R&S®GB4000V
Audio Unit
SW Version 3.0x
User Manual

6166.4484.02 – 01

ROHDE&SCHWARZ

Radio Communications Systems Division

User Manual

The User Manual describes the following R&S®GB4000V models and options:

- 6148.3073.02
- 6148.3073.03
- 6148.3073.12
- 6148.3467.03 (SW 03.01)

The firmware of the instrument makes use of several valuable open source software packages. the most important of them are listed below, together with their corresponding open source license. The verbatimlicense texts are provided on the user documentation CD-ROM (included in delivery).

Package	Link	License
Linux	http://www.kernel.org	GPL v.2
Mongoose	http://www.code.google.com/p/mongoose	MIT

Rohde&Schwarz would like to thank the open source community for their valuable contribution to embedded computing.
The source code of the open source packages is available on request.

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The following abbreviations are used throughout this manual:
R&S®GB4000V is abbreviated as R&S GB4000V.

CE 0682 !

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DECLARATION OF CONFORMITY in accordance with the Radio and Telecommunications Terminal Equipment Act (FTEG) and Directive 1999/5/EC (R&TTE Directive) Annex V, certified by the Notified Body CETECOM ICT Services GmbH Germany, Identif. No. 0682 as well as the Regulation (EC) No. 552/2004 (Interoperability Regulation)

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Zertifikat-Nr.: / Certificate No.: 2010-55

Hiermit wird in alleiniger Verantwortung bescheinigt, dass die Funkanlage
We herewith certify under our sole responsibility that the radio equipment

Gerätetyp Equipment Type	Materialnummer Stock No.	Benennung Designation
GB4000V	6148.3073.02/03/12	AUDIO UNIT

Geräteklasse: / Equipment class: 2.12 (Infrastructure equipment)

bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) sowie den grundlegenden Anforderungen der Verordnung (EG) Nr. 552/2004 (Interoperabilitäts-Verordnung) entspricht.
complies with the essential requirements of §3 and the other relevant provisions of the FTEG (Article 3 of the R&TTE Directive) as well as of the Regulation (EC) No. 552/2004 (Interoperability Regulation), when used for its intended purpose.

- Gesundheit und Sicherheit gemäß § 3 (1) 1, (Artikel 3 (1) a))
- Health and safety requirements pursuant to § 3 (1) 1, (Article 3(1) a))

- Schutzanforderungen in Bezug auf die elektromagn. Verträglichkeit § 3 (1) 2, (Artikel 3 (1) b))
- Protection requirements concerning electromagnetic compatibility § 3(1)(2), (Article 3(1)(b))

- Maßnahmen zur effizienten Nutzung des Funkfrequenzspektrums § 3 (2), (Artikel 3(2))
- Measures for the efficient use of the radio frequency spectrum § 3 (2), (Articel 3(2))

- Luftschnittstelle bei Funkanlagen gemäß § 3(3), (Artikel 3(3))
- Air interface of the radio systems pursuant to § 3(3), (Article 3(3))

Angewendete harmonisierte Normen:
Harmonized standards applied:

DIN EN 60950-1:2006
ETSI EN 301489-1 V1.8.1 (2008-02)
ETSI EN 301489-22 V1.3.1 (2003-11)
EN 55022:2006 Class B

Einhaltung der grundlegenden Anforderungen auf andere Art und Weise (hierzu verwendete Standards/Spezifikationen):
Other means of proving conformity with the essential requirements (standards/specifications used):

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Mühldorfstr. 15, D-81671 München

München, den 16.06.2010
Munich, 2010-06-16

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DÉCLARATION DE CONFORMITÉ selon la loi sur les équipements radio et les équipements terminaux de télécommunications (FTEG) ainsi que selon la Directive 1999/5/CE (Directive R&TTE) Annexe V, certifié par l'Organisme Notifié CETECOM ICT Services GmbH Allemagne, numéro d'identification 0682et le Règlement (CE) N° 552/2004 (règlement sur l'interopérabilité)

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Zertifikat-Nr.: / Certificat N° : 2010-55

Hiermit wird in alleiniger Verantwortung bescheinigt, dass die Funkanlage
Par la présente, nous certifions sous notre responsabilité exclusive que l'équipement radio

Gerätetyp Type	Materialnummer N° de référence	Benennung Désignation
GB4000V	6148.3073.02/03/12	AUDIO UNIT

Geräteklasse: / Classe d'équipement :

bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) sowie den grundlegenden Anforderungen der Verordnung (EG) Nr. 552/2004 (Interoperabilitäts-Verordnung) entspricht.
est conforme aux prescriptions fondamentales du paragraphe 3 et aux autres prescriptions applicables de la loi susmentionnée (Article 3 de la Directive R&TTE) et du Règlement (CE) N° 552/2004 (règlement sur l'interopérabilité), à condition qu'il soit utilisé dans les conditions stipulées.

- Gesundheit und Sicherheit gemäß § 3 (1) 1, (Artikel 3 (1) a))
- Prescriptions en matière de sécurité et de santé selon le paragraphe 3 (1) 1, (Article 3 (1) a))

- Schutzanforderungen in Bezug auf die elektromagn. Verträglichkeit § 3 (1) 2, (Artikel 3 (1) b))
- Prescriptions en matière de protection relative à la compatibilité électromagnétique selon le paragraphe 3 (1) (2) (Article 3 (1) b))

- Maßnahmen zur effizienten Nutzung des Funkfrequenzspektrums § 3 (2), (Artikel 3(2))
- Mesures pour l'utilisation efficace du spectre radioélectrique le paragraphe 3 (2), (Article 3(2))

- Luftschnittstelle bei Funkanlagen gemäß § 3(3), (Artikel 3(3))
- Interface radio des équipements radio selon le paragraphe 3 (3) (Article 3 (3))

Angewendete harmonisierte Normen:
Normes harmonisées utilisées :

DIN EN 60950-1:2006
ETSI EN 301489-1 V1.8.1 (2008-02)
ETSI EN 301489-22 V1.3.1 (2003-11)
EN 55022:2006 Class B

Einhaltung der grundlegenden Anforderungen auf andere Art und Weise (hierzu verwendete Standards/Spezifikationen):
Autres moyens servant à établir la conformité aux prescriptions fondamentales (normes/spécifications utilisées) :

ROHDE & SCHWARZ GmbH & Co. KG
Mühldorfstr. 15, D-81671 München

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München, den 16.06.2010
Munich, 2010-06-16

Zentrales Qualitätsmanagement MF-QZ / Chadzelek
Central Quality Management MF-QZ / Chadzelek

CE Marking

The marking by the CE symbol means that the R&S GB4000V audio unit fulfills the EMC guideline and the low-voltage guideline of the European Union.

Furthermore it points out that the following technical standards are fulfilled:

- DIN EN 60950–1:2006
- EN 55022:2006 (ancillary equipment)
- ETSI EN 301 489–1 V1.8.1
- ETSI EN 301 489–22 V1.3.1

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Documentation Overview

This user manual is part of the product. We recommend keeping it close to the product for reference. You can find information on the following topics:

- User Information
- Getting Started
- Operation
- Malfunction
- Maintenance
- Technical Information

Conventions Used in the Documentation

The following conventions are used throughout the R&S GB4000V Manual:

Typographical conventions

Convention	Description
"Links"	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

For safety signs refer to the Basic Safety Instructions (part of the front matter of this Manual).

Abbreviations

A	Ampere
AC	Alternating Current
ATC	Air Traffic Control
ACL	Access Control List
AUX	Auxiliary
BNC	Bayonet Neill-Concelman Connector
CD	Compact Disc
CE	European Certificate of Conformity
CMOS	Complementary Metal Oxide Semiconductor
COM	Communication
CWP	Controller Working Position
D	Depth
dB	Decibel
dBm	Decibel referred to 1 mW
dBµV	Decibel above µV
DC	Direct Current
DIN	Deutsches Institut für Normung (German Institute for Standardization)
DNS	Domain Name System
DSCP	Differentiated Services Code Point
ED	EUROCAE Documents
E&M	Earth & Magnet / Ear & Mouth
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EN	European Norm
EUROCAE	European Organization for Civil Aviation Equipment
ETSI	European Telecommunications Standards Institute
EXT	External
EXT SP	External Speaker
GO	Go
GUI	Graphical User Interface
GPL	General Public License
HTTP	Hypertext Transfer Protocol
HU	Height Unit
HS CONTR	Headset Controller

HS INSTR	Headset Instructor
IEC	International Electrotechnical Commission
IP	Internet Protocol
KG	Kilogram
kHz	Kilo Hertz
LAN	Local Area Network
LED	Light Emitting Diode
M3SR	Multiband, Multimode and Multirole Surface Radio
MAX	Maximum
MAC	Media Access Control
MHz	Mega Hertz
MIN	Minimum
MM	Millimeter
MIL-STD	The United States Military Standard
MIT	Massachusetts Institute of Technology
MTBF	Mean Time Between Failures
N	Coaxial RF connector standard N
Nm	Newton meters
PC	Personal Computer
PTT	Push To Talk
RFC	Request for Comments
RMS	Root Mean Square (effective value)
RTP	Real-time Transport Protocol
RX	Receiver
R&S	Rohde and Schwarz
SELV	Safety Extra Low Voltage
SETUP	Setup
SIP	Session Initiation Protocol
SP	Speaker
SQL	Squelch
SW	Software
TCP	Transmission Control Protocol
TX	Transmitter
URI	Uniform Resource Identifier
USB	Universal Serial Bus
VA	Volt Ampere

VAC	Volt Alternating Current
Vcc	Operating Voltage
VCCS	Voice Communication Control System
VCS	Voice Communication System
VDC	Volt Direct Current
VoIP	Voice over IP
W	Width
WAN	Wide Area Network
µs	Microsecond

1 User Information

1.1 General Features

The R&S GB4000V provides audio, push-to-talk (PTT) and squelch (SQ) to and from radios in a remote location. The unit is compact and fits into any console. The R&S GB4000V can be connected to the radios using either 4-wire E&M (analog line) or voice over IP (VoIP). For VoIP connection, the R&S®Series 4200 must be used. When connected using an analog line, either 4-wire E&M lines (PTT, SQ) or in-band tones for E&M can be used. The available tones are 2040 Hz and 2440 Hz. In-Band signaling is handled by the R&S GB4000V, thus eliminating the need for other external devices.

When used with the R&S GB4000T touch screen control unit, the R&S GB4000V can be connected to any of up to nine R&S®Series 4200 radios via VoIP.

Key facts:

- Compact design to minimize the space required in operator consoles
- Analog connection for use with all the Rohde & Schwarz radios
- In-Band PTT and SQ signaling for use with the R&S®Series 4200 radios
- EUROCAE ED137-1 compliant to VoIP connection to the R&S®Series 4200 radios
- Built-In loudspeaker with the volume control
- Configurable minimum volume setting to ensure safety
- LEDs indicate the status of the radios (PTT, SQ, VoIP)
- Available with an additional headset connector for instructor operation
- External loudspeaker connection for monitoring
- Can be mounted in a 19" rack or in operator consoles
- Two independent DC connections for redundant power supply
- Easily configurable via a web browser
- Splash-proof front panel

Figure 1-1: The R&S GB4000V audio unit, front view (VAR03).

1.2 Required Personnel

Installation, start-up and maintenance of the R&S GB4000V audio unit require qualified personnel.

Qualified personnel in the sense of this Manual and the safety references contained herein are trained specialists who have the authorization to install devices, systems and electric circuits in accordance with the standards of safety engineering.

The personnel must be familiar with this Manual.

1.3 Required Power Supply

The R&S GB4000V operates on an external supply voltage of +19 V DC to +32 V DC (for details on current consumption refer to chapter “1.5”). Additionally, for a backup supply another power supply may be connected.

⚠ CAUTION

The used power supply (SELV) must fulfill the requirements for reinforced/double insulation for main supply circuits in accordance to DIN/EN/IEC 61010 (UL 61010B-1, CSA 22.2 No. 1010.1) or DIN/EN/IEC 60950 (UL 1950, CSA 22.2 No. 950).

1.4 Design

The R&S GB4000V is accommodated in a non-magnetic metal case of 19”/4, 3 HU.

The R&S GB4000V is switched on and off via the power supply.

The main assemblies of the R&S GB4000V are a mounting plate with a single board electronic, headset connectors (NF7), loudness control potentiometers and power supply.

Interfaces at the front:

- 1x Headset Connector (VAR02/VAR12)
- 2x Headset Connector (VAR03)
- 2x Volume Control (VAR02/VAR12)
- 3x Volume Control (VAR03)
- 6x LED indicators

Interfaces at the rear:

- 1x DC Power
- 1x Auxiliary Interface
- 1x Ethernet
- 1x Audio Interface
- 1x External Speaker
- 1x USB (reserved)

Figure 1-2: The R&S GB4000V audio unit, rear view.

1.5 Technical Data

Designation/Type	R&S GB4000V Audio unit
Part No.	6148.3073.02 (1 headset version) 6148.3073.03 (2 headset version) 6148.3073.12 (1 headset version)
Front Panel (W x H)	VAR02 / 03 (mounting in line with IEC 60297): 19”/4, 3 HU, 106.4 mm x 128.7 mm (4.2. in x 5.1 in)
	VAR12: 100.6 mm x 131 mm (4.0 in x 5.2 in)
Body (W x H x D)	93 mm x 103 mm x 120 mm (3.7 in x 4.1 in x 4.7 in)
Weight	<0.8 kg (<1.8 lb)
Temperature	–20 °C to +55 °C (operation), acc. to DIN EN 60068-2-1 / DIN EN 60068-2-2 –40 °C to +70 °C (storage)
Humidity	≤95 % rel. at 55 °C, non-condensing acc. to DIN EN 60068-2-30
Vibration	1.3 g_{rms}; 5 to 500 Hz (random, operating) acc. to EN 60068-2-64
Shock	15 g peak/11 ms acc. to EN 60068-2-27
Altitude	5000 m above sea level operation acc. to DIN EN60068-2-13 10 000 m above seal level transport
Ingress protection	IPx4 for front panel
Supply voltage	+19 to +32 V DC main and backup supply
Power estimation	typ. 0.4 A at +28 V DC; max. 1 A at +28 V DC
EMC/EMI	ETSI EN 301 489-1 /-22, MIL-STD-461F (CE101, CE102, CS101, CS114, RE102, RS101, RS103) MIL-STD-461F CE101 - Power leads, 30 Hz to 10 kHz CE102 - Power leads, 10 kHz to 10 MHz CS101 - Power leads, 30 Hz to 150 kHz CS114 - Bulk cable injection, 10 kHz to 200 MHz RE102 - Electric field, 2 MHz to 1 GHz RS101 - Magnetic field, 30 Hz to 100 kHz RS103 - Electric field, 2 MHz to 1GHz

Table 1: Summary of technical data.

1.6 Scope of Delivery

Item	Rohde & Schwarz Order number
R&S GB4000V audio unit	6148.3073.02 6148.3073.03 6148.3073.12

Table 2: Scope of delivery.

2 Getting Started

2.1 Unpacking and Checking

1. Check the packaging for damage.
2. Unpack the delivered goods.
3. Check the delivered goods (including accessories) against the delivery note.
4. Check the delivered goods for signs of transport damage.
5. Contact the shipping agent immediately, if damage is found.

Keep the packing material for re-use e.g. if the unit is to be sent to the nearest Rohde & Schwarz representative (refer to www.rohde-schwarz.com) for service.

2.2 Packing, Transport and Storage

Prior to any transport carry out the following steps:

1. Use the original package (box, etc.) and packaging material, if possible, to prevent mechanical and electrical damage. Make sure that the stability of the packaging is adequate to the contents.
2. Put the unit in the plastic bag (protection against moisture and dust).
3. Put the unit in the package by using the packaging material. Avoid direct lateral contact between unit and packaging.
4. Seal the package.
5. Affix a HANDLE WITH CARE label on the package.
6. Remove the old address and shipment labels from the package and affix the new ones.

NOTICE

If the unit is exposed to climate fluctuations, condensation may occur.

Precipitation of humidity (condensation) on and within the unit may be the cause of damage or even destruction.

After storage or transport in cold weather or if extreme variations in temperature occur, the R&S GB4000V must be slowly adapted to the ambient temperature of the installation site.

With condensation, allow at least 12 hours of temperature adjustment before starting up.

NOTICE

For storage observe the environmental data specified in chapter “1.5”.

2.3 Installation

The sequence of installation and cabling depends on the installation site (panel, rack) and the accessibility of the interfaces when the unit is installed.

For dimensions of the R&S GB4000V refer to the Installation Drawing in “Appendix”.

Preparation for installation into a control panel

► Prepare the control panel to accommodate the R&S GB4000V. For dimensions of the panel cutout refer to “Figure 2-1” and “Figure 2-2”.

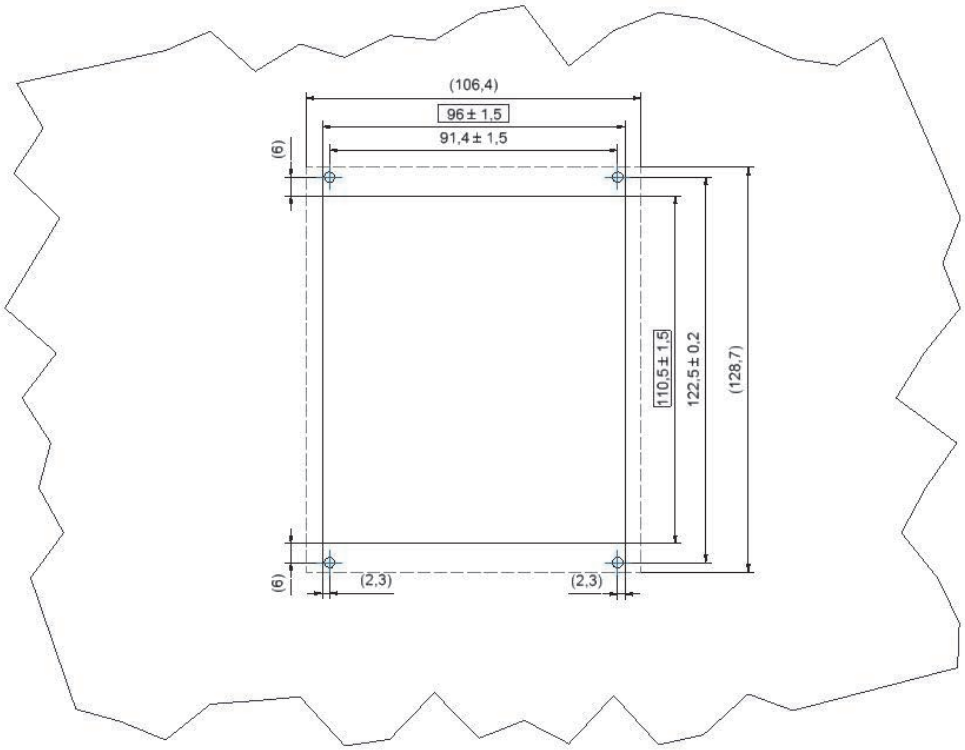


Figure 2-1: Dimensions of panel cutout (VAR02/03).

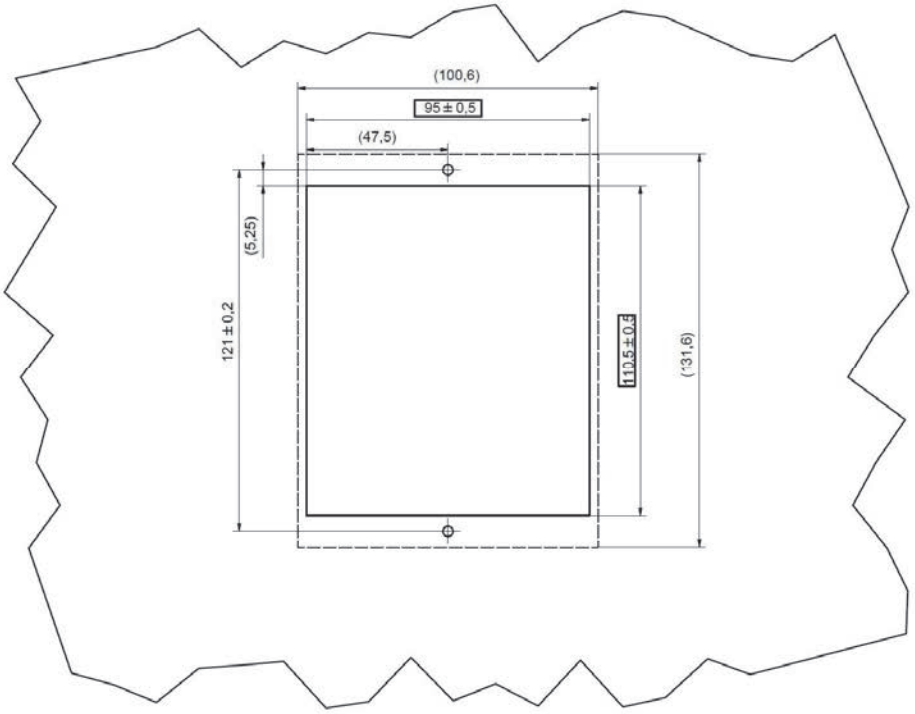


Figure 2-2: Dimensions of panel cutout (VAR12).

1. Insert the R&S GB4000V into the control panel or rack at its designated position.
2. Secure the unit by means of four screws passed through the bore holes in the corners of the front panel.

NOTICE

The unit is to be mounted according to IEC 60297 (VAR02/03).

Figure 2-3: Bore holes for fixture of the R&S GB4000V.

NOTICE

When installing the unit ensure that existing sealing profiles are not damaged.

To prevent overheating damages make sure the ventilation holes on both sides of the audio unit are not covered.

NOTICE

Make sure the environmental conditions specified in “1.5” are complied with.

NOTICE

Avoid strong magnetic fields which can have influence on the audio signals.

NOTICE

Avoid strong interfering voltage on the supply lines. This interfering voltage can have influence on the audio signals.

2.4 Cabling

Read the relevant documentation for the equipment before attaching external devices.

Always take hold of the plug when pulling or connecting cables. Do not pull on the cables. All connections and cables must have a sufficient electric and voltage strength.

NOTICE

It is recommended to use shielded cables.

⚠ CAUTION

Danger of burns on the rear panel. The rear of the unit becomes hot. Do not directly touch the body during or soon after an operation.

► For normal operation the power supply cable (X8), the headset connector (X1) and the LAN (X4) or audio cable (X5) need to be plugged in.

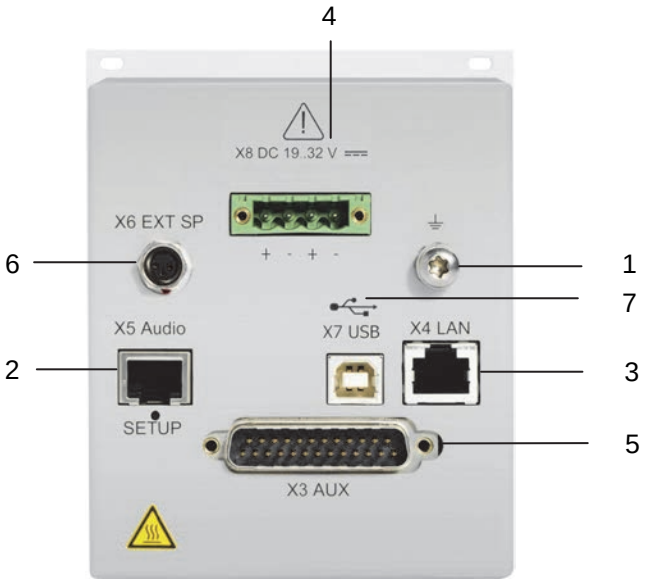


Figure 2-4: Location of external interfaces, rear view of the R&S GB4000V.

Item	Connector	Function
1		Grounding bolt (M5)
2	X5 Audio	Audio interface (analog audio mode)
3	X4 LAN	Ethernet (configuration and VoIP mode)
4	X8 DC 19..32 V	DC power supply +19 V DC to +32 V DC
5	X3 AUX	Auxiliary connector. For details on connector design and pin out refer to Appendix "A Technical Information"
6	X6 EXT SP	Connector for external speaker / max. 5 W at 8 Ω
7	X7 USB	USB connector (reserved)

Table 3: Connections on the rear panel of the R&S GB4000V.

1. Establish a connection to ground, e.g. via the 19" rack. Ensure that the grounding line has the required cross-section (observe the relevant safety regulations).
2. Connect the "X5 Audio" via a twisted pair cable to the Radio. For details on connector design and pin out refer to Appendix "A Technical Information".
3. Connect the Ethernet "X4 LAN" via LAN to the remote control computer, the network installation or the VoIP radio.
4. Connect the "X8 DC 19..32 V" Power supply to the main power supply and the backup supply (optional). The audio unit automatically uses the backup supply if the main supply fails.

Front cabling (VAR02)

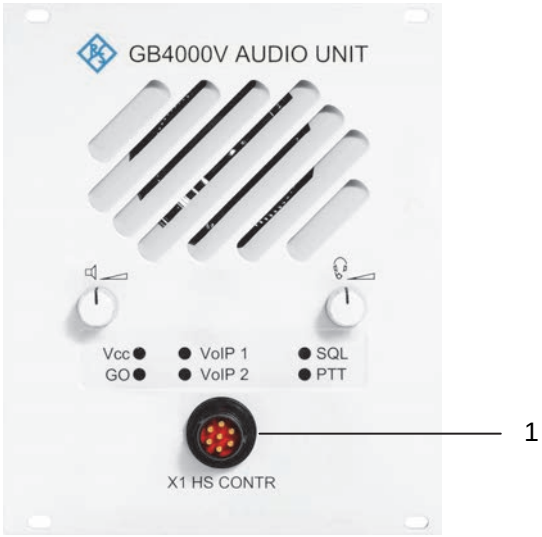


Figure 2-5: External interface, front view of the R&S GB4000V (VAR02).

Item	Connector	Function
1	X1 HS CONTR	Headset Controller

Table 4: Connections on the front panel of the R&S GB4000V (VAR02).

1. Connecting the headset controller including the PTT button using the connector X1 HS CONTR.

Front cabling (VAR03)

Figure 2-6: External interface, front view R&S GB4000V (VAR03).

Item	Connector	Function
1	X1 HS CONTR	Headset Controller
2	X2 HS INSTR	Headset Instructor

Table 5: Connections on the front panel of the R&S GB4000V (VAR03).

1. Connecting the headset controller including the PTT button using the connector X1 HS CONTR.
2. Connecting the instructor headset including the PTT button using the connector X2 HS INSTR.

Note: The PTT of the headset connected to X2 HS INSTR has a higher priority than the PTT of the headset connected to X1 HS CONTR. The headset connected to X2 HS INSTR is over writing the PTT and voice of the headset connected to X1 HS CONTR.

For details on the connector design and pin-out refer to Appendix “A Technical Information”.

CAUTION

Before connecting the R&S GB4000V to an external power supply, make sure that the requirements are fulfilled in accordance with technical data in chapter “1.5”.

To connect the power supply use the power supply connector included in the mating connector set R&S ZF4000V with the Order No. 6148.3444.02.

When preparing the power cable, the following should be observed:

- Minimum cross-section: 0.2 mm^2 (AWG 24),
  maximum cross-section: 2.5 mm^2 (AWG 12)
- I_{max} = 2.5 A
- Wire stripping length: 7 mm
- Tightening torque for screws on connector: 0.5 Nm (min.) to 0.6 Nm (max.)

You may also connect a backup power supply. For details on pins to be used refer to Appendix “A Technical Information”.

3 Operation

3.1 General

Detailed information on how to operate the R&S GB4000V will be given in the following chapters.

CAUTION

Using the headsets at a high volume setting for long periods of time can cause hearing damage.

3.2 Control Elements and Interfaces

The R&S GB4000V has control elements and interfaces on the rear and front side.

Front view (VAR02)

Figure 3-1: Front view.

Item	Connector	Function
1	Volume Control X1	Volume Control for the headset connected to X1 HS CONTR
2	Volume Control Loudspeaker	Volume Control for internal and external loudspeaker (connected to X6 EXT SP) **Note:** It is possible to set a minimum volume on the loudspeaker. Please refer to chapter "3.8.2".
3	LED indicators	LED indication for the status of Vcc, GO, VoIP1, VoIP2, SQL, PTT
5	X1 HS CONTR	Headset
6	Loudspeaker	Internal loudspeaker

Table 6: Control elements of the R&S GB4000V (VAR02).

Front view (VAR03)

Figure 3-2: Front view.

Item	Connector	Function
1	Volume Control X1	Volume Control for the headset connected to X1 HS CONTR
2	Volume Control X2	Volume Control for the headset connected to X2 HS INSTR
3	Volume Control Loudspeaker	Volume Control for internal and external loudspeaker (connected to X6 EXT SP)
4	LED indicators	LED indication for the status of Vcc, GO, VoIP1, VoIP2, SQL, PTT
5	X1 HS CONTR	Headset Controller
6	X2 HS INSTR	Headset Instructor
7	Loudspeaker	Internal loudspeaker

Table 7: Control elements of the R&S GB4000V (VAR03).

Rear view

Figure 3-3: Rear view.

Item	Connector	Function
1	X4 LAN	Ethernet
2	X5 Audio	Audio Interface
3	X6 EXT SP	External Speaker / max. 5 W at 8 Ω
4	X7 USB	USB Device Connector (Reserved)
5	X8 DC 19..32 V	DC Power supply +19 V DC to +32 V DC
6	X3 AUX	Auxiliary Interface
7		Grounding bolt (M5)
8	SETUP	Setup button

Table 8: Connections and control elements of the R&S GB4000V.

3.3 Indication via LEDs

LED	Color	Function
Vcc	Green	Main or backup DC Power Supply is available
GO	Green	No error on the R&S GB4000V
VoIP 1	Orange/Green	VoIP connection 1 is established or in process OFF: No URI configured, refer to chapter "3.8.2". ORANGE FLASHING: No connection established to the radio associated with the configured URI, establishment of connection in progress ORANGE: No connection established to radio, radio cannot be reached, a session could not be established or a session termination is in progress GREEN: Connection established, audio unit and radio connected via VoIP
VoIP 2	Orange/Green	VoIP connection 2 is established or in process OFF: No URI configured, refer to chapter "3.8.2". ORANGE FLASHING: No connection established to the radio associated with the configured URI, establishment of connection in progress ORANGE: No connection established to radio, radio cannot be reached, a session could not be established or a session termination is in progress GREEN: Connection established, audio unit and radio connected via VoIP
SQL	Green	SQ indicator from radio, receive signal is available
PTT	Green	PTT is activated on the R&S GB4000V

Table 9: Meaning of the LED display.

3.4 Switching On and Off

The audio unit has no ON/OFF switch. The device is switched externally via the power supply.

NOTICE

Before switching off, terminate active connections and log off. Otherwise components may be damaged or data may be lost.

3.5 Headset Volume Control

The audio unit has one (VAR02) or two (VAR03) potentiometers to control the loudness of the headsets connected to X1 HS CONTR or X2 HS INSTR (VAR03 only). Please refer to chapter “3.2”.

⚠ CAUTION

Using the headsets at a high volume setting for long periods of time can cause hearing damage.

High sound pressure levels at the headphones may cause hearing damage.

In order to protect your hearing, check the volume setting carefully before putting on the headphones.

3.6 Speaker Volume Control

The audio unit has one potentiometer to control the loudness of the internal and external speaker which is connected to X6 EXT SP in parallel.

Note: A minimum volume level can be set using the Web Interface.

3.7 IP Reset and VoIP Mode via SETUP Button

To allow the IP address of the audio unit to be reset to the default factory settings and the URIs of the RX/TX radio pair to be reset without a network connection and a control PC, the unit has a setup button (SETUP) on the rear panel (see “Figure 3-3”).

1. Using a pointed object (e.g. non-metallic insulated tool), press the setup button (SETUP) for at least 5 seconds to reset the IP address of the unit as well as the URIs to their factory default values. The audio unit performs a reboot and restarts with activated VoIP mode.

Note: All other parameters are not preset to factory defaults.

Note: The connection to the configured radio set will be automatically established.

3.8 Device Configuration via Web Interface

The configuration of the audio unit is done via the remote control interface X4 LAN using the HTML based web interface.

⚠ CAUTION

Using the headsets at a high volume setting for long periods of time can cause hearing damage.

3.8.1 Factory Default Settings

The audio unit is preconfigured with the factory default settings. These settings will be activated the first time the audio unit is switched on.

All device parameters are stored in a non-volatile memory. The settings active at the time of a power failure are restored when the unit is switched back on.

The factory default settings can be changed and read out via the web interface, see chapter “3.8.2”.

Parameter	Range	Default	Restart required
IP Address	IPv4 address	192.168.52.100	YES
Subnet Mask	IPv4 address	255.255.255.0	YES
Gateway	IPv4 address	0.0.0.0	YES
Primary DNS Server	IPv4 address	0.0.0.0	YES
Secondary DNS Server	IPv4 address	0.0.0.0	YES
Location Info	Max. 20 characters	No text	NO
Installation Info	Max. 20 characters	No text	NO
Main URI RX	Max. 255 characters	rx@192.168.52.101	YES
Main URI TX	Max. 255 characters	tx@192.168.52.102	YES
Standby URI RX	Max. 255 characters	No text	YES
Standby URI TX	Max. 255 characters	No text	YES
DSCP	0 – 63	0	YES
Microphone input level	–22.5, –18, –13.5, –9, –4.5, –1.5, 0, +1.5 dB	0 dB	NO
Speaker output level	–12, –9, –6, –3, 0, +3, +6, +9 dB	0 dB	NO

Parameter	Range	Default	Restart required
Operation mode	Analog audio mode / VoIP	Analog audio mode	NO
Impedance RX	Low / High	Low	NO
Impedance TX	Low / High	Low	NO
Automatic gain control	On / Off	On	NO
Min. volume internal/external speaker	Speaker Off, Min, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50 %	5 %	NO
Min. headset volume	Off, Min, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 %	2 %	NO
External speaker volume	Off, Min, 2.5, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 %	100 %	NO
RX Audio Level	–30 to +10, integer values	0	NO
In-Band PTT	Active / Inactive	Inactive	NO
In-Band SQL	Active / Inactive	Inactive	NO
SQL Mode	On / Auto	On	NO
PTT Mode	External Audio / Controller Audio	External Audio	NO

Table 10: Possible system configuration for the R&S GB4000V in VoIP mode.

3.8.2 Device Configuration

The audio unit can be configured via the Ethernet using the integrated web server. The currently set parameters of the audio unit can be read out.

The following requirements must be met in order to set up a connection to the web server:

- A computer with a web browser application must be available
- The audio unit must be connected to Ethernet (see chapter "2.4 Cabling")
- The configuration computer and audio unit must be configured in such a way that the network address and subnet mask allow communications. The default values of the audio unit are listed in "Table 10"

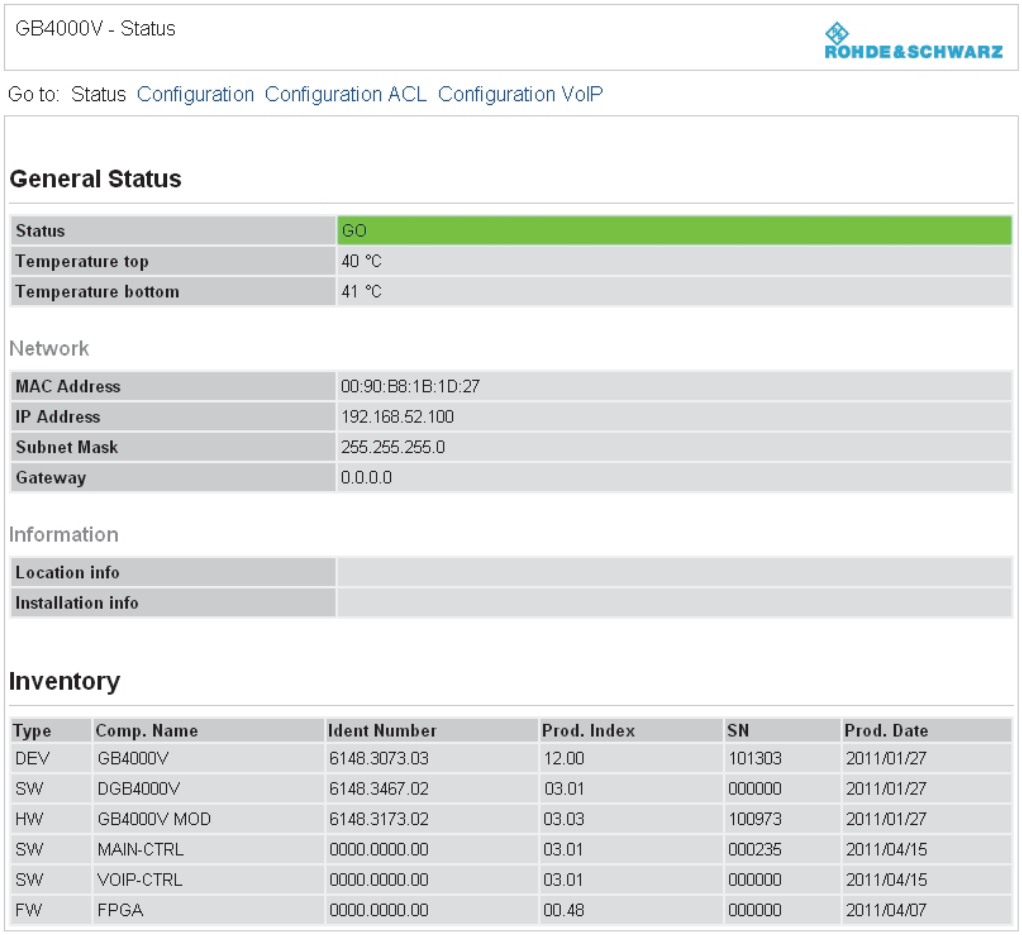
3.8.2.1 Content of the Web Interface

The web interface of the R&S GB4000V is HTTP-based. The audio unit can therefore be configured and read out using any HTTP-capable web browser.

The web interface of the audio unit consists of 4 HTTP pages:

Page name	Address	Function
status	http://<IP-address-GB4000V>/status Example: http://192.168.52.100/status	Shows the status and inventory data of the R&S GB4000V. (See "Figure 3-4")
config	http://<IP-address-GB4000V>/config Example: http://192.168.52.100/ config	Shows the configuration data of the R&S GB4000V; the displayed parameters can be configured. (See "Figure 3-5")
config_gb2pp	http://<IP-address-GB4000V>/config_gb2pp Example: http://192.168.52.100/config_gb2pp	Shows the configuration for the ACL protocol; the data can be configured. (See "Figure 3-6")
config_voip	http://<IP-address-GB4000V>/config_voip Example: http://192.168.52.100/ config_voip	Shows the configuration for VoIP mode; the data can be configured. (See "Figure 3-7")

Table 11: Description of configuration interface of the R&S GB4000V.



GB4000V - Status

ROHDE&SCHWARZ

Go to: Status Configuration Configuration ACL Configuration VoIP

General Status

Status	GO
Temperature top	40 °C
Temperature bottom	41 °C

Network

MAC Address	00:90:B8:1B:1D:27
IP Address	192.168.52.100
Subnet Mask	255.255.255.0
Gateway	0.0.0.0

Information

Location info	
Installation info	

Inventory

Type	Comp. Name	Ident Number	Prod. Index	SN	Prod. Date
DEV	GB4000V	6148.3073.03	12.00	101303	2011/01/27
SW	DGB4000V	6148.3467.02	03.01	000000	2011/01/27
HW	GB4000V MOD	6148.3173.02	03.03	100973	2011/01/27
SW	MAIN-CTRL	0000.0000.00	03.01	000235	2011/04/15
SW	VOIP-CTRL	0000.0000.00	03.01	000000	2011/04/15
FW	FPGA	0000.0000.00	00.48	000000	2011/04/07

Figure 3-4: Status page.

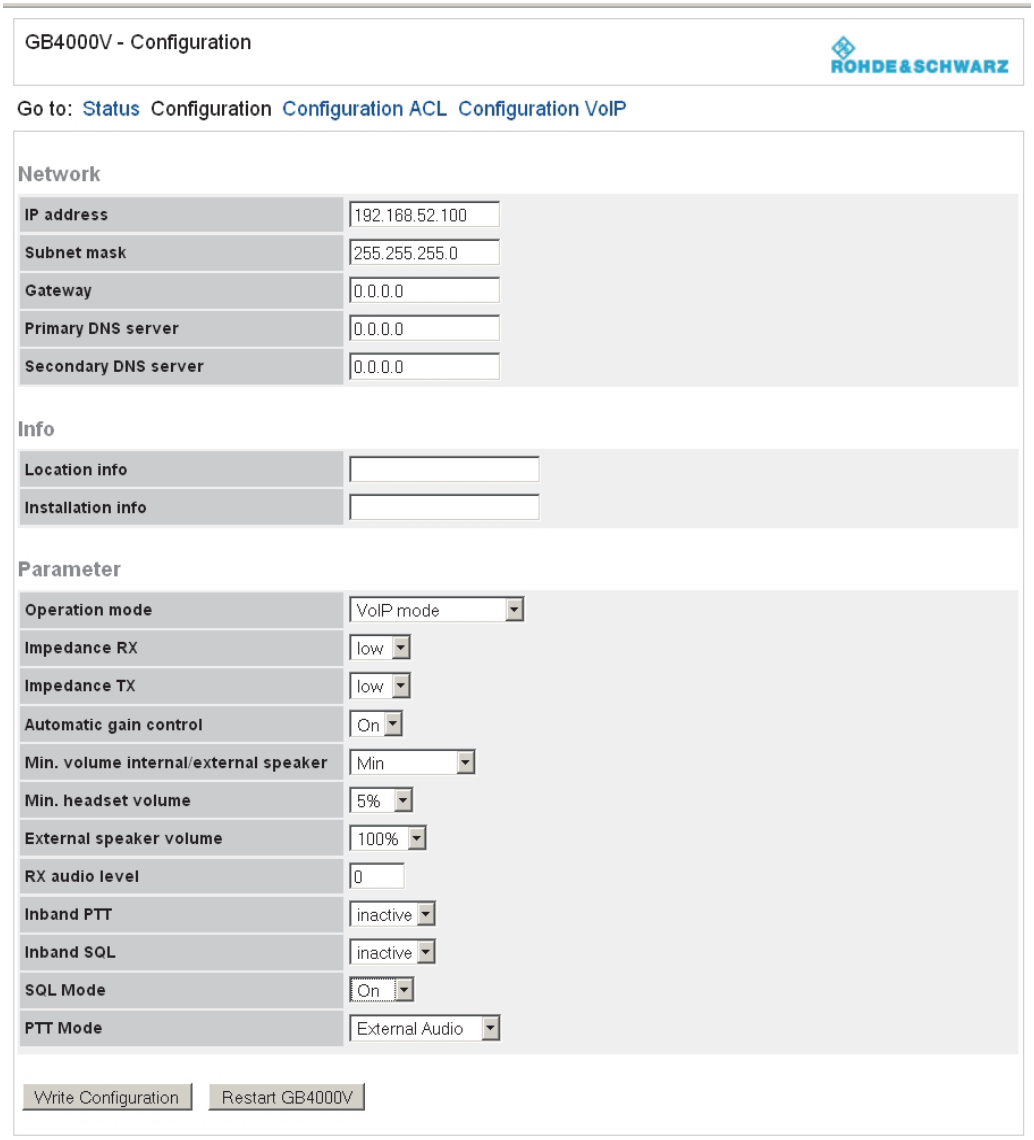


Figure 3-5: Configuration page.

Figure 3-6: Configuration GB2PP page.

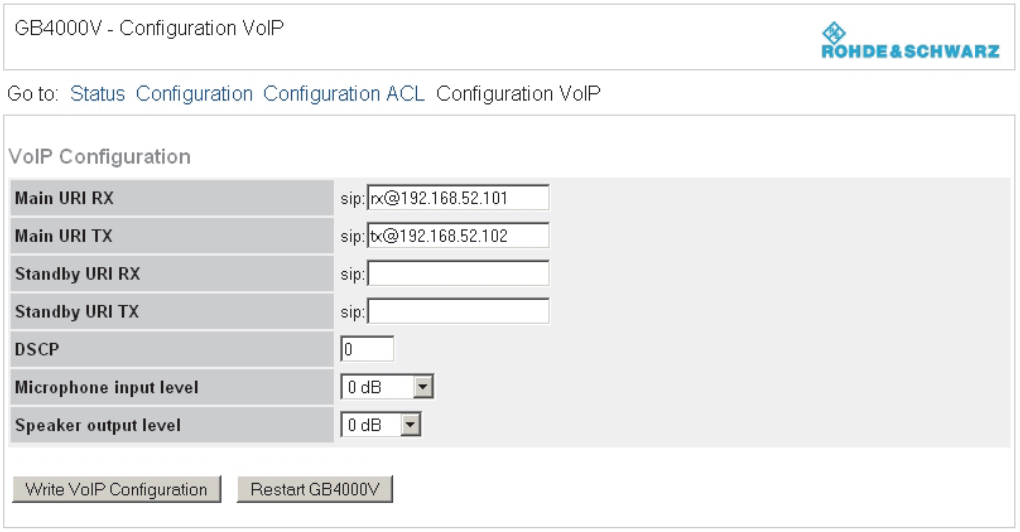


Figure 3-7: Configuration VoIP page.

3.8.2.2 Setting Up Connection to the Web Server

The section below describes how to set up a connection between the audio unit and the configuration computer:

1. Start the web browser on the configuration computer and enter the following address: “http://<IP-address-of-GB4000V>”.

Note: The IP address can be reset to the default factory setting using the SETUP button. See chapter “3.8.1” and “Table 10”.

2. The “status” web page of the web interface of the audio unit now appears in the web browser. The Status page simply shows the non-configurable data of the audio unit; refer to chapter “3.9”.
3. After successful setup of the connection, the hyperlinks Status, Configuration, Configuration GB2PP and Configuration VoIP in the top part of the web page can be used to switch between the web pages of the audio unit.
4. On “config” page, the general configuration of the R&S GB4000V can be changed. The meaning of the parameters is explained in chapter “3.8.3”; refer to “Table 12, Table 13, Table 14”.
5. On the Configuration ACL page, the ACL of the R&S GB4000V can be configured. The meaning of the parameters is explained in chapter “3.8.3”; refer to “Table 15”.
6. On “config-voip” page, the VoIP configuration of the R&S GB4000V can be configured. The meaning of the parameters is explained in chapter “3.8.3”; refer to “Table 16”.
7. After a parameter has been changed via the web interface, click at the “Write Configuration” button so that the changes are saved in the non-volatile memory. The changes are activated only after the audio unit is restarted. A restart can be activated by clicking the Restart GB4000V button. If a parameter is changed and the new parameter setting becomes active after the restart, a restart prompt message is displayed in the web interface. After the restart, the web browser reconnects automatically to the Status page of the R&S GB4000V.

3.8.3 Meaning of Parameters

3.8.3.1 Website Configuration

Network

Parameter	Description
IP Address	An IP address must be assigned to the network device which allows each Device to be uniquely identified and operated in configuration and *VoIP mode*. Additionally, specifying the netmask and gateway makes it possible to work within different subnets via a router.
Subnet Mask	The subnet mask is used to divide an IPv4-based network into various subnets.
Gateway	A gateway can be entered here (e.g. a router). A gateway allows the audio unit to communicate with other networks.
Primary DNS Server	IP address of the primary domain name server.
Secondary DNS Server	IP address of the secondary domain name server.

Table 12: Meaning of settings of the Network group.

Info

Parameter	Description
Location Info	Information (up to 20 characters) can be entered to describe the location of the R&S GB4000V.
Installation Info	Information (up to 20 characters) can be entered to describe the R&S GB4000V installation more precisely.

Table 13: Meaning of settings of the Info group.

Parameter

Parameter	Description
Operation mode	This parameter is used to switch between the *analog audio mode* and *VoIP mode* of the audio unit.
Impedance RX	The audio interface between an R&S RX module and the R&S GB4000V is based on a 600 Ohm system with galvanic isolation. The impedance can be switched to high or low impedance.
Impedance TX	The audio interface between an R&S TX module and the R&S GB4000V is based on a 600 Ohm system with galvanic isolation. The impedance can be switched to high or low impedance.
Automatic gain control	This parameter is used to enable or disable the automatic gain control.
Min. volume internal/external speaker	This parameter is used to set the minimum volume for the loudspeakers.
Min. headset volume	This parameter is used to set the minimum volume for the headsets.

Parameter	Description
External speaker volume	This parameter sets the volume of the external speaker in ratio of the internal speaker.
RX audio level	This parameter is used to set the level of the audio line.
Inband PTT	The parameter is used to enable/disable the PTT in-band signaling to the radio.
Inband SQL	The parameter is used to enable/disable the SQ in-band signaling from the radio.
SQL Mode	The parameter is used to setup the squelch mode. When the parameter is set to “Auto”, the speaker and headset are muted when no squelch signal is present. Set the parameter to “On” to activate the speakers continuously.
PTT Mode	The parameter is used for the PTT signal configuration. In “External Audio” mode all PTT sources are activated. The external PTT shall be used to enable the controller microphone.

Table 14: Meaning of settings of the Parameter group.

3.8.3.2 Website Configuration GB2PP

ACL

Parameter	Description
Allowed IP Address	This configuration is used to set the access control list of the R&S GB4000V. The ACL is only applicable if the R&S GB4000V is used with the control unit R&S GB4000T. If the ACL is configured, only the R&S GB4000T having an IP address contained in the ACL is allowed to connect to the R&S GB4000V. If no IP address is entered in this list, any unit can connect to the R&S GB4000V.

Table 15: Meaning of settings of the ACL group.

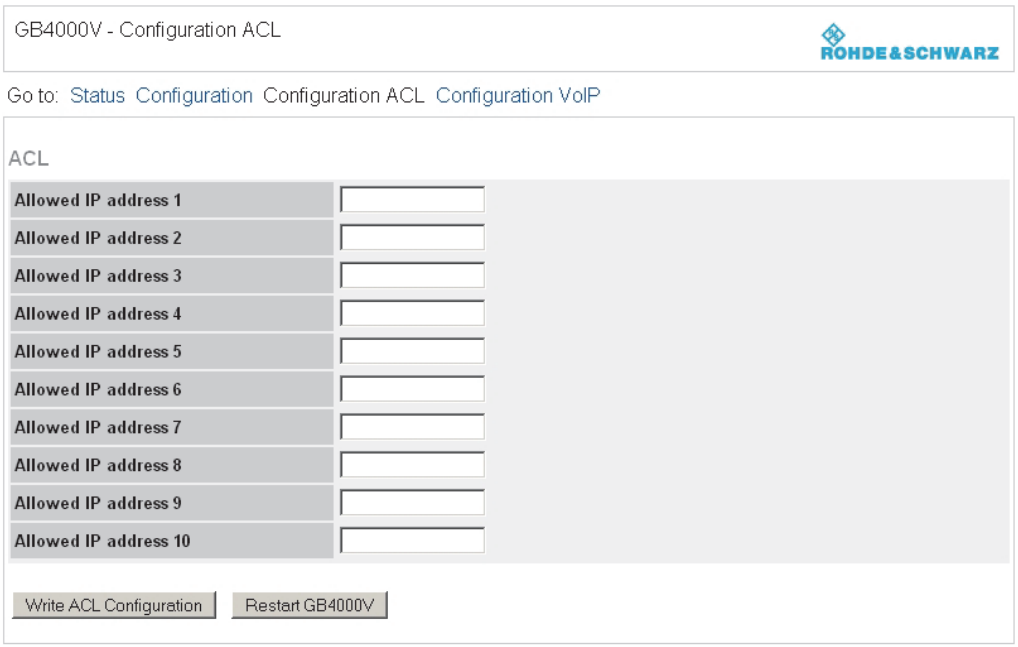


Figure 3-8: Configuration ACL page.

3.8.3.3 Website Configuration VoIP

VoIP Configuration

Parameter	Description
Main URI RX	This entry is the URI of the radio receiver with which the audio unit is to be connected after the startup if the *VoIP mode* is activated.
Main URI TX	This entry is the URI of the radio transmitter with which the audio unit is to be connected after the startup if the *VoIP mode* is activated.
Standby URI RX	Reserved for further use
Standby URI TX	Reserved for further use
DSCP	Diffserv is a quality of service method (refer to RFC 2474) which is used in VoIP mode for ATM. The configured DSCP value will be included in each VoIP packet that will be send by the R&S GB4000V. This value will be used during the network transfer to prioritise the VoIP packets.
Microphone input level	The parameter is used to adjust the microphone input level in VoIP mode.
Speaker output level	The parameter is used to adjust the speaker output level in VoIP mode.

Table 16: Meaning of settings of the VoIP Configuration group.

3.9 Device Status

The status of the R&S GB4000V can be evaluated not only using the LEDs on the front panel of the R&S GB4000V but also using the web interface. For this purpose, a connection to the web interface must be set up in the way described in chapter "3.8.2.2". The following information can be read out on the Status page of the R&S GB4000V:

General status

Parameter	Description
Status	GO: The unit is ready for operation. NOGO: A system fault has occurred.
Temperature top	Temperature on the top side of the R&S GB4000V hardware
Temperature bottom	Temperature on the bottom side of the R&S GB4000V hardware

Table 17: Meaning of information of General Status group.

Network

Parameter	Description
MAC Address	MAC address of the R&S GB4000V. This parameter is set for the R&S GB4000V during production. The MAC address is used for unambiguous identification in the network.
IP Address	Set IP address of the R&S GB4000V.
Subnet Mask	Set Subnet mask of the R&S GB4000V. It can be configured via the web interface.
Gateway	Set Gateway of the R&S GB4000V. It can be configured via the web interface.

Table 18: Meaning of information of Network group.

Information

Parameter	Description
Location Info	Set Location info. It can be configured via the web interface.
Installation Info	Set Installation info. It can be configured via the web interface.

Table 19: Meaning of information of Information group.

Inventory

The module data of the R&S GB4000V is listed here. This data is used to identify the various components of the R&S GB4000V and firmware version.

3.10 Operation Modes

The R&S GB4000V can be operated in two different modes. In *analog audio mode*, the audio and signaling data is transferred to the radio via the analog interface (Audio Interface – X5 AUDIO). In *VoIP mode*, audio and status data is transferred to the connected radio (RX/TX) via the LAN interface (Ethernet – LAN Remote Control X4 LAN) in accordance with ED-137[1]. The two modes only differ with regard to their installation and configuration. Operation is identical in both modes, with the exception of the VoIP LEDs which indicate the status of the VoIP connection. See chapter “3.3”.

3.10.1 Analog Audio Mode

In *analog audio mode*, the analog audio interfaces of the R&S GB4000V and the radio are used.

3.10.1.1 Cabling in the Analog Audio Mode

Instructions

1. Connect the TX and RX audio signals, the PTT and SQ signals with the radio set (RX/TX). For details on connector design and pin out refer to Appendix “A Technical Information”.
2. Set the PTT mode of the radio to “R&S standard”.

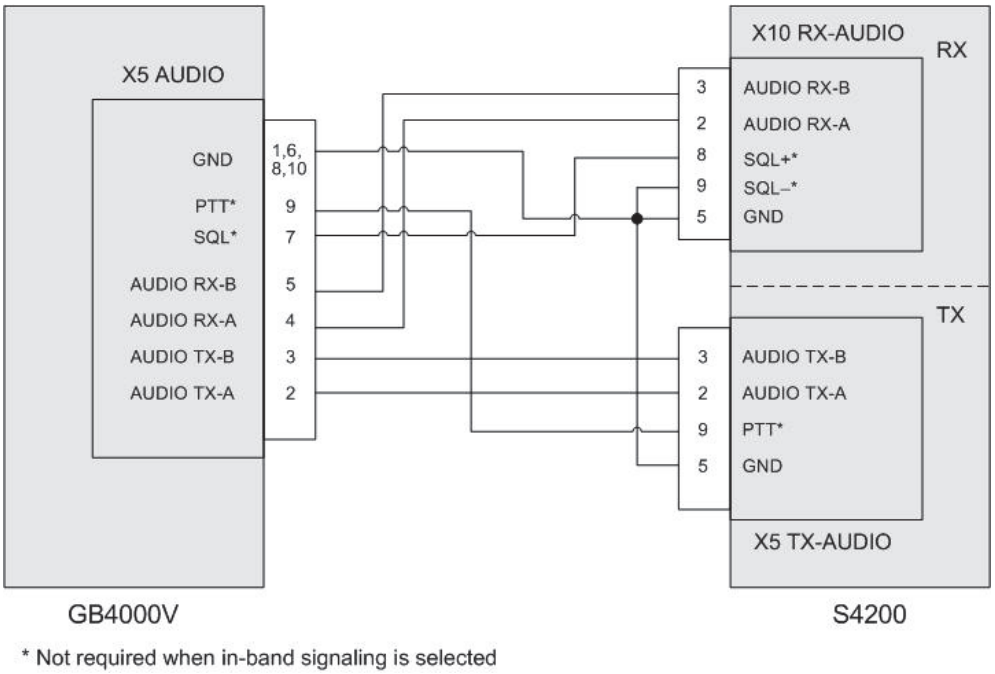


Figure 3-9: Connector pin assignment of the R&S GB4000V analog connector cable.

3.10.1.2 Operation in the Analog Audio Mode

After the settings required for *analog audio mode* have been made, the R&S GB4000V audio unit starts when voltage is applied to the connector X8 (see chapter "2.4") in the *analog mode*. The audio unit is ready for operation as soon as the *GO* LED on the front panel of the R&S GB4000V lights up. The two LEDs *VoIP1* and *VoIP2* have no meaning in this mode. The R&S GB4000V can be operated after a suitable headset has been connected to it. Details about the pin assignment of the headset can be found in Appendix "A Technical Information". The two LEDs *PTT* and *SQL* indicate the status of the connected radio. Illumination of the *PTT* LED indicates that audio signals are being sent to the connected radio. This occurs as soon as the *PTT* button of the headset is pressed. Illumination of the *SQL* LED means that the radio is receiving audio signals. In this case, the signals received at the antenna of the radio exceed the SQL level set there and the radio places the demodulated audio signals on the RX line. These signals are output on the headset/loudspeaker by the R&S GB4000V.

NOTICE

To avoid acoustic feedback the internal speaker is muted while PTT of the headsets or the microphone is keyed.

NOTICE

For proper operation the audio levels of the R&S GB4000V has to be adapted to the audio levels of the radio (see chapter "3.8.3.1").

3.10.2 VoIP Mode

In *VoIP mode* the LAN interfaces of the R&S GB4000V and the radio set (RX/TX) are used.

3.10.2.1 Introduction/Overview

In *VoIP mode*, an SIP/RTP connection to the transmitter and receiver module is set up. The VoIP connection is set up automatically after the R&S GB4000V is started. The connection status is indicated by the LEDs *VoIP1* and *VoIP2*; refer to chapter "3.3".

3.10.2.2 Cabling in the VoIP Mode

Instructions

1. Connect the Ethernet LAN interfaces of the audio unit and the radio sets (RX/TX).

Note: The VoIP connection is only established if an SIP/RTP session to both receiver and transmitter has been successfully configured.

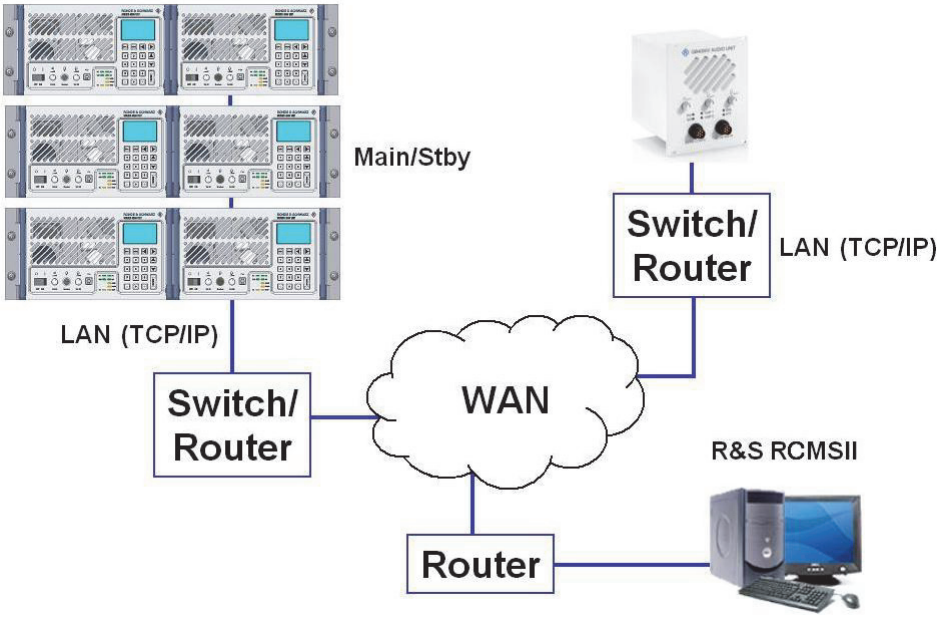


Figure 3-10: Network structure of the R&S GB4000V in VoIP mode

3.10.2.3 Operation in the VoIP Mode

After the settings required for *VoIP mode* have been made, the R&S GB4000V audio unit starts when voltage is applied to the connector X8 (see chapter "2.4") in *VoIP mode*. The audio unit is ready for operation as soon as the *GO* LED on the front panel of the R&S GB4000V lights up. The LEDs on the front panel indicate the status of the VoIP connection. A more detailed description of the LEDs can be found in chapter "3.3". The R&S GB4000V can be operated after a suitable headset has been connected to it. Details about the pin assignment of the headset can be found in Appendix "A Technical Information". The two LEDs *PTT* and *SQL* indicate the status of the connected radio. Illumination of the *PTT* LED means that audio signals are being sent to the connected radio. This occurs as soon as the PTT button of the headset is pressed. Illumination of the *SQL* LED means that the radio is receiving audio signals. In this case, the signals received at the antenna of the radio exceed the SQL level set there and the radio sends the audio data to the R&S GB4000V via the Ethernet. This data is output on the headset/speaker by the R&S GB4000V.

NOTICE

To avoid acoustic feedback the internal speaker is muted while PTT of the headsets is keyed.

3.10.3 PTT Configuration

The effect of different PTT sources is configurable via the web front-end.

Controller audio mode

The state of the instructor microphone in relation to the three possible PTT sources is shown below. The state of the controller microphone and external microphone is given in two independent tables.

		Instr. PTT = 0	**Instr. PTT = 1**
Ctrl. PTT = 0	Ext. PTT = 0	Microphone Off	Microphone On
Ctrl. PTT = 0	Ext. PTT = 1	Microphone Off	Microphone On
Ctrl. PTT = 1	Ext. PTT = 0	Microphone Off	Microphone On
Ctrl. PTT = 1	Ext. PTT = 1	Microphone Off	Microphone On

Table 20: Instructor microphone logic for the PTT instructor.

The state of the controller microphone in relation to the three possible PTT sources is shown below. The state of the instructor microphone and external microphone is given in two independent tables.

		Ctrl. PTT = 0	**Ctrl. PTT = 1**
Instr. PTT = 0	Ext. PTT = 0	Microphone Off	Microphone On
Instr. PTT = 0	Ext. PTT = 1	Microphone On	Microphone On
Instr. PTT = 1	Ext. PTT = 0	Microphone Off	Microphone Off
Instr. PTT = 1	Ext. PTT = 1	Microphone Off	Microphone Off

Table 21: Controller microphone logic for the PTT controller.

The state of the external microphone in relation to the three possible PTT sources is shown below. The state of the instructor microphone and controller microphone is given in two independent tables.

		Ext. PTT = 0	**Ext. PTT = 1**
Instr. PTT = 0	Ctrl. PTT = 0	Microphone Off	Microphone Off
Instr. PTT = 0	Ctrl. PTT = 1	Microphone Off	Microphone Off
Instr. PTT = 1	Ctrl. PTT = 0	Microphone Off	Microphone Off
Instr. PTT = 1	Ctrl. PTT = 1	Microphone Off	Microphone Off

Table 22: Controller microphone logic for the external PTT.

External audio mode

The state of the instructor microphone in relation to the three possible PTT sources is shown below. The state of the controller microphone and external microphone is given in two independent tables.

		Instr. PTT = 0	Instr. PTT = 1
Ctrl. PTT = 0	Ext. PTT = 0	Microphone Off	Microphone On
Ctrl. PTT = 0	Ext. PTT = 1	Microphone Off	Microphone On
Ctrl. PTT = 1	Ext. PTT = 0	Microphone Off	Microphone On
Ctrl. PTT = 1	Ext. PTT = 1	Microphone Off	Microphone On

Table 23: Instructor microphone logic for the PTT instructor.

The state of the controller microphone in relation to the three possible PTT sources is shown below. The state of the instructor microphone and external microphone is given in two independent tables.

		Ctrl. PTT = 0	Ctrl. PTT = 1
Instr. PTT = 0	Ext. PTT = 0	Microphone Off	Microphone On
Instr. PTT = 0	Ext. PTT = 1	Microphone Off	Microphone On
Instr. PTT = 1	Ext. PTT = 0	Microphone Off	Microphone Off
Instr. PTT = 1	Ext. PTT = 1	Microphone Off	Microphone Off

Table 24: Controller microphone logic for the PTT controller.

The state of the external microphone in relation to the three possible PTT sources is shown below. The state of the instructor microphone and controller microphone is given in two independent tables.

		Ext. PTT = 0	Ext. PTT = 1
Instr. PTT = 0	Ctrl. PTT = 0	Microphone Off	Microphone On
Instr. PTT = 0	Ctrl. PTT = 1	Microphone Off	Microphone Off
Instr. PTT = 1	Ctrl. PTT = 0	Microphone Off	Microphone Off
Instr. PTT = 1	Ctrl. PTT = 1	Microphone Off	Microphone Off

Table 25: Controller microphone logic for the external PTT.

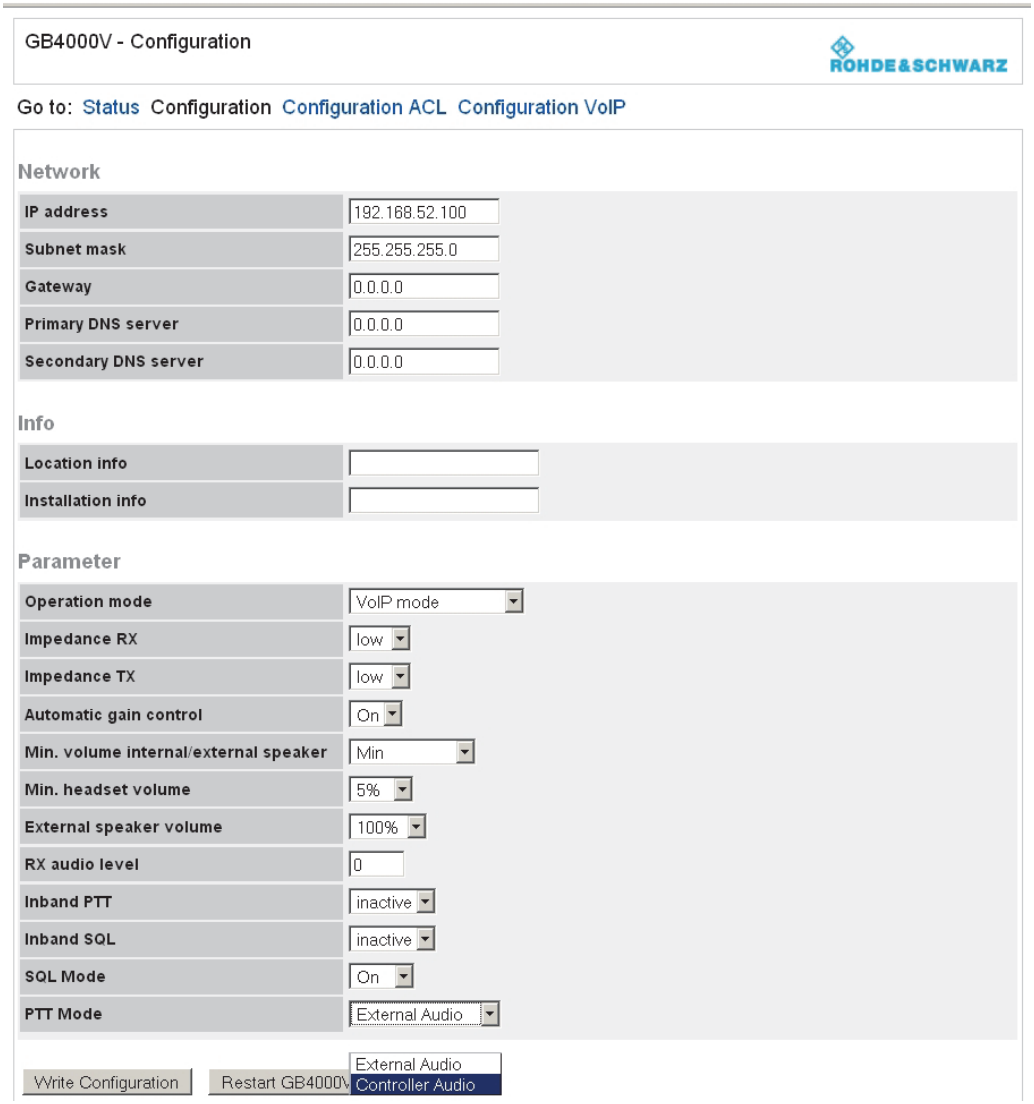


Figure 3-11: Configuration PTT page.

4 Malfunction

4.1 Visual Inspection

1. Check external cabling between the R&S GB4000V and external equipment.
2. Check all connectors for good contact and the cables at the rear for mechanical damage. If necessary, replace cables by new ones, one at a time, until the defective connection has been found.

4.2 Other Troubleshooting Measures

Error	Possible Cause	Remedy
No function	No connection of power supply	Check if cable connection is correct. Check polarity of pinning.
R&S GB4000V does not boot.	Electronics is defective.	Please contact your supplier for service.
Vcc LED does not light even if main or back up supply voltage is present.	Electronics is defective.	Please contact your supplier for service.
GO LED does not light.	Electronics is defective.	Please contact your supplier for service.
No Ethernet connection is established.	Cable connection failure Failure in IP configuration	Check if cable connection is correct. Check polarity of pinning. Check if the IP addresses configured do fit to your radio and network settings.
The radio does not send any audio signals in analog mode.	The cable connection is defective. The headset is defective. The configuration is incorrect. The radio is not tuned correctly.	Check the cable connection and the assignment of the cable. Replace the headset. Check whether the analog mode is activated. Check whether the frequency of the in-band PTT on the radio is set to 2040 Hz.
The audio unit is not receiving any signal from the radio although the radio indicates a squelch signal.	The cable connection is defective. The radio is not tuned correctly.	Check the cable connection and the assignment of the cable. Check whether the frequency of the in-band squelch on the radio is set to 2440 Hz.
No VoIP connection can be set up.	The cable connection is defective. The radio is not switched on. The URI configuration is	Check the cable connection. Check whether the radio is switched on and is in VoIP mode. Check the URI configuration.

Error	Possible Cause	Remedy
	incorrect. The network settings are incorrect.	Check whether the network settings of the R&S GB4000V match the settings of the radio.
A VoIP connection is active, but no audio signals are audible on speakers or headsets.	Loudness of speakers or headsets is set up to “low”. The URIs for TX and RX module are interchanged.	Increase the volume of the speakers or headsets. Check the URI configuration of the audio unit.
Although a connection to the radio is active no audio signals are audible on speakers or headsets.	Volume of the speakers or headsets is set to “low”.	Increase the volume of the speakers or headsets.
No audio signals are audible on speakers but on headsets.	Volume of the speakers is set to “low”. To avoid acoustic feedback the internal loudspeaker is muted while the PTT of the headset is keyed.	Increase the volume of the speakers. Check if PTT is keyed.
The audio signals have a high volume and cannot be decreased.	The minimal loudness is set to “high”.	Check the setting of the minimal loudness via the Web Interface.

Table 26: Troubleshooting.

5 Maintenance

5.1 Cleaning

The front side of the R&S GB4000V can be cleaned with a lint-free moistened cloth.

In order to avoid damage to the front panel please note that:

- No high pressure cleaners and steam jet shall be used
- No corrosive cleaning agents, no dilution, no scrubbing means or hard objects shall be used for cleaning
- No excessive contact pressure shall be applied during cleaning

6 Appendix

A Technical Information

A.1 Connector Specifications

Headset Controller X1 HS CONTR

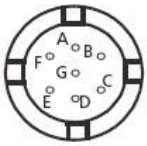


Figure 6-1: Headset Controller X1, recessed socket, 7-way, NF7.

Column D (Direction):	**O** = Output	**I** = Input	**B** = Bidirectional
Column T (Type):	**A** = Analog	**D** = Digital	**P** = Power
Column TI (Test Instructions):	**P** = Test Value	**T** = Trimming Value	**D** = Type Test Value
	E = Setting Value		

Signal Description	D	T	Range	TI	Contact	Remarks
Headphone	O	A	Max. 2 V / 200 Ohm (300 Hz to 3.4 kHz) S/N > 60 dB K < 0.5 %	D	X1.A	Headphone
GND	B	A	Ground	P	X1.B	
D_MIC_INPUT	I	A	1 mV ±20 dB Input impedance 200 Ohm (300 Hz to 3.4 kHz) Automatic level controlled (ALC)		X1.C	Dynamic microphone
GND	B	A	Ground	P	X1.D	
V_MIC_INPUT	I	A	100 mV ±20 dB Input impedance 330 Ohm (300 Hz to 3.4 kHz) 8 V DC ±10 % Automatic level controlled (ALC)	–	X1.E	
/PTT_IN	I	D	Low = PTT ON TTL	P	X1.F	Push-To-Talk input, Contact against GND = transmit
GND	B	A	Ground	P	X1.G	

Headset Instructor X2 HS INSTR (VAR03)

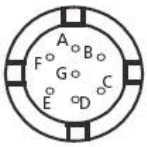


Figure 6-2: Headset Instructor X2, recessed socket, 7-way, NF7.

Column D (Direction):	**O** = Output	**I** = Input	**B** = Bidirectional
Column T (Type):	**A** = Analog	**D** = Digital	**P** = Power
Column TI (Test Instructions):	**P** = Test Value	**T** = Trimming Value	**D** = Type Test Value
	E = Setting Value		

Signal Description	D	T	Range	TI	Contact	Remarks
Headphone	O	A	Max. 2 V / 200 Ohm (300 Hz to 3.4 kHz) S/N > 60 dB K < 0.5 %	D	X2.A	Headphone
GND	B	A	Ground	P	X2.B	
D_MIC_INPUT	I	A	1 mV ±20 dB Input impedance 200 Ohm (300 Hz to 3.4 kHz) Automatic level controlled (ALC)		X2.C	Dynamic microphone
GND	B	A	Ground	P	X2.D	
V_MIC_INPUT	I	A	100 mV ±20 dB Input impedance 330 Ohm (300 Hz to 3.4 kHz) 8 V DC ± 10 % Automatic level controlled (ALC)	–	X2.E	
/PTT_IN	I	D	Low = PTT ON TTL	P	X2.F	Push-To-Talk input, Contact against GND = transmit
GND	B	A	Ground	–	X2.G	

Auxiliary Interface X3 AUX

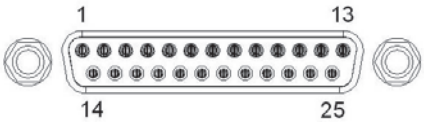


Figure 6-3: Audio interface X3, DSUB female (25pins).

Column D (Direction):	**O** = Output	**I** = Input	**B** = Bidirectional
Column T (Type):	**A** = Analog	**D** = Digital	**P** = Power
Column TI (Test Instructions):	**P** = Test Value	**T** = Trimming Value	**D** = Type Test Value
	E = Setting Value		

Signal Description	D	T	Range	TI	Contact	Remarks
PTT_RADIO	O	P	Contact against GND = PTT I sink = 3 to 4 mA Output: Low = GND	P	X3.1	Push-To-Talk output, Contact against GND = transmit
PTT_EXT	O	D	Contact against GND = PTT I sink = 3 to 4 mA	P	X3.2	Push-To-Talk output, Contact against GND = transmit
SQL_RADIO_RECORDER	O	D	TTL Low: Signal on Radio above SQ threshold High: No RX signal (max. input current 0.2 A)	P	X3.3	Radio Squelch forwarded to the recorder
GND	B	A	Ground	P	X3.4	
D_MIC_INPUT_EXT_MIC	I	A	1 mV ±20 dB Input impedance 200 Ohm (300 Hz to 3.4 kHz) Automatic level controlled (ALC)	P	X3.5	Dynamic microphone
GND	B	A	Ground	P	X3.6	
V_MIC_INPUT_EXT_MIC	I	A	100 mV ±20 dB Input impedance 330 Ohm (300 Hz to 3.4 kHz) 8 V DC ± 10 % Automatic level controlled (ALC)	P	X3.7	Electret microphone
/PTT_IN_EXT_MIC	I	D	Low = PTT ON TTL	P	X3.8	Push-To-Talk input, Contact against GND = transmit

Column D (Direction): **O** = Output **I** = Input **B** = Bidirectional
Column T (Type): **A** = Analog **D** = Digital **P** = Power
Column TI (Test Instructions): **P** = Test Value **T** = Trimming Value **D** = Type Test Value **E** = Setting Value

Signal Description	D	T	Range	TI	Contact	Remarks
GND	B	A	Ground	P	X3.9	
RECORDER_OUT_A	O	A	0 dBm +1/–2 dB 600 Ohm ±15 % 300 Hz to 3.4 kHz	P	X3.10	Output to external voice recorder
RECORDER_OUT_B	O	A		P	X3.11	
PTT_RECORDER	O	D	Low = PTT ON TTL	P	X3.12	Push-To-Talk output, Contact against GND = transmit
AF_RX_Line_OUT_A	O	A	0 dBm +1/–2 dB 600 Ohm ±15 % 300 Hz to 3.4 kHz	P	X3.13	Output to external device
AF_RX_Line_OUT_B	O	A			X3.14	
CARR_IN	I	A	Carrier Input		X3.15	
GND	B	A	Ground		X3.16	
User_IO_1	B	D	3.3 V TTL		X3.17	Reserved – do not use
User_IO_2	B	D	3.3 V TTL		X3.18	Reserved – do not use
User_IO_3	B	D	3.3 V TTL		X3.19	Reserved – do not use
Voltage Summation Test Point	O	P	0 – 5 V		X3.20	Reserved – do not use
3.3 Voltage Test Point	O	P	3.3 V		X3.21	Reserved – do not use
JTAG_EN_TMS	I	D			X3.22	Reserved – do not use
JTAG_EN_TCK	I	D			X3.23	Reserved – do not use
JTAG_EN_TDI	I	D			X3.24	Reserved – do not use
JTAG_EN_TDO	O	D			X3.25	Reserved – do not use

Ethernet – LAN Remote Control X4 LAN

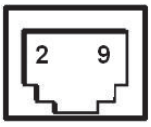


Figure 6-4: Ethernet – LAN remote control X4, RJ-45 (8 pins) MDI connector.

Column D (Direction):	**O** = Output		**I** = Input		**B** = Bidirectional	
Column T (Type):	**A** = Analog		**D** = Digital		**P** = Power	
Column TI (Test Instructions):	**P** = Test Value		**T** = Trimming Value		**D** = Type Test Value	
	E = Setting Value					
Signal Description	**D**	**T**	**Range**	**TI**	**Contact**	**Remarks**
ETH_TX+	O	D	Acc. to 100 Base TX	P	X4.2	
ETH_TX–	O	D	Acc. to 100 Base TX	P	X4.3	
ETH_RX+	I	D	Acc. to 100 Base TX	P	X4.4	
ETH_Common	–	–	Matched to 75 Ohm	P	X4.5	
ETH_Common	–	–	Matched to 75 Ohm	P	X4.6	
ETH_RX–	I	D	Acc. to 100 Base TX	P	X4.7	
ETH_Common	–	–	Matched to 75 Ohm	P	X4.8	
ETH_Common	–	–	Matched to 75 Ohm	P	X4.9	

Audio Interface X5 AUDIO

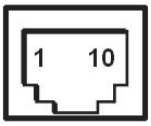


Figure 6-5: Audio interface X5, RJ-48 (10 pins).

Column D (Direction):	**O** = Output	**I** = Input	**B** = Bidirectional
Column T (Type):	**A** = Analog	**D** = Digital	**P** = Power
Column TI (Test Instructions):	**P** = Test Value	**T** = Trimming Value	**D** = Type Test Value
	E = Setting Value		

Signal Description	D	T	Range	TI	Contact	Remarks
GND	B	P	Ground	P	X5.1	
AUDIO_TX_A	O	A	Nominal 0 dBm +1/–2 dB 300 Hz to 3.4 kHz	P	X5.2	Audio Transformer min. 500V Isolation to GND
AUDIO_TX_B	O	A	Configurable: 600 Ohm (high) 60 Ohm (low)	P	X5.3	
AUDIO_RX_A	I	A	Nominal 0 dBm +1/–2 dB into 600 Ω	P	X5.4	Audio Transformer min. 500 V Isolation to GND
AUDIO_RX_B	I	A	–30 to +10 dBm at 600 Ohm, settable via SW 300 Hz to 3.4 kHz Configurable: 600 Ohm (high) 10 Kilohm (low)	P	X5.5	
GND	B	P	Ground	P	X5.6	
SQ	I	D	Closed = RX Signal Level above SQ–threshold Open = No RX Signal Max. 0.2 A	P	X5.7	
GND	B	P	Ground	P	X5.8	
PTT_RADIO	O	D	Contact against GND = PTT I sink = 3 to 4 mA Output: Low = GND	P	X5.9	Push-To-Talk output, Contact against GND = transmit
GND	B	P	Ground	P	5.10	

External Speaker X6 EXT SP

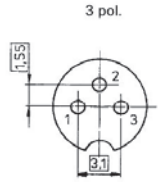


Figure 6-6: External speaker X6, 3-way female connector.

Column D (Direction):	**O** = Output	**I** = Input	**B** = Bidirectional
Column T (Type):	**A** = Analog	**D** = Digital	**P** = Power
Column TI (Test Instructions):	**P** = Test Value	**T** = Trimming Value	**D** = Type Test Value
	E = Setting Value		

Signal Description	D	T	Range	TI	Contact	Remarks
LOUDSPEAKER+	O	A	Max. 5 W / 8 Ohm 300 Hz to 3.4 kHz	P	X6.1	
NC	–	–		–	X6.2	
LOUDSPEAKER–	B	A	Ground	P	X6.3	

USB Device Connector X7 USB (Reserved – Do not use.)

Figure 6-7: USB X7, USB-B-S-S-B-TH (4 pins).

Column D (Direction):	**O** = Output	**I** = Input	**B** = Bidirectional
Column T (Type):	**A** = Analog	**D** = Digital	**P** = Power
Column TI (Test Instructions):	**P** = Test Value	**T** = Trimming Value	**D** = Type Test Value
	E = Setting Value		

Signal Description	D	T	Range	TI	Contact	Remarks
USB_PWR	I	P	+5 V	P	X7.1	
USB–	B	D	According to USB specification 2.0	P	X7.2	USB data minus
USB+	B	D	According to USB specification 2.0	P	X7.3	USB data plus
GND	I	P	Ground	P	X7.4	

Power Connector X8 DC 19 .. 32V

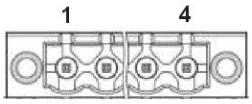


Figure 6-8: Power connector X8.

Column D (Direction): **O** = Output **I** = Input **B** = Bidirectional
Column T (Type): **A** = Analog **D** = Digital **P** = Power
Column TI (Test Instructions): **P** = Test Value **T** = Trimming Value **D** = Type Test Value **E** = Setting Value

Signal Description	D	T	Range	TI	Contact	Remarks
+28 V Main	I	P	+19 to +32 V max. 1 A	P	X8.1	DC-Supply Main
GND	I	P	Ground	P	X8.2	
+28 V Backup	I	P	+19 to +32 V max. 1 A	P	X8.3	DC-Supply Backup
GND	I	P	Ground	P	X8.4	

B Drawings

C References

[1] ED-137_Part 1.doc, Final Draft 1.2, December 2008

[2] https://tools.ietf.org/html/rfc3261, April 2010

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