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Technical Documentation

Wired Communication Systems of the type series

WSV UNIVERSAL

CONTENTS

1. General

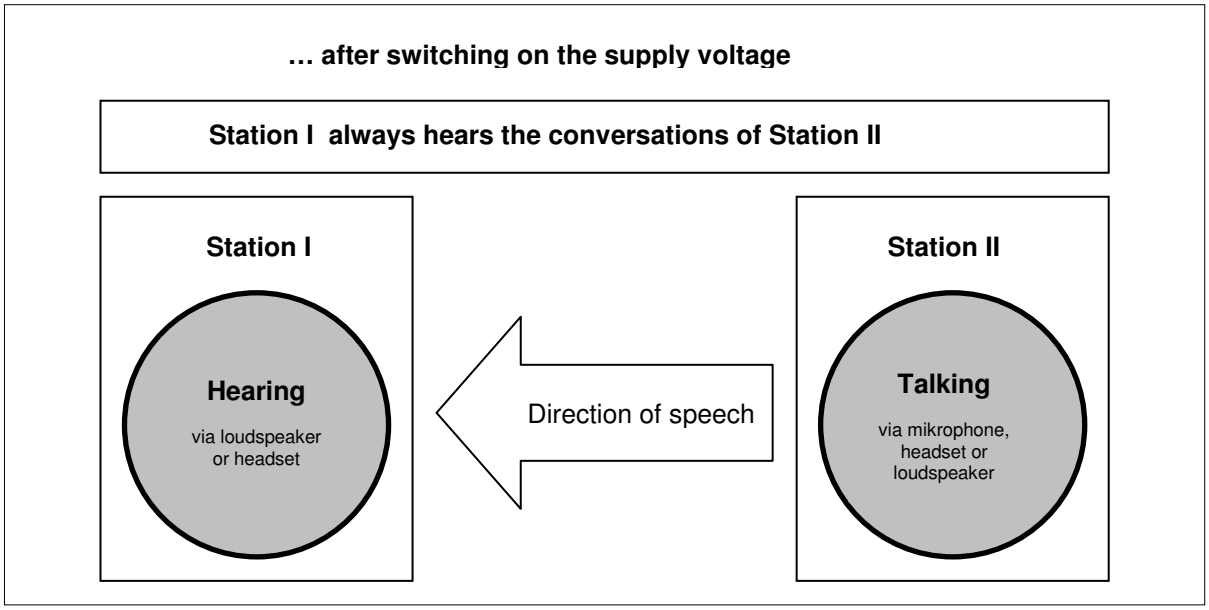
1.1 Intended use

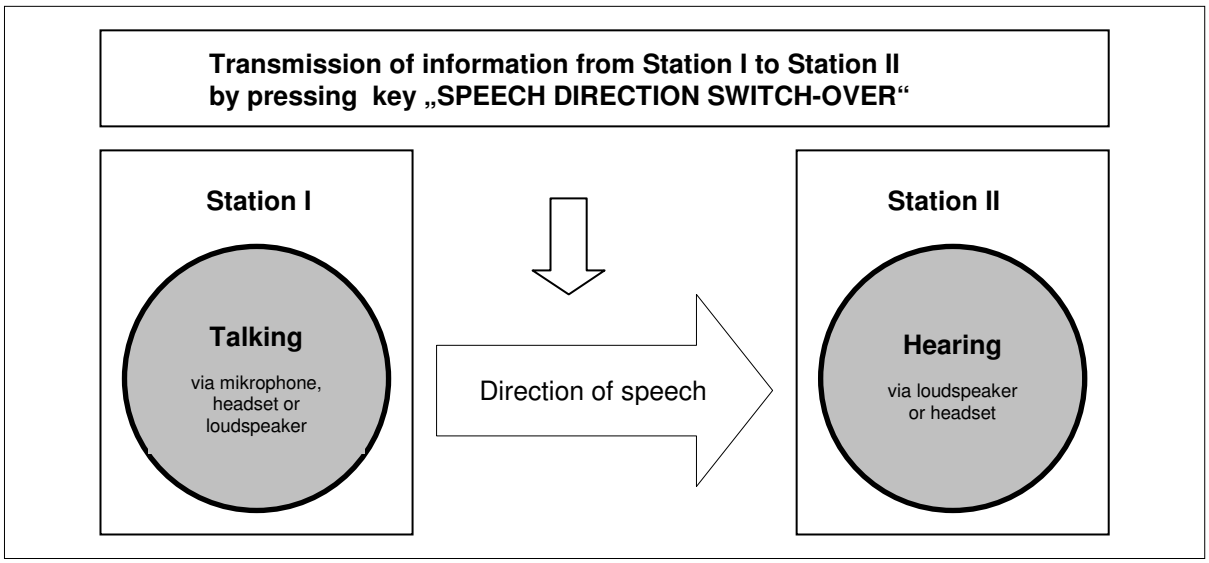
The **Intercom amplifier** is used as intercom system and provides communication between two positions, for example communication between operator's platform and rescue cage of a turntable ladder or a vehicle with integrated lifting working platform.

The WSV system variation consists of two separate modules. First of all of the amplifier module proper, and then of a preamplifier module which due to its compact dimensions can be integrated directly into the loudspeaker of station II.

1.2 General information on system concept with basic circuits

1.2.1 Functional diagram of intercom amplifier system

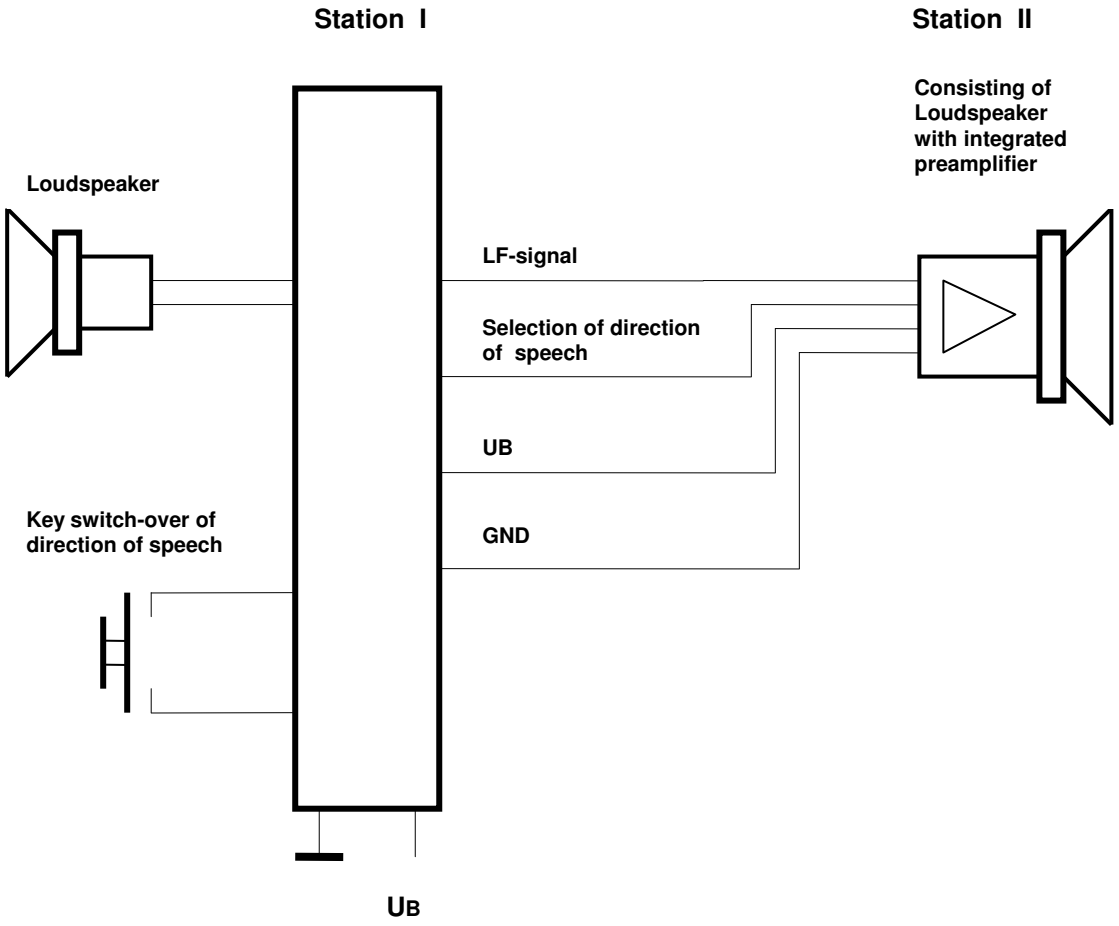




1.2.2 Basic circuitry of current variations

1.2.2.1 Variation

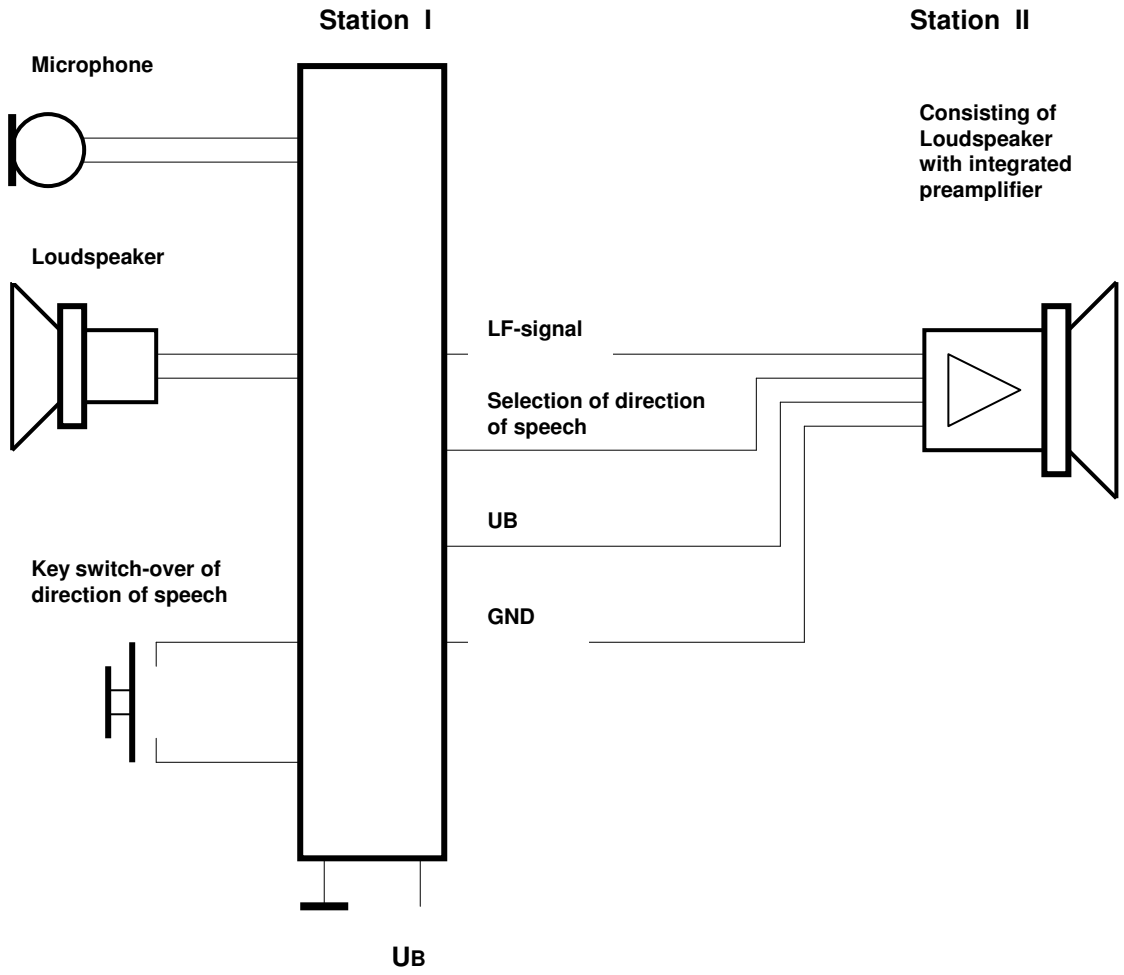
Station I: **Loudspeaker**
Station II: **Loudspeaker with integrated preamplifier**



WSV Station I xx OLO x

1.2.2.2 Variation

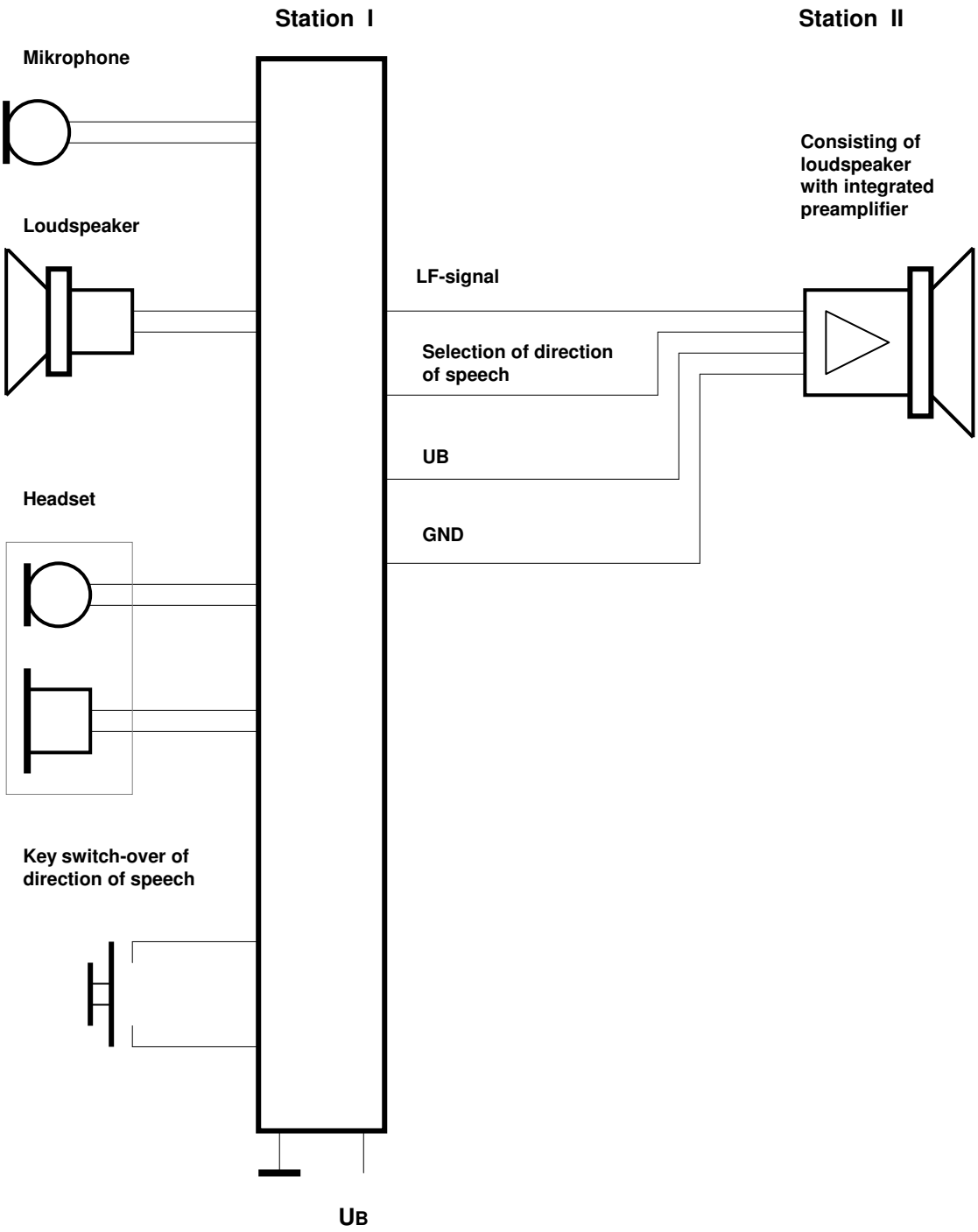
Station I: **Microphone / Loudspeaker**
Station II: **Loudspeaker with integrated preamplifier**



WSV Station I xx DLO x
WSV Station I xx ELO x

1.2.2.3 Variation

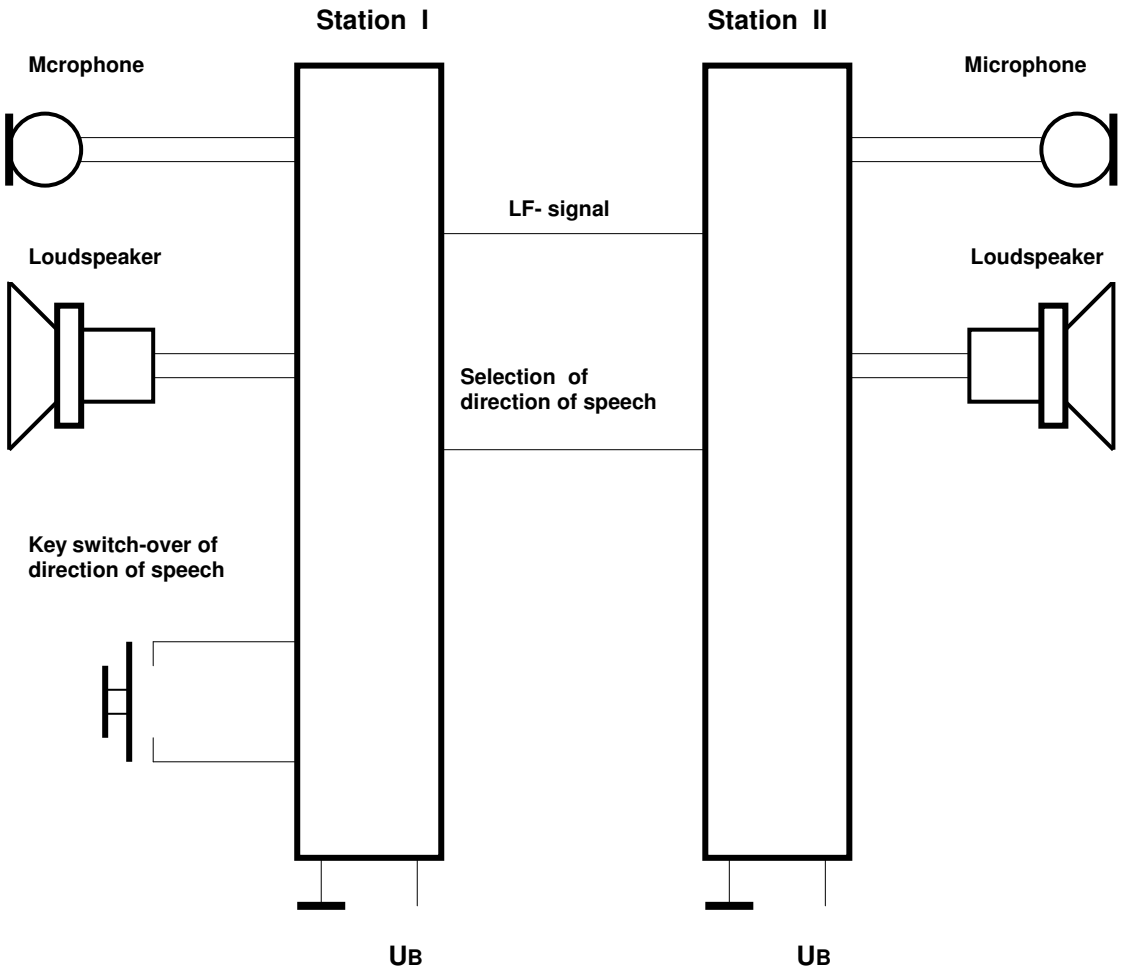
Station I: **Mikrophone / Loudpeaker / Headset**
Station II: **Loudspeaker with integrated preamplifier**



WSV Station I xx DLD x
WSV Station I xx DLE x
WSV Station I xx ELD x
WSV Station I xx ELE x

1.2.2.4 Variation

Station I: **Microphone / Loudspeaker**
Station II: **Microphone / Loudspeaker**

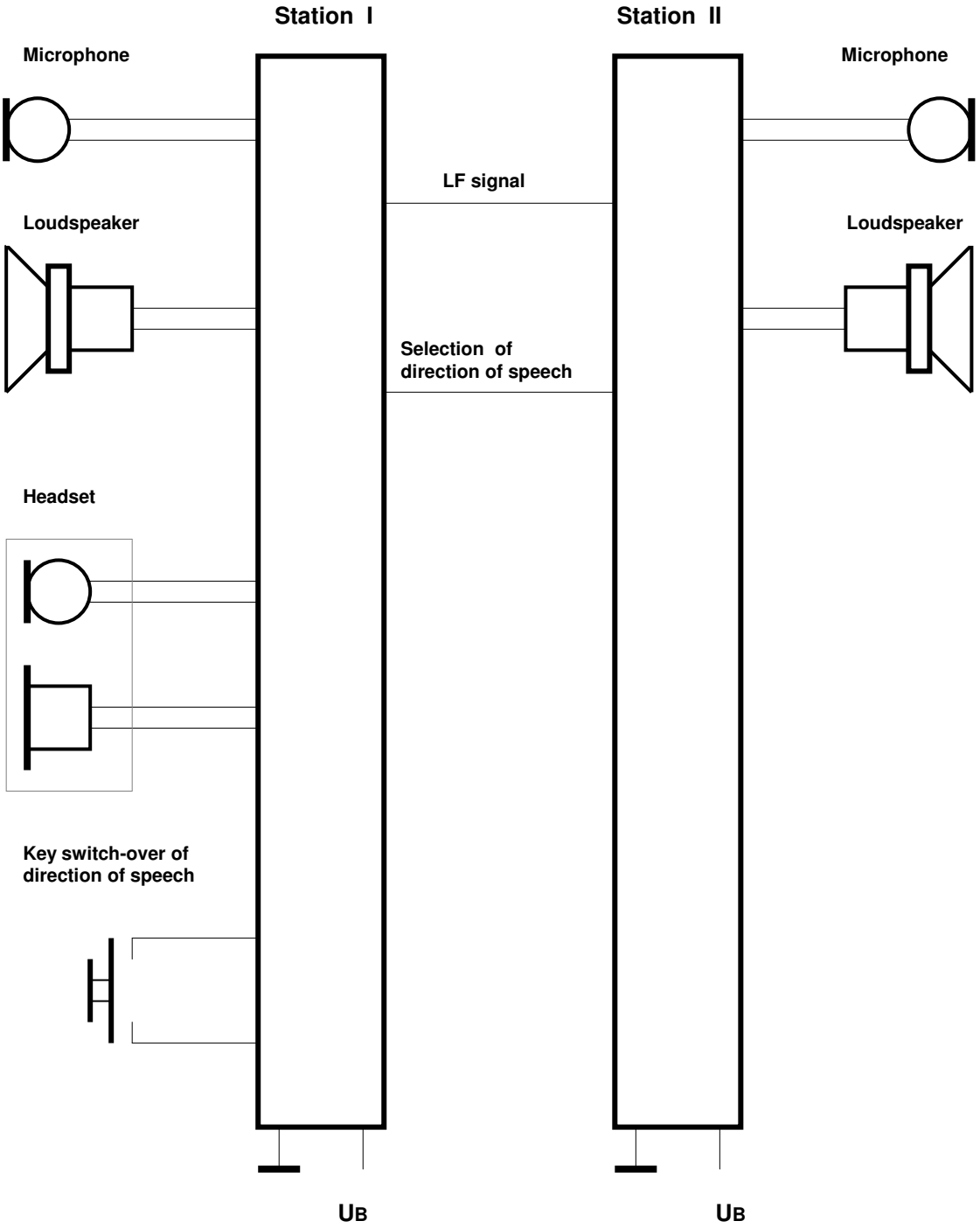


WSV Station I xx DLO x
WSV Station I xx ELO x

WSV Station II xx DLO
WSV Station II xx ELO

1.2.2.5 Variation

Station I: **Microphone / Loudspeaker / Headset**
Station II: **Microphone / Loudspeaker**

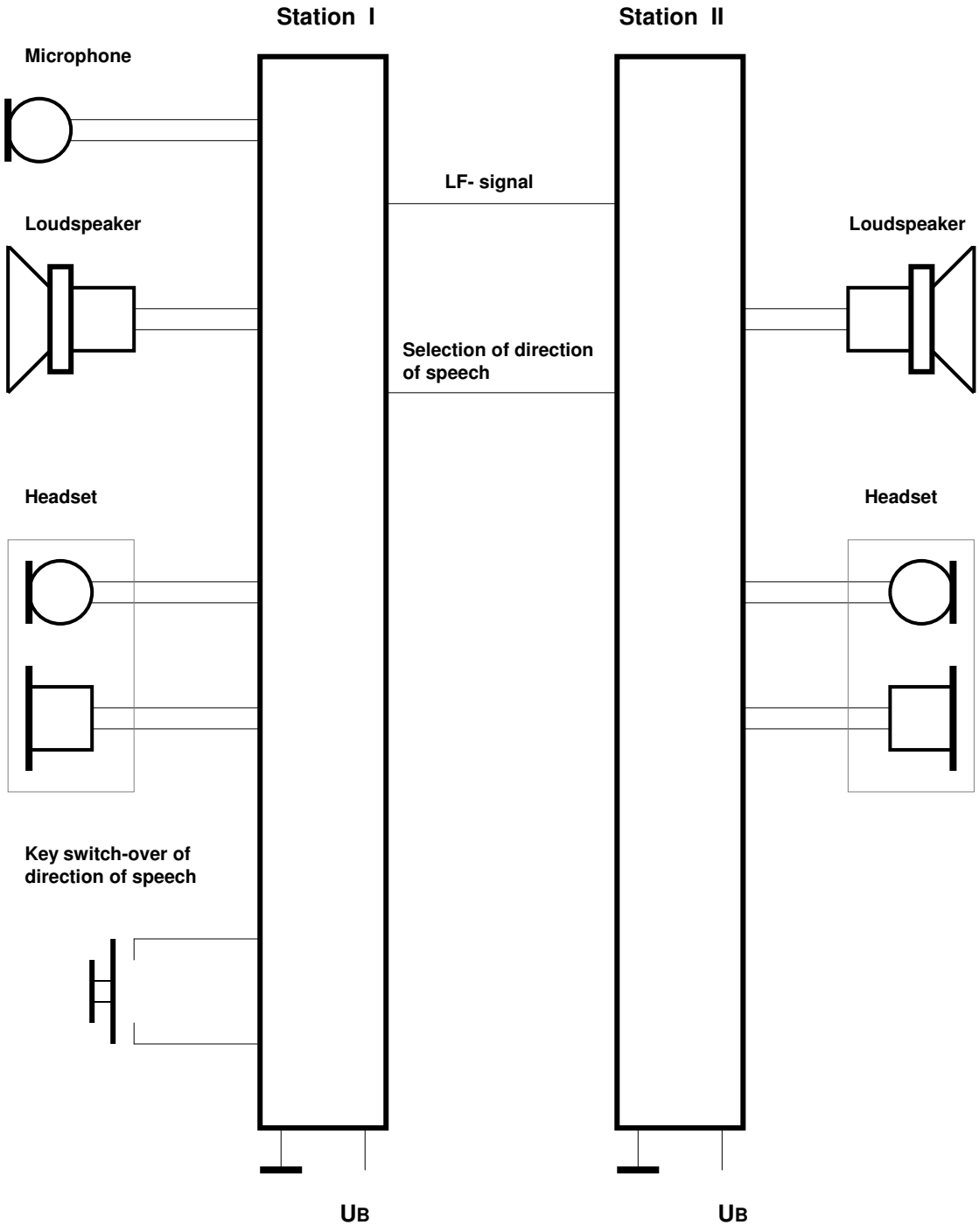


WSV Station I xx DLD x
WSV Station I xx DLE x
WSV Station I xx ELD x
WSV Station I xx ELE x

WSV Station II xx DLO
WSV Station II xx ELO

1.2.2.6 Variation

Station I: **Microphone / Loudspeaker / Headset**
Station II: **Loudspeaker / Headset**

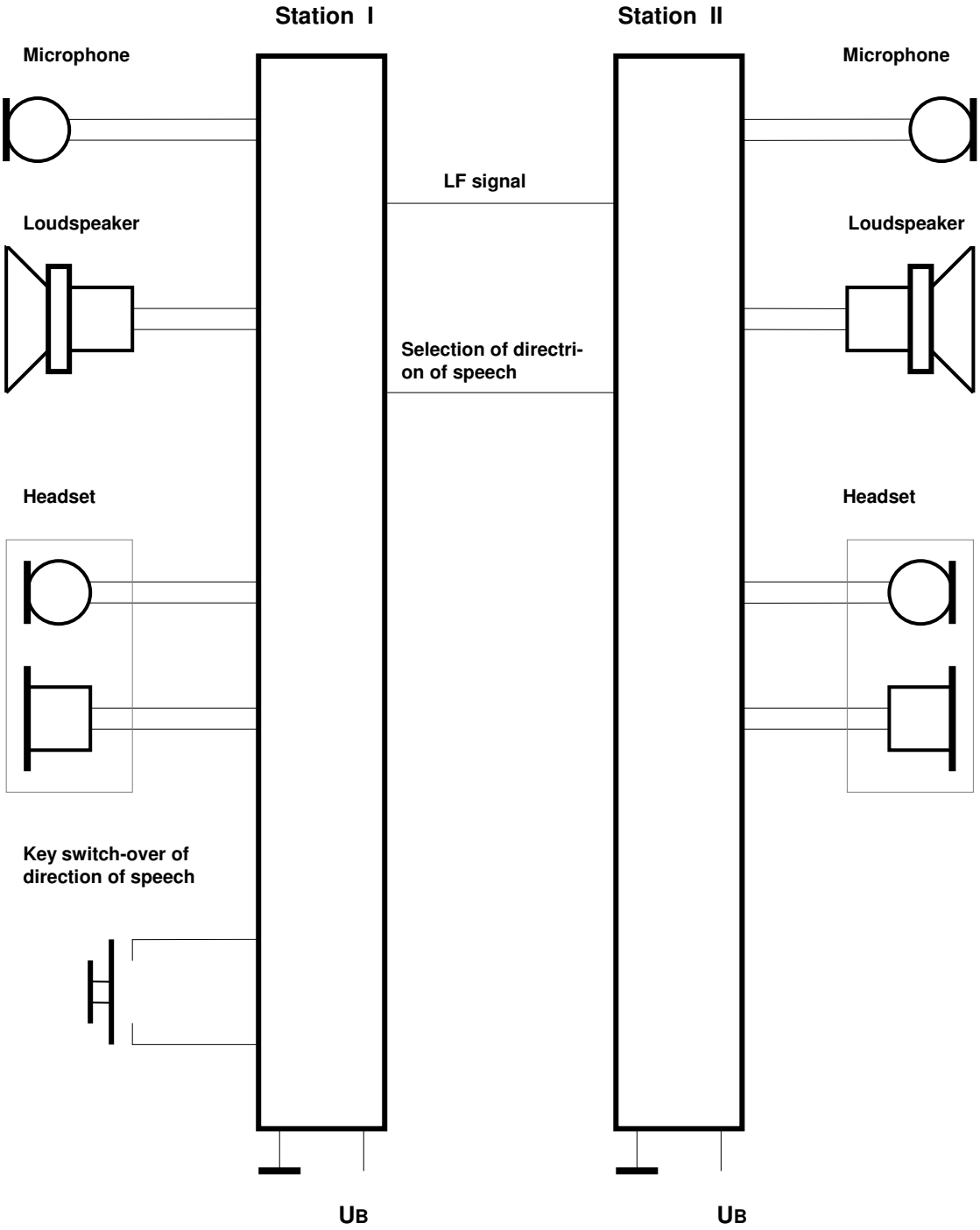


WSV Station I xx DLD x
WSV Station I xx DLE x
WSV Station I xx ELD x
WSV Station I xx ELE x

WSV Station II xx OLD
WSV Station II xx OLE

1.2.2.7 Variation

Station I: **Microphone / Loudspeaker / Headset**
Station II: **Microphone / Loudspeaker / Headset**

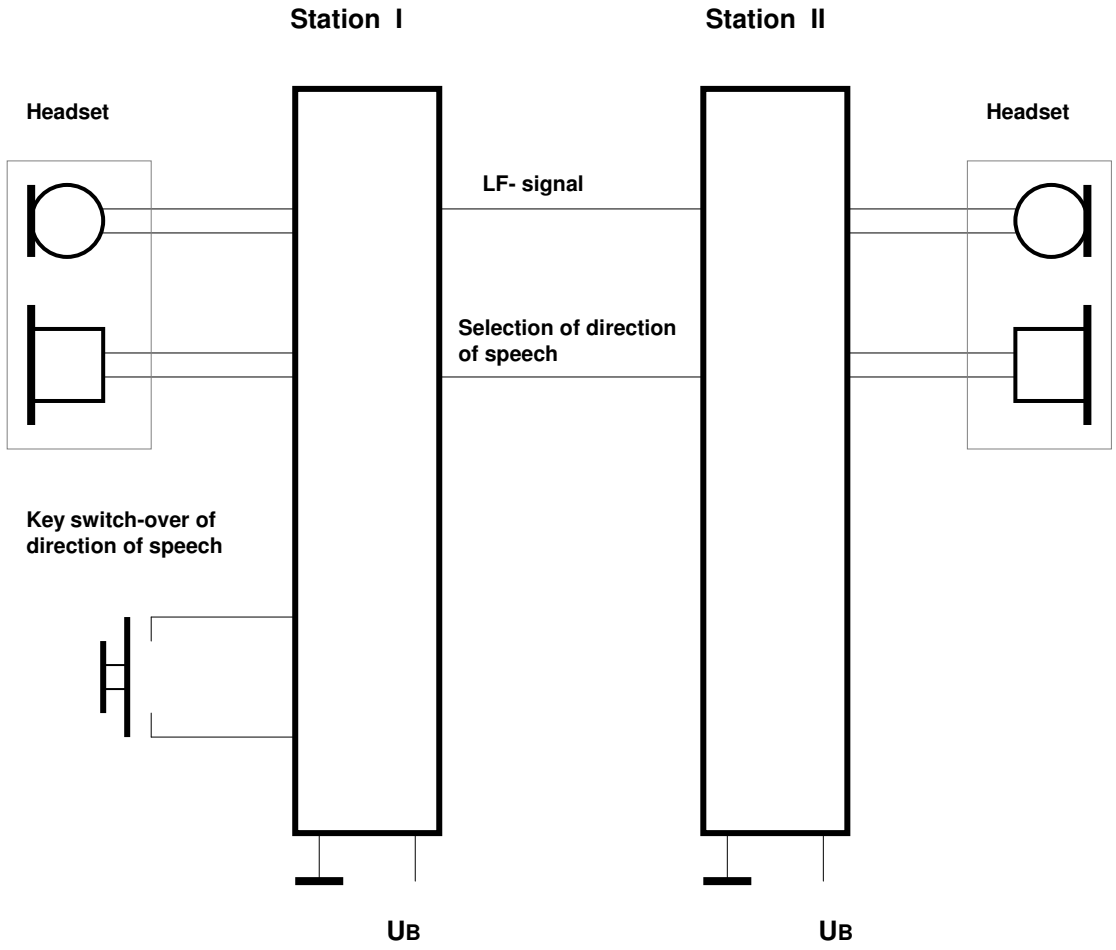


WSV Station I xx DLD x
WSV Station I xx DLE x
WSV Station I xx ELD x
WSV Station I xx ELE x

WSV Station II xx DLD
WSV Station II xx DLE
WSV Station II xx ELD
WSV Station II xx ELE

1.2.2.8 Variation

Station I: **Headset**
Station II: **Headset**



WSV Station I xx OOD x
WSV Station I xx OOE x

WSV Station II xx OOD
WSV Station II xx OOE

1.3 Use of documentation

This documentation will help you to familiarize with the wired communication system of the type series WSV Universal and to make full use of its operating capabilities.

The documentation contains important information on the safe, proper and economical operation of the communication system. Its observance helps to avoid hazards, to minimize installation costs and to avoid unnecessary repair due to improper connection.

The documentation should always be available at the scene where the communication system is used and must be read and correctly applied by all persons involved in installation, start-up, operation, maintenance and repair of the communication system.

After the first start-up of the communication system this documentation can be used as reference. The table of contents and cross-references in the texts will help you to look up subject areas.

In the interest of your own safety please strictly follow all instructions and directions, in particular those of chapter 2 „Safety instructions“.

1.4 Copyright

1.5 Repair and spare parts service, technical support

In the event of queries and problems arising with regard to this communication system Hinrichs Electronic will give you comprehensive support:

First of all please read this documentation carefully. This will often help to solve your problem. Otherwise you may proceed as follows.

- Telephone service:

  For special questions the staff of Hinrichs Electronic will be glad to assist you.

- Sending the communication system to Hinrichs Electronic:

  Whenever possible please use the packaging in which the unit has been delivered.
  In general it must be such as to ensure jerk-free transport of the communication system.
  Please enclose an error list with the defective unit.

What Hinrichs Electronic must know:

To enable us to help you efficiently and rapidly we need:

- The serial number and the variation of the communication system:

  You will find these on the type plate on the case

- A description of your problem as detailed as possible:

  Please inform which keys have been pressed and which settings or other actions you have made. Furthermore we need an accurate description of any damage occurred.

  Shipping address:

  Hinrichs Electronic GmbH
  Creidlitzer Straße 68
  D-96450 Coburg
  Tel.: +49 (0) 9561 18400
  Fax: +49 (0) 9561 28522
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1.6 Guarantee

Each communication passes comprehensive quality tests before leaving Hinrichs Electronic. In particular an intermittent performance test is made which usually reveals premature failures.

Nevertheless it can happen that a functional failure occurs only after prolonged operation.

In this case Hinrichs Electronic, following the General Conditions of Supply for Products and Services of the Electrical Industry, gives a **guarantee of 12 months.**

Please note:
Hinrichs Electronic will decline any guarantee if modifications or manipulations have been made on the communication system.

2. Safety instructions

2.1 Warnings

In this documentation the following terms and signs are used for particularly important statements:

Advice!

Special information on the economically and technically correct use of the communication system.

Warning!

Special statements, rules and prohibitions to prevent damage.

Danger!

Statements, rules and prohibitions to prevent injury to persons and serious material damage.

2.2 Intended use of the system

The communication system WSV Universal is intended exclusively for amplifying LF signals up to a maximum power output of 10 W on 4 Ohm impedance.

Suitable for connection are microphones and loudspeakers complying with the specifications given in the technical data.

Hinrichs Electronic expressly declines the liability for any damage caused by the non-compliance with the specifications mentioned.

Any modification of the system and ancillary units are to be agreed with Hinrichs Electronic in writing. Otherwise the risk will be transferred to the user.

The intended use also includes compliance with the procedures and data as specified in this technical documentation.

2.3 Information on general safety requirements.

Any work on live components of the amplifier may only be performed by qualified personnel in accordance with national and international regulations.

The current VDE regulations must be complied with, in particular VDE 0100, VDE 0550 / 0551, VDE 0700, VDE 0711 and VDE 0860.

Maintenance and repair jobs may only be performed by qualified personnel.

The conductors of the amplifier system are regularly to be checked for insulation faults and fractures. Any fault detected is to be eliminated immediately.

It is prohibited to manipulate with easily flammable or combustible liquids at the amplifier system

The amplifier system may not be used in an environment in which inflammable gases and fumes may occur.

The amplifier system may only be used in clean dry rooms. It is to be protected against the effects of heat.

Avoid the penetration of humidity (splash) into the system! The protective paint coating applied in the factory is only a protective measure against the normal humidity of the atmosphere.

2.4 Prohibition of unauthorized modifications

All add-ons, modifications, accessories and spare parts not supplied and authorized by Hinrichs Electronic are inadmissible since they may negatively affect the design features of the amplifier system. They can jeopardize the active and passive safety of the system.

For such measures it is always necessary to obtain beforehand the authorization by Hinrichs Electronic in writing. Otherwise the liability and guarantee of Hinrichs Electronic will expire.

2.5 Repairs and service

Any damage caused by faulty intervention of other companies will cancel the guarantee of Hinrichs Eletronic!

Please also see the information in chapter 1.5 "Repair and spare parts service".

3. Installation

3.1 Operative range

Danger !

The Universal intercom amplifier system may not be used in Ex areas!

The following must **not** be present in the environment of the system:

- easily inflammable or combustible liquids
- inflammable gases and fumes
- heat sources
- excessive humidity
- excessive contamination
- strong jerk and vibration sources

3.2 Assessment of possible damage

Prior to installation please check the following:

- Is the packaging damaged? If so, before opening any further, have this confirmed by the forwarding agent, if necessary subsequently.
- Is the case damaged, or accessories, if any?
- When moving the system, is there any noise within the case?
- **Is the WSV variation supplied the same as that you have ordered?**
  The variation supplied is marked on the type plate.

If you can answer „Yes“ to any of these questions, please contact Hinrichs Electronic before continuing the installation.

Remark !

There is no potentiometer at the front panel of the WSV

- in plants with external volume control or
- in plants where the volume is regulated via a PWM signal.

3.3 Fixing of amplifier

The case of the amplifier is to be fixed with 4 screws M4.
Make sure it is fastened securely.

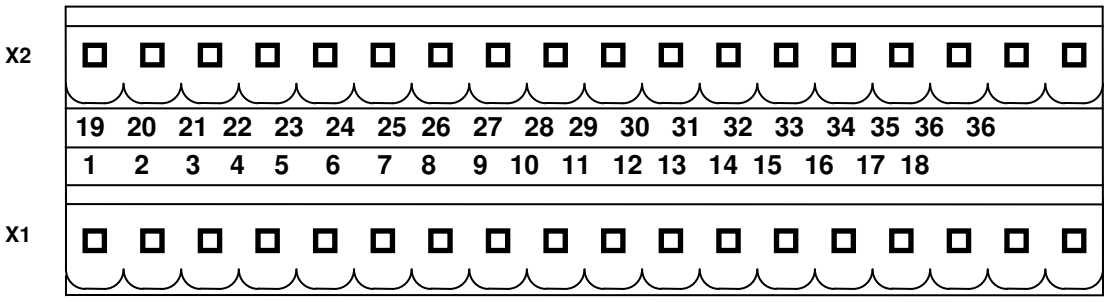
The casing must have a well conductive connection to the chassis!

Drill distances of case: see chapter 8.

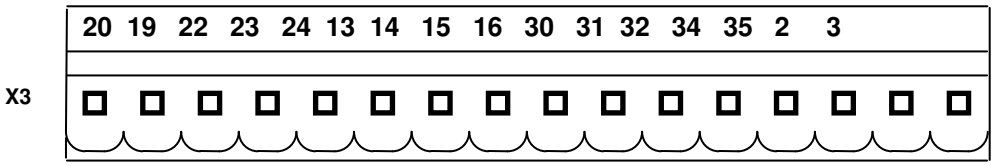
3.4 Wiring

3.4.1 Connector

Station I



Station II



Technical data

for the 2 x18-pin multiway connector

Product: PHOENIX-CONTACT

Type series: COMBICON connector 2 x 18-pin

Basic grid: 5.0mm

Connections:

Rigid conductor:	0.2 ... 2.5mm²
Flexible conductor:	0.2 ... 2.5mm²
Flexible conductor with sleeve-joint:	0.25 ... 2,.5mm²
Flexible conductor with sleeve-joint and plastic sleeve:	0.25 ... 2.5mm²
Conductor size:	24 ... 12 AWG

Advice !

Install all conductors in such a way that they are absolutely free from pull and not at risk of being sheared or crushed!

3.4.2. Connection of supply voltage

Warning !

The amplifier system may only be operated with the supply voltage marked on the type plate.

Prior to installation make sure that the supply voltage of the amplifier complies with the on-board voltage of your vehicle or with the supply voltage available.

Two supply voltage ranges can be selected:

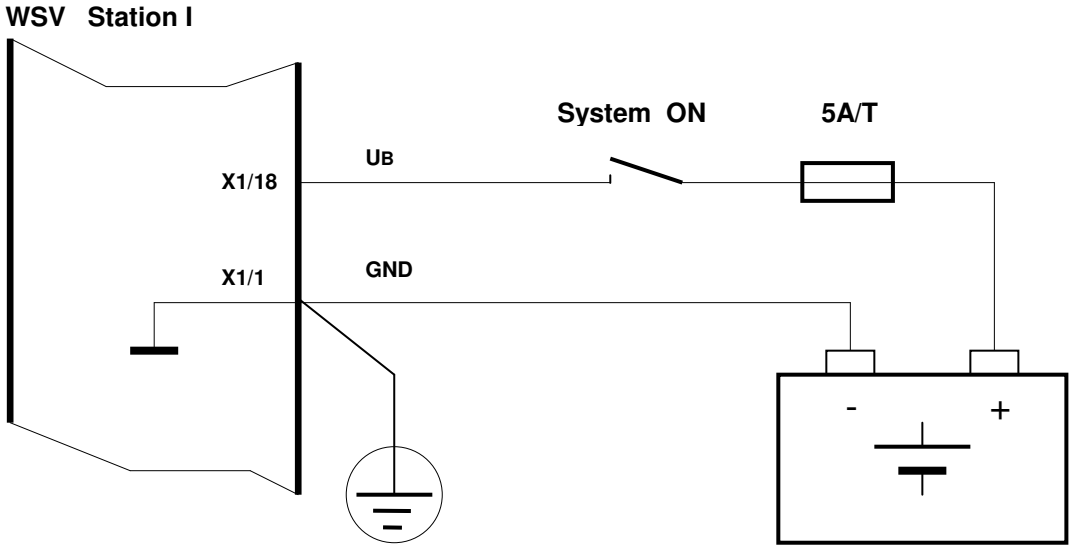
UB: 12 VDC (+/- 10%)
UB: 24 VDC (+/- 10%)

Remark:

A Multifuse element is integrated in the element. This is a resettable fuse that after release by short circuit or excess current may be reset automatically by switching ON and OFF the supply voltage.

Advice!

It is recommended to have a pre-fuse protection with a nominal current of 5A.



Clamp X1/1 (GND) and casing must have a well conductive connection to the chassis!

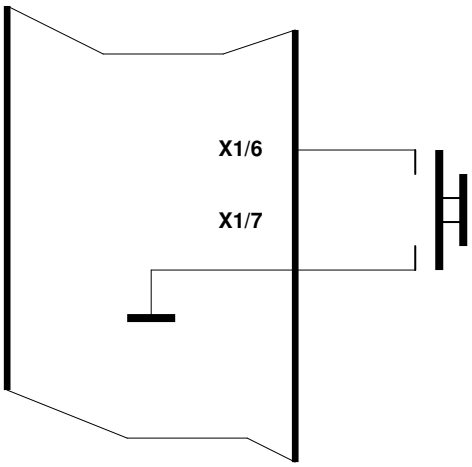
3.4.3 Connection of key for commutation of speech channels

The key for commutation of speech channels is not included in the scope of supply. Generally any key with the following specifications can be connected:

Key data of key:

Contact: NOC **Breaking voltage: >30V DC** **Switching current: >10mA** **Contact material: Au / Ag**

WSV Station I



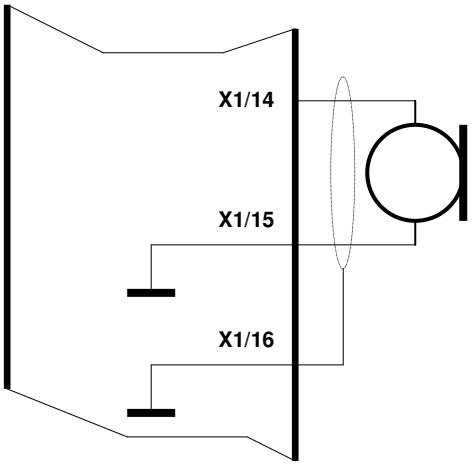
3.4.4 Connection of microphones

Depending on the variation it is possible to connect **dynamic microphones** as well as **Elektret microphones.**

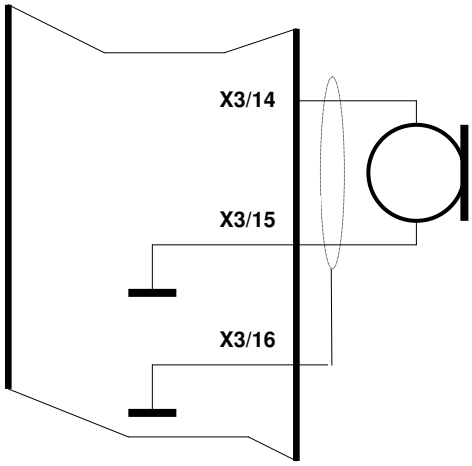
Key data of dynamic microphones:

No-load sensitivity at 1kHz: 1-2 mV/Pa +/-3dB **Impedance: abt. 200 Ohm**

WSV Station I



WSV Station II

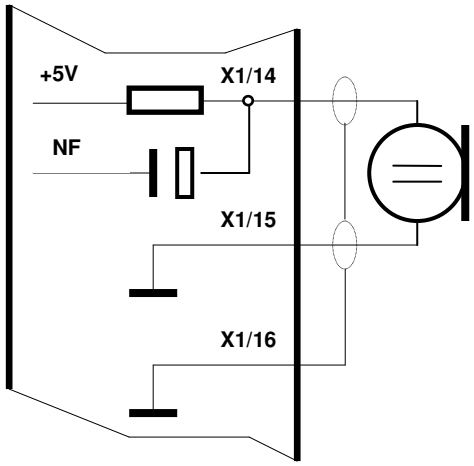


Key data of Elektret microphones:

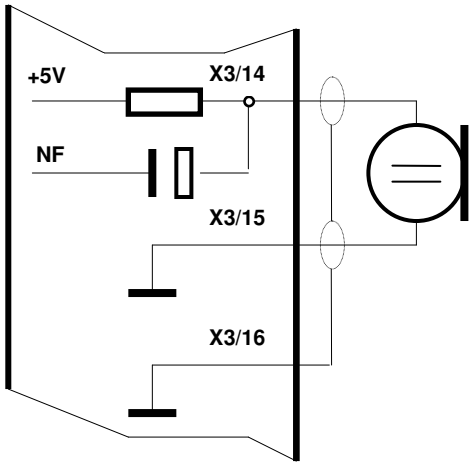
No-load sensitivity at 1kHz: 5-20mV/Pa +/-3dB **Impedance: 1000 – 2000 Ohm**

Operating voltage: **1.5 – 9 V** **Current consumption: < 0.5mA**

WSV Station I



WSV Station II



Remarks:

The voice reproduction of microphones may be widely differing!
Prior to use it is recommended to test the quality!
In case of poor voice reproduction therefore first check the microphone and then the amplifier system.

Microphones with testesd usability may be obtained from Hinrichs Electronic.

Important advice on microphone lines:

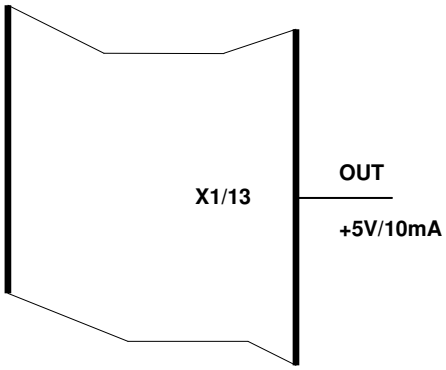
Microphone lines must have a screening with high screening effect!

The microphone lines may not be longer than 2m!

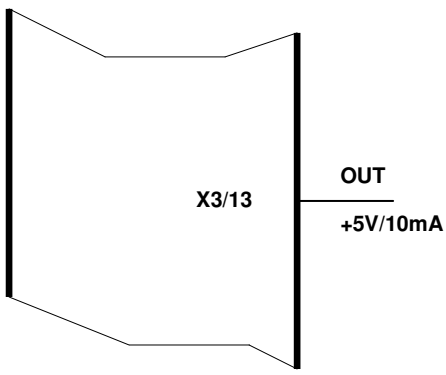
Voltage supply for special microphones

Microphones or microphone speakers with a digital signal processor need an additional voltage supply.

WSV Station I



WSV Station II



3.4.5 Connection of loudspeakers

Warning !

Loudspeakers with integrated pre-amplifier (Station II) may not be connected to Station I as loudspeaker.

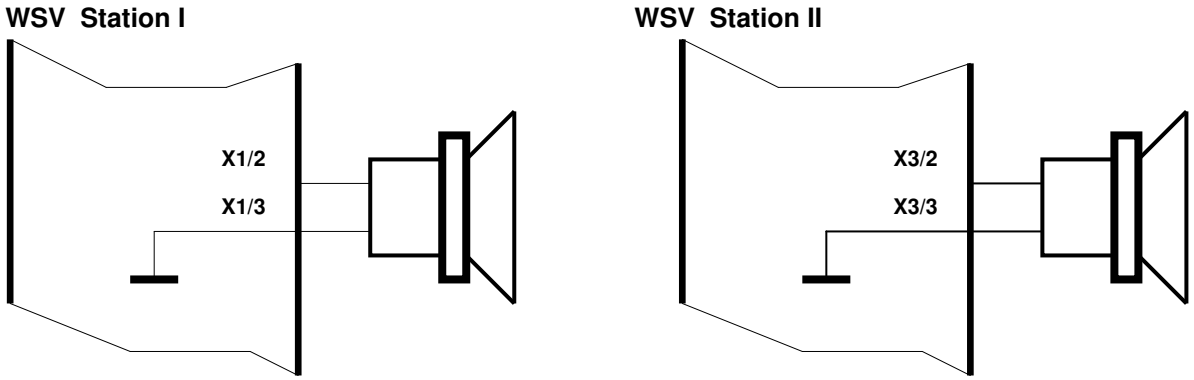
Connect loudspeakers with the following specifications:

Impedance: **> / = 4 Ohm (Recommended: 4...8 Ohm)**
Conductor cross section: **> 0,75 mm²**

Please note:

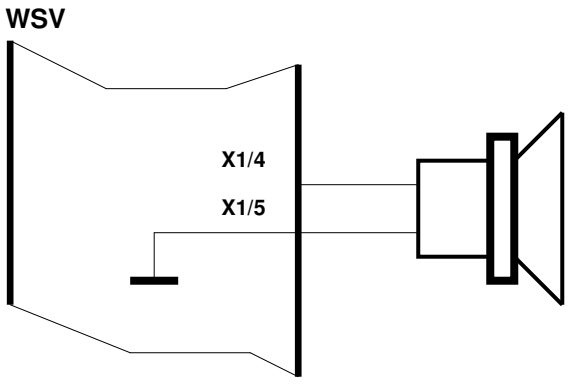
The necessary conductor cross section depends on the length of the cable!

For WSV variations where the loudspeaker also serves as microphone it is recommended to use only loudspeakers with good microphone performance.



Connection of a secondary loudspeaker to Station I

It is possible to connect an additional loudspeaker to Station I.
To that end it has its own amplifier stage, i.e. the connection can double the output.



Remark:

When the headset is plugged the secondary loudspeaker is not muted.

Loudspeakers with tested usability may be obtained from Hinrichs Electronic.

3.4.6 Connection of headset

Headsets with the following specifications may be connected:

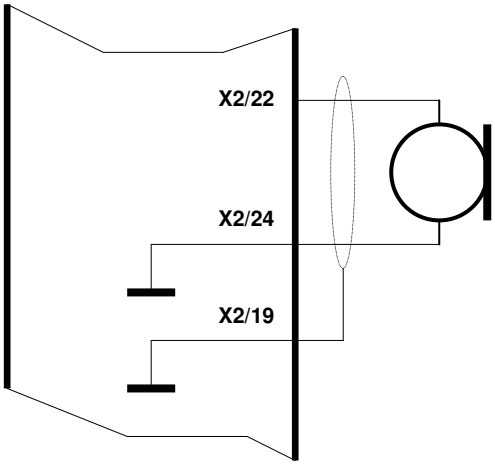
Microphone capsule:

According to variation it is possible to connect d**ynamic microphone capsules** al well as **Elektret-microphone capsules.**

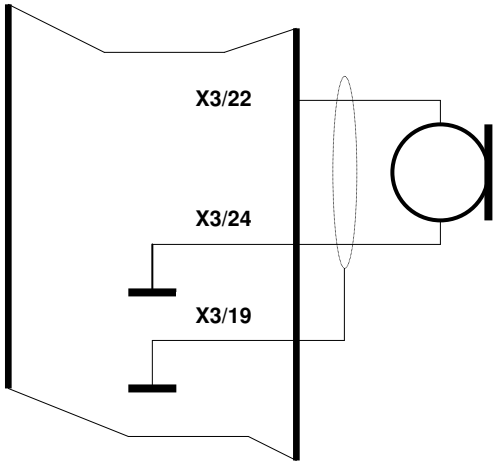
Key data of dynamic microphone capsules:

No-load sensitivity at 1kHz: 1-2 mV/Pa +/-3dB Impedance: abt. 200 Ohm

WSV Station I



WSV Station II

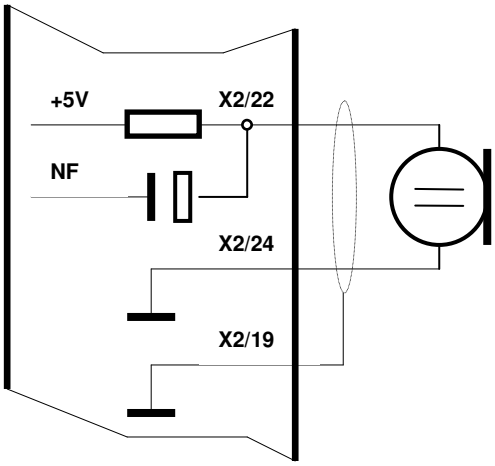


Key data of Elektret microphone caspules:

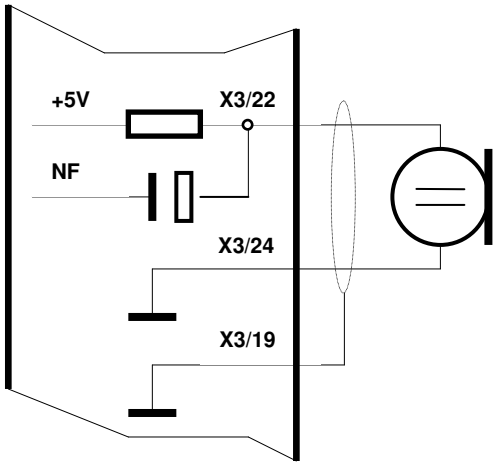
No-load sensitivity at 1kHz: 5-20mV/Pa +/-3dB Impedance: 1000 – 2000 Ohm

Operating voltage: 1.5 – 9 V Current consumption: < 0.5mA

WSV Station I



WSV Station II

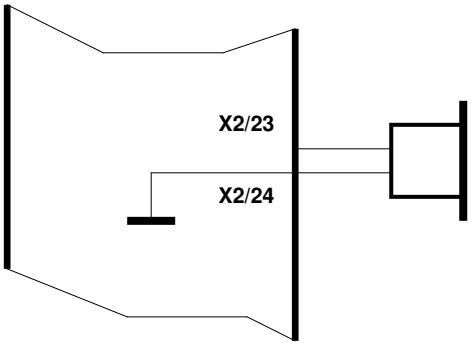


Earphone(s):

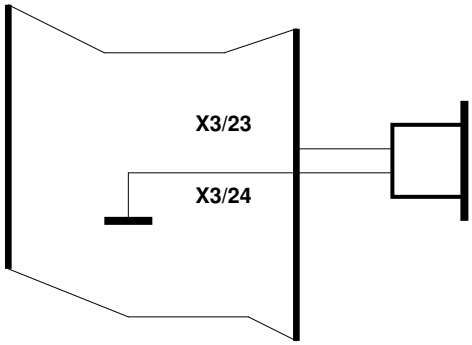
Headset with one earphone

Key data of earphone(s): **Impedance: 4...500 Ohm** **Output: 1 - 500mW (adaptable)**

WSV Station I



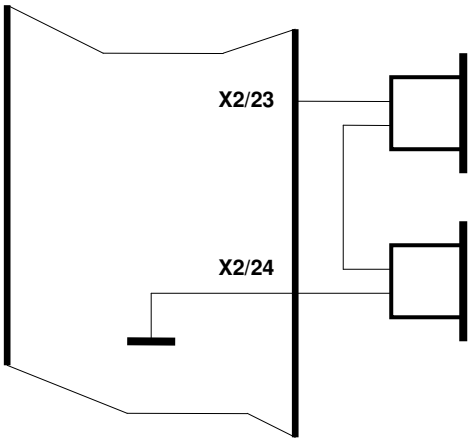
WSV Station II



Headset with two earphones

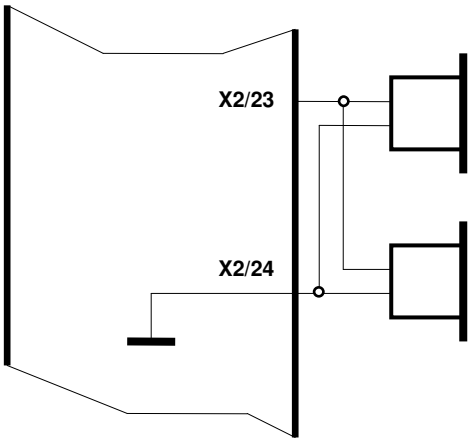
Headsets with two earphones can be connected in series or in parallel according to impedance.

WSV



Earphones connected in series

WSV

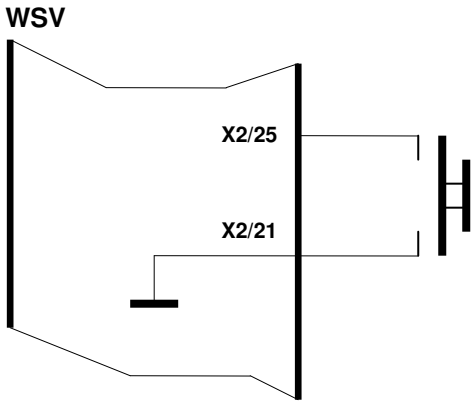


Earphones connected in parallel

Connection of headset talking key on WSV

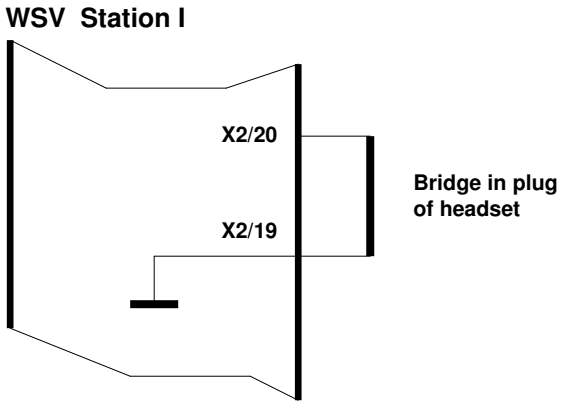
In headset operation the key for switch-over of speech channels may be used to commute the direction of speech.

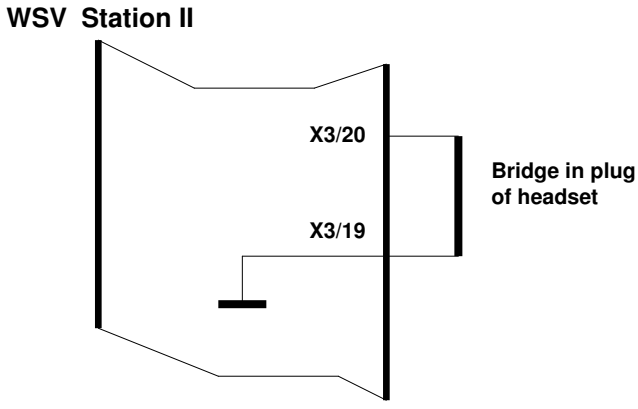
If the headset has its talking key this can be connected as shown in the following picture.



Identification: Headset plugged / not plugged

The bridge is to be inserted into the plug of the headset.
It serves to identify Headset plugged/ not plugged.
If the headset is plugged the connected microphone of the relevant station is automatically deactivated and the loudspeaker is muted.





Remark:
Please inform Hinrichs Electronic about the type of headset to be used.
In this case it is possible to preset the unit in the factory for an optimal adaptation of the headset to the amplifier system.

Attention !

Avoid overloading the earphones!

Connection lines to external headset junction boxes should be screened!

Headsets with tested usability may be obtained from Hinrichs Electronic.

3.4.7 Connection of external volume control

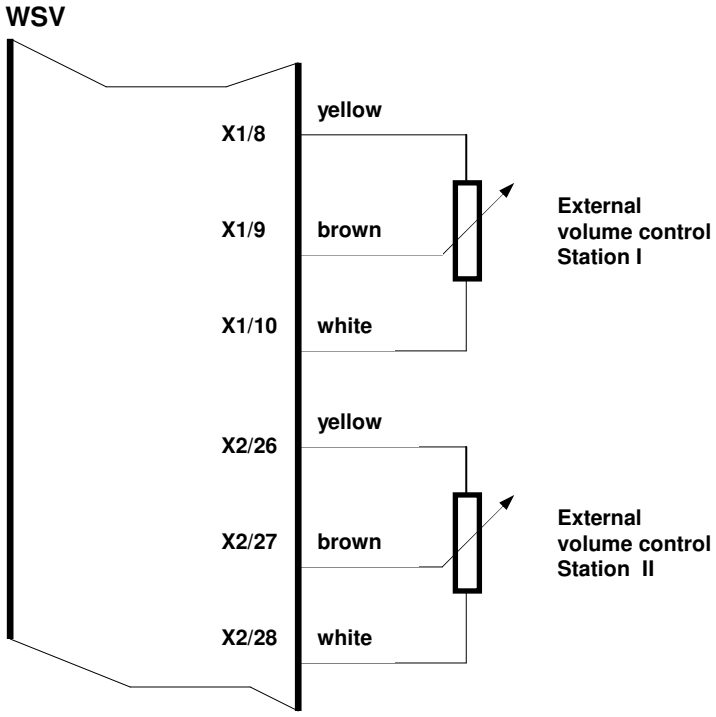
Remark:

External volume controls can only be connected to systems with the variation number „E“.

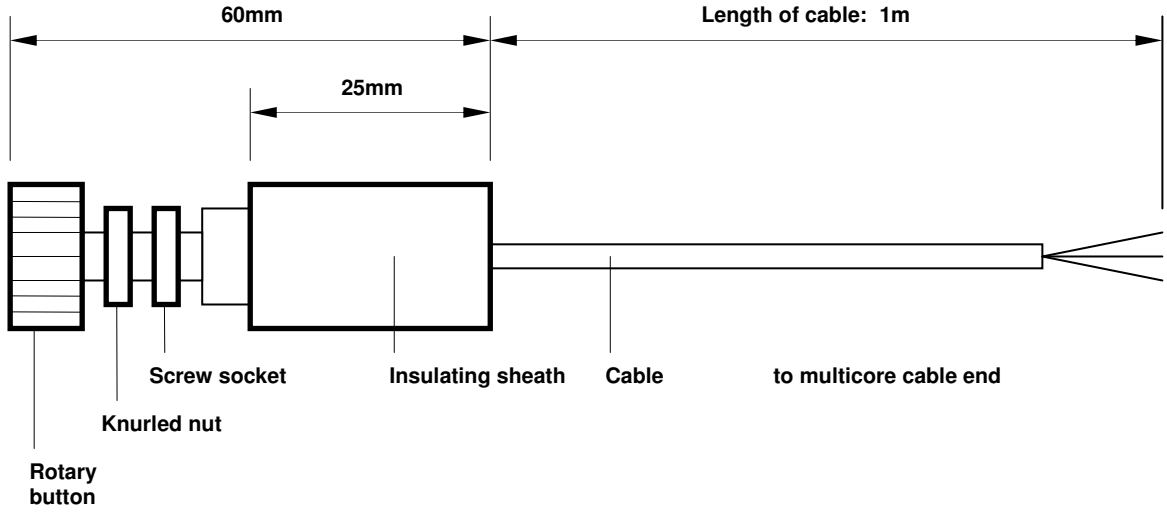
See type plate WSV

WSV ☐☐ — ☐☐☐ — ☐☐☐ — **E**

In this variation the two volume controls in the front panel of Station I are missing.



Layout of external volume controls



3.4.8 Connection of PWM outputs on WSV for volume control

Remark:

PWM signals for volume control can only be connected to systems with variation number „P“.

See type plate WSV

WSV ☐☐ — ☐☐☐ — ☐☐☐ — **P**

In this variation the two volume controls in the front panel of Station I are missing.

Specification of PWM inputs (WSV side)

Basic frequency: 500Hz

Input amplitude: 5 Vs - 24 Vs

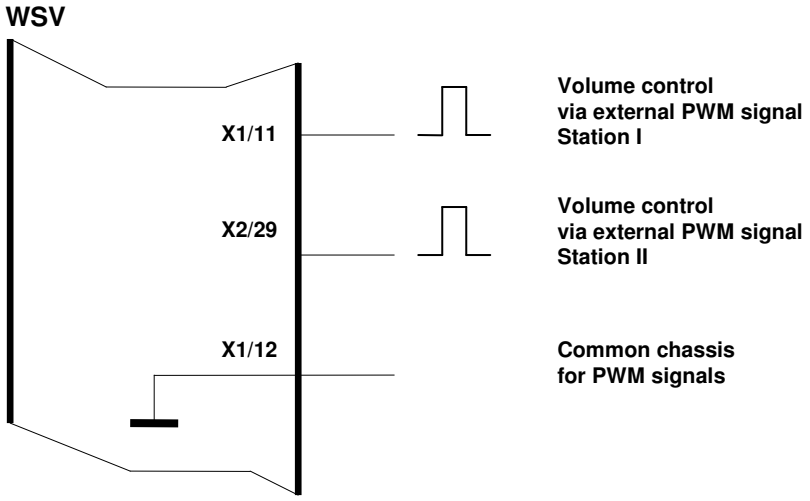


Table: Ratio between output and pulse duty factor of PWM signal

Pulse duty factor		**Percentage sine output Final stages**
T on	T off	
0% = 0ms	100% = 2,0ms	0%
10% = 0,2ms	90% = 1,8ms	2%
20% = 0,4ms	80% = 1,6ms	5,5%
30% = 0,6ms	70% = 1,4ms	8,5%
40% = 0,8ms	60% = 1,2ms	12,5%
50% = 1,0ms	50% = 1,0ms	18,5%
60% = 1,2ms	40% = 0,8ms	26,5%
70% = 1,4ms	30% = 0,6ms	38%
80% = 1,6ms	20% = 0,4ms	52%
90% = 1,8ms	10% = 0,2ms	71%
100% = 2,0ms	0% = 0 ms	100%

3.4.9 Connection of junction between Station I and Station II

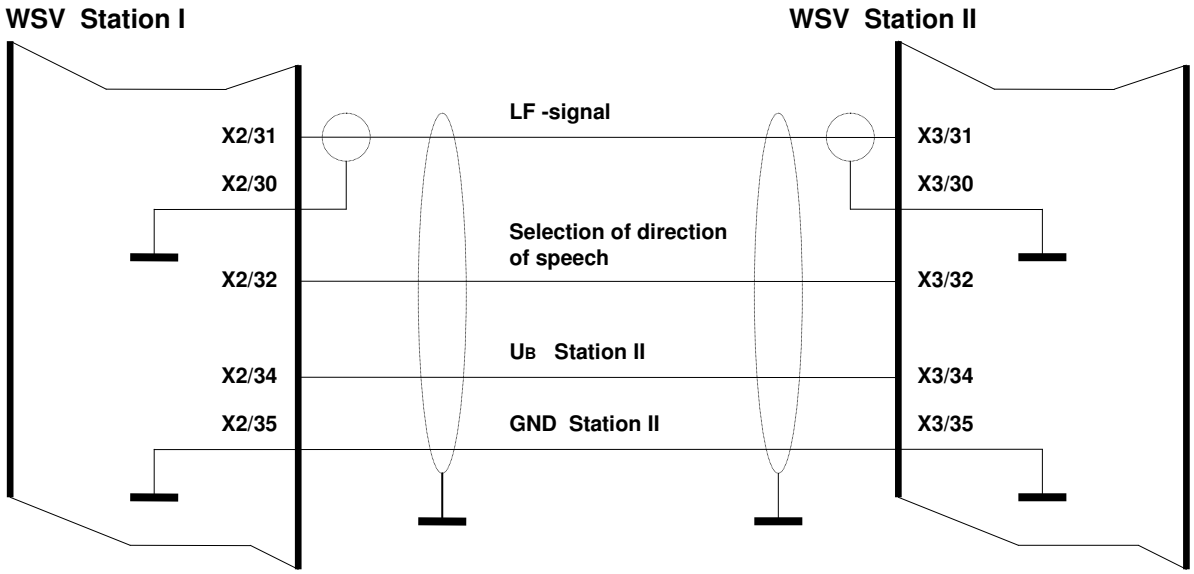
The connection between Station I and Station II requires a screened four-core conductor.

Conductor cross section: > / = 0,75 mm²

Please note:

To prevent deterioration of the voice quality by „interference over metallic circuits“ the following is to be observed when laying the cable:

Whenever technically possible avoid laying the connection line in parallel to other lines.
Should this not be possible due to technical reasons, use only screened lines with high screening effect.
The screening of this line is to be grounded on both sides.



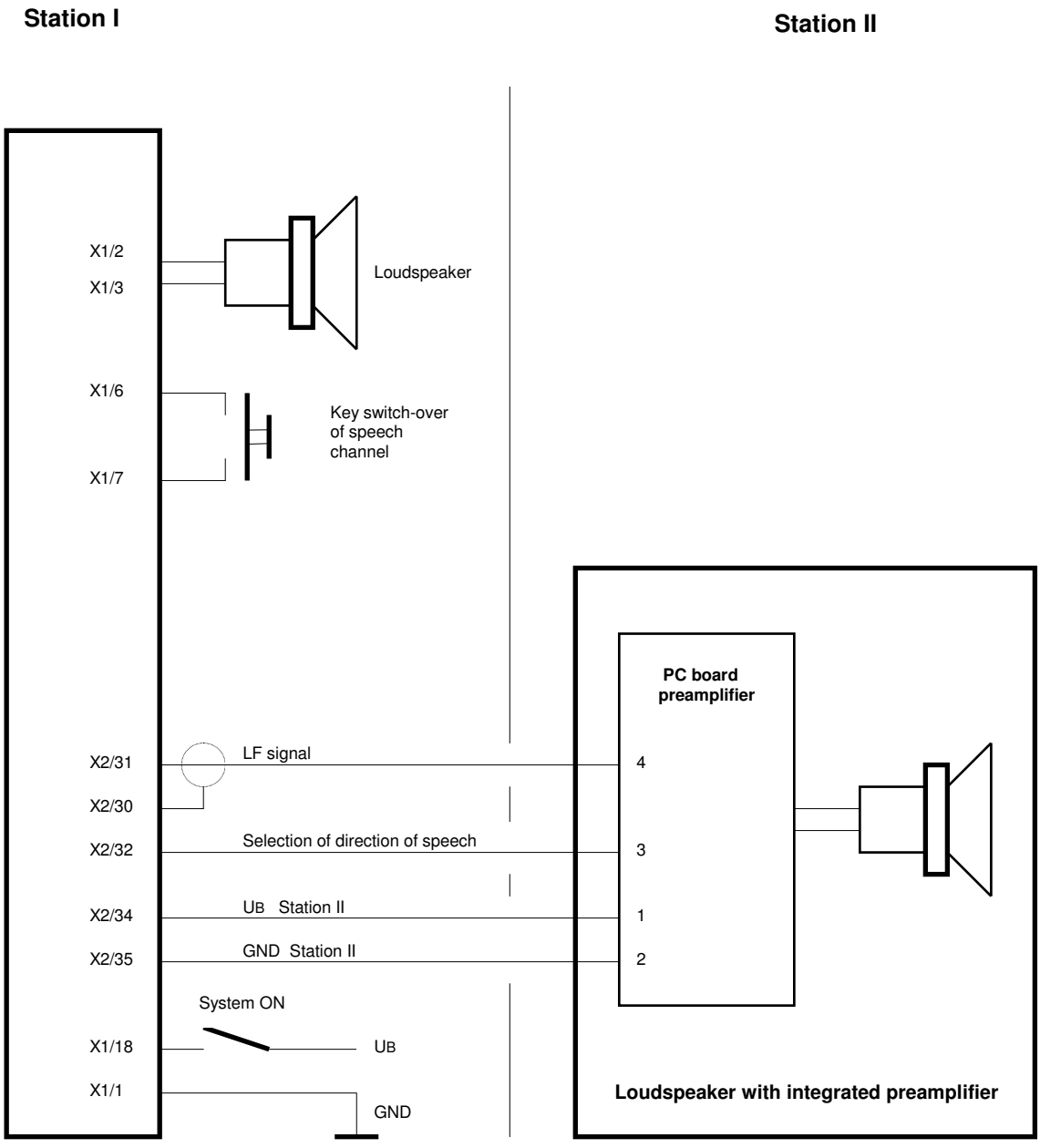
Functions of single cores

LF signal	Transmission of LF signal Direction of speech Station II to Station I amplified LF signal from preamplifier Station II to input final stage Station I Direction of speech Station I to Station II amplified LF signal from final stage Station I to loudspeaker Station II
Selection of direction of speech	Key switch-over of speech channel not actuated: Station II talking Station I hearing: U = 0V Key switch-over of speech channel actuated: Station I talking Station II hearing: U = +UB
UB / GND	Supply voltage for preamplifier Station II Remark: A Multifuse element is integrated in the amplifier to protect the preamplifier of Station II.

3.5 Connection diagrams

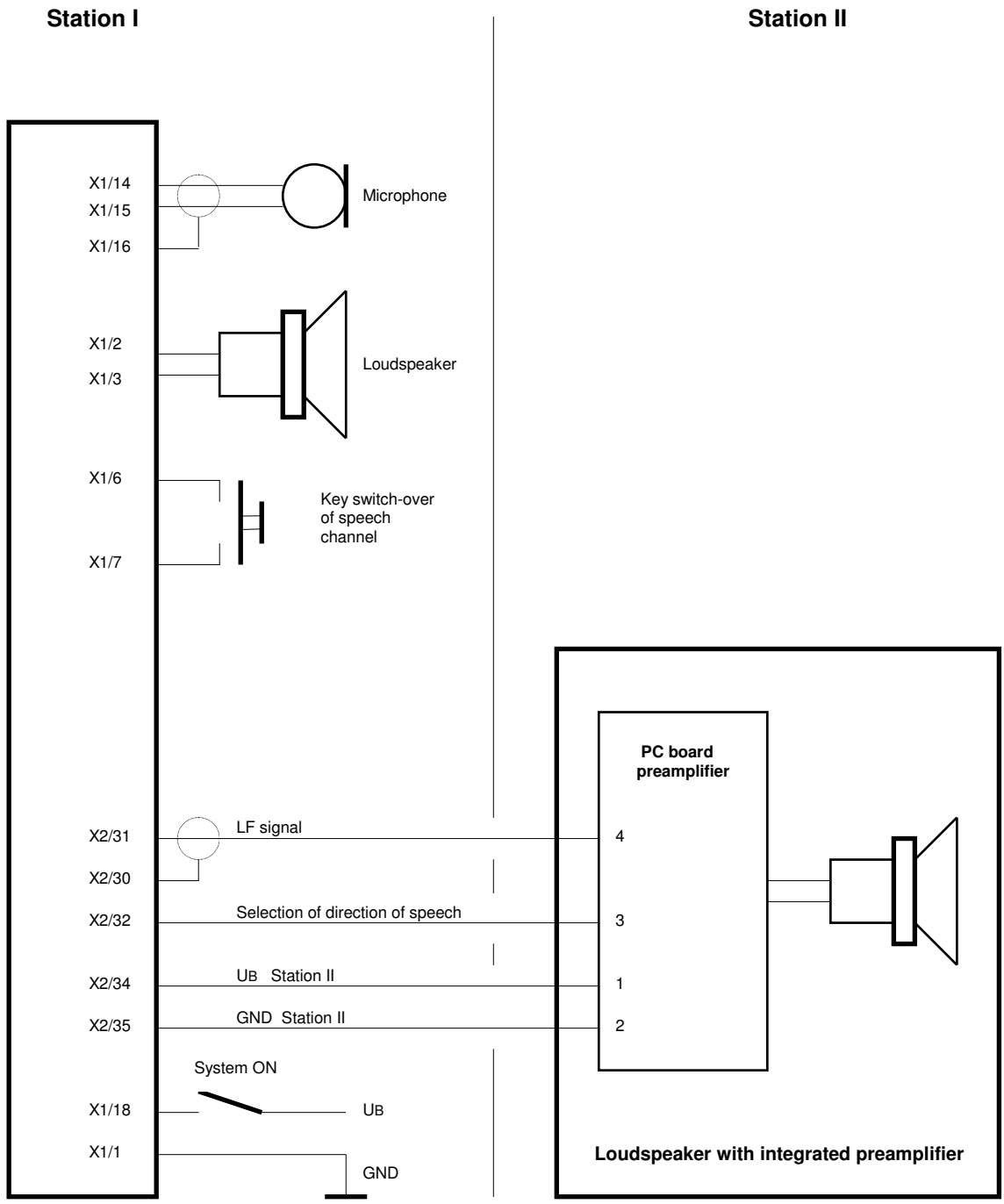
Connection diagram Variation

Station I: **Loudspeaker**
Station II: **Loudspeaker** with integrated preamplifier



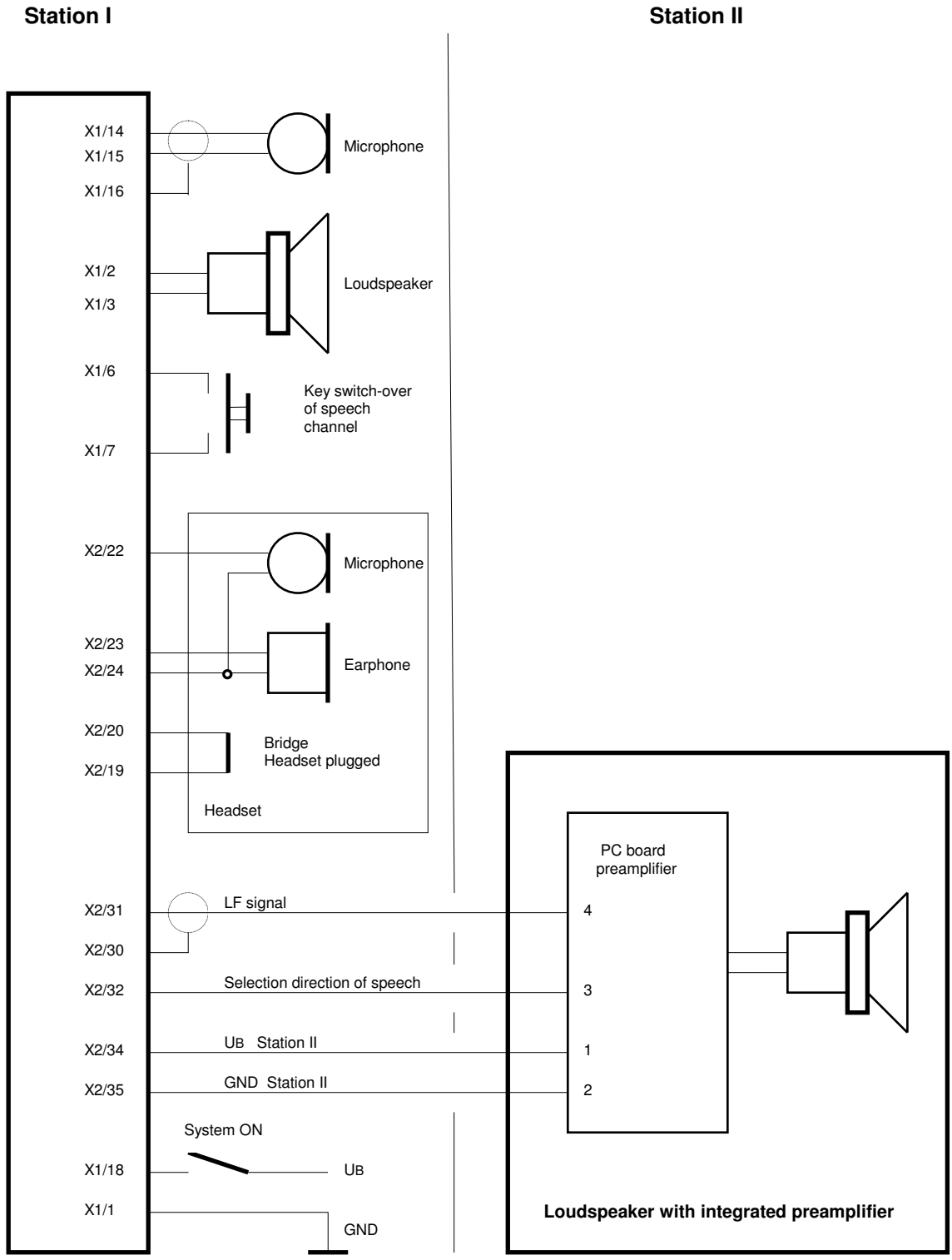
Connection diagram Variation

Station I: **Microphone / Loudspeaker**
Station II: **Loudspeaker** with integrated preamplifier



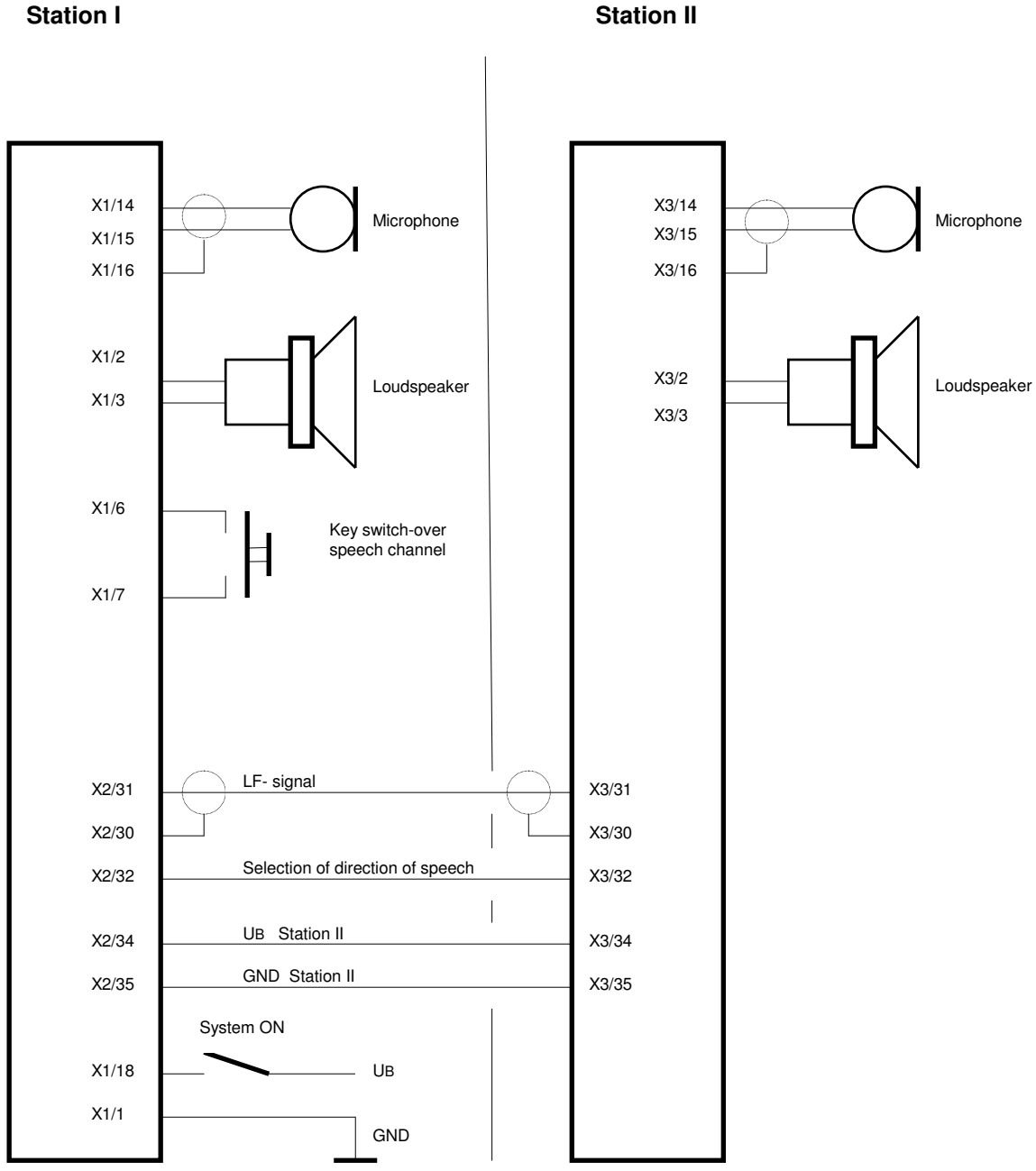
Connection diagram Variation

Station I: **Microphone / Loudspeaker / Headset**
Station II: **Loudspeaker** with integrated preamplifier



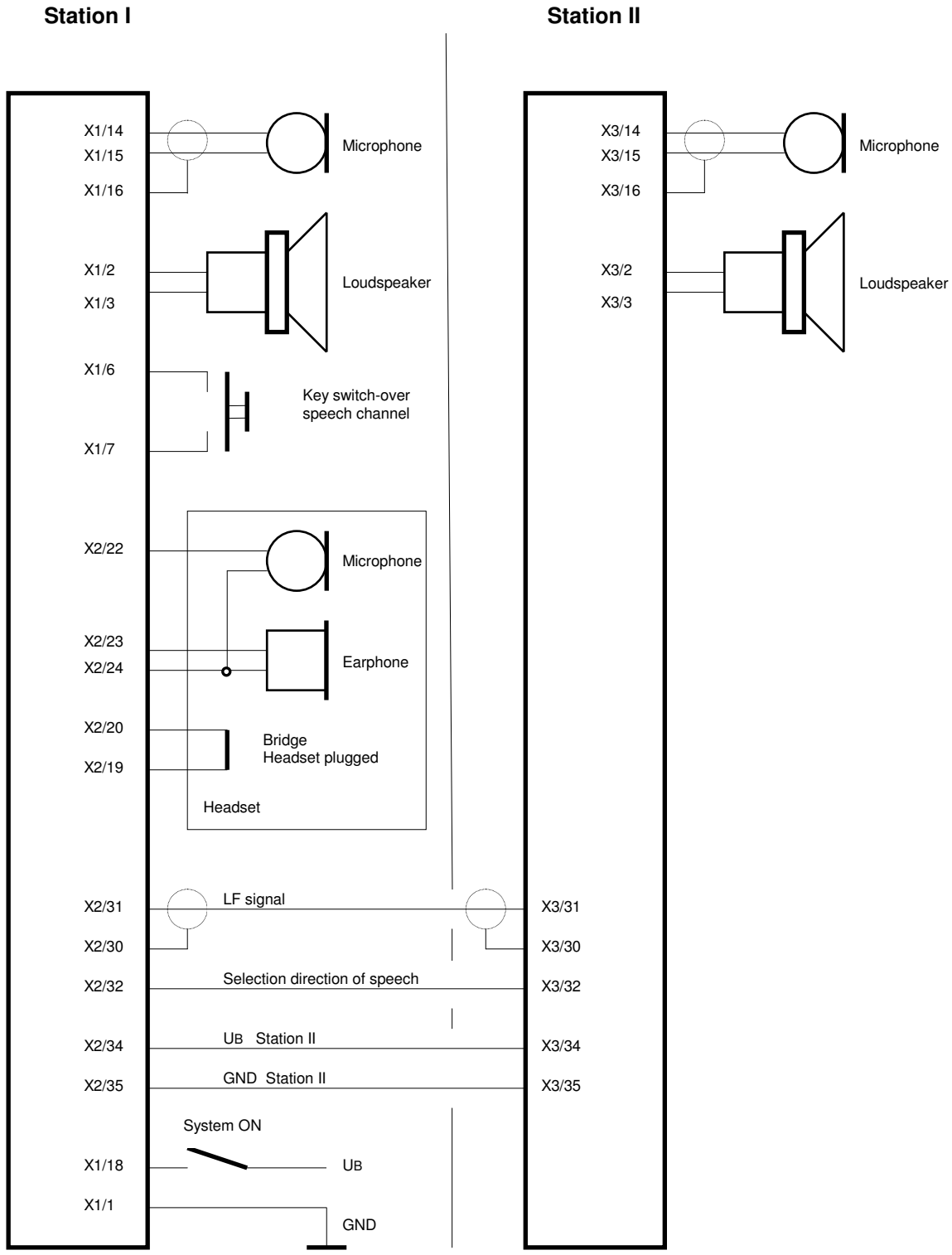
Connection diagram Variation

Station I: **Microphone / Loudspeaker**
Station II: **Microphone / Loudspeaker**



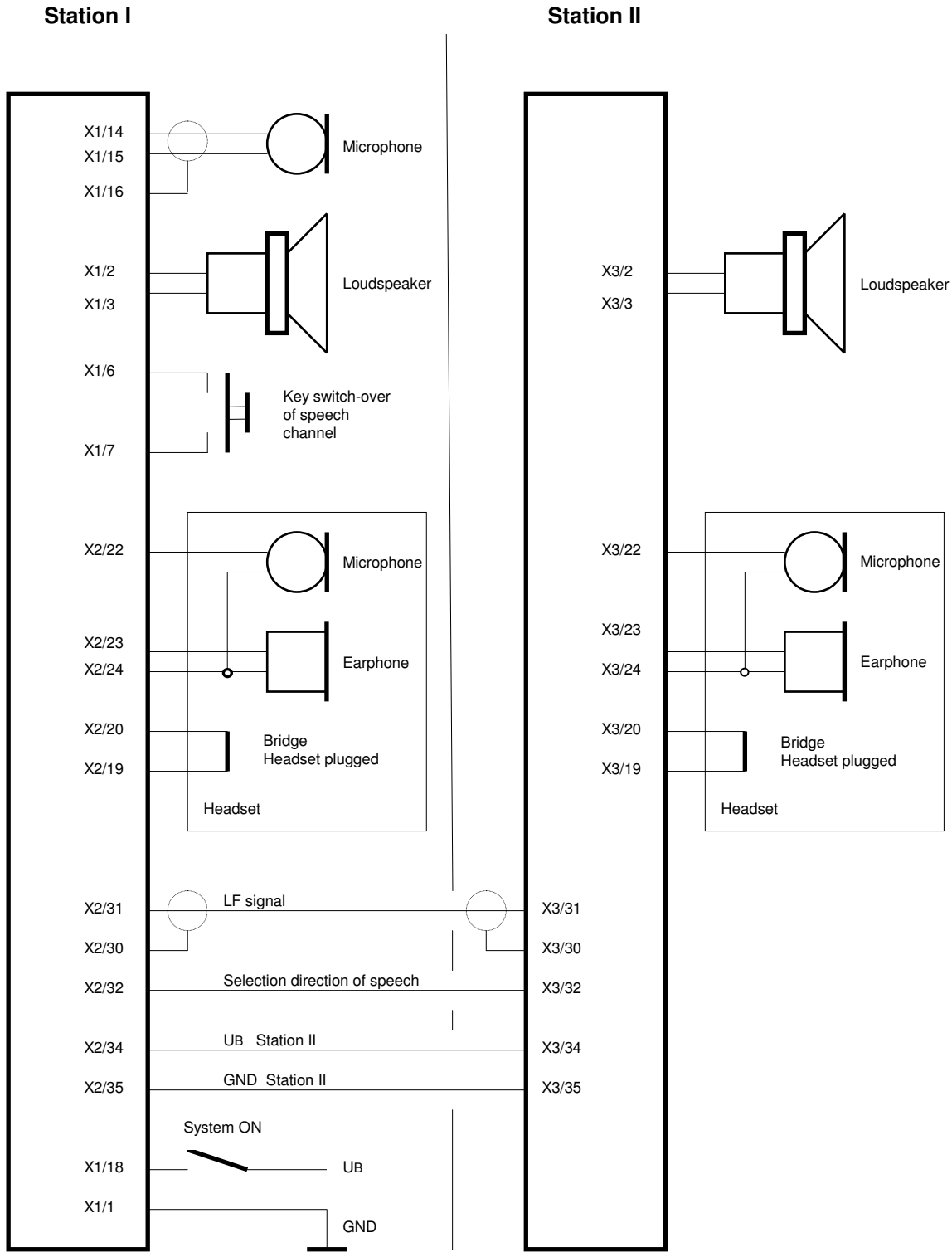
Connection diagram Variation

Station I: **Microphone / Loudspeaker / Headset**
Station II: **Microphone / Loudspeaker**



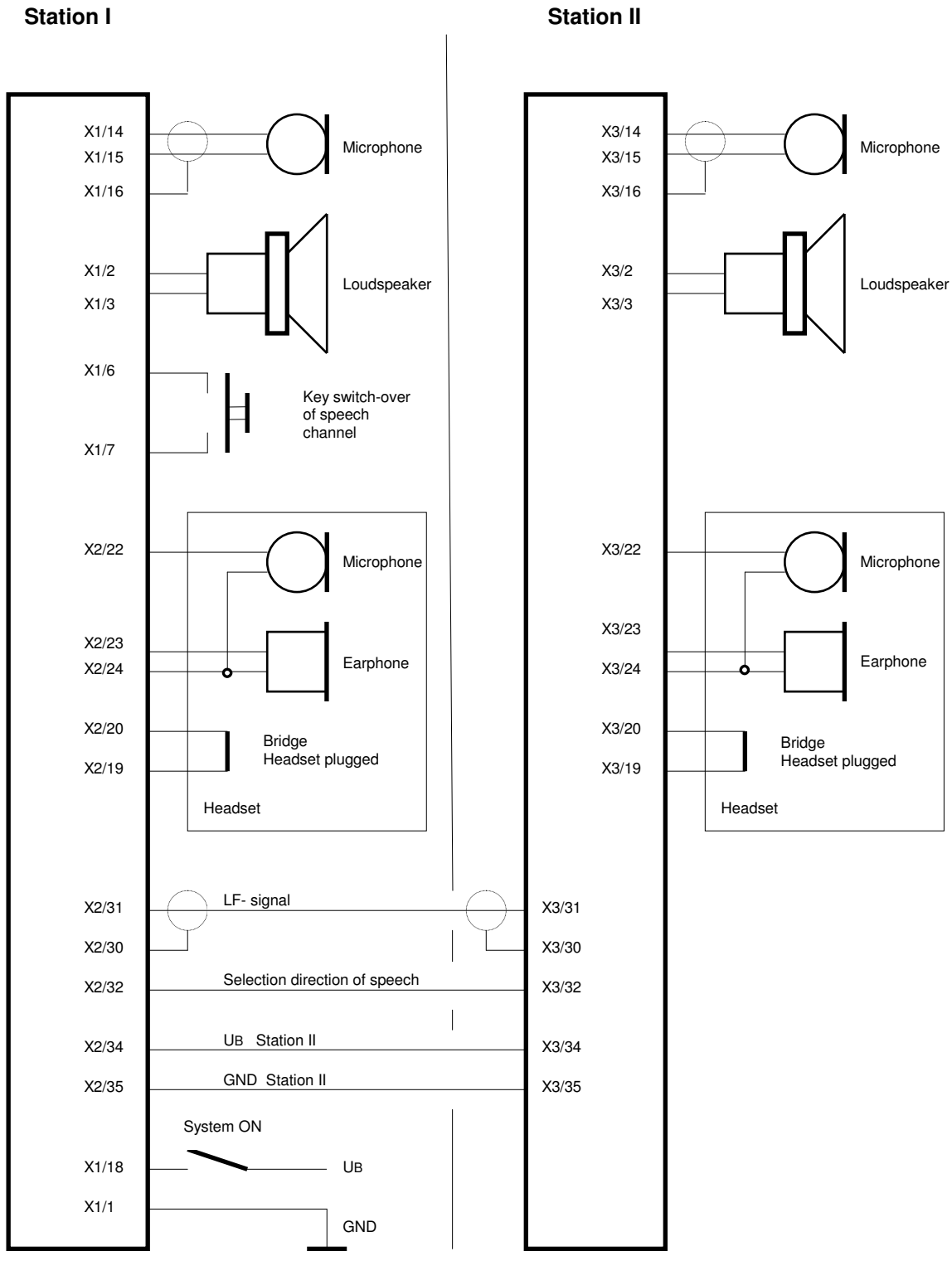
Connection diagram Variation

Station I: **Microphone / Loudspeaker / Headset**
Station II: **Loudspeaker / Headset**



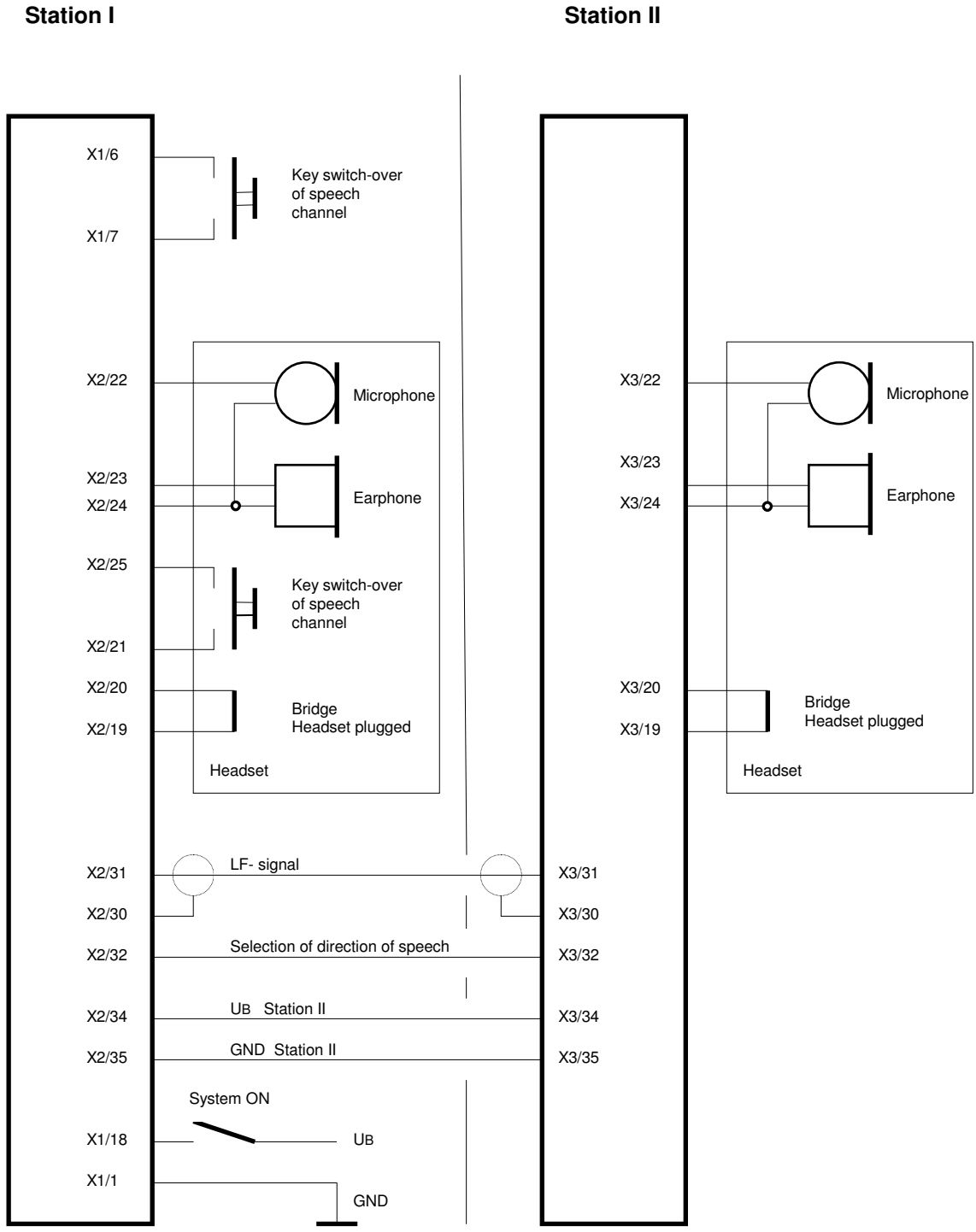
Connection diagram Variation

Station I: **Microphone / Loudspeaker / Headset**
Station II: **Microphone / Loudspeaker / Headset**



Connection diagram Variation

Station I: Headset
Station II: Headset



4. Operation

4.1 Turning ON and OFF

Turning ON and OFF is by making and breaking the supply voltage.

4.2 Volume adjustment

According to the WSV Variation the volume can be adjusted separately for each station via

- the internal volume controls (potentiometers) on the front panel of Station I
- the connected external volume controls (potentiometers)
- via the PWM signals.

4.3 Switch-over of direction of speech

The direction of speech is switched over by means of the key switch-over of direction of speech.

Direction of speech:	**Key not actuated:**	**Station II talking, Station I hearing**
	Key actuated:	**Station I talking, Station II hearing**

4.4 Plug-in of headset

When the headset is plugged the microphone is automatically deactivated and the loudspeaker is muted.

Remark !

A secondary loudspeaker connected to Station I is not muted.

5. View of front panel

Station I

Station II

Function of the LEDs

LED in **STATUS**

Power

Lights up after switching on the supply voltage
Supply voltage UB is OK.

Talk Selection

Lights up when the key switch-over of direction of speech is actuated.

Headset plugged

Lights up when the headset is plugged into Station I.

LED in **ERROR**

Power

Lights up when supply voltage is exceeded or falls below

12V DC - Variation: 10V DC < UB > 14,5V DC
24V DC - Variation: 21V DC < UB > 29V DC

Talk Selection

Flashes when line Talk Selection has ground contact.

Volume control in **VOLUME**

The volume can be adjusted separately for each station

Symbol Headset

Volume control to adjust the basic volume for headset at station I

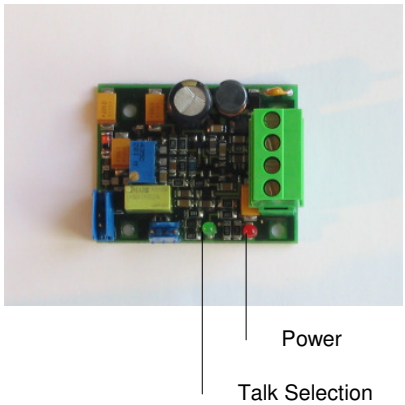
Station II

Volume control to adjust the basic volume for headset at station II

Station I

Volume control to adjust the volume at station I

Function of the LEDs of PC board preamplifier Station II



Power

Lights up after switching on the supply voltage
Supply voltage UB OK.

Talk Selection

Lights up when key Talk Selection is actuated.

6. Maintenance and repair

6.1 Maintenance instructions

Check if all line and plug connections are firmly seated.

6.2 Safety element

A Multifuse element is integrated in the intercom amplifier. This is a resettable fuse that after release by short circuit or excess current may be reset automatically by switching ON and OFF the supply voltage.

6.3 Repairs

It is recommended to have repairs made only by Hinrichs Electronic and also to purchase spare parts from them.

Please enclose an error list with the defective unit!

7. Technical data

Operating voltage range:

According to variation:
U B: + 12V DC (+ / - 10%)
U B: + 24V DC (+ / - 10%)

Current consumption:

12V DC - Variation:

I No-load:	140mA
I Full load:	580mA
I Preamplifier:	22mA

24V DC - Variation:

I No-load:	180mA
I Full load:	1,12A
I Preamplifier:	18mA

* Full load: Two loudspeakers with 4 Ohm impedance each

Output:

12V DC – Variation:

P Sinus Station I : 2 x 5 W to 4 Ohm / 1kHz
P Sinus Station I : 2 x 2,5 W to 8 Ohm / 1KHz

P Sinus Station II : 5 W to 4 Ohm / 1kHz
P Sinus Station II : 2,5 W to 8 Ohm / 1KHz

24V DC – Variation:

P Sinus Station I : 2 x 10 W to 4 Ohm / 1kHz
P Sinus Station I : 2 x 5 W an 8 Ohm / 1KHz

P Sinus Station II : 10 W to 4 Ohm / 1kHz
P Sinus Station II : 5 W to 8 Ohm / 1KHz

Frequency response:

12V DC – Variation:

f fu-fo: 300Hz - 6,8 kHz (-3dB / 1kHz)
f fu-fo: 220Hz – 11,3 kHz (-6dB / 1kHz)

24V DC – Variation:

f fu-fo: 450Hz - 6,6 kHz (-3dB / 1kHz)
f fu-fo: 280Hz – 8,5 kHz (-6dB / 1kHz)

Admissible temperature range:

-20...+70 °C in operation
-25...+85 °C when stored

Admissible rel. air humidity:

10...85 % in operation
5...90 % when stored

Admissible jerks:

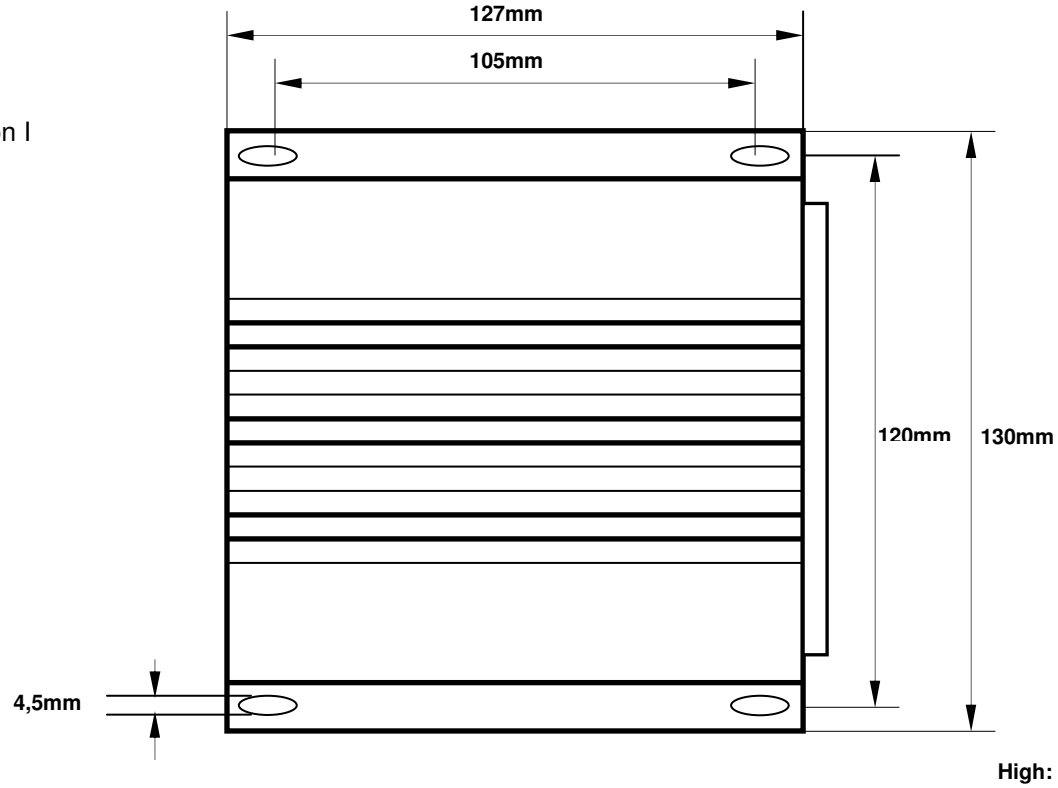
up to 2 G within 1 ms in operation
up to 4 G within 1 ms when stored

Admissible vibrations:

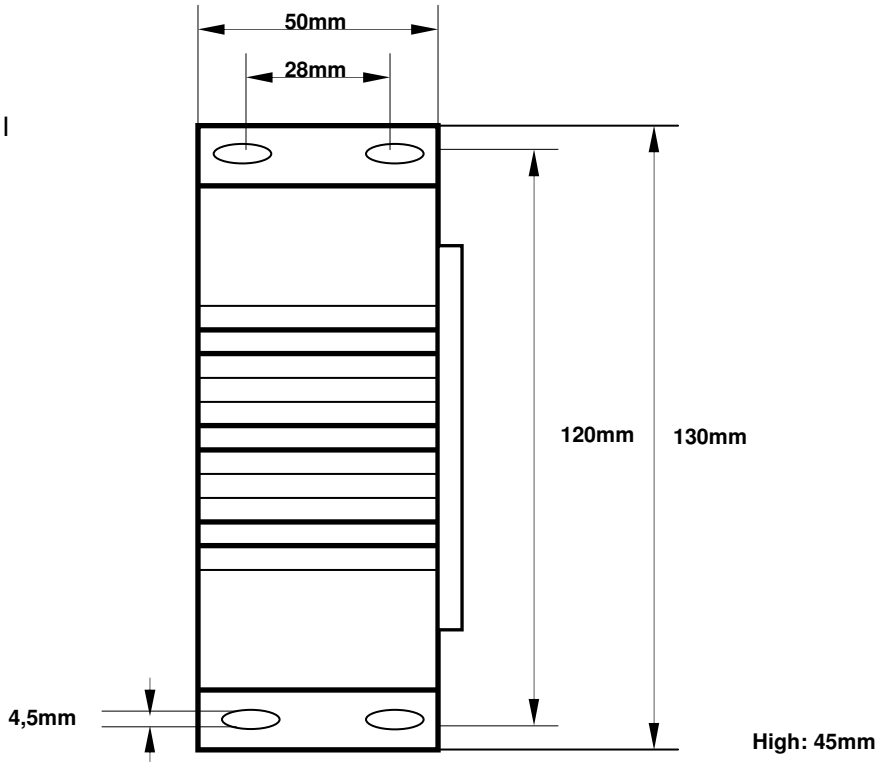
up to 0,5 G at10...55 Hz in operation
up to 1 G at 10...55 Hz when stored

8. Case

Station I



Station II



Case:	**Extruded aluminium section AlMgSi0,5**
Case cover:	**Aluminium sheet AlMgSi0,5**
Surface protection:	**Synthetic resin baked enamel colour RAL 9005 (black)**
Weight:	**Station I: 600g Station II: 200g**
Protective system:	**Station I / Station II: IP40**

Order key

Station I

WSV Station I 

Operating voltage
12 - 12V DC
24 - 24V DC

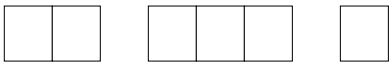
Microphone
O - no microphones
D - dynamic microphones
E - Elektret microphones

Loudspeaker
O - no loudspeaker
L - loadspeaker

Headset
O - no headset
D - Headset with dynamic microphone capsule
E - Headset with Elektret microphone capsule

Volume adjustment
I - Control integrated in front panel
E - via external potentiometer
P - via PWM signal

Station II

WSV Station II 

Operating voltage
12 - 12V DC
24 - 24V DC

Microphone
O - no microphones
D - dynamic microphones
E - Elektret microphones

Loudspeaker
O - no loudspeaker
L - loudspeaker

Headset
O - no headset
D - Headset with dynamic microphone capsule
E - Headset with Elektret microphone capsule

Please note when ordering: Operating voltage of Station I and Station II must be the same.