI1 (AUTO MODE ON/OFF; ext. Signal generator).

8.8. Configuration menu

This can only be opened by service personnel after entering the configuration password The following can be configured:

- Number of installed REPEATER UNITs
- Resetting through SERIAL IN 1 (JG1) or SERIAL IN 2 (JA1)
- Set time and date through SERIAL IN 1 (JG1) or SERIAL IN 2 (JA1)

8.9. Units

- WATCH ALARM MAIN UNIT (MU)
- RESET UNIT (RSU)
- SELECTOR UNIT (SU)
- REPEATER UNIT (RPU)
- BOOSTER UNIT (BU)

8.10. Configuration password

The configuration password is needed in order to open the configuration menu. The configuration password cannot be changed. The configuration may only be known to the service personnel.

8.11. Emergency Call

In case of an emergency, an emergency call is activated. It activates the internal and external signal generators.

8.12. Password

With the password, qualified ship's personnel can undertake alterations to the BNWAS. The password is laid down independently for the MU and for each RPU.

8.13. Palm button

Mushroom-shaped button to reset the BNWAS 3000 at the MU and the RSU.

8.14. Reset

Resets the watch alarm time and ends any alarm.



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8.15. Sabotage

There is a sabotage interface for the reset sensor equipment. Through this, alterations to the reset sensor equipment can be detected.

8.16. SERIAL IN 1 (JG1) and SERIAL IN 2 (JA1)

Serial inputs on the MU. Using the NMEA protocol, it is possible to:

- reset
- activate an emergency call
- read in the time or date

8.17. Event and alarm message

Event and alarm messages are outputted through the serial outputs SERIAL OUT 1 (JV1) and SE-RIAL OUT 2 (JV2) on the MU using the NMEA protocol. SERIAL OUT 1 (JV1) can be used, for example, for a VDR.

8.18. Service menu

Configuration of the BNWAS 3000, displaying of errors and events through the output SERIAL OUT 2 (JV2). In order to activate the service menu, the key SM1 must be pressed.

8.19. Serial

Serial means the serial interface. A Universal Synchronous and Asynchronous serial Receiver and Transmitter (USART) is used as hardware on the BNWAS 3000. As standard, either RS-232 and/or RS-485 are used.

8.20. Serial resetting

Setting through the inputs SERIAL IN 1 (JG1) and SERIAL IN 2 (JA1).

8.21. Signal sound

The signal sound is emitted by the internal and external signal generators in case of an alarm and is a characteristic tone sequence, from which the alarm of the BNWAS 3000 can be clearly identified.

8.22. Signal generator

There are acoustic (beeper/sirens) and optical signal generators (blinking palm button). The internal acoustic signal generators are in the housings of the MU and RPU. The external signal generator can be connected to the interface JPI1 (AUTO MODE ON/OFF; ext. signal generator).



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8.23. Reset sensor equipment

The reset sensor equipment resets the BNWAS 3000. This occurs through the input RESET SENSOR (JE1).

8.24. Watch alarm

When the watch alarm is active, the watch alarm time expires and the alarm is activated unless the BNWAS 3000 is reset.

8.25. Watch alarm time

The watch alarm time is the time, within which the BNWAS 3000 has to be reset in order that no alarm is activated.



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9. Menu structure of the BNWAS 3000

9.1. WATCH ALARM MAIN UNIT



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9.2. REPEATER UNIT

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BNWS 3000 WU-Menu



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10. Labelling of the UNITs

Legend

- A Manufacturer
- B Description of unit and system
- 🔘 Unit type
- D Hardware version of the printed circuit board
- Software version of the controller (handwritten)
- Serial number of the unit
- G Production year of the unit
- \rm Approval mark
- Compass safe distance
- J Description of interface, displays
- K Article and serial number as bar codes for simple recording

10.1. WATCH ALARM MAIN UNIT





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10.2. REPEATER UNIT



10.3. SELECTOR UNIT





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10.4. RESET UNIT

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10.5. BOOSTER UNIT

