

Installation & User Manual

SOUND RECEPTION SYSTEM

VSS-V2

Document Scope

This document describes system features, models, interfaces and functions for the VSS-V2 Sound Reception System. It also includes instructions for installation, commissioning and adjustment, and provides the end-user with the necessary information to operate the VSS-V2 system.

Product Information

Item number	Type number	Description
1021001100	VSS-MP	VSS Master Panel - V2
1021001200	VSS-SP	VSS Slave Panel - V2
1021002100	VSS-MU	VSS Microphone Unit - V2

Publication Log

Rev.	Date	Author	Comments
1.0	12.8.2012	SEN	Published
1.1	12.11.2012	SEN	Small updates PA mute, mounting of mic. unit
1.2	30.10.2013	SEN	Important text for installation of microphone unit added, p.11. Updated text system function p.5. Updated cable connection diagram p.15. Corr. number of LEDs p.20,23.
1.3	08.01.2014	SEN	Environment temperature for VSS-MU changed from -30°C to +55°C to -55°C to +55°C
1.4	03.10.2016	SEN	Update with Installation performance test, reverse LED function etc...

Related Documentation

For further information, refer to the following documentation:

Doc. number	Documentation
A100K11278	Autocad drawing VSS - V2 Master Panel
A100K11279	Autocad drawing VSS - V2 Slave Panel
A100K11277	Autocad drawing VSS - V2 Microphone Unit
A100K11050	VSS - V2 System datasheet

Abbreviations

The list below should define all abbreviations used in this document:

Abbreviation	Actual meaning
DSP	Digital Signal Processor
UTP	Upper Threshold Point

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1 Functional Overview

1.1 System Function

The VINGTOR VSS-V2 Sound Reception System is a navigational aid system required on ships with enclosed bridges. The system enables the officer in charge of the navigational watch to hear sound signals and determine their direction.

The system conforms to SOLAS regulation HSC Code, ISO 14859 and DNV 845.50 (6/2012) type approval programme.

One weatherproof microphone unit with four directional microphones is mounted on top of the wheelhouse and connected to the VSS bridge panel.

By use of the microphone unit, the VSS-V2 system will detect the direction of the incoming horn signal and activate the corresponding LED at the VSS-V2 front panel. Depending on the signal measured at two adjacent microphones, additional directions between those microphones can be measured.

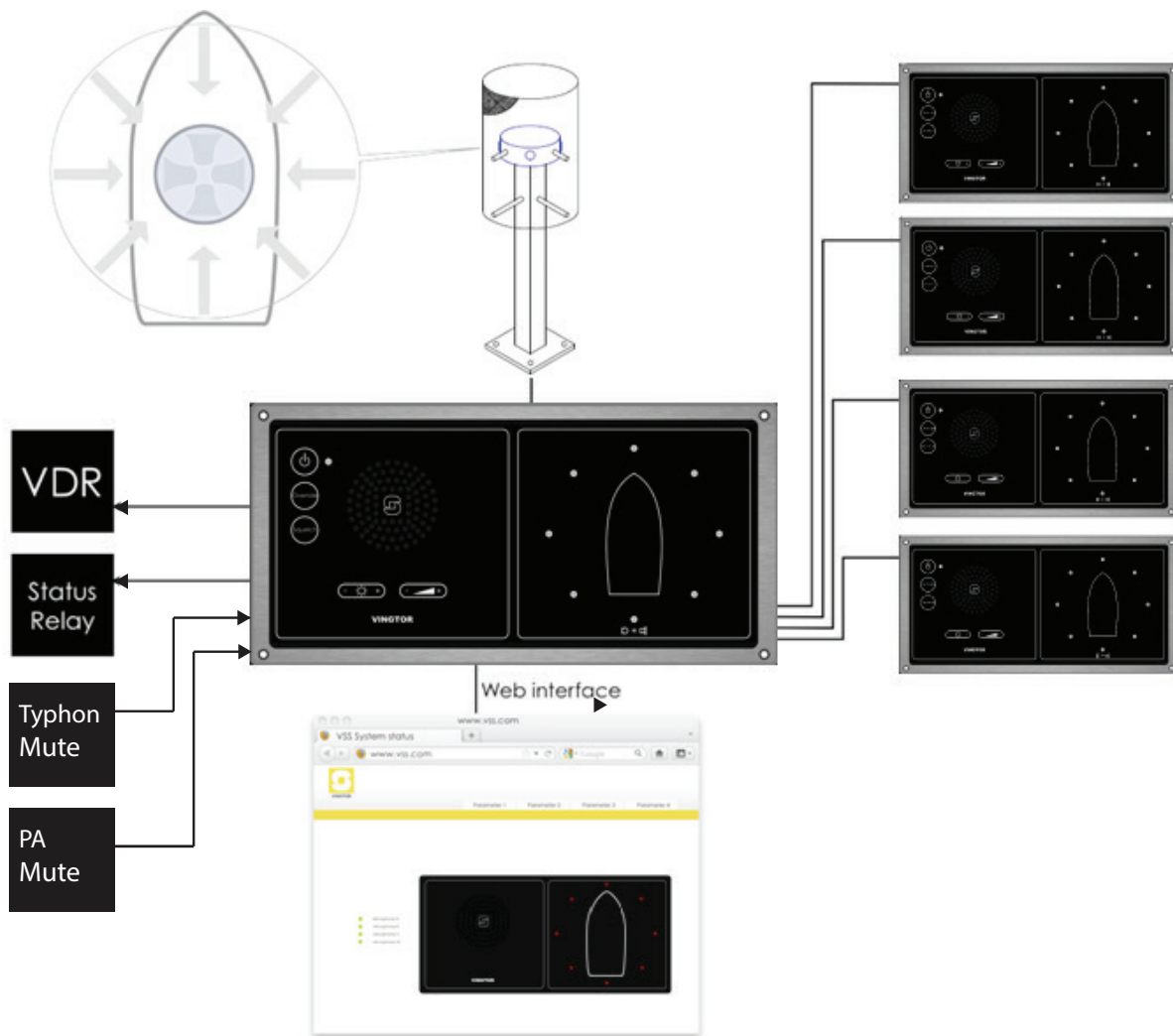
1.2 System Characteristics

- Easy to operate
- Input for remote muting of the amplifier circuit when the vessel's own horn is activated
- Noise cancelling with DSP filtering
- Manual dimmer control
- Sector indication by use of 8 LEDs
- Input for four directional microphones
- The microphone unit is weatherproof and for bulkhead mounting outside, on top of the wheelhouse
- Web interface with two different login types. One for reading the system status and one for access to settings and system parameters
- Output for voyage data recorder
- Override function to hear the unfiltered sound from the microphone unit
- Able to connect 4 slave panels

1.3 Reading Distance

According to requirements in IEC 62288, are both master panel and slave panel readable from a distance of 1 meter.

1.4 System Drawing



All systems will consist of at least a master panel and a microphone unit.

The master panel will indicate the horn signal by turning on the corresponding LED for direction, and outputting the DSP filtered horn signal into the speaker.

Connections to master panel

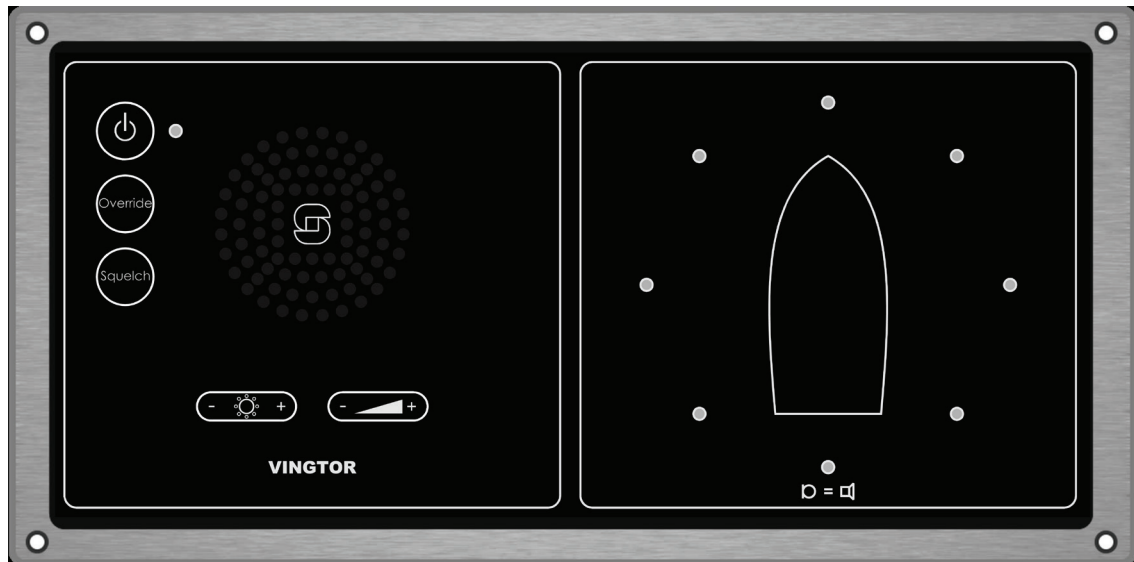
- Microphone unit
- VDR
- Status relay output
- Typhoon/foghorn mute input
- Public Address mute input
- Web site
- Slave panels

It is possible to connect up to four slave panels to the master panel. Slave panels will, from the operator's point of view, operate as master panel with access to the same keys and functionalities.

1.5 Models

1.5.1 VSS-V2 Master Panel

Dimensions (W x H x D): 280 x 140 x 120 mm



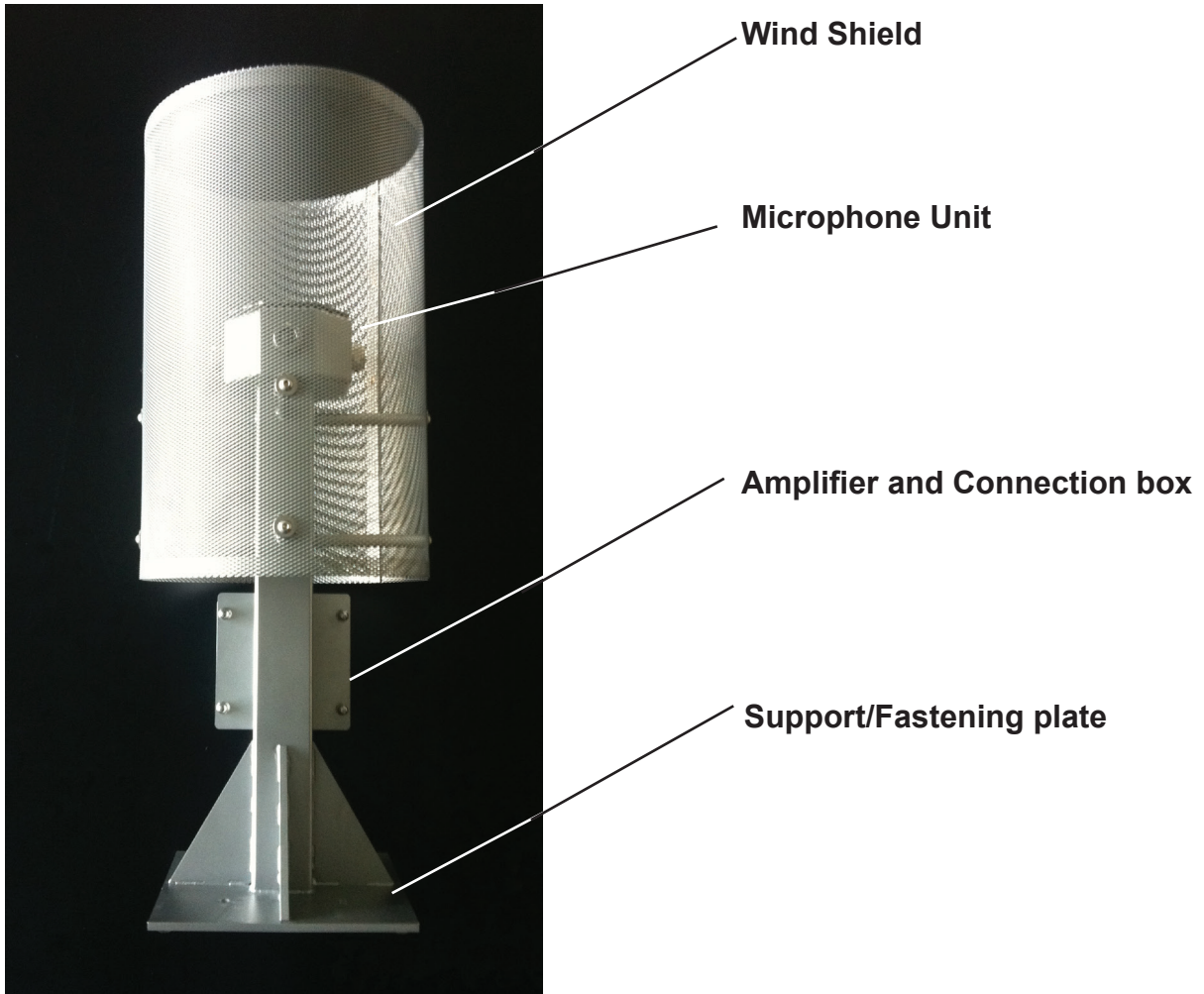
1.5.2 VSS-V2 Slave Panel

Dimensions (W x H x D): 280 x 140 x 53 mm



1.5.3 VSS-V2 Microphone Unit

Dimensions (H x W): 660 x 250 mm



1.6 Target Groups

According to requirements, this product is mandatory on all ships with enclosed bridges.

2 Interfaces

2.1 Master Panel

2.1.1 VDR

- Analog audio output to Voyage Data Recorder.
- Signal is outputting 0dB by default.
- Signal can be adjusted by potentiometer P1 from 0dB to mute.

2.1.2 Typhoon/foghorn mute

Potential-free input makes the system's horn detection inactive while the vessel's own horn is active.

2.1.3 Public Address mute

There is a potential-free input for muting the VSS microphones when the Public Address system is active.

2.1.4 Relay status

There is one NC output for system status and one NO output for each panel direction LED activity. Continuous load current is 170mA.

2.1.5 Web interface

There is an Ethernet connection to access the web interface. Default IP settings are:

- IP: 169.254.1.10
- Subnet: 255.255.0.0
- User: vssadmin
- Pass: vssadmin

2.2 Slave Panel / Master Communication

6-wire interface to slave panel consists of power lines, balanced audio signal and RS485 communication lines.

2.3 Microphone Unit

10-wire interface to microphone consists of power lines and 2-wire set for each microphone. Microphone lines have balanced audio signal and its own keep-alive signal.

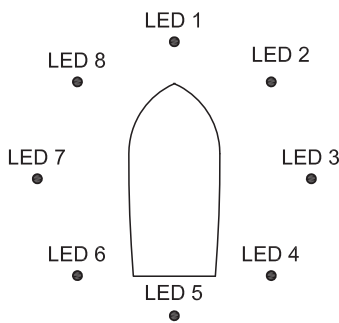
3 Functions

3.1 Electrical

3.1.1 Power requirements

The unit shall be powered from 24 VDC +30% / -10%. The master panel will provide power to the microphone unit and slave panels.

Type	Minimum	Nominal	Maximum	Unit
Voltage Supply	21.6	24	31.2	VDC
Current Load - Master & Mic	-	190	200	mA
Current Load including 1 Slave	-	260	270	mA



3.1.2 Relay outputs

The following outputs are provided:

- One relay output per direction LED.
 - Activated simultaneously with the diodes on the panel.
 - NC logic.
 - Possibility for power out 24VDC.
- One system status relay.
 - Normally closed when system is fully operational.

3.2 Mute Input Typhoon/Foghorn

This mute input will be connected to the ship's typhoon/foghorn in order to hinder the typhoon/foghorn from being sounded on the speaker and trigger LEDs.

3.3 Mute Input Public Address

This mute input will disconnect the VSS microphones when public address messages are broadcasted.

3.4 Audio Interface

This is an external audio interface. It is possible to adjust audio volume by a potentiometer.

4 Installation & Configuration Procedures

4.1 General

For proper installation and operation of the VSS-V2 system, we recommend reading this section thoroughly together with technical and connection drawings.

- ① **Zenitel has experienced that certain types of ships have a too high ambient noise level in the area where the microphone unit is installed. This means that installing the microphone in such an area will degrade the performance of the system. Zenitel therefore highly recommends performing noise measurements before the installation to make sure the ambient noise level does not exceed 70dB in the area where the microphone is to be mounted.**
- ① **In order to comply with DNV ship requirements, the procedures in this section have to be followed strictly.**

4.2 Mounting

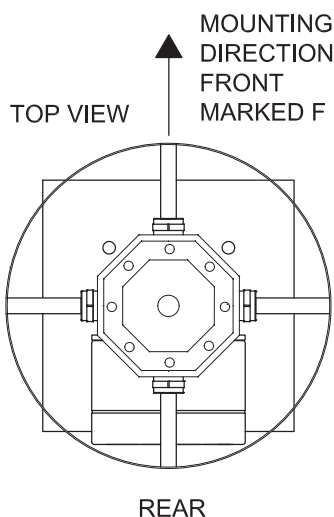
4.2.1 VSS-V2 Master Panel & VSS-V2 Slave Panel

The panels should be flush or bulkhead mounted in a normal and ventilated indoor environment with a temperature of maximum +55 °C. The Master Panel is normally mounted in the Bridge control panel. Make sure that there is sufficient space for cables and maintenance.

4.2.2 VSS-V2 Microphone Unit

The effectiveness of the system depends on the microphone installation. The location of the unit outside the wheelhouse is critical due to the ship's velocity, wind and vibrations.

Normally, the microphone unit is mounted outside, on top of the bridge.



Precautions:

Background noise & Feedback

For best performance, the unit must be placed as far away from noise sources as possible. This allows for the detection of signals from longer distances.

- Undertake noise measurements before the installation to make sure the ambient noise level does not exceed 70dB in the area where the microphone is to be mounted.
- Mount the Microphone Unit according to *Figure 1 Microphone Mounting Guidance* on page 12.
- Do not mount the microphone where vessels own typhoon will exceed 100-110dB when activated. This will cause the microphone unit to temporary malfunction in microphone check signal. This may cause permanent damages to microphones mounted in unit.
- Do not mount the microphone too close to regularly opened doors or windows near the Master panel / Slave panel in order to prevent the system from oscillating due to acoustic feedback.
- Mount the microphone in the correct direction - front is marked **F**.

Obstacles

Direction estimation is based on measurement of phase differences between microphones. If the unit is placed in such a way that large portions of the signal can be reflected back towards the unit, this will influence the phase between the microphones and cause wrong direction estimation. Optimal performance is obtained when the unit has a clear path to all directions.

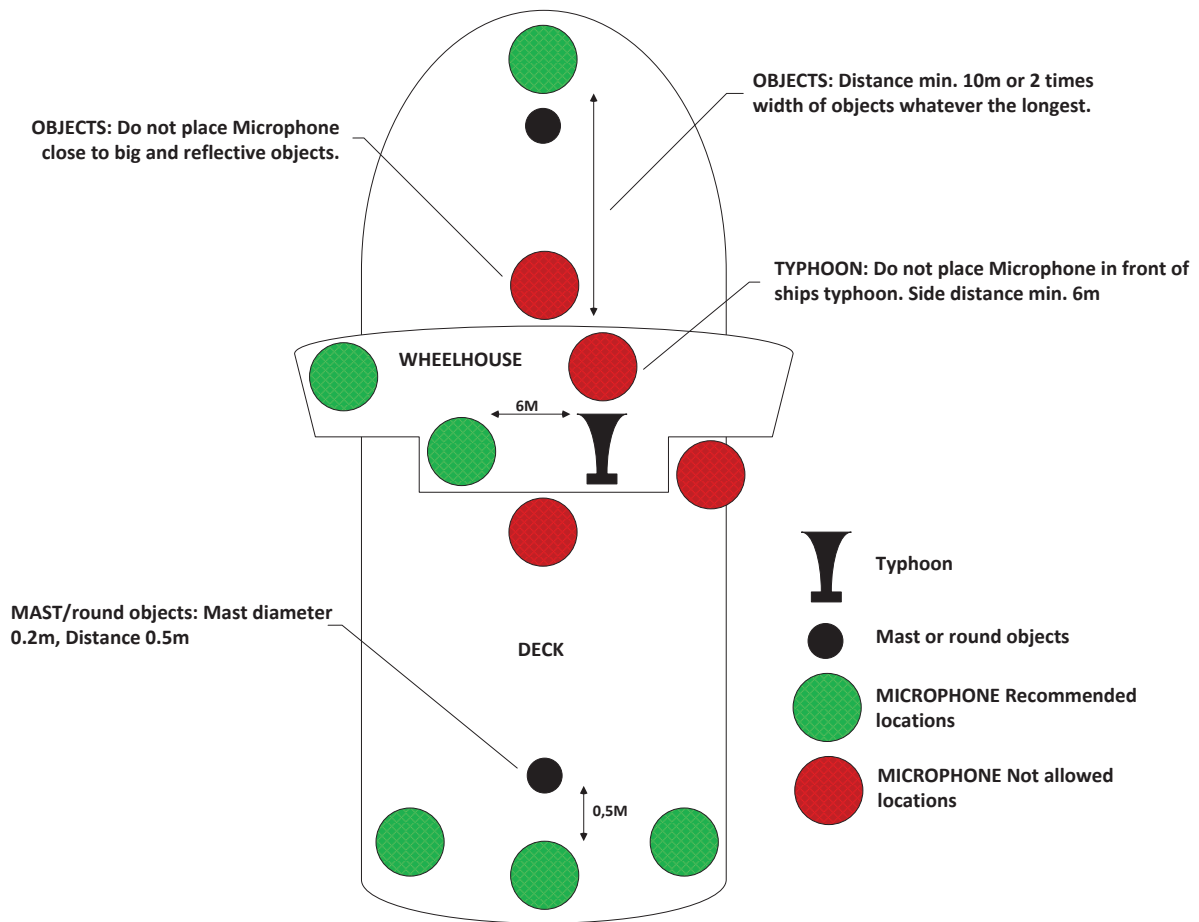


Figure 1 Microphone Mounting Guidance

4.2.3 Microphone Cable Precautions

When the microphone bracket is fastened on the bulkhead, let the cables do a one-turn service-loop before entering the microphone housing. The loop will ensure that the effect of the vibration shock absorber is not impaired. This is necessary to reduce ship-borne vibrations reaching the sensitive microphone elements.

4.2.4 Compass safety distance

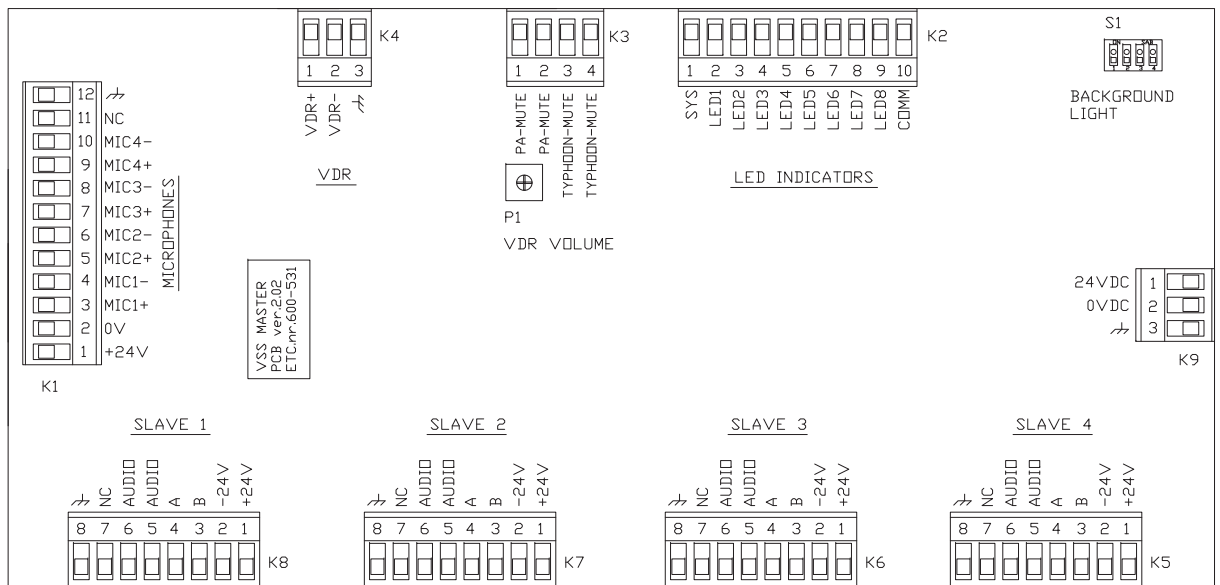
All units must be mounted with a distance of 70 cm from the vessel's standard compass and steering compass.

4.3 Terminals, Jumper and Potentiometer Configurations

Pluggable screw terminals for cables of max. 2.5 mm² are utilized.

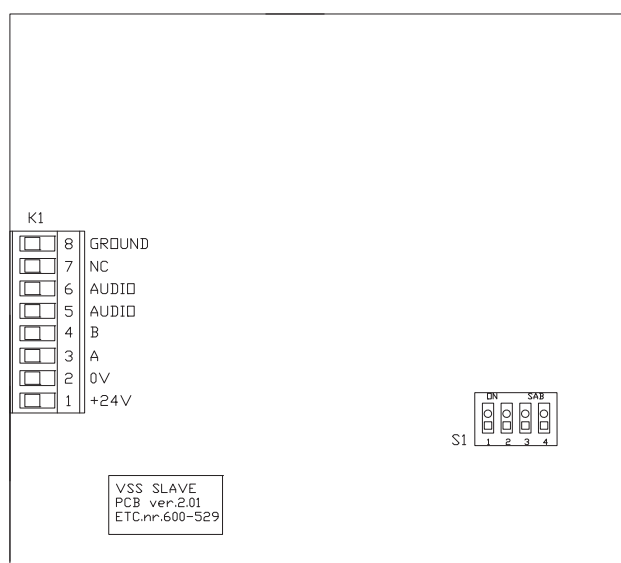
Refer to connection diagram for more detailed information.

4.3.1 VSS-V2 Master Panel PCB ETC 600-868



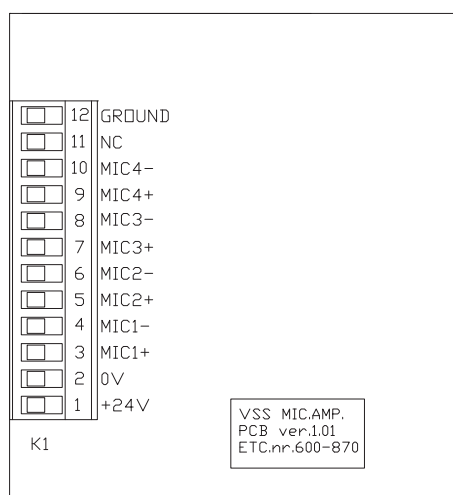
- Terminal Block K1 VSS-V2 Microphone Unit
- Terminal Block K2 LED Indicators
- Terminal Block K3 Switch for muting Typhoon/foghorn
- Terminal Block K4 Audio out to Voyage Data Recorder (VDR)
- Terminal Block K5 - K8 VSS-V2 Slave Panels
- Terminal Block K9 24V Power supply
- DIP switch S1/4 Background Light On/Off
DIP switch S1/2: Reverse LED function
- Potentiometer P1 for adjusting VDR volume

4.3.2 VSS-V2 Slave Panel PCB ETC 600-529



- Terminal Block K1 Connection to VSS-V2 Master pane
- DIP switch S1/4 Background Light On/Off
DIP switch S1/2: Reverse LED function I

4.3.3 VSS-V2 Microphone Amplifier PCB ETC 600-870



- Terminal Block K1 Connection to VSS-V2 Master panel

4.4 Cable Requirements

All signal cables have to be approved ship cable of type twisted-pair with outer braided copper shield.

- ① See section 4.7 *Cable Connection Diagram* for further details.

Terminal block marked “GROUND” is the common ground point for all shields.

4.4.1 Grounding

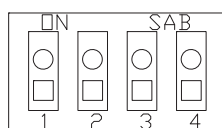
Proper grounding is essential for reliable operation.

The shields must be interconnected in junction boxes and grounded in a common point in the central unit only.

Terminal block marked “GROUND” is the common ground point.

4.5 Setting Master Panel

S1



4.5.1 DIP switch S1

S1/4: Dipswitch on / off

S1/2: Reverse LED function

When in reverse mode normal LED indication position will be flipped 180 degrees.

4.5.2 Potentiometers

Potentiometer P1 is for VDR analog audio output. This must be set in default middle position.

4.6 Setting Slave Panel

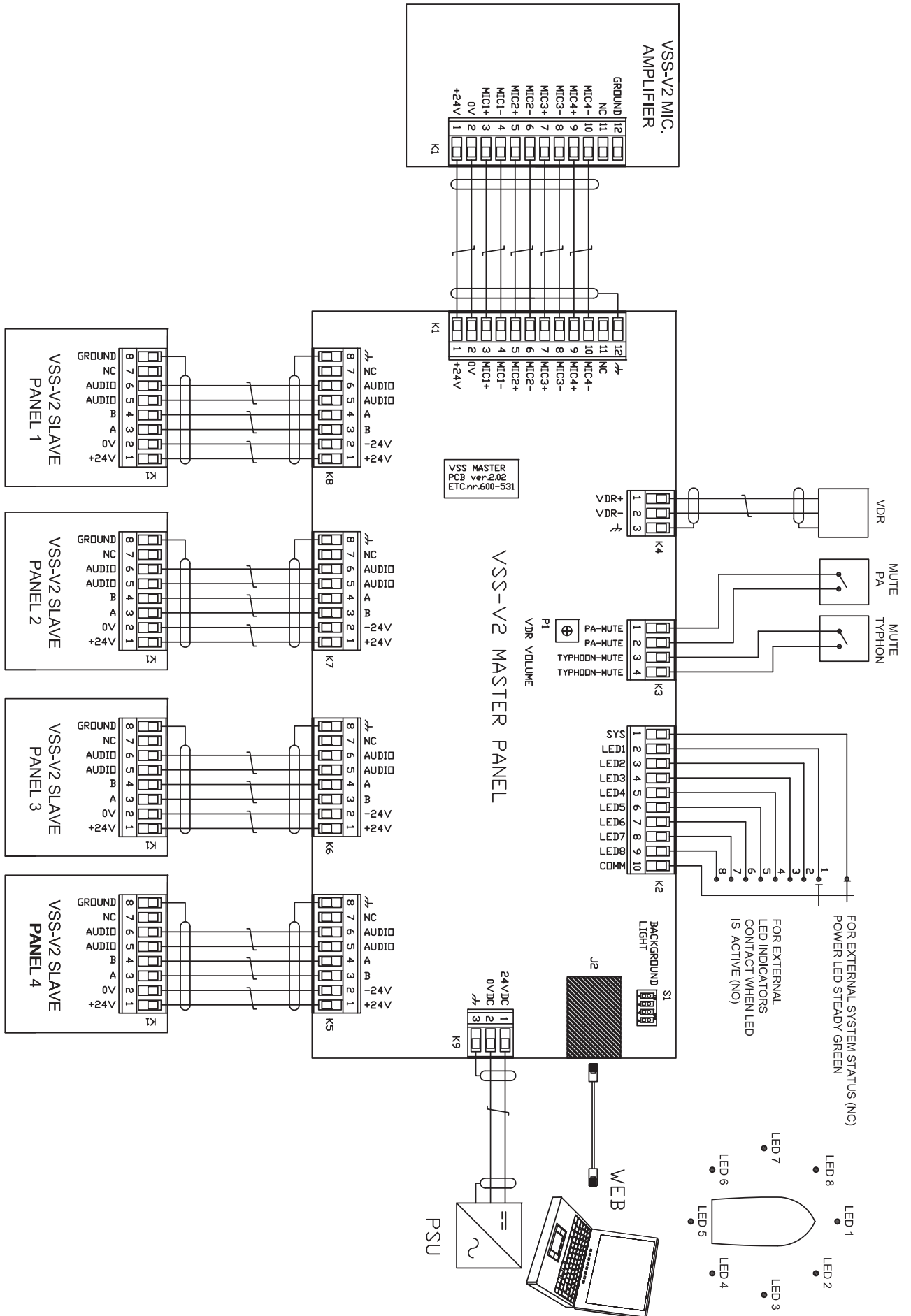
4.6.1 DIP switch S1

S1/4: Backlight on / off

S1/2: Reverse LED function

When in reverse mode normal LED indication position will be flipped 180 degrees

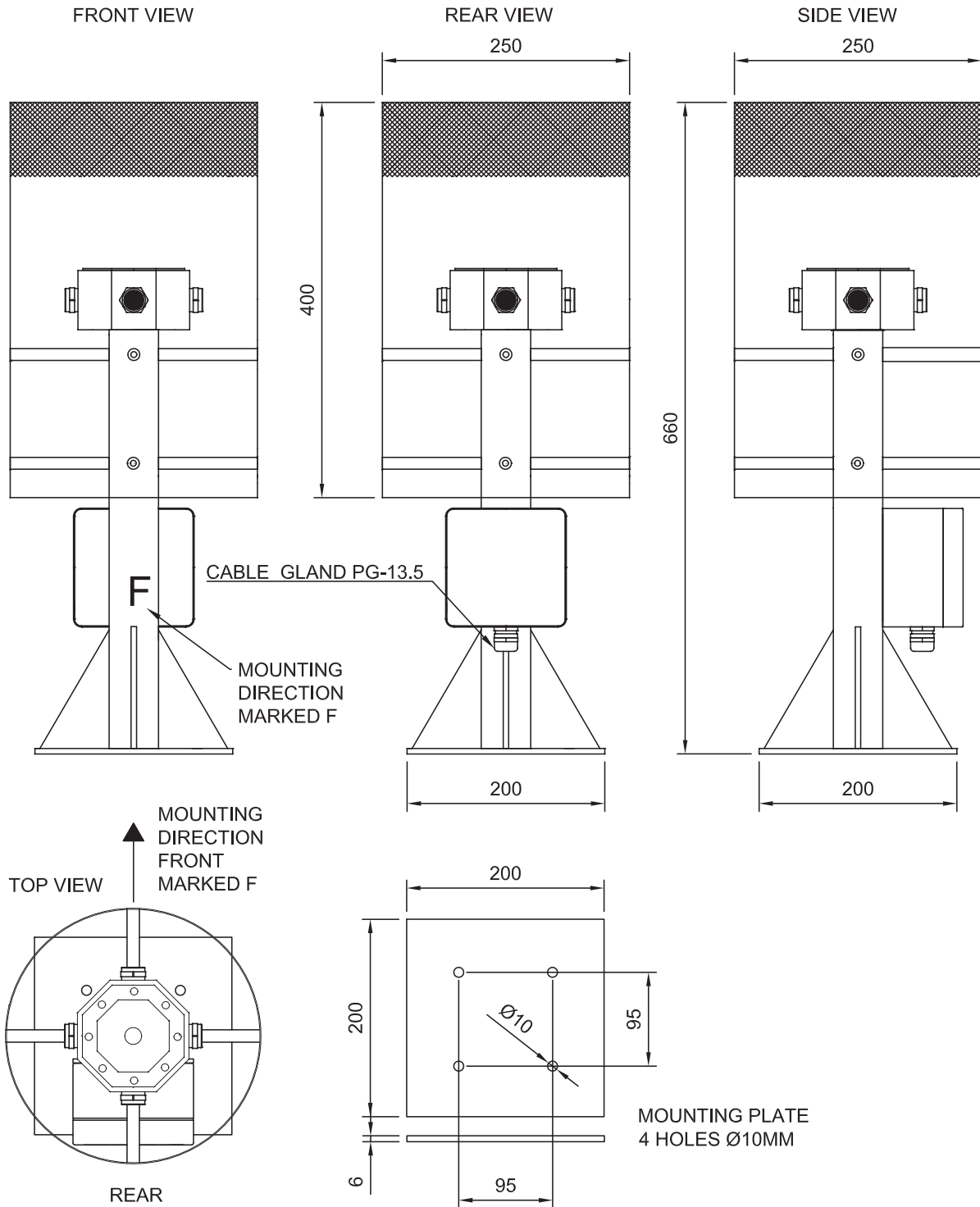
4.7 Cable Connection Diagram



5 Dimensions & Mounting Details

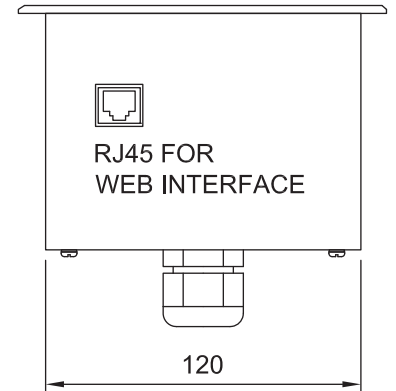
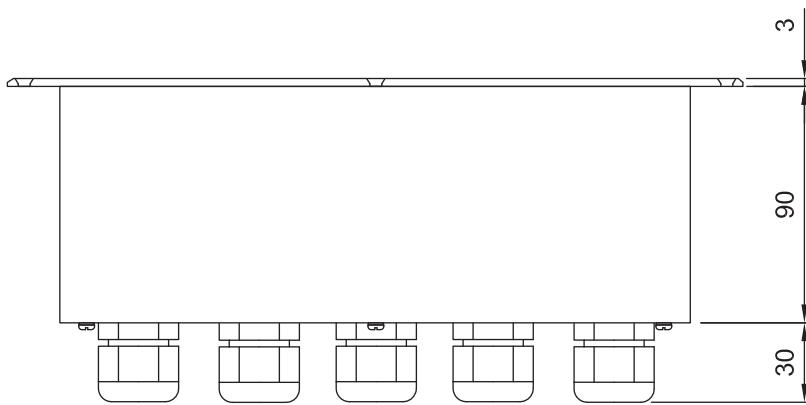
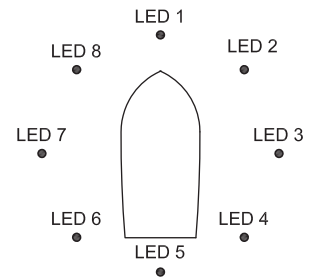
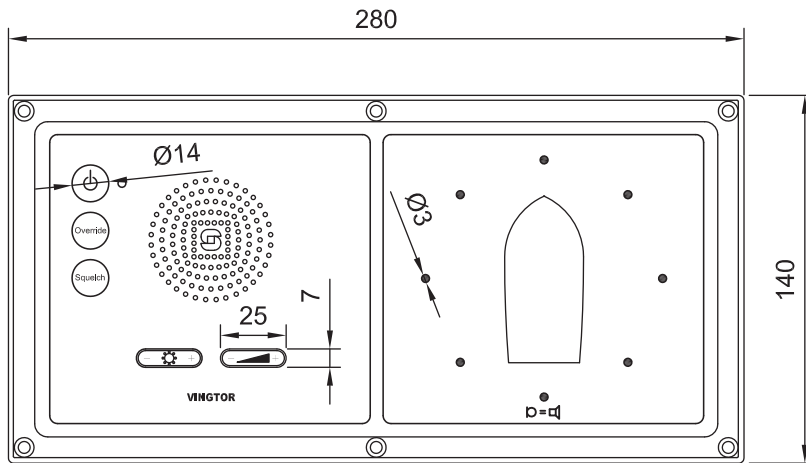
5.1 VSS-V2 Microphone Unit

- Dimensions in mm

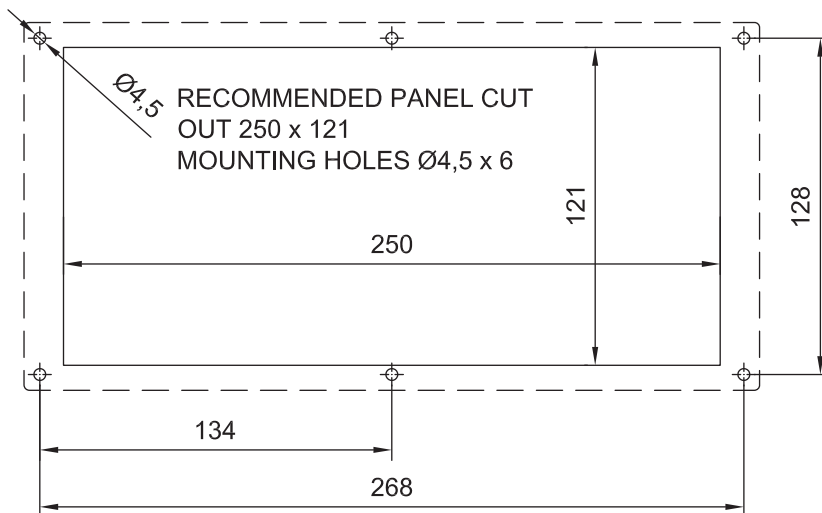


5.2 VSS-V2 Master Panel

- Dimensions in mm

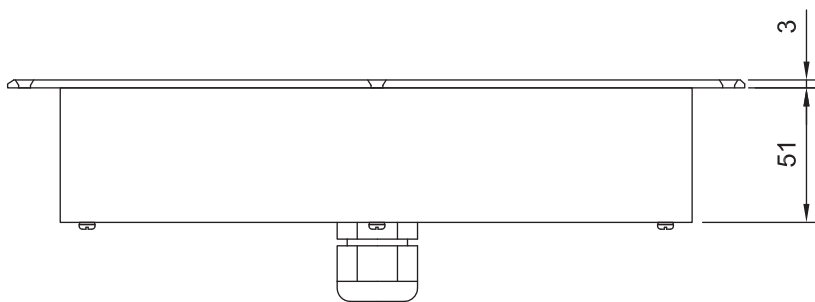
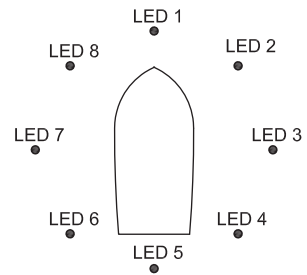
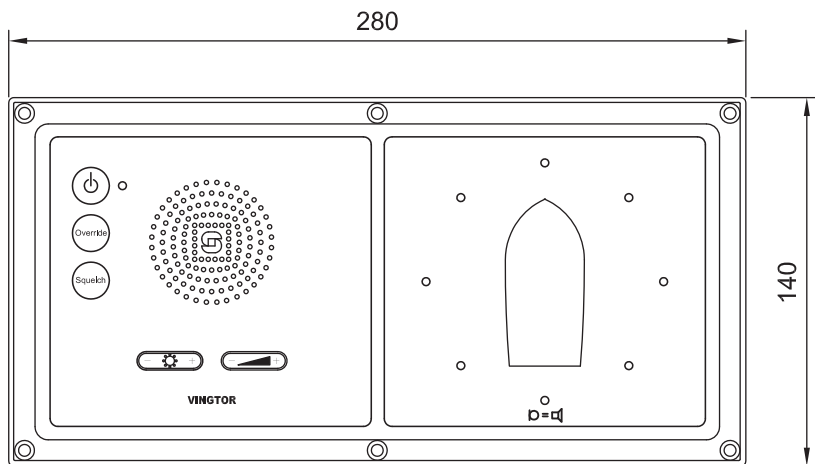


CABLE INLET 5 x PG-16

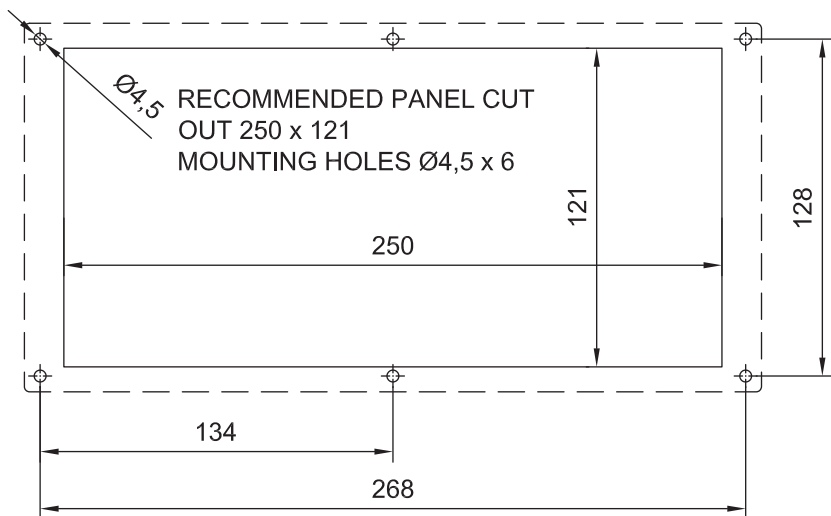
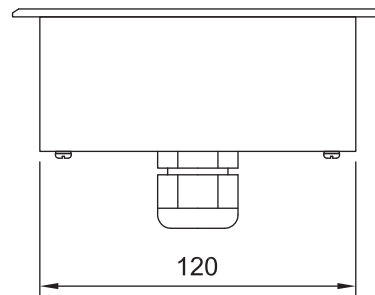


5.3 VSS-V2 Slave Panel

- Dimensions in mm



CABLE INLET 1 x PG-16



6 Startup and Commissioning of System

6.1 General

The VSS-V2 units have been fully tested in our test laboratory before delivery. To ensure that the system operates properly after installation and configuration, carry out the following procedures before using the system.

6.2 Mechanical Inspection - Panels

- All equipment is well fastened in the console or wall.
- All cable and cable glands are well tightened and fastened.

6.3 Mechanical Inspection - Microphone Unit

The unit is installed according to procedures described in section 4.2.2.

① Important!

The microphones shall be installed in such a way that they are as far away from noise sources on the vessel as is practically possible, where wind-induced noise from objects (such as wires) and mechanical vibrations are reasonably reduced.

6.4 Cable Inspection

Make sure that all cables are connected according to section 4.7 *Cable Connection Diagram* and check all terminals. Check that:

- All signal cables are min. 0.75 mm² approved ship cable of type twisted-pair with outer braided copper shield
- All cable shields are connected to the ground terminals
- Power cable is 0.75 mm² and connected to terminal block K9 (+ to terminal 1, - to terminal 2). The shield is grounded on terminal 3.
- Cable for microphone is arranged according to section 4.2.3 *Microphone Cable Precautions*

6.5 Start Up Master Panel

Set master panels to on. When the green status / self test LED is steadily lit, use a horn or similar device that sends out harmonic signals with a higher SPL than the background noise to activate each microphone. The master panel shall activate the diode from the correct direction. At the minimum, check all sides FWD, AFT, STB and PORT.

See section 7 *Operating Procedures* for all other functions.

6.6 Start Up Slave Panel(s)

Set slave panels to on. Use the same procedure as for the master panel.

6.7 Ship's Typhoon/Foghorn

Activate the ship's typhoon/foghorn and check that the system is muted.

6.8 Ship's Public Address System

Broadcast a PA message and check whether the VSS-V2 microphones are muted.

7 Installation performance test

7.1 General

The system shall indicate approximate direction of incoming sound signals to determine at least whether the sound signal being detected is forward or abaft the beam and from which side it is being detected from. For the VSS-V2 resolution of direction detection is eight (8). The system is tested according to ISO 14859:2012 . For a performance test at installation site as the following test procedure is recommended.

7.2 Test set up

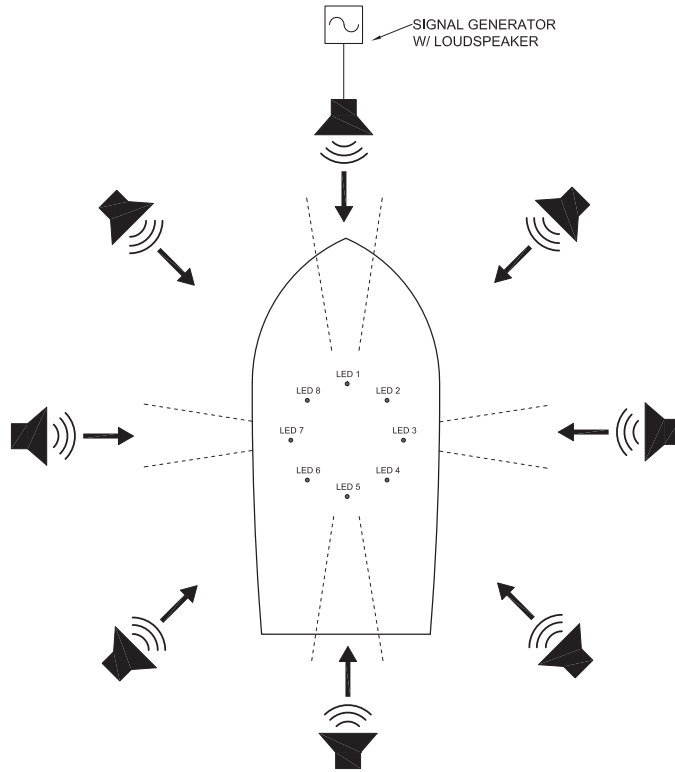
A test signal is needed to make performance test. As test signal, a true typhoon or whistle can be used, a handheld/mobile aircompressed horn or even a speaker can be used. This test is to be performed for eight (8) different angles to verify that all directions are correctly indicated and that vessels obstacles and reflections have no influence on direction detection.

Note: In full scale testing resolution and physical direction can be difficult to decide.

Test signal:

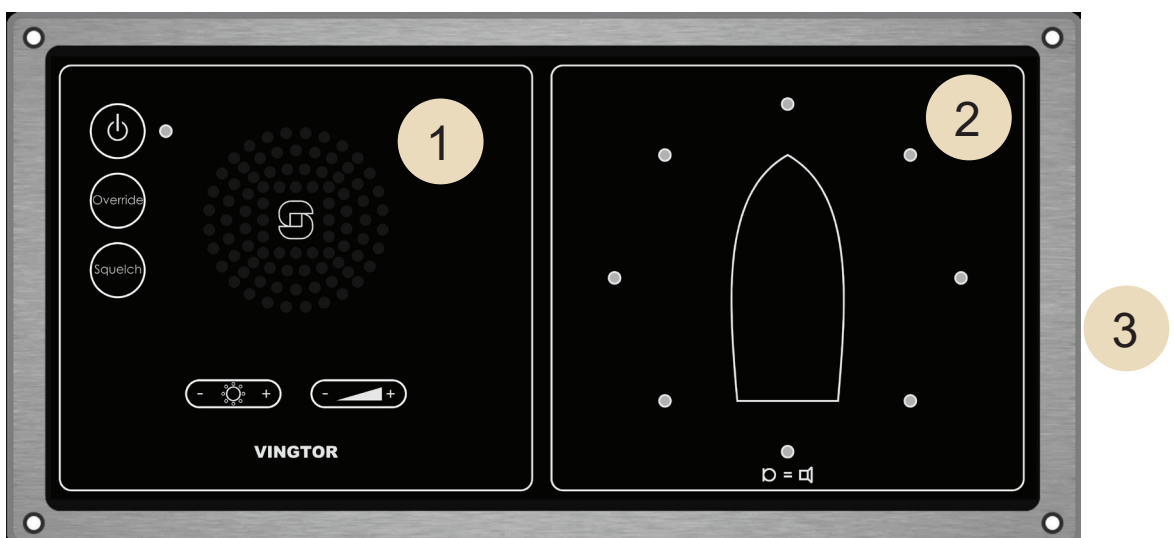
- Test signal source must resemble actual horn signal as much as possible. For best performances use signals rich in harmonics such as a square or triangle signal.
- The fundamental frequency of the signal shall lie within the range 70-820 Hz.
- Test signal must be set to generate a minimum sound pressure level, SPL, of 75dB(A) measured at center of the microphone unit.
- The test signal shall be a 3 second long test tone. Best testing is with a minimum signal separation of ten (10) seconds between tests and different angles.

Move test signal source or the microphone unit (read: vessel) under test throughout 360 degrees to reach all LED directions. Distance between signal source and vessel is not limited as long as above conditions are met



7.3 Check the following

1. Sound signal is being presented in speaker
2. Visual check that direction indication is correct
3. Visual check that direction indication is the duration of the detected horn signal plus two (2) seconds.



8 Operation Instructions

8.1 Panel Operation



8.1.1 Speaker

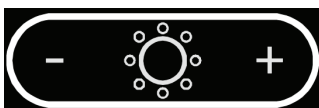
The internal speaker only outputs detected horn signals. The speaker is muted on standby.

8.1.2 Indicators

The panel has LED indicators for direction of the received sound signal. Together it makes a circle of 8 red LEDs. The LED will be ON for the period of the sound signal + 2 seconds.

System and power LED (green) is lit steadily when the system is functional with no errors. A fault in the system will make the system LED flash. If the fault is in one of the microphones, the corresponding microphone LED will be flashing as well. Faulty flashing frequency for both LEDs is 200ms toggle.

The system LED indicates active override function by flashing. Override flashing frequency is 1s toggle.



8.1.3 Dimmer

The panel has dimmer control on the front panel to adjust the light intensity of the LEDs. It is not possible to turn it completely off. Dimmer control is via the + and - buttons.

8.1.4 Volume Control

The panel consists of one internal loudspeaker.

There is only a single volume control affecting signals reproduced from the microphones equally. The volume control can be adjusted and set to an SPL of an incoming signal at least 10dBA above ambient bridge noise, which itself is a maximum of 65dBA. Volume is adjusted by pressing either of the two buttons (up or down) reserved for this.

Speaker level is indicated by the 8 LEDs. When pressing the button, the level will show in the LEDs and will turn off again when pressing has stopped. After level adjustment, the system will automatically return to normal operation mode.

The volume level has eight steps indicating from 1 to 8 LEDs lit, 8 being maximum volume and 1 the minimum. This can be shown by pressing the volume buttons. When powering on the system or making an off/on cycle, the volume will be set at default level.



Default level is 5 LEDs lit. At this level the output in the internal speaker will be the same as the sound levels at the outdoor listening post, which is the sound levels at the microphones. It is marked with the symbol as shown on the left.



8.1.5 Squelch

The panel has a squelch button (Squelch). By pressing the squelch button, the level of UTP (Upper Threshold Point) in DSP is adjusted. It is not possible to listen to noise that is lower than this level. The level is the same for all panels - hence, adjusting the level on one panel changes them all. Adjusting the level with the squelch button will be indicated by direction LEDs.

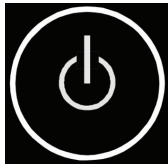
Adjustment of squelch is carried out according to the specifics of the noise. If the noise is white, e.g. common wind noise, then the UTP point will adjust itself so as not to cause false alarms.

If the noise is periodic, e.g. mechanical vibrations, wind howling or sea gulls, then the algorithm could trigger a false detection, as it is not possible to differentiate these sounds from the horn sound, which is also periodic. Short burst periodic sounds will be filtered by the algorithm, but persistent periodic sounds can be problematic. The squelch button can raise the UTP point above these noise sources to avoid false detections.



8.1.6 Override function (audio)

The override button (Override) is used to send audio from the microphone unit directly to the speaker. The speaker will output no matter if there is horn detection or not and be in listen mode. Override is individual for each panel. The override button is latching and press/listen mode is indicated by the system LED 1s toggle. Override will time out after 15s.



8.1.7 Power

The power button is for powering the panel on or off. Indication for power ON is via the green LED.

8.2 Web Interface

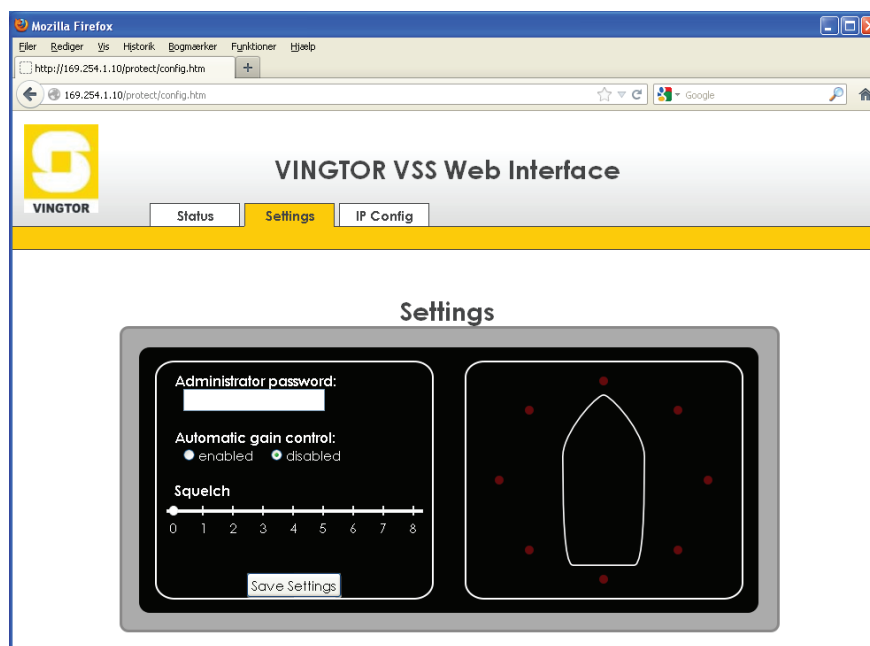
8.2.1 Open site

- Microphone status and LED direction.



8.2.2 Administrator site

- For authorized personnel only, password needed.
 - Normally set up at installation.
- Settings for signal processing algorithm.



Automatic Gain Control (AGC)

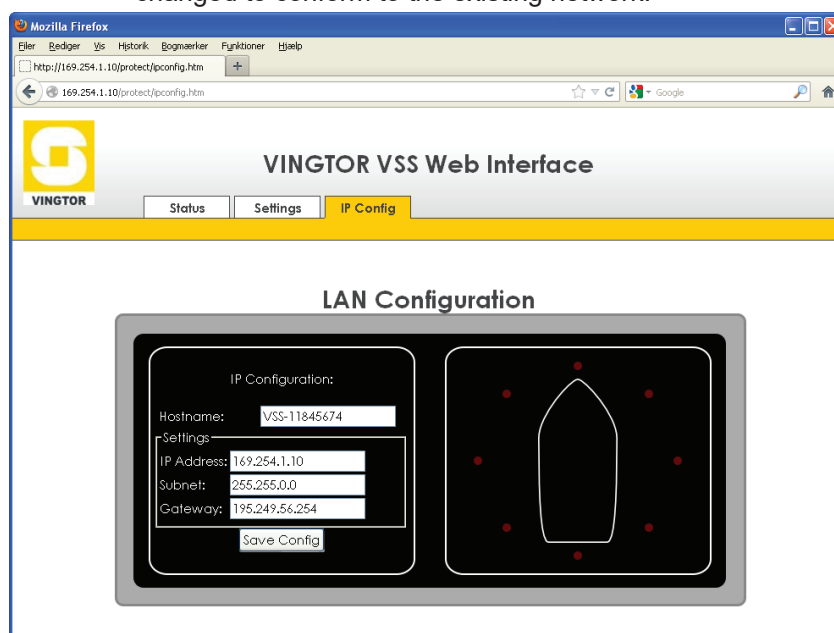
Enabling AGC, the algorithm will adjust the level of the output to be constant.

Ambient noise level (Squelch)

The squelch button can be used to adjust the threshold level for the detection algorithm. The threshold level is adaptive, which means that it is calculated automatically based on frame-by-frame data available. However, threshold offset adjustment is available to the user via the squelch button, or Ambient Noise Level slider from the webpage.

8.2.3 IP Configuration

- When setting the IP configuration, default address is 169.254.1.10 which is the address of the VSS web interface page. This can be changed to conform to the existing network.



9 Reverse LED function

9.1 Updated VSS-MP & VSS-SP firmware

The advantage of the firmware is a reverse LED indication mode. In this mode normal direction of LED indication will be reversed by 180 degrees. Mode is activated by a switch.

9.2 DIP switch S1

S1/4: Dipswitch on / off

S1/2: Reverse LED function

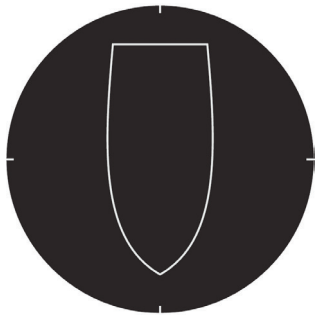
When in reverse mode normal LED indication position will be flipped 180 degrees.

9.3 Description

This firmware is for both panels VSS-MP and VSS-SP. This function can be useful if panel is mounted in vessels aft direction or vessel is a double-ended ferry. In a setup one panel can be in normal mode while the other is set to reverse mode. Mode is changed by dip-switch on PCBs at installation if function is needed.

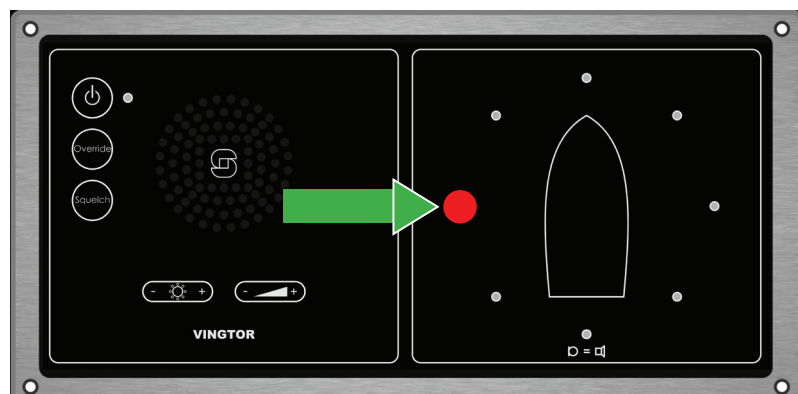
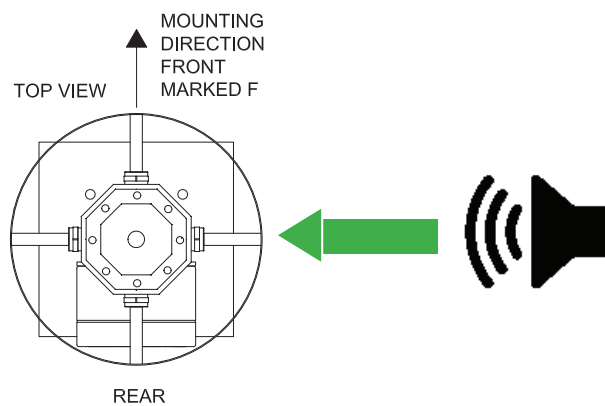
A new item, VSS-VESSEL, is registered and is a label which is ordered separately and is to be mounted at installation if reverse symbol of vessel is needed.

See next pages examples for use of this item.



Panel is set in reverse mode by activation of PCB dip-switch.

An incoming sound signal is registered at starboard side at the microphone unit. The panel will make its LED indication at opposite direction - in this example it will lid port side.



9.3.1 Variant 1 Normal Default setting



9.3.2 Variant 2 Double-ended

Reverse function mode. LED indication reversed. Panel vessel display normal. This can be useful for double-ended ferries



9.3.3 Variant 3 Reverse

Reverse reverse function mode. Vessel sticker added. LED indication reversed and panel vessel display reversed.

The third variant will require an additional item
1021001011 Rev.1.00 VSS-VESSEL Front panel vessel
label – V



10 Troubleshooting

10.1 All 4 microphone fault indication LEDs are flashing.

- This can be due to the microphone preamplifier not being powered correctly.
- Make sure that the cables are properly connected.

10.2 Wrong direction estimation

- Verify that the microphone unit is connected in the correct direction, with the part marked **F** in front.
- Check that the cables from the microphone preamplifier are connected correctly to master PCB.
- Cabling **MUST** be 1 to 1, otherwise the wrong direction will be shown.
- Verify that the unit is not in close proximity to obstacles that are able to reflect large portions of the sound back to the microphones.

10.3 Green status diode is flashing

- The microphone is not responding, the system is in override status or DSP is not answering.

10.4 No background light

- Check whether DIP switch S1 / switch 4 is set to ON.

10.5 No sound in the speaker during detection

- Press the Override button to on and check the sound in the speaker.
- If there's still no activity, check the cable from the speaker to the PCB.

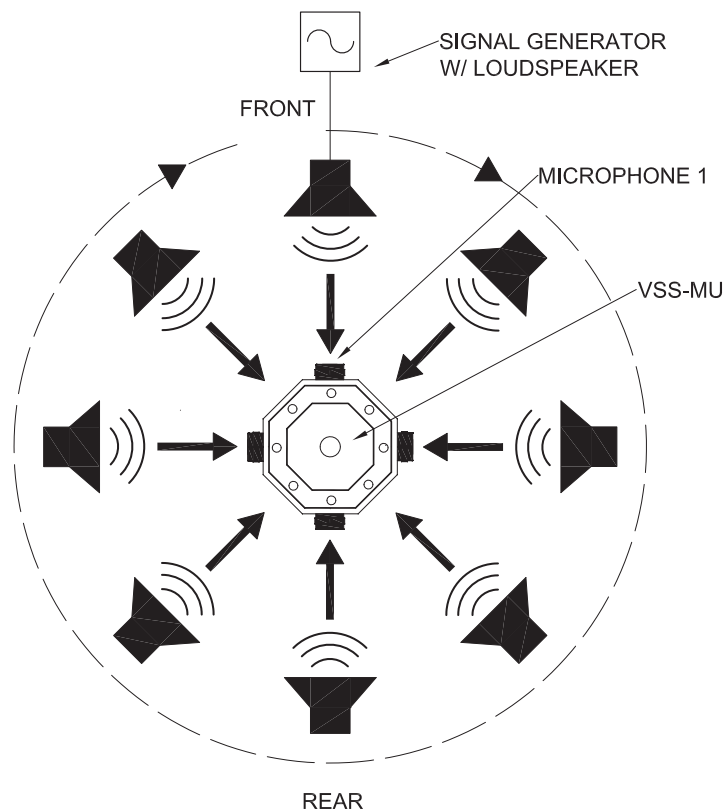
10.6 No detection

If test signal used is a pure sine tone or a human vocal the system might not detect it. The system is constantly suppressing wind and mechanical noises within frequency band of whistles as well as frequencies outside this band. This includes filters suppressing background noise from wind, wires and own ships machinery letting only sounds having characteristics reckoned to be a ships whistle pass through.

10.7 Direction indication wrong

If there's still no activity, check the cable from the speaker to the PCB. If you experience direction problems in full scale testing this may be due placement of microphone unit and obstacles reflections. A method to clarify where the problem is located can be done with a close-up microphone testing. Test set-up as the following:

- Set up a function generator to generate a square signal with a frequency between 70-820 Hz. Place loudspeaker as close as possible to the microphone unit pointing to microphone 1. Increase level on loudspeaker until a detection occurs. See illustration. This can be performed with smartphone and application.
- Create a test signal appearing for 3 seconds intervals throughout 360 degrees around the microphone unit. LED indication must be finished before new direction is to be tested. Confirm VSS-MP displays corresponding visual LED indication. If this is confirmed panel and microphone operates correctly and malfunction has to be found in placement and surroundings.



11 Maintenance

11.1 General

IMPORTANT! Care must be taken not to use heavy water jets directly onto microphone unit VSS-MU when vessel and/or unit is due to a cleaning. Nor should chemicals be used. This may damage sealings and/or water protective fabric.

It is recommended to periodically check the system. The system has a self-test function but it will not check whether the microphone itself is working properly. To check this, use a horn or similar device that sends out harmonic signals with higher SPL than the background noise to activate each microphone to see whether it is detected on the diodes and monitored in the internal loudspeaker of the master unit. It is also recommended to visually check all terminal cables and microphone housing for damages.

Check the microphone unit every 3 months.

11.2 Spare Parts

The microphone housing consists of four microphones and a preamplifier. The housing is regarded as one spare part. It is designed to be easily changeable.

Ref. Assembly manual for replacement of microphones
A100K11577 VSS-V2 Microphone Replacement v.1
For microphone unit VSS-MU 2.06 & former

Ref. Assembly manual for replacement of microphones
A100K11577 VSS-V2 Microphone Replacement v.2
For microphone unit VSS-MU from ver.2.07

Item number	Type number	Description
1021001020	VSS-MPCP	VSS Master PCB – V2
1021001030	VSS-SPCB	VSS Slave PCB – V2
1021002001	VSS-SPK	Microphone sparepart kit VSS-MU 2.06 and former
1021002002	VSS-SPK-207	Microphone sparepart kit VSS-MU from ver.2.07

12 Technical Data

12.1 VSS-V2 Master Panel

Dimensions (WxHxD)	280 x 140 x 90 mm
Mounting	Flush
Housing	Brushed aluminum with foil
IP rating	IP-22
Operation voltage	24V DC
Audio	70 Hz to 2'100 Hz Active noise cancellation Adjustable volume Squelch to adjust the automatic threshold
LEDs	8
Buttons	Power, Override, Squelch, Dimmer, Volume
Operation voltage	24V DC +30% / -10%
Current load Master & Mic Including 1 slave panel	Max. 200mA Max. 270mA

12.2 VSS-V2 Slave Panel

Dimensions (WxHxD)	280 x 140 x 51 mm
Power	Internal from the master panel
Mounting	Flush
Housing	Brushed aluminum with foil
IP rating	IP-22
Operation voltage	24V DC
LEDs	8
Buttons	Power, Override, Squelch, Dimmer, Volume

12.3 VSS-V2 Microphone Unit

Dimensions (WxHxD)	280 x 140 x 51 mm
Housing	Stainless steel
IP rating	IP-66 / IP-67
Environment	-55°C to +55°C
Directional microphones	4
Power	Internal from the master panel



The WEEE Directive does not legislate that Zenitel, as a 'producer', shall collect 'end of life' WEEE.

This 'end of life' WEEE should be recycled appropriately by the owner who should use proper treatment and recycling measures. It should not be disposed to landfill.

Many electrical items that we throw away can be repaired or recycled. Recycling items helps to save our natural finite resources and also reduces the environmental and health risks associated with sending electrical goods to landfill.



Under the WEEE Regulations, all new electrical goods should now be marked with the crossed-out wheeled bin symbol shown.

Goods are marked with this symbol to show that they were produced after 13th August 2005, and should be disposed of separately from normal household waste so that they can be recycled.