Application Handbook

Application Handbook - English

Contents

1. General Information

1.1. Copyright & Acknowledgment

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Bittner Audio reserves specification privileges Information in this manual is subject to change without notice.

Congratulations and thank you for buying Bittner Audio.

1.2. Disclaimer

In no case shall Bittner Audio be liable for any special, incidental, or consequential damages to loudspeakers, amplifiers, or other equipment if such damages are based upon negligence during installation or operation. Such damages include, but are not limited to, loss of profits or any other loss of property of the purchaser. In case the contractual liability of Bittner Audio is excluded or limited, this also applies to the personal liability of employees, representatives, assistants and other auxiliary persons.

Should any part of the equipment show defects in materials and workmanship, including transport damage, the customer is asked to complain to Bittner Audio. Failure of complaint, however, has no consequences for your legal claims.

Bittner Audio points out that all specifications may be subject to change without notice and that liability for incorrect, incomplete or outdated information is excluded. This warranty does not affect your statutory rights.

⚠ International: Please contact your supplier for specific regional information, as rights and disclaimers may vary from country to country.

1.3. Safety Instructions

⚠ CAUTION!

To reduce the risk of electrical shock, do not remove the cover. There are no user serviceable parts inside, refer all servicing to qualified personnel. Replace fuses only with same type. Avoid damaging the AC plug or cord. Damage may potentially cause a shock hazard. The unit should only be connected to an AC power supply of the correct voltage.

Never isolate the ground of the AC power cord (the non-fused earthed protective conductor) to eliminate hum-problems.

To reduce the risk of fire or electrical shock, do not expose this appliance to rain or moisture and don't use it in damp areas or near water.

The unit must be adapted slowly to extreme temperature changes. These extreme changes can cause inside moisture development that can cause failure and /or electrical shock.

The power fuses are located on the back panel of the amplifier and may be accessed from the outside. Use only the appropriate fuses as labeled.

Though all Bittner Audio devices are quite simple to operate and are covered by a solid steel chassis, improper use may be dangerous. Some of the units can put out very high voltages and a sizable current at frequencies up to 30 kHz.

Always use safe operating techniques! Incompetent and improper servicing will void the warranty.

1.4.   Declaration of Conformity

Bittner Audio hereby declares that this product is in accordance with the following standards:

- Low Voltage Directive 73/23/EEC, last amended by 93/68/EEC
- EMC Directive 89/336/EEC, amended by 92/31/EEC and 93/68/EEC
- EN 60065: 2002
- EN 55013: 2001 + A1: 2003 + A2: 2006
- EN 55020: 2002 + A1: 2003 + A2: 2005
- EN 61000-3-2: 2006
- EN 61000-3-3: 1995 + A1: 2001 + A2: 2006
- EN 55103-1: 1996
- EN 55103-2: 1996

1.5.   European Directives

Bittner Audio also declares that this product is in compliance with the requirements of the European Directives 2002/96/EC (WEEE) and 2002/95/EC (RoHS).

The primary aim of the WEEE Directive and RoHS Directive is to reduce the impact of disposal of electrical and electronic equipment at end-of-life. The WEEE Directive aims to reduce the amount of WEEE sent for disposal to landfill or incineration by requiring producers to arrange for collection and recycling. The RoHS Directive bans the use of certain heavy metals and brominates flame retardants to reduce the environmental impact.

1.6.   Warranty Terms & Conditions

Bittner Audio warrants this product to be free from defects in materials and workmanship.

Should any part of this equipment be defective, the Manufacturer agrees to repair or replace any defective part free of charge (except transportation charges) for a period of three years from the date of the original purchase.

Warranty service is effective and available to the original purchaser only.

To obtain service under this warranty, the product must, on discovery of the defect, be properly packed and shipped to the nearest Bittner Audio dealer. The party requesting service must provide proof of original ownership and date of purchase of the product.

If the warranty is valid, Bittner Audio will, without charge for parts or labor, either repair or replace the defective parts. Without a valid warranty, the entire cost of the repair is the responsibility of the product's owner.

The warranty does not cover defects or repairs needed as a result of:

1. Damage caused by abuse, accident, or negligence.
2. Damage caused by any tampering, alteration, or modification of the product or its components.
3. Damage caused by failure to maintain and operate the product in strict accordance to the written instruction of this operating manual.
4. Damage caused by repairs or attempted repairs by unauthorized persons.
5. Damage caused by fire, water and other natural events.
6. Damage caused by operation on improper voltages.

1.7.   Packing

Upon unpacking, please inspect the product. If you find any damage, notify your supplier immediately. Be sure to save the carton and all packing materials in case you have to send the product to the supplier.

Please use only the original factory packing. If the shipment carton is unavailable, contact Bittner Audio International GmbH (www.bittner-audio.com) to obtain a replacement.

1.8.   Air Ventilation & Cooling Requirements

The amplifier is equipped with a forced air-cooling system with variable speed and temperature controlled fans to guarantee low operating temperature and minimal ventilation noise. The air flow takes place from the rear to the front of the amplifier. The air-pulling fans are installed on the back side of the unit. The air flow is always from the front to the rear side.

In case a heat sink becomes too hot, the temperature sensor opens the respective output relay, disconnecting the output load from the particular channel. In case the power transformer gets overheated, a different sensor causes the output relays on all channels to open and to interrupt the outputs. After cooling down to an appropriate operating temperature level the relay contacts are closed again automatically.

It is important to have adequate air ventilation space behind the amplifier to allow a proper air flow. In case the amplifier is mounted inside a closed rack, do not cover the front of the rack with doors. If using racks with a closed backside, use fans on the rear rack panel. Bittner Audio recommends one open rack space for every 3 mounted power amplifiers.

1.9.   Installation in Rack

All devices will mount in standard 19-inch racks having sufficient depth and should be mounted with four standard rack bolts. To avoid the deformation of the chassis it is recommended to mount heavy units on horizontal brackets.

Please ensure a sufficient airflow. In the case, closed racks are being used rack-fans should be used. For larger installations one open rack space (1RU) for every 3 mounted power amplifiers should be provided.

1.10. Power Connection

⚠️ The power amplifier must be connected only with the attached three-wire safety power cord with protective conductor (non-fused earthed conductor).

This amplifier is made for use with the mains voltage labeled on the back of the amplifier only. Check the label on the back panel of the amplifier for the appropriate voltage. Make sure the voltage of your mains outlet is correct. The power voltage is factory set as labeled on the back panel and cannot be changed afterwards. Damage caused by connecting the amplifier to improper AC voltage voids the warranty.

NEVER isolate the ground of the AC power cords (the non-fused earthed protective conductor) to eliminate hum-problems.

Always turn off and disconnect the amplifier from the mains voltage before making any audio connections. As a precaution, turn the audio attenuators on the front panel down during powering up.

The power fuses are located on the back panel of the amplifier and can be accessed from the outside. Use only the appropriate fuses as labeled.

After properly mounting and connecting the AC cord and the audio connections, the unit can be switched on.

2. Technical Features

2.1.   AC Power Switch

The main power switch is located on the rear panel of the unit. If the remote switching option is not being used, the device must be switched on and off with the main power switch. To use the remote power switching option, the main power switch must be turned off.

2.2.   Remote Switching

2.2.1.   Control Voltage   XB XV XR 4X 8X

The PHOENIX terminal block (see picture below) is used to remotely power up the amplifier with a control voltage (12 VDC 80mA). Terminal **IN** is used as the control voltage input. Feeding these terminals with the control voltage will switch the amplifier on.

After a delay of one second the control voltage will appear on the terminals labeled **OUT** of the PHOENIX terminal block. The **OUT** terminals may be connected to the terminals **IN** of the next amplifier for sequential power switching. Up to 16 units may be daisy-chained this way.

The control voltage must be applied until the last amplifier in the daisy-chain is being switched on. By supplying the inverted DC control voltage to terminal **IN**, all connected amplifiers will be switched off.

Remote Switching PHOENIX Connector:

IN+	Amplifier Switching POSITIVE terminal
IN-	Amplifier Switching NEGATIVE terminal
OUT+	Control Voltage output for sequential switching POSITIVE terminal
OUT-	Control Voltage output for sequential switching NEGATIVE terminal

2.2.2.   SXL & RS-485   XR 4X 8X

If the device is connected to a Bittner Audio SXL or via the RS-485 interface to a PC (XR only), the unit can be remotely switched on and off at any time.

2.3.   LED Indicators

The amplifiers are equipped with 4 LEDs for each amplifier channel:

CLIP, SIGNAL, PROTECT and POWER

LED	Color	Function
POWER	green	The amplifier is powered up
CLIP	red	The input is overloaded. The LED starts illuminating as soon as the signal is 0.5 dB under full power.
SIGNAL	green	The signal reaches the output stage of the amplifier.
PROTECT	Red	This LED will light up as soon a protection circuit has been activated or if one of the output relays has been activated. When the amplifier is switched on, this LED will light up for approximately 1.5 seconds.

2.4.   Level Control

2.4.1.   Analog Level Control   BASIC XB XV

The amplifier XB and XV series are equipped with two analog level control knobs at the rear panel, the BASIC series has two at the front panel of the unit. These control knobs are setting the level of the amplifier.

2.4.2.   Digital Level Control   4X 8X AX16

These products are equipped with a rotary switch on the backside of the amplifier. The adjusting range is -90dB to 0dB. The 16 different settings of the digital switch are as follows:

 -90, -78, -66, -54, -42, -30, -24, -18, -15, -12, -9, -6, -3, -2, -1 and 0 dB.

⚠️ There is no stopping position for the rotary control. If the switch is turned beyond -90dB setting to the 0dB setting, the level will not jump from full attenuation to full power but remain in the -90dB position.

This feature will prevent the destruction of connected equipment and/or injury of persons. As the rotary direction is being sensed, it is necessary to turn the switch clockwise again to set the amplifier to higher levels.

Please keep in mind that the position of the rotary control will be detected by a microcontroller which will then set the according level of the amplifier. If the amplifier was operated at full attenuation before turning it off with the rotary control accidentally set to 0dB it will start up with full power!

In the opposite case it will start up fully attenuated at -90dB and you won't hear any audio!

2.5.   Audio Connections

Always turn off the amplifier before making any connections. As an additional precaution by switching the amplifier on for the first time, turn the audio attenuators down during powering up.

2.5.1.   Phoenix   XB XV XR 4X 8X AX16

The Phoenix audio connectors are electronically balanced. Each input contains three pins: **Signal+**, **Signal-** and **Shield**. Depending on the model more than one channel might be combined on the Phoenix connector.

2.5.2.   XLR / ¼" Jack   BASIC XR

The amplifiers series BASIC and XR are equipped with two combined input connectors.

They can be used for regular XLR connectors and for 6.3 mm TRS jacks, mounted in the same connector chassis. The audio inputs of the BASIC and XR amplifiers are electronically balanced.

Standard pinout for the XLR connectors:

1	Ground, Shield
2	Signal positive
3	Signal negative
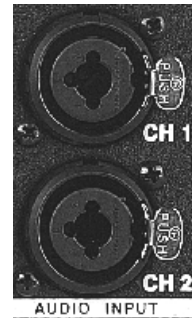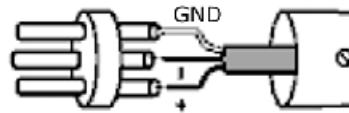
Standard pinout for the 6.3 mm TRS-jack:

Tip	Signal positive
Ring	Signal negative
Sleeve	Ground, Shield

2.6.   Balanced & unbalanced Inputs

The amplifier may be operated with unbalanced or balanced lines. For optimum performance use balanced lines whenever possible.

The driving device should be equipped with a balanced output.

Nevertheless, short cables inside a rack are not that critical. In these cases unbalanced cables may be used.

2.7.   Earth / Shielding   BASIC XB XV

The chassis ground of the amplifier is connected with the ground of the AC power cord (the non-fused earthed protective conductor).

Therefore, if several devices are connected in a signal chain a ground loop may be created.

This ground loop will cause a compensating current to travel on the shields of the audio cables causing hum-problems.

The **GROUND LIFT** switch on the back side of the unit will isolate the chassis ground from the signal ground and interrupt the flow of the compensating current.

This is an accepted and well-proven method to suppress signal hum.

⚠ Isolating the ground of the AC power cord is technically different and eliminates the protective earth connection. Therefore, **NEVER** isolate the ground of the AC power as this may pose a serious danger to your life.

2.8. Loudspeaker Output Connectors

2.8.1. Phoenix   XB XV XR 4X 8X

The Phoenix audio connectors contain two pins per channel: **Signal+** and **Signal-**. Depending on the model more than one channel might be combined on the Phoenix connector.

2.8.2. SPEAKON   BASIC XR

Speaker cables may be connected to the 4 pin NEUTRIK SPEAKON connectors.

Pin-out SPEAKON connector NL4FC for channel 1 and 2:
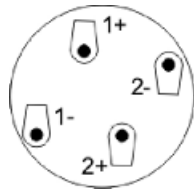
The SPEAKON connector of Channel 1 is internally connected to both output channels: Channel 1 to pair 1+/1- and Channel 2 to pair 2+/2-.

The SPEAKON connector of Channel 2 is internally connected only to output channel 2 on pair 1+/1-.
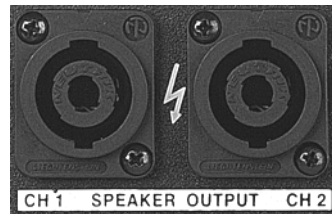
This twin pin-out on connector 1 allows for the connection of two-wire and four-wire speaker cables. (See also the illustrations in chapter 2.10 Operation Modes Seite 12)

The PHOENIX connectors (not available for BASIC Series) are connected in parallel to channel 1 and 2 of the SPEAKON connectors (not BASIC series). It is possible to use both connections at the same time (to parallel several loudspeakers). In this case the polarity of the speakers has to be the same. It is also important not to go below the minimum load impedance of the amplifier.

In BRIDGE mode, the loudspeaker cable needs to be connected to the two **+** poles of the PHOENIX connectors.

2.8.3. Binding Post   BASIC 8XT

The Binding Posts contain two pins per channel: **Signal+** and **Signal-**. Every two channels are combined on one block.

2.9. Loudspeaker Connection

Use heavy gauge wire. It is advisable to use thicker cables to bridge greater distances between amplifier and speakers. This will minimize power losses across the wire and improve the damping factor.

Please note: Wire thickness specifications (gauges) get larger as the wire gets thinner. So a 14-gauge wire is thicker than 18-gauge wire.

2.10. Operation Modes

On the rear of the amplifier three different operation modes can be selected on the DIP-Switch panel:

- STEREO
- PARALLEL
- BRIDGED MODE

The amplifier must be re-powered before the mode change is activated.

If the amplifier doesn't have a switch, the operation mode has to be set up by the wiring of the inputs and loudspeaker outputs.

2.10.1. Stereo Mode

For stereo operation set the mode select switch to STEREO (factory default). Models without a switch are automatically working in stereo mode. Please connect the input signals for both channels to the input connectors of CH1 AND CH2.

Stereo operation with two independent channels:
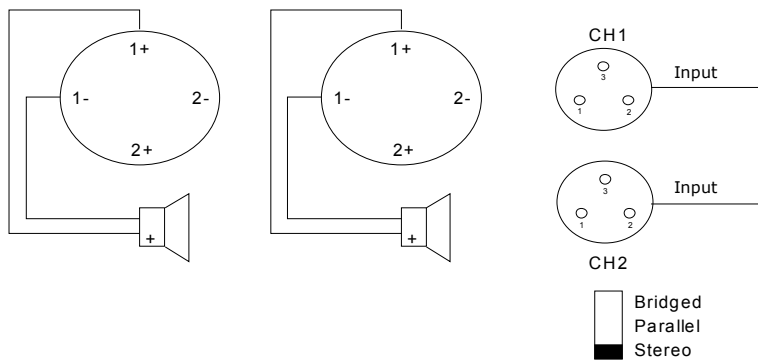
Stereo operation with a two-way loudspeaker cabinet (both channels connected to SPEAKON connector 1):
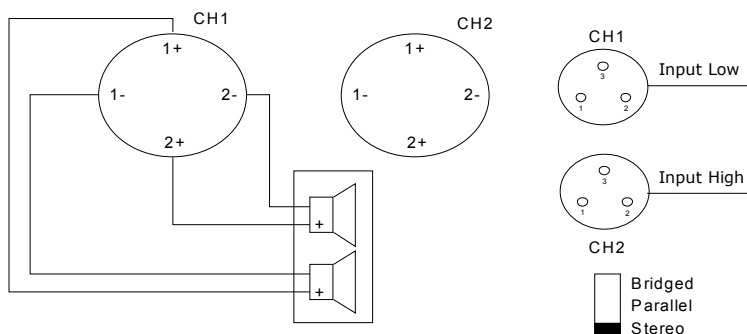
2.10.2.   Parallel Mode

In PARALLEL mode both amplifier channels get the same input signal.

In case of a mode switch set it to PARALLEL. Connect the input signal to input CH1 (Channel 2 is disabled). The input signal of channel 1 is available on both output channels.

In case of no mode switch simply connect both inputs to the same audio source.
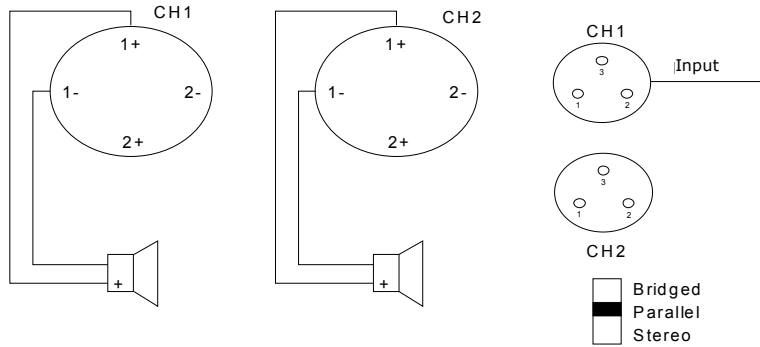
The loudspeaker may be connected to the SPEAKON connector and / or to all other terminals.

2.10.3.   Bridged Operation

⚠️   This operation mode is not available for the amplifiers of the XV series!

Both amplifiers may be bridged together to create a powerful single-channel mono amplifier.

2.10.3.1.   Operation Mode Switch   BASIC XB XR

The mode select switch needs to be set to the BRIDGE position.

Connect the input signal to CH1 (Channel 2 is not active!). The amplified signal is now available on both positive **+** pins of the output terminals (Please see picture below).

⚠️   Both potentiometers remain active and should be set to the same value.
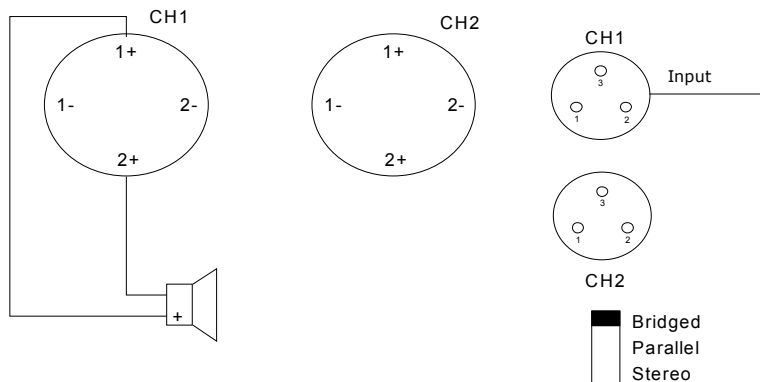
2.10.3.2. Without an Operation Mode switch   **4X 8X**

Each pair of channels can operate in bridge mode. This is achieved by using a reversed polarity of the channels to each other. The second channel gets the same input signal, but the plus and minus pins are connected the other way round (see drawing below).
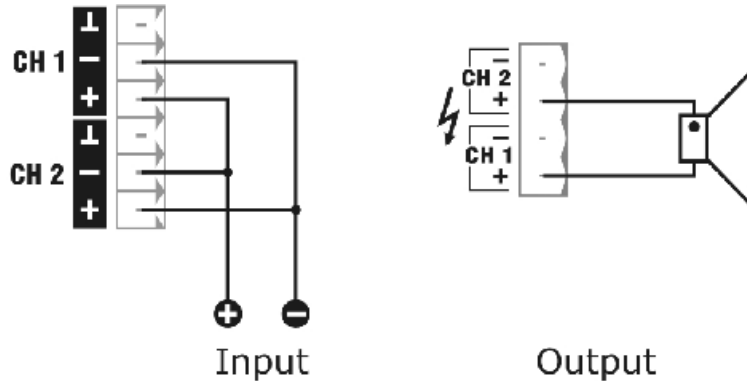
2.11. Alive Contact   **XB XV XR 4X 8X AX16**

All Bittner Audio amplifiers (with the exception of the BASIC Series and the Switching Unit AX16 are equipped with an ALIVE contact. The GPI contact is located on the rear panel of the amplifier and indicates the operational condition of the amplifier.

It is designed as a 3-pole contact closure that may be used in the **open** or the **closed** mode.

ALIVE Contact active	indicates that the amplifier is working in normal conditions
ALIVE Contact inactive	indicates that the amplifier is not working properly: it is shut down by the protection circuit, overheated etc. or generally switched off

This contact closure is the simplest form of remote system monitoring of the amplifier without establishing a remote control network and provides easy system surveillance. The ALIVE Contact may also be integrated into a media control network as a GPI contact closure to trigger other control functions, i.e. backup amplifier (spare amplifier) switching, if required.

2.12. Data Port   **XR 4X 8X SXL AX16**

Bittner Audio amplifiers Series XR, 4X, 8X and the switching unit AX16 are equipped with the SXL data port to connect to an SXL Programmable Control Interface to the amplifier (refer to 3.7. SXL - Programmable Control Interface Seite 33).

Up to 16 amplifier channels may be connected to the SXL. The 16 amplifier channels may be freely combined of 2-, 4- and 8-channel amplifiers.

After the amplifier has been connected to the SXL, it will be automatically recognized. The Link LED on the SXL front panel indicates ON. Communication with the SXL unit is indicated by the fast blinking green (TX) LED on the amplifier's rear panel.

For more details please refer to chapter 3.7. SXL - Programmable Control Interface Seite 33.

2.13. Address-IDs   XR 4X 8X

To connect the amplifiers to the SXL all amplifiers must have a unique address. The address is selected on the DIP switch at the rear panel of the amplifier.

⚠   After an address change the amplifier must be re-powered to activate the changes!

3. Specifications of the Devices

3.1. BASIC Series

3.1.1. General Information

BASIC - that's meeting the tightest budgets and professional requirements in reliability, flexibility and sound. Alone or in combination with the other products of the Bittner Audio portfolio.

The consequent realization of the Bittner Audio quality standards indicates once more our understanding of the contracting business. It underlines our philosophy that cost consciousness has nothing to do with giving up standards. Compromise is a word unknown to Bittner Audio!

The incorporation of detent potentiometers, clip limiter, protection circuits for any imaginable situation, as well as a first-class production process using only highest-quality components made the BASIC series the choice of most contractors.

Certainly more than basic!

3.1.2. Features

- High Tech SMT design
- Excellent sound and superior impulse response
- Protection Circuits: DC, LF, HF, Thermal, Short Circuit, Current Limiter
- XLR Inputs
- SPEAKON and Binding Posts
- Toroidal transformers
- LED Indicators for SIGNAL, CLIP, PROTECT, POWER
- Temperature controlled, variable speed, low noise fans
- Detent potentiometers
- Stereo/Bridged/Parallel Mode
- Ground Lift
- Robust Steel Chassis
- 3 Years Warranty

3.1.3.   Front View

3.1.4.   Rear View
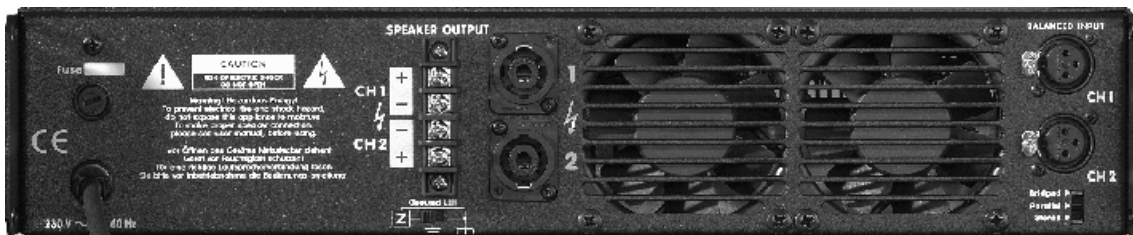
Connectors and Controls of the rear panel

Inputs	XLR connectors
Outputs	SPEAKON and screw terminals
Groundlift	2 position switch
Amp Mode	3 position switch
Power	Fixed 230 V cord

3.2.   XB Series

3.2.1.   General Information

The XB series has been designed for music, voice and alarm signals. Versatile, dynamic and extremely durable according to IEC286-3. For the highest operational safety.

Sequential power or alive contacts - the XB offers complete solutions. Hassle free. For uninterrupted, trouble free operation.

3.2.2.   Features

- High Tech SMT Design
- Protection Circuits: DC, LF, HF, Thermal, Short Circuit, Current Limiter
- PHOENIX input and output connectors
- XB 1600/2500 with High-End Switched Power Supply
- Temperature controlled, variable speed low noise fans
- Volume Controls on the rear panel
- LED Indicators for POWER, SIGNAL, CLIP and PROTECT
- Stereo/Bridged/Parallel Mode
- Softstart
- Sequential Remote Power On
- Alive Contact
- Ground Lift
- 3 Years Warranty

3.2.3.   Front View
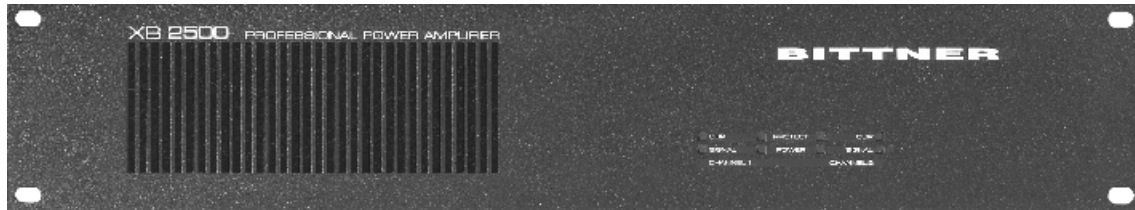
3.2.4.   Rear View
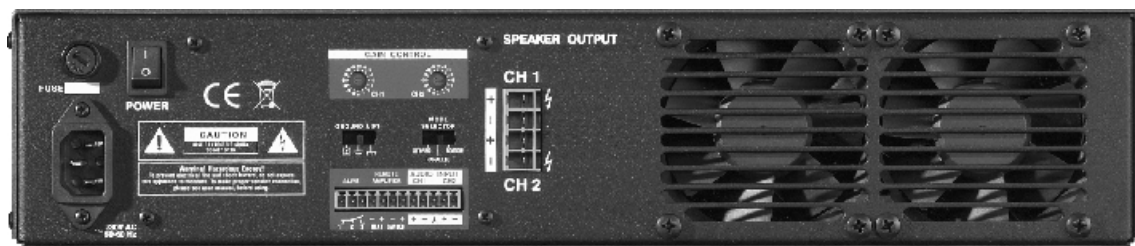
Connectors and Controls of the rear panel

Input	Contact 8 to 12 of the 12-pin PHOENIX connector
Outputs	High current 4-pin PHOENIX connector
Volume Controls	2
Alive Contacts	Contact 1 to 3 of the 12-pin PHOENIX connector
Remote Power On	Contact 4 to 7 of the 12-pin PHOENIX connector
Amp Mode	3 position switch
Groundlift	3 position switch
Power	Power switch, pluggable 230 V cord

Important!

The amplifier is only completely switched off by unplugging the mains.

Dangerous Voltage!

Even after completely disconnecting the amplifier from the mains, the capacitors of the power supply will be charged.

RISK OF ELECTRIC SHOCK!
DO NOT OPEN THE COVER!
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL!

3.3.   XV Series

3.3.1.   General Information

Power Without Compromises.

The XV is designed for paging, music and alarm signals. Versatile, dynamic and extremely rugged according to IEC286-3. For the highest requirements in safety and quality.

Sequential power on, alive contacts and incorporated ground fault detection - the XV is the solution under all conditions. Without the need for additional equipment. For uninterrupted and troublefree operation.

Needless to say that the Bittner Audio High-End toroidal output transformers in the XV series are some of the best available.

3.3.2.   Features

- Ideal for fixed installations: Controls from the back panel only
- High Tech SMT Design
- Protection Circuits: DC, LF, HF, Thermal, Short Circuit, Current Limiter
- PHOENIX inputs and outputs
- High-End Toroidal 100V Output Transformers
- Ground Fault Detection
- LED Indicators for POWER, SIGNAL, CLIP, PROTECT and GNDFAULT
- Temperature controlled, variable speed low noise fans
- Volume Controls at the back
- Softstart
- Sequential Remote Power On
- Alive Contact
- Ground Lift
- 3 Years Warranty

3.3.3.   Front View
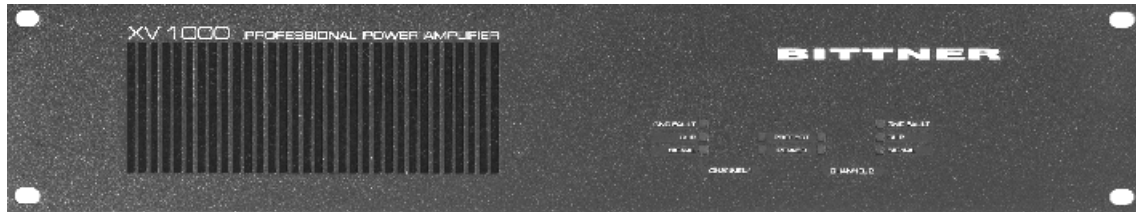
3.3.4.   Rear View
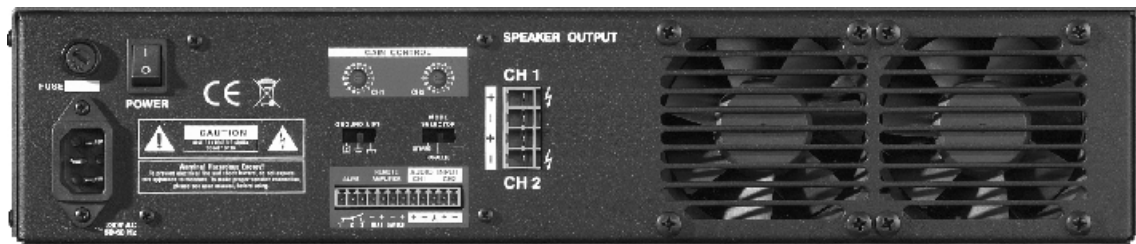
Connectors and Controls of the rear panel

Inputs	Contact 8 to 12 of the 12-pin PHOENIX connector
Outputs	High current PHOENIX connector
Volume Controls	2
Alive Contacts	Contact 1 to 3 of the 12-pin PHOENIX connector
Remote Power On	Contact 4 to 7 of the 12-pin PHOENIX connector
Amp Mode	2 position switch
Groundlift	3 position switch
Power	Power switch, pluggable 230 V cord

3.3.5.   Ground Fault Detection

The XV Series amplifier is equipped with a Ground Fault contact closure. This contact will be activated in case of a detected ground short. The contact is designed as a 3-pole contact closure; it may be used in the 'open' mode or the 'closed' mode.

3.4.   XR Series

3.4.1.   General Information

New Horizons:

A lightweight with enormous power output.

Combined with digital signal processing. That's what we call flexibility! Locally controlled or completely networked. No matter what the requirements are.

The integrated powerful digital signal processor (DSP) and controller allows for a trouble free and easy adjustment to any acoustical environment.

Wear-free digital potentiometers, sequential remote power on, alive contacts for easy supervision, computer controlled monitoring – its endless list of useful features make it the right choice for any installation.

XR - the new definition of Intelligent Power.

3.4.2.   Features

- High Tech SMT Design
- Digital Signal Processor
- Excellent sound and superior impulse response
- Protection Circuits: DC, LF, HF, Thermal, Short Circuit, Current Limiter
- PHOENIX/SPEAKON inputs and outputs
- High-End Switched Power Supply with Power Factor Correction
- LED Indicators for SIGNAL, CLIP, PROTECT, POWER
- Temperature controlled, variable speed low noise fans
- Digital wear-free Volume Controls
- Stereo/Bridged/Parallel Mode
- Softstart
- Sequential Remote Power On
- Alive Contact
- Paging Input
- Monitor Output
- SXL Data port
- Perfect Weight-to-Power ratio
- 3 Years Warranty

3.4.3.   Front View

3.4.4.   Rear View
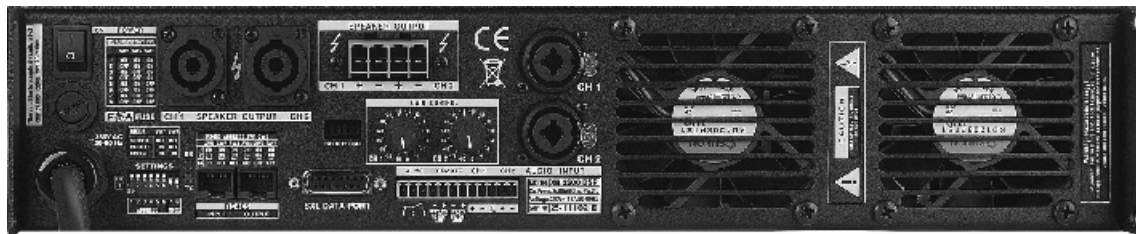
Connectors and Controls of the rear panel

Inputs	XLR with 1/4" mono jack Contact 8 to 12 of the 12-pin PHOENIX connector
Outputs	SPEAKON and high current PHOENIX connector
Volume Controls	2
Alive Contacts	Contact 1 to 3 of the 12-pin PHOENIX connector
Remote Power On	Contact 4 to 7 of the 12-pin PHOENIX connector
DIP Switch with 8 switches: Switch 1 to 3: Switch 1 to 6: Switch 7 to 8 :	 Sets the address of amp if connected to an SXL Sets the address of amp if connected to RS-485 Set the mode of amplifier channels: STEREO, PARALLEL or BRIDGED
SXL Data port	15-pin Sub-D Connector
DSP Data port	RS-485, 2 RJ-45 jacks (8-pin) paralleled 2 LEDs RX and TX
Power	Power switch, 230 V cord

⚠ **Important!**

The amplifier is only completely switched off by unplugging the mains.

Dangerous Voltage!

Even after completely disconnecting the amplifier from the mains, the capacitors of the power supply will be charged.

RISK OF ELECTRIC SHOCK!
DO NOT OPEN THE COVER!
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL!

3.4.5.   SXL Data Port

The Bittner Audio amplifiers of the XR series are equipped with the SXL data port to connect to an SXL Programmable Control Interface to the amplifier (refer to 3.7. SXL - Programmable Control Interface Seite 33).

To connect the amplifiers to the SXL all amplifiers must have a unique address. The address is selected on the DIP switch at the rear panel of the amplifier.

Address	SW1	SW2	SW3
ID 1	ON	ON	ON
ID 2	OFF	ON	ON
ID 3	ON	OFF	ON
ID 4	OFF	OFF	ON
ID 5	ON	ON	OFF
ID 6	OFF	ON	OFF
ID 7	ON	OFF	OFF
ID 8	OFF	OFF	OFF

3.4.6.   DSP with Software

The XR amplifiers are equipped with an internal DSP processor for extended functionality:

- Level Control
- Input routing of the two amplifier channels
- 10-Band Equalizer
- Dynamics (Limiter/Compressor/Gate)
- Delay
- Cross-Over
- Signal generator
- Up to 100 presets

The internal DSP can be controlled by:

- the Bittner Audio SXL control interface
- the DSP software installed on a computer, connected via RS-485

3.4.6.1.   Control by SXL Web interface

The DSP may be controlled with the Web Interface of the Bittner Audio SXL Controller.

To establish control the amplifier needs to be connected to the SXL using the SXL control port on the backside of the amplifier.

The SXL features a built-in web server that may be accessed through an Ethernet control network.

Addressing the SXL via any web browser (Microsoft™ Explorer, Firefox, etc.) will open up its web interface (see below).

The internal memory of the SXL will store all presets/configurations.

Home	Main	Amp Settings	SXL Settings	Configurations	Advanced & Names	AX16	Log File

[192.168.0.89]   **Amplifier Status**   **BITTNER**

Amplifier	Model	Standby	Powered	Mode	Channel	Clip	Prot	T[°C]	Load[Ω]	Short[Ω]	Open[Ω]	Power[W]
1	XR2000 DSP	ON	ON	Stereo	1	OFF	OFF	33	4.8	-	-	128
					2	OFF	OFF	32	4.6	-	-	121
2	Not connected	ON	-	-	3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
3	Not connected	ON	-	-	5	-	-	-	-	-	-	-
					6	-	-	-	-	-	-	-
4	Not connected	ON	-	-	7	-	-	-	-	-	-	-
					8	-	-	-	-	-	-	-
5	Not connected	ON	-	-	9	-	-	-	-	-	-	-
					10	-	-	-	-	-	-	-
6	Not connected	ON	-	-	11	-	-	-	-	-	-	-
					12	-	-	-	-	-	-	-
7	Not connected	ON	-	-	13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
8	Not connected	ON	-	-	15	-	-	-	-	-	-	-
					16	-	-	-	-	-	-	-

Actual Cfg : 1	Cfg Status : Ok

Run time: 0 days, 2 hours, 16 minutes, 3 seconds	Free Memory: 72720 bytes

⚠ To obtain access to the SXL web interface, the user must first log-in. Default name/password is:

Username: sxl
Password: 11111

For more detailed information please refer to section 3.7.10.3. Web Interface Seite 56.

3.4.6.2.   Control by RS-485 and PC

The DSP can also be controlled via the RS-485 port on the rear panel of the amplifier.

To establish control, the appropriate software must be installed on a computer. The RS-485 interface was chosen to allow for direct control from a computer or media controller without the use of an SXL control interface. Although RS-485 offers many advantages, i.e. long distances, a data bus, it is not a standard interface on a standard computer.

⚠ To allow for easy connection of a laptop to a RS-485 network, Bittner Audio offers the USB to RS-485 converter **NA-1**.

3.4.6.2.1.   RS-485 Ports

The XR Series amplifiers are equipped with two parallel RS-485 ports, PORT1 and PORT2 (RJ-45). To establish a RS-485 bus topology, PORT1 should be used as an input and PORT2 as the output to the next amplifier in the chain.

To connect the amplifier to the control computer, the RS-485 address must be set with the DIP switches on the rear panel of the amplifier. Up to 64 addresses may be set.

For your information: RS-485 is a multi-point communications network with up to 32 drivers and 32 receivers on a single (2-wire) bus and able to withstand "data collisions" (bus contention) problems and bus fault conditions. RS-485 extends the common mode range for both drivers and receivers in the so-called "tri-state" mode.

3.4.6.2.2.   RS-485 Connector Pin-out

The RS-485 interface on the XR Series amplifiers is a half-duplex transceiver with one single bus (2-wire) for transmitting and receiving data on the same bus.

The pin assignment of the RS-485 connector (RJ-45) is shown in the table on the right.

⚠ DATA+ is pulled via 10k resistor to +5V volts and DATA- is pushed to RS-485GND via 10k in idle state.

Pin	Function
1	GND
2	NC
3	DATA+
4	DATA-
5	DATA-
6	DATA+
7	NC
8	GND

3.4.6.2.3.   RS-485 Indicators

Two LED indicators are active while receiving data (red=RX) and transmitting data (green=TX) over RS-485.

3.4.6.2.4.   RS-485 Address

In the RS-485 control mode the amplifier is identified by its address. Use the DIP SWITCH ADDRESS 1-6 settings to set the RS-485 node address from 01 to 64:

Example: Address 01:   ON ON ON ON ON ON
             Address 02:   OFF ON ON ON ON ON

⚠ The amplifier must be re-powered before the address change is activated!

3.4.6.2.5.   Channel parameters

The input/output values of all amplifier channels are being monitored. The following reduced set of values and conditions is available via the RS-485 interface:

- Heatsink temperature
- Protect
- Clip
- Load impedance (reliable values only between -30dB under maximum power and maximum output level)

3.4.7.   Digital Level Control

The XR amplifier is equipped with a rotary switch on the backside of the amplifier.

The adjusting range is -90dB to 0dB. The 16 different settings of the digital switch are as follows:

-90, -78, -66, -54, -42, -30, -24, -18, -15, -12, -9, -6, -3, -2, -1 and 0 dB.

⚠️ Contrary to all other models with digital level control, the XR series offers a stopping position. In addition, the last set level is stored in the DSP. After powering up, the amplifier will be set to this level. Exception: The stored level will be ignored if the rotary control is being set to -90dB.

3.4.8.   Paging Input

This input can be switched into the audio path as a priority signal, e. g. for emergency announcements. It's available through the data port connector.

⚠️ This feature is only available in connection with an SXL (refer to 3.7.7.3. Emergency Paging Bus Seite 37).

3.4.9.   Monitor Output

This additional output allows to listen to the audio signal directly at the loudspeaker output of the amplifier. It's available through the data port connector.

⚠️ This feature is only available in connection with an SXL (refer to 3.7.7.4. Monitor Bus Seite 38).

3.5.   4X Series

3.5.1.   General Information

Powerpack - literally taken.

Unlimited and uncompromising - for a superior sound and unrivalled stability.

Switched supplies? Naturally! Peak performance won't come easy!

Wear-free digital potentiometers, sequential remote power on, alive contacts for every channel pair, computer control, detachable connectors.

Answers can be so simple.

Power density - a matter of intelligence!

3.5.2.   Features

- Up to 4x 1400 W in only 2 RU
- Ready for 2 Ohm operation
- 2 separate stereo amplifiers
- Ideal for fixed installations: Controls from the back panel only
- High Tech SMT Design
- Protection Circuits: DC, LF, HF, Thermal, Short Circuit, Current Limiter
- PHOENIX inputs and outputs
- High-End switched power supply
- LED indicators for SIGNAL, CLIP, PROTECT, POWER
- Temperature controlled, variable speed low noise fans
- Softstart
- Sequential Remote Power On
- 2 Alive Contacts
- Digital wear-free Volume Controls
- SXL Data port
- 3 Years Warranty

⚠ **Important!**

The amplifier is only completely switched off by unplugging the mains.

Dangerous Voltage!

Even after completely disconnecting the amplifier from the mains, the capacitors of the power supply will be charged.

RISK OF ELECTRIC SHOCK!
DO NOT OPEN THE COVER!
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL!

3.5.3.   Front View
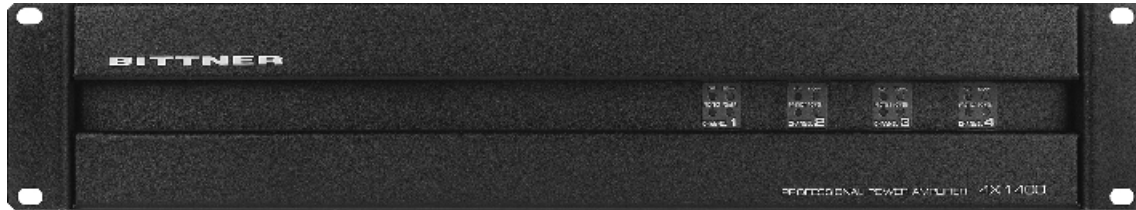
3.5.4.   Rear View
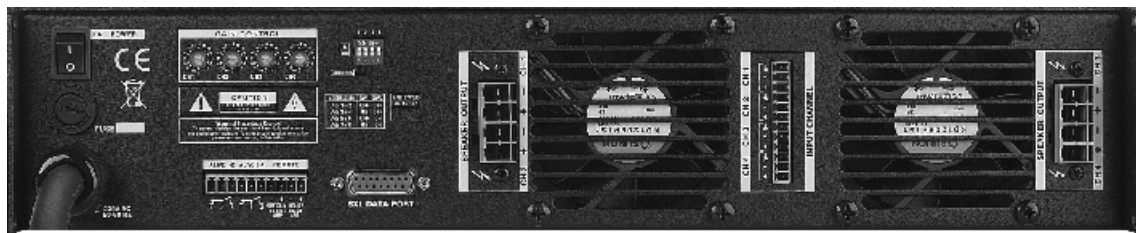
Connectors and Controls of the rear panel

Inputs	12-pin PHOENIX connector
Outputs	High current 4-pin PHOENIX connector for channels 1-2 and 3-4 each
Volume Controls	4
Remote Power On	Contact 7 to 10 of the 10-pin PHOENIX connector
Alive Contacts	Contact 1 to 6 of the 10-pin PHOENIX connector 1 contact for 2 channels each (1+2, 3+4), function can be used as open or close contact
DIP Switch with 2 switches	Switch 1 + 2: Sets the address of amp if connected to an SXL
SXL Data port	15-pin Sub-D Connector
Power	Power switch

3.5.5.   SXL Data Port

The Bittner Audio amplifiers of the 4X series are equipped with the SXL data port to connect to an SXL Programmable Control Interface to the amplifier (refer to 3.7. SXL - Programmable Control Interface Seite 33).

To connect the amplifiers to the SXL all amplifiers must have a unique address. The address is selected on the DIP switch at the rear panel of the amplifier.

Address	SW1	SW2
ID 1+2	OFF	OFF
ID 3+4	ON	OFF
ID 5+6	OFF	ON
ID 7+8	ON	ON

3.6.   8X Series

3.6.1.   General Information

Setting the Standard

Customer wishes and requirements are the only standard for Bittner Audio. It is our pride to realize them in the most innovative way imaginable.

Confidence is good - two separate power supplies are better. And wear-free digital potentiometers, an integrated Noise Gate per channel, sequential remote power on, ALIVE contacts for every channel pair, computer control - how much intelligent power fits into such a compact design?

8X - that's multiple reliability. For the highest demands in sound and flexibility.

To handle a complete installation with only one dense power package - well, that's what we call a standard.

3.6.2.   Features

- Up to 8x 400 W @ 4 Ohm in only 2 RU
- 4 separate amplifier channels
- Ideal for fixed installations: Controls from the back panel only
- High Tech SMT Design
- Protection Circuits: DC, LF, HF, Thermal, Short Circuit, Current Limiter
- PHOENIX inputs and outputs
- 2 High-End toroidal transformers
- 2 seperate power supplies
- LED indicators for SIGNAL, CLIP, PROTECT, POWER
- Temperature controlled, variable speed low noise fans
- Softstart
- Sequential Remote Power On
- 4 ALIVE Contacts
- Digital wear-free Volume Controls
- SXL Data port
- Noise Gate (switchable)
- 3 Years Warranty

3.6.3.   Front View

3.6.4.   Rear View
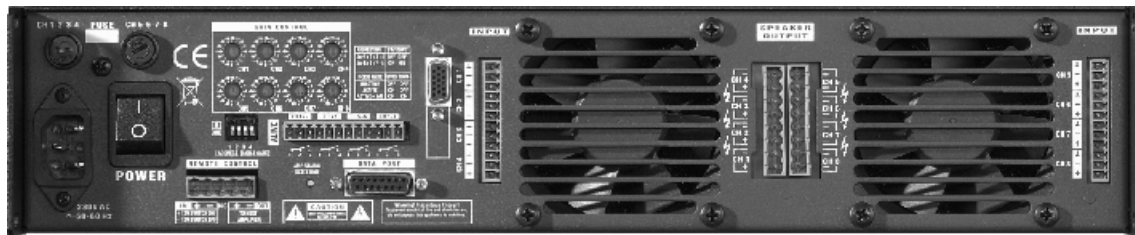
Connectors and Controls of the rear panel

Inputs	12-pin PHOENIX connector for channels 1-4 and 5-8 each
Outputs	8-pin PHOENIX connector for channels 1-4 und 5-8 each
Volume Controls	8
Remote Power On	5-pin PHOENIX connector
Alive Contacts	1 contact for 2 channels each (1+2, 3+4, 5+6, 7+8)
	3-pin PHOENIX connectors, function can be used as open or close contact
DIP Switch with 4 switches:	
Switch 1 + 2	Sets the address of amp if connected to an SXL
Switch 3 + 4	Function of Noise Gate
SXL Data port	15-pin Sub-D Connector
Power	Power switch, pluggable 230 V cord
Power fuses	1 fuse for the channels 1-4 and 5-8 each

3.6.5.   Noise Gate

The 8X amplifiers are equipped with individual noise gates per channel. The noise gates are activated by the DIP switch on the rear panel of the amplifier. The threshold can be selected by the DIP switch settings.

Parameters

Attack Time	400 µs
Release Time	4 s
Damping	90 dBu
DIP SW3	ON= Noise Gate ON OFF= Noise Gate OFF
DIP SW4	ON= -54 dBu Threshold OFF= -48 dBu Threshold

3.6.6.   SXL Data Port

The Bittner Audio amplifiers of the 8X series are equipped with the SXL data port to connect to an SXL Programmable Control Interface to the amplifier (refer to 3.7 SXL - Programmable Control Interface Seite 33)

To connect the amplifiers to the SXL all amplifiers must have a unique address. The address is selected on the DIP switch at the rear panel of the amplifier.

Address	SW1	SW2
ID 1+2+3+4	OFF	OFF
ID 5+6+7+8	ON	ON

3.7.   SXL - Programmable Control Interface

3.7.1.   General Information

SXL is the center piece for power management, amplifier control and monitoring. It works embedded in a LAN network, over the internet, or as a stand-alone unit with front panel control.

Up to 16 amplifier channels may be connected to one SXL. The 16 amplifier channels may be freely combined of two-, four- and eight-channel amplifiers. The amplifiers are connected to the SXL with the I^{2}C system bus via a ribbon cable. As the ribbon cable length may not exceed 2 m, it is recommended to keep the controlled amplifiers and the SXL in the same rack.

The SXL is not only used to control the amplifiers but to provide an unparalleled level of monitoring.

The control side of it will power up the amplifiers, control the volume, etc. The monitoring, however, will inform about the current status of the amplifier or individual channels (e.g. temperature, etc.). In addition, the SXL provides full control of all features of the DSP incorporated into the XR-series.

Up to 15 complex scenarios (snapshots) may be recalled via the four logic inputs. Its four output relays may be used for the signalization of errors or the control of external devices.

Relay 4 may be used for time controlled applications, e.g. line monitoring, etc.

The SXL offers extensive protocols for various events: for uninterrupted control, all relevant events are being stored and available over the Internet as Syslog and/or e-mail.

3.7.2.   Features

- Integration into Ethernet LAN
- Independent backup modes
- Computer free operation
- Local programming without computer
- Logging of all events
- Forwards log-events via email and SNMP Syslog
- Integrated web server
- User programmable web interface
- Simple integration into object orientated, graphic programming languages
- 16 non-volatile memories
- Automatic detection of connected amplifiers
- Monitoring of voltage and current
- Non-polarity logical inputs (5V to 24V)
- Relay Outputs
- 3 Years Warranty

3.7.3.   Front View

3.7.4.   Rear View

3.7.5.   Starting Up

3.7.5.1.   Network Connection

The SXL communicates via Ethernet. An unlimited number of SXL units may be connected to an Ethernet network. The SXL establishes the communication with local devices (amplifiers, backup switches, etc.). It communicates via the LAN with the control computer. A standard RJ-45 connector, located on the back panel of the device, interfaces with the Ethernet network.
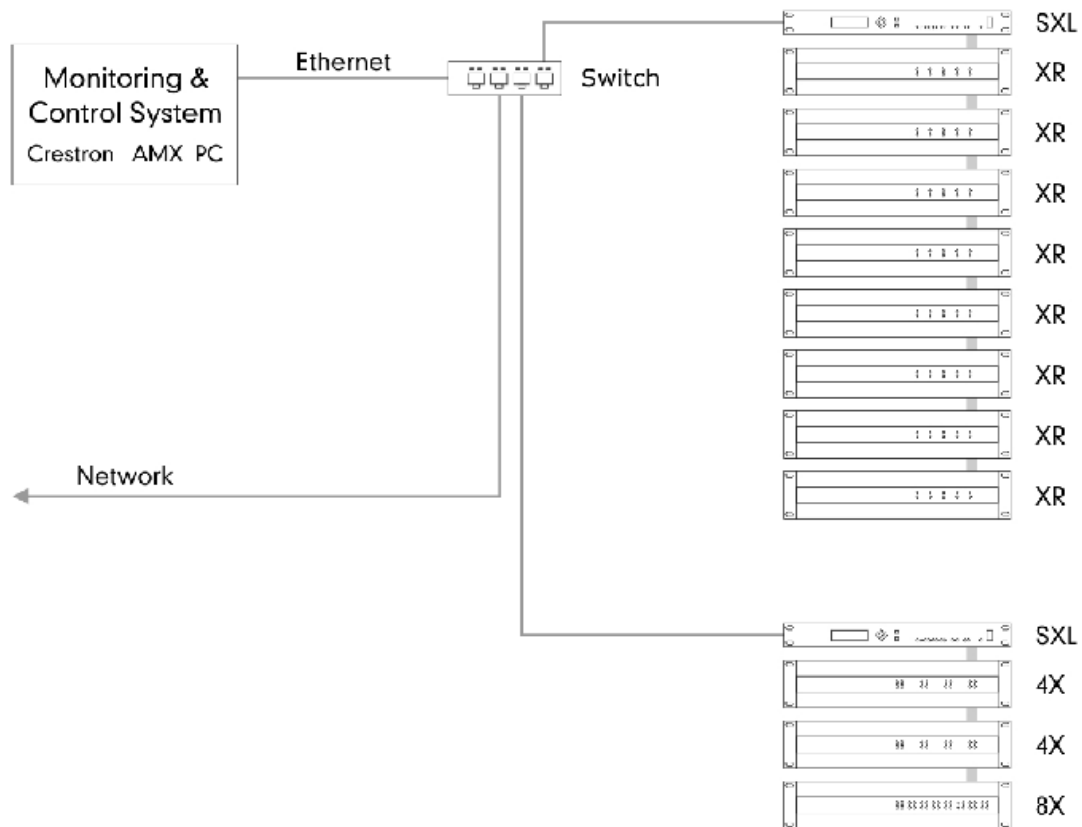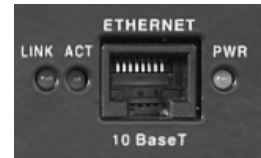
The SXL unit works with 10 Mbps (you might have to reconfigure your PC). In the case your computer does not support 10 Mbps, it is recommended to connect to an Ethernet switch that supports both data rates.

3.7.5.2.   Connection of the Amplifiers and the AX16

The amplifiers and the AX16 are connected with a 15-pin ribbon cable (I^2C System Bus). It is equipped with male Sub-D DB-15 connectors. One connector is required for each amplifier, the AX16 and the SXL.

The system bus transmits the following signals:

- Control signals in I^2C format
- Audio of the emergency paging bus
- Audio of the monitor bus
- 12V supply voltage for the interface boards of the amplifiers and the AX16
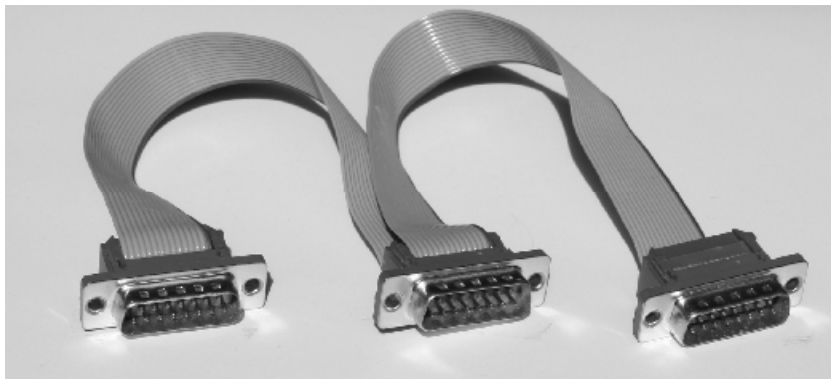
The maximum cable length is 2 meters. The devices need to be installed in such a way as to not exceed the maximum cable length.

Preassembled cables or ribbon cables and single connectors may be ordered from your supplier.

3.7.5.3.   Address IDs

A unique ID needs to be assigned to every amplifier that is connected to an SXL via the system bus. It may be set via the DIP switch on the backside of the amplifier.

Every two channels of an amplifier share one ID. Consequently, every two-channel amplifier uses one ID, four-channel amplifiers two IDs and eight-channel amplifiers four IDs. The table on the right hand side explains the different settings.

⚠️ After setting the ID(s), the amplifier needs to be disconnected from the SXL (ribbon cable) and from the mains supply (power cord) to activate the new ID.

Number of the Amplifier's Channels		
2	**4**	**8**
ID 1	IDs 1+2	IDs 1+2+3+4
ID 2		
ID 3	IDs 3+4	
ID 4		
ID 5	IDs 5+6	IDs 5+6+7+8
ID 6		
ID 7	IDs 7+8	
ID 8		

3.7.5.4.   Settings of Network Parameters

To operate the SXL in an Ethernet network, the network settings need to be set. The settings may be changed manually via the front panel.

To avoid inadvertent changes, these network parameters are only accessible via SERVICE MODE 1 (SM1).

Pushing the **UP** and **DOWN** keys at the same time will set the SXL into SERVICE MODE 1. **!sm1** will light up in the upper right space of the display. By pushing the **RIGHT** or **LEFT** key, the **SXLSTAT** menu group may be selected. Select the appropriate parameters by pushing the **UP** and **DOWN** keys. The parameters that may be set are IP address (IP) and subnet mask (MS).

Push **UP** and **DOWN** keys until **IP** lights up in the lower left space of the display.

To change this parameter, push **ENTER**. **Square brackets** indicate that the parameter value may now be set by pushing the **UP** and **DOWN** keys. To change the next number of the IP address, push the **RIGHT** button. After having set all four IP address blocks, pushing **ENTER** once again will save the new settings. The **UP** key will open the parameter subnet mask (**MS**) that may be changed accordingly.

⚠️ The SXL needs to be power cycled after changing and saving the network settings. After power-up it automatically starts in the USER MODE.

3.7.6.   LED Indicators

The SXL is equipped with 12 LEDs on the front panel:
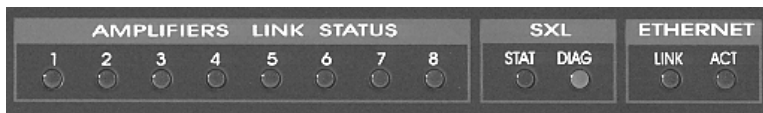
LED	Color	Function
AMPLIFIERS LINK STATUS	8x red	Indicates an existing connection with the amplifiers via data port (Online Status). Each LED represents 2 channels of one amplifier (equivalent to the IDs). A blinking LED indicates an error.
SXL STAT	1x red	Indicates the status of the SXL. A once-a-second heartbeat indicates normal operation.
DIAG	1x green	This LED is freely programmable via Ethernet and may be used as readout of any condition. As a special function (refer to 3.7.9.6. Permanent Backup of Operation Modes Seite 52), it may light up while data are being stored on the internal flash disk.
ETHERNET LINK	1x red	Indicates connection of the SXL to the Ethernet network.
ETHERNET ACT	1x red	Indicates activity (data exchange) of the SXL with the Ethernet network.

3.7.7.   Ports

3.7.7.1.   Logical Inputs

The SXL is equipped with 4 voltage inputs. A DC voltage below 5V is interpreted as a logical 0, DC voltages between 5V and 24 as a logical 1. The interpretation is polarity independent, i.e. the **+** and **–** poles may be connected arbitrarily.

The logical inputs may be used for the following applications:

- Recall of the 15 internal configurations
- Readout via Ethernet (e.g. conditions inside the rack, etc.)
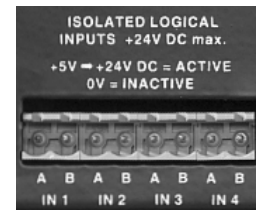
3.7.7.2.   Relay outputs

These relays are of the DPST type and feature a switching capacity of 24V (AC/DC)/ 5A max.

Each relay offers 3 pins labeled A, B and C. C is the joint root. If the relay is activated, pins B and C are connected. Otherwise, pins A and C.

The relay offers various uses:

- Recall of arbitrary switching configurations via the 15 internal configurations
- Fault indication contacts (relays 1 to 3) of the error matrix (refer to 3.7.9.2. Error Matrix Seite 50)
- Switching of time controlled operations (relay 4) e.g. line monitoring (refer to 3.7.9.3. Line Monitoring Seite 50)
- Control via the Ethernet (e.g. to allow for remote controlled switching inside the rack via Ethernet)
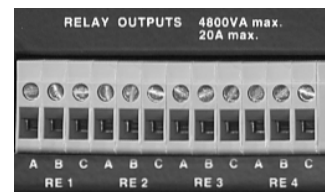
3.7.7.3.   Emergency Paging Bus

The emergency paging bus is an audio bus that transmits an audio signal (line level), to every amplifier connected to the SXL. If the amplifier is equipped with an internal PAGING RELAIS, its audio input will be switched to the paging signal.
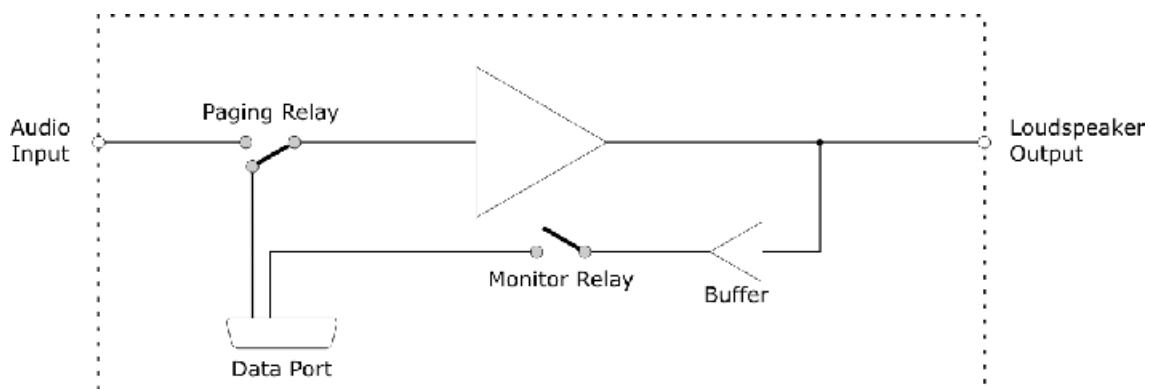
If there are several SXL inside one rack, the paging signals may be bussed together (see also 3.7.7.4. Monitor Bus Seite 38).

⚠️ Currently, only amplifiers of the XR series support that operation.

3.7.7.4.   Monitor Bus

The monitor bus enables the tapping into the loudspeaker outputs of an appropriately equipped amplifier. The amplifier is equipped with one relay for each channel which adds the line level audio signal to the monitor bus. The signal will then appear on the PHOENIX terminals MONITOR OUT.
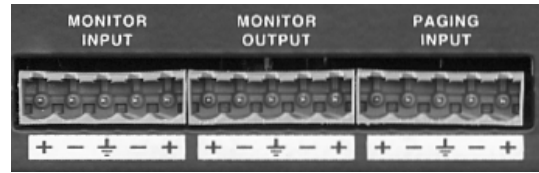
Additional SXL may be connected to the monitor bus via the PHOENIX terminal MONITOR IN. The internal logic of the SXL(s) ensures that only one audio signal is switched to the monitor bus (the amplifier output or the MONITOR IN).
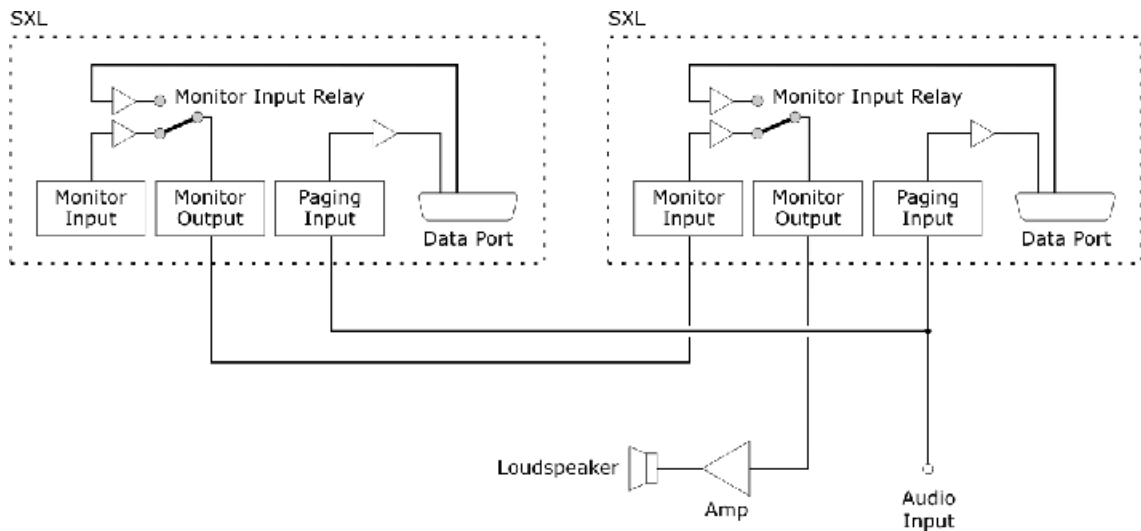
Currently, only the amplifiers of the XR series support that feature.

3.7.8.   Operation

3.7.8.1.   Manual operation

The SXL may be locally controlled using the front panel **UP/DOWN** and **LEFT/RIGHT** keys.

All parameters are displayed on the two-line LCD with 16 digits each.
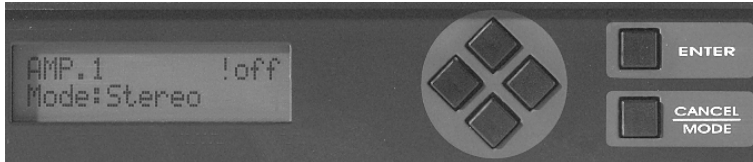
LCD and Front Panel Control

The LCD is divided into three sections:

Line 1 – left side	menu (refer to 3.7.8.1.1. Menus & Parameters unterhalb)
Line 1 – right side	mode and status information (refer to 3.7.8.1.2. Entry Modes & Status Information Seite 40)
Line 2	parameters and their values (refer to 3.7.8.1.1. Menus & Parameters unterhalb)

Example:
```
----------------
CHAN.2       !off
#Gain= -19.5dB
----------------
```

Explanation: The SXL is in the **CHAN** menu, channel 2 is selected. The abbreviation **!off** indicates that the respective amplifier is **offline**. The channel volume is set to **-19,5 dB**. The symbol **#** in front of the parameter indicates that it is user controllable.

3.7.8.1.1.   Menus & Parameters

The menu items and their parameters are selected with the arrow keys:

- Use the keys **LEFT** and **RIGH**T to select the menu items
- Use the keys **UP** and **DOWN** to select the parameters of the menu items

The reduced size of the display requires abbreviations. Their meanings are:

AMP.1 to AMP.8	Parameter per amplifier (e.g. Standby)
CHAN.1 to CHAN.16	Parameter per channel (e.g. Gain)
LINPUTS	Logical inputs
RELAYS	Relay outputs
SXLSTAT	Date & time, network settings
MONITOR	Monitor bus
DIAG	Function of the DIAG LED
CONFIG	Configuration
MATRIX	Error matrix
AX16	Parameters of the AX16

A parameter may be changed by selecting it and pushing **ENTER.** The value will appear in brackets, e.g. **#Standby=[ON]**. It may now be changed by using the **UP** and **DOWN** keys. If a large value range needs to be changed (e.g. volume), holding the key down will speed it up.

Pushing **ENTER** to finalize the setting, **CANCEL** to abandon the changes.

User controllable parameters are indicated by a hash (#), e.g. **#Standby=ON** (also see section 3.7.8.1.2. Entry Modes & Status Information unterhalb).

⚠️ If a connected amplifier is not featuring a certain parameter, the parameter will not be displayed.

3.7.8.1.2.   **Entry Modes & Status Information**

In the first line's right corner of the LCD, more information is displayed with 4 symbols.

<u>Entry mode</u>

The entry mode defines how the parameter are displayed and edited. It may be selected by repeatedly pushing the **MODE** key:

- **<w1>** only indicates the writable, respectively the controllable parameters (w=write). **1** means that only the currently addressed amplifier/channel may be altered.
- **<w2>** is similar to **w1** but will also set the parameters of the associated stereo channel. The menu items are accordingly displayed, e.g. CHAN.3+4
- **<w*>** is similar to **w1** but the asterisk (*) represents all amplifiers/channels. In this mode, for example, all amplifiers may be set to standby at the same time or set mute at the same time.
- **<rw>** is similar to **w1** but additionally, all values, including the read only conditions are displayed, e.g. ACStatus (= mains supply) of an amplifier, etc.

<u>Status Information</u>

- **!off**
  The indicated device (e.g. AMP.1) is **offline**. Only valid for **AMP**, **CHAN** and **AX16**

The two following Service Mode Levels are used to protect parameters from accidental changes.

- **!sm1**
  Service Mode Level 1 - will be started by pushing the keys UP and DOWN at the same time. The following parameters may then be changed:

  ▶ Network settings (refer to 3.7.5.4. Settings of Network Parameters Seite 36)
  ▶ Delay time when a configurations is re-called via the logic inputs (refer to 3.7.9.1. Configuration Switching via the Logic Inputs Seite 49)
  ▶ Continuous storage the SXL's current condition to the intern flash disk ON/OFF(refer to 3.7.9.6. Permanent Backup of Operation Modes Seite 52)

- **!sm2**
  Service Mode Level 2 – will be started by pushing the keys **UP** and **DOWN** at the same time, followed by simultaneously pushing keys **LEFT** and **RIGHT**. The following parameters may then be changed:

  ▶ Manual confirmation of an error ON/OFF (refer to 3.7.9.4. Error Acknowledgment Seite 51)

3.7.8.1.3.   Saving and Loading of Configurations

The saving and loading of a configuration on the SXL requires two steps:

- Selection of configuration number
- Loading/Saving

The associated parameters can be found in the **CONFIG** menu. The sequence is:

1. Select parameter **CfgNumber** and set the configuration number accordingly.

2. Select parameter/function **CfgSave** or **CfgRecall**. This parameter is set to **OFF**.

3. Setting the parameter to **ON**. After completing the desired changes, the parameter will automatically be set **OFF** again.

The parameters **CfgStatus** and **ActualCfg** may be used to check whether the procedure has been accomplished correctly. The parameter **CfgStatus** should show **OK** and the parameter **ActuaCfg** should display the selected configuration number.

⚠ This procedure may seem to be a little complicated. But if it is repeated several times, it offers a significantly faster operation (e.g. saving a configuration) as the first step becomes unnecessary.

3.7.8.2.   Web Interface

As an easy way of operation, the SXL offers a web interface. The advantages are:

- Access to all parameters (except Service Mode) and status messages
- No software installation necessary
- Software and firmware always match

The web interface is made up of several files (pages). These files may be edited with any standard text or web editor. Consequently, specific requirement, e.g. illustrations in different languages, may easily be accommodated.

To use the web interface, it is necessary to:

- connect it to a PC (directly or via an Ethernet network)
- run a common web browser (Internet Explorer, Firefox, Safari, Opera, Konqueror, etc.)
- know the IP address of the SXL

Please follow the instructions below to activate the web interface:

- Open the web browser
- Enter the IP address of the SXL in the address line of the browser (press **ENTER**)
- A login mask appears. Register and finish with **SUBMIT**.

⚠ The preset login is:

Name: sxl
Password: 11111

Do not use caps for the name. The password is five times the figure "one".

Basically, working with the web interface takes this approach: Parameters to be changed need to be entered into the appropriate form field. Then, the new values need to be transmitted to the SXL. This may be achieved by using the appropriate button: **Set**, **Save**, **Recall** or **Show**.

⚠ Parameters not available for a specific amplifier model are greyed out and cannot be changed.

In the following, the various web pages will be specified.

3.7.8.2.1.   Main Page

The main page is a status page only and provides an overview over the condition of the SXL and the connected amplifiers.

As on every page of this web interface, the navigation menu to access the different functions of the SXL is located at the top.

Home	Main	Amp Settings	SXL Settings	Configurations	Advanced & Names	AX16	Log File

[192.168.0.89]	Amplifier Status	BITTNER

The IP address and the title of the accessed page are also displayed.

The main part of the page indicates the condition of the amplifiers/channels.

Amplifier	Model	Standby	Powered	Mode	Channel	Clip	Prot	T[°C]	Load[Ω]	Short[Ω]	Open[Ω]	Power[W]
1	XR2000 DSP	ON	ON	Stereo	1	OFF	OFF	33	4.8	-	-	128
					2	OFF	OFF	32	4.6	-	-	121

The condition of the SXL, the current configurations and status files completes the main page.

Actual Cfg : 1	Cfg Status : Ok
Run time: 0 days, 2 hours, 16 minutes, 3 seconds	Free Memory: 72720 bytes

⚠ The main page will be refreshed every 15 seconds to display changes of the parameters.

3.7.8.2.2.   Amplifier & Channel Settings (incl. DSP)

This page (accessible via **Amp Settings**) provides access to all parameters of one amplifier and its channels.

Amplifier	StandBy	PowerUp[s]	Channel	Mute	In1[dB]	In2[dB]	Gain[dB]	Page	Active	Invert	Sens[V]	Short[Ω]	Open[Ω]	LoadSigChk
1. XR2000 DSP	☐	0.0	1.	☐	0.0	-90.0	-90.0	☐	☑	☐	1V	1.0	40.0	☐
			2.	☐	-90.0	0.0	-90.0	☐	☑	☐	1V	1.0	40.0	☐

⚠ Parameters not available for a specific amplifier model are grayed out.

The following parameters may be accessed:

Standby	Standby On/Off
PowerUp	A delay may be set before powering up the amplifier after receiving the command
Mute	Channel mute On/Off.
In1 and In2*	These level values (-90 to +6 dB in 0.5 dB steps) and the level values of the neighboring channel form a 2 by 2 mixer. It may be used for mixing of both channels.
Gain	Output level (-90 to +6 dB in 0.5 dB steps)
Page*	Overrides the audio signal with the paging signal.
Active*	Activates or deactivates the audio signal input of a channel. This switching takes place before the paging input.
Invert*	Phase shift of 180°
Sens*	Input sensitivity
Short*	Indicates the lowest value of the window for impedance measurement. Values below this value are interpreted as a short-circuit.
Open*	Indicates the highest value of the window for impedance measurement. Values above this value are interpreted as opened output.
LoadSigChk*	Line-monitoring. On/Off

* Available only for specific models

Access to the DSP settings of a channel may be accessed at the lower part of the page.

The DSP page offers all parameters and the option to save and recall up to 50 configurations. The configurations may be labeled for easier identification.

3.7.8.2.3.   Error Matrix and Relay Control

The SXL Settings page is made up of three functional blocks.

3.7.8.2.3.1.   Error Matrix

Relays 1 to 3 of the SXL may be assigned as fault indication contacts, using the Bittner Audio Error Matrix. In this indication concept, each relay may be assigned to a certain type of defect/problem. The matrix applies to all connected amplifiers. A general fault indication is generated if all types of defect are assigned to one relay.

Error Matrix	Relay1 (ON)	Relay2 (ON)	Relay3 (ON)
ACStatus Error	☑	☐	☐
Protect	☐	☑	☐
Output Short	☐	☐	☑
Output Open	☐	☐	☑
Temperature High	☐	☑	☐
Amp Offline	☑	☐	☐
Load Invalid Check	☐	☐	☑
Error Matrix Enable ☑			Set
Last Matrix Error	Name=NONE.01.NonePar : Date=00.00.0000 : Time=00:00:00		

Example: In the illustration above, the fault indication contacts have been assigned to logical groups. Relay 1 indicates defects of the amplifier as a whole. Relay 2 is activated by channel based defects, relay 3 signalizes impedance problems.

The error matrix may be activated for individual configuration. This is important while saving new or edited configurations!

⚠️   A detailed description of the error matrix can be found in chapter 3.7.9.2. Error Matrix Seite 50.

3.7.8.2.3.2.   Relay Control

If the error matrix is not being used (in general or a single SXL configuration), the conditions for activating relay 1 – 4 are user definable (manually or via Ethernet) and may be saved in a configuration.

Logical Inputs & Outputs	1	2	3	4	Combination
Logical Inputs	OFF	OFF	OFF	OFF	0
Relay Outputs	☑	☑	☑	☐	7 Change

3.7.8.2.3.3.   Time Controlled Tasks

Relay 4 may be used for time controlled tasks. It may be activated in configurable intervals for a configurable amount of time. A third parameter defines the delay until this function becomes active after having switched on the SXL.

The following three parameters need to be set:

LoadSig start after	600	s	Period of Check	90	s	Switch signal for	10	s	Set

LoadSig start after	Delay after switching the SXL on
Period of check	Interval between deactivation and operation
Switch signal for	Active time
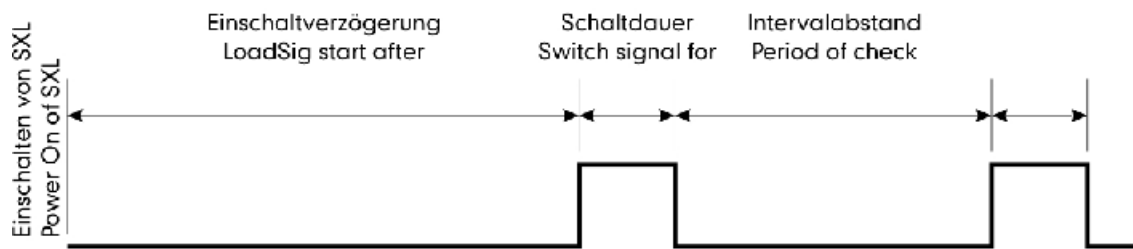
This function is generally being used for impedance measurements (refer to 3.7.9.3. Line Monitoring Seite 50).

3.7.8.2.4.   Configurations

The SXL offers the option to save up to 15 configurations. This includes all parameters of the SXL and all devices connected to the system bus. The configurations may be labeled for easier identification.

This page also provides status information and additional functions.

Actual SXL Configuration	Indicates the current SXL configuration and its name
Last SXL Configuration Result	Status of the last operation (save or recall of a configuration)
Default SXL Configuration Recalled after restart	Configuration that is re-called at the start-up of the SXL
Defined SXL Configurations	Shows the saved configurations
Default SXL Configuration (Parameter)	Defines the start-up configuration
SXL Configuration selection by logical inputs	This function enables the re-calling of SXL configurations via using the logical inputs (refer to 3.7.9.1. Configuration Switching via the Logic Inputs Seite 49)

The SXL powers up with the saved data of a configuration. If no configuration has been set for the start-up (see table below), configuration 0 will be the default. This default configuration has a special status and is administrated by the SXL. Depending on setting, configuration 0 is made up of following data:

A. A copy of the lastly re-called configuration 1 to 15
B. The current condition of all parameters

Point A is important if the configurations are re-called by the logic inputs (refer to 3.7.9.1. Configuration Switching via the Logic Inputs Seite 49). Point B is a special function, explained in chapter 3.7.9.6. Permanent Backup of Operation Modes Seite 52.

⚠ Since the SXL may overwrite data in configuration 0, it should not be used for storing user settings.

3.7.8.2.5.   Special Settings

Some function blocks of the SXL have been combined on the page **Advanced Settings & Names**. They are global settings for the SXL and will be explained in the following sections.

3.7.8.2.5.1.   Device and Channel Labels

For a better identification, the SXL and the amplifiers may be labeled.

SXL Name	Stadium North		
Channel 1 Name		Channel 2 Name	
Channel 3 Name		Channel 4 Name	

3.7.8.2.5.2.   Login

Username and **Password** may be changed arbitrarily.

Username	sxl	Password	*****	Set

3.7.8.2.5.3.   Syslog

The SXL records every important event on its intern flash disk (refer to 3.7.8.2.7 Logbook Seite 48). To obtain more security, these record files may be mirrored via Syslog to any Host or IP address in the network and recorded there.

Syslogging By Host	192.168.0.201

Several free Syslog programs respectively deamons are available for Windows. Kiwi Enterprises, for example, (http://www.kiwisyslog.com) is a well-known supplier.

Kiwi Syslog Daemon (Version 8.2.18)

File Edit View Help

Display 00 (Default)

Date	Time	Priority	Hostname	Message
08-09-2007	11:02:26	User.Notice	192.168.168.89	matrix error "AMP[1] : Online" cleared by user
08-09-2007	11:02:06	User.Alert	192.168.168.89	matrix error "AMP[1] : Online" detected
08-09-2007	10:58:33	User.Info	192.168.168.89	sxl started, firmware revision: 03.46
08-09-2007	10:54:25	User.Info	192.168.168.89	sxl started, firmware revision: 03.46

100% 4 MPH   11:02 08-09-2007

3.7.8.2.5.4.   SMTP

SMTP stands for **Simple Mail Transfer Protocol**. The SXL is able, via an appropriate gateway in the network, to send logbook entries as emails.

	Send Log Message To e-mail Address	sxl@bittner-audio.com	
Our SMTP Name	SXL_192.168.0.89	Send By SMTP Gate	192.168.0.250	Set

To ensure trouble-free transmission of the data, the following parameters need to be set:

Our SMTP Name	Sender's address
Send Log Message to email address	Recipient (email address)
Send by SMTP Gate	Gateway address

⚠ Please contact your network administrator for the correct values of above parameters.

3.7.8.2.5.5.   SXL Home Address

The address may be re-called when **Home** in the navigation menu is called. This address may be used, for example, to save an overview page for the selection of several SXL devices in a bigger installation.

SXL Home Address	http://192.168.0.80

3.7.8.2.5.6.   Re-start

The SXL may be re-started from the web interface. This feature is very useful after upgrading the firmware via the network (refer to 3.7.10.2 Firmware Seite 55).

Restart SXL	☐ Set

To re-start, set the checkmark and click **SET.**

3.7.8.2.6.   AX16 Intelligent Amplifier Switch

The AX16 device is an intelligent amplifier switching unit that may also be connected to the SXL via its system bus. Together, both devices form a powerful solution to guarantee a failure-free operation.

The **AX16** web page offers mainly status information. Practically all settings are made with DIP switches on the back panel (refer to 3.8.6. Starting Seite 63). These settings are evaluated by the SXL which takes over control of the AX16 in case of amplifier error.

AX16 Controlled by SXL **YES** (selected by DIP switch on AX16)	AX16 Online **YES** Firmware version is **v.3**	AX16 OK **YES**
AX16 backup mode **7/1** (selected by DIP switch on AX16)	Modes are selected by DIP switch on AX16: "1/1"=backup scheme (1-->2),(3-->4),(5-->6),(7-->8) "3/1"=backup scheme (1,2,3-->4),(5,6,7-->8) "7/1"=backup scheme (1,2,3,4,5,6,7-->8)	
Statistics: Number of amp fails from AX16 start: **0**, Last failed=**Amp.None**		

The controllable parameters are located at the lower part of the page:

Amp	1	2	3	4	5	6	7	8
Model	XR2000 DSP	Not connected	Not connected	Not connected	Not connected	Not connected	Not connected	XR2000 DSP
Alive	YES	NO	NO	NO	NO	NO	NO	YES
Replaced by								
Use AX16 for amp	☑	☐	☐	☐	☐	☐	☐	☑
Force an error (for test)	☐	☐	☐	☐	☐	☐	☐	☐

Copy all amplifier settings to backup before switch
☑
(the guarded and backup amp should be of same model)

Change Settings

Use AX16 for amp	Defines which amplifiers are part of the backup switching.
Force an error	For testing purposes, an error may be simulated for the specified amplifier(s).
Copy all settings to backup before switch	If an amplifier fails, its settings will be transferred to the backup amplifier.

⚠ Please note: The parameters are not globally set but depend on the SXL configuration.

Copying all settings to the backup amplifier is a unique Bittner Audio feature and should always be activated. If the faulty amplifier and the backup amplifier are of the same model, all settings will be transmitted 1 to 1. This procedure and the following switch-over will be completed after 250ms.

The copying includes all settings that are provided by the backup amplifier. In any case, the system will try to maintain the same volume. To achieve this, the SXL "translates" the level settings of the different amplifiers. This feature allows for the replacement of defective amplifiers by models of different power, for example a XR1500 with a XR4000!

⚠ The copying of all settings to the backup amplifier is a unique Bittner Audio feature and will not work with models of third-party suppliers.

3.7.8.2.7.   Logbook

The SXL logs every important event on its internal flash disk. The amount of recordable events is about 2600.

The SXL works with the Syslog Protocol (refer to 3.7.8.2.5.3. Syslog Seite 46). This protocol subdivides the events into priorities:

The amount of the logbook entries may be recalled according to these priorities. In addition, all entries may be limited to a certain amount of time.

For storage reasons, the logbook may be copied to a control computer from the flash disk of the SXL (refer to 3.7.10.3. Web Interface Seite 56).

Emergency
Alert
Critical
Error
Warning
Notice
Info

Filter	☑ emergency	☑ alert	☑ critical	☑ error	☑ warning	☑ notice	☑ info	Logged days	1 ▾	Show

					1
15.07.2007	10:24:06	info	sxl started, firmware revision: 03.45		2
15.07.2007	10:24:08	notice	host 192.168.0.74, user sxl logged in		3
15.07.2007	10:24:06	info	sxl stopped		7
15.07.2007	10:28:28	info	sxl started, firmware revision: 03.46		30
15.07.2007	10:28:45	notice	host 192.168.0.74, user sxl logged in		60
15.07.2007	12:12:09	notice	host 192.168.0.74, user sxl logged in		All

3.7.9.   Special Functions

3.7.9.1.   Configuration Switching via the Logic Inputs

The configurations of the SXL may be also re-called via the SXL's logic inputs. This provides, for example, external control without a network connection. The voltages applied 4 logic inputs are interpreted as a 4-Bit word:

Configuration	Input 4	Input 3	Input 2	Input 1
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

⚠️   The bit-word 0000 is not listed as it is being used for a different purpose (see below).

Switching by the logical inputs is globally activated for the SXL. The appropriate parameter **CfgByInput** is located in menu **SXLSTAT** and should be switched **ON**.

To re-call a configuration, it makes no difference whether the applied bit-word is permanently or momentarily applied. The appropriate SXL configuration will be re-called and then written to configuration 0 which will then be started. Please note: configuration 0 always holds a copy of the last re-called configuration (refer to 3.7.8.2.4. Configurations Seite 45).

Example: To re-call configuration 11, the bit muster 1011 should be applied to the logic inputs. The SXL will start configuration 11. The contents of configuration 11 will then be copied to configuration 0. After disconnecting the control voltages, the SXL switches to configuration 0 which is now identical to configuration 11.

If the switching should be controlled by a mechanical multi-switch, it is important to note that the contacts may bounce electrically. This effect is typical for elastic components inside switching mechanisms. As a result, the SXL may switch several times between two configurations.

The parameter **CfgDelay** in the **SXLSTAT** menu is used to avoid this negative effect. It is accessible in Service Mode 1 (refer to 3.7.8.1.2. Entry Modes & Status Information Seite 40). It defines how long a bit-word needs to be applied (in steps of 100ms) until it is recognized by the SXL. The delay is set by numbers between 2 and 20. These numbers need to be multiplied by 100ms. Consequently, the value 5 represents 500ms.

If the relays of the SXL are not being used for the error matrix, they may be used to represent the active configuration. To obtain a correct read-out, the bit-words of the above table need to be configured. An additional external decoder may then display these bit-words on a line of LEDs.

3.7.9.2.   Error Matrix

In the case that the SXL is not integrated into a network, it is still possible to provide an error indication. The error matrix offers the possibility to use relays 1 to 3 of the SXL as fault indication contacts. Therefore, every relay may be allocated to a certain type of defect.

Type of Defect	Description
AC Status Error	Mains fuse or mains supply failure
Protect	Amplifier channel in protect mode
Output Short*	Impedance below lower limit
Output Open*	Impedance above upper limit
Temperature High*	Critical temperature
Amp Offline	Amplifier does not answer via data bus
Load Invalid Check*	Impedance measurement could not be accomplished

*This function is only for certain devices available.

The allocation of the relays applies to all connected amplifiers. In case of a defect, the 8 LEDs on the front of the SXL (refer to 3.7.6. LED Indicators Seite 36) will indicate which amplifier is affected.

Although, the three relays may be programmed to indicate different types of defects (refer to 3.7.8.2.3.1. Error Matrix Seite 44), a general default indication is usually required instead. This general indication may be created by allocating all types of defect to one relay only.

It is also possible to combine the error matrices of several SXL. To achieve this, every SXL is set to the same relay allocation. The relays of each SXL are then either wired in series (released contacts) or parallel (activated contacts).

⚠ "Released relay contacts in case of defect" are the regular case in installations. The SXL works accordingly: In case of error-free operation of the connected amplifiers, the relays are active, i.e. pin B and C are connected. In case of an error (including a failure of the mains supply of the SXL) all relays release and pins A and C are connected. Therefore, it is also possible to use a "negative" logic by inversely wiring the contacts.

The error matrix may be activated per individual SXL configuration. This needs to be noted in case of creating or storing configurations. In addition, the time controlled line monitoring can be activated by the error matrix. For more information, please refer to the following chapter 3.7.9.3. Line Monitoring.

3.7.9.3.   Line Monitoring

The SXL may be used as a low impedance line monitoring device together with appropriately equipped Bittner Audio amplifiers. If required, the measurements may be accomplished in intervals less than 100 seconds to provide full compliance with EN60489.

The following functions and parameters are involved in the line monitoring:

- Time control via **relay 4** (refer to 3.7.8.2.3.3. Time Controlled Tasks Seite 44)
- Parameter **LoadSigChk** per amplifier channel (refer to 3.7.8.2.2. Amplifier & Channel Settings Seite 42)
- **Short** and **Open** for impedance window (upper and lower limit) (refer to 3.7.8.2.2. Amplifier & Channel Settings Seite 42)

The following illustration shows the principal lay-out. The diagram shows an uninterrupted monitoring of the audio path in compliance with the EN-60489:
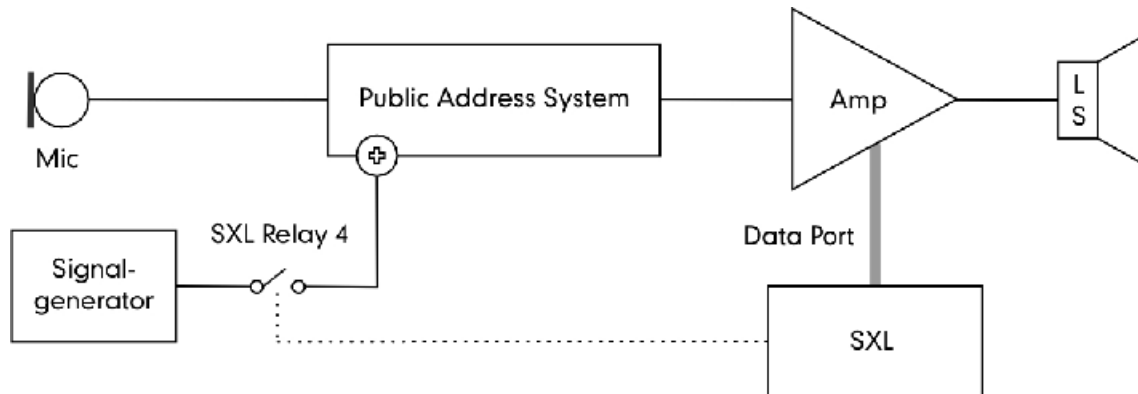
The paging system is responsible for the monitoring from microphone capsule to its own inputs, whereas the SXL monitors the rest of the audio chain. Every 90 seconds, relay 4 switches a 20kHz pilot tone for 10 seconds to the transmission chain. During the 10 seconds, the SXL measures the impedance of the amplifier channels of interest (parameter **LoadSigChk**). In the case that the measured value is not within the impedance window, an error will be displayed.

To ensure a reliable measurement, a sufficiently high output level is required. This level averages at about 1 to 2 Watts, depending on the amplifier model. Therefore, the line length and its corresponding losses are important.

At very low levels (close to the lower limit), the measurement taken during the first few minutes after turning on the amplifier may yield inaccurate results. To avoid misunderstandings, the system offers the parameter **LoadSig start after** to delay the first measurement. A value of 600 s (= 10 minutes) has proven to be adequate.

3.7.9.4.   Error Acknowledgment

A possible amplifier problem will be indicated by a blinking AMPLIFIER LINK STATUS LED (refer to 3.7.6. LED Indicators Seite 36) on the front panel and by a short description on the LCD (refer to 3.7.12. Error Codes Seite 59). In addition, the error is recorded to the logbook (refer to 3.7.8.2.7. Logbook Seite 48).

To meet the safety requirements of today's installations, a detected error needs to be confirmed after its clearance. The confirmation results in two events:

- The SXL tests whether the error has really been removed or still exists
- If the test has been successful, the verification will be recorded to the logbook

It is not possible to confirm an error via the network. Therefore, it is necessary to perform the following steps on the front panel of the device:

- After an error has been detected, the display of the SXL enters the **ErrMatrix** menu automatically and shows the appropriate error codes under **LastErr** (see below)
- Push the **DOWN** key once will gain to the parameter **ErrorClr**. Its value is **OFF**.
- Push **ENTER** and **UP** or **DOWN** to set its value to **ON**.
- Complete the setting with **ENTER**. The SXL will automatically start the verification – this may take up to 10 seconds.
- In case the error has been removed, the AMPLIFIER LINK STATUS LED will permanently light up again.

This safety feature is certainly not needed in every installation. Therefore, it may be deactivated. The necessary parameter **ClrErrorAuto** in the menu **SXLSTAT** is only available after the activation of Service Mode 2 (refer to 3.7.8.1.2. Entry Modes & Status Information Seite 40).

⚠️ If the confirmation of errors is deactivated, the SXL will no longer be compliant with safety requirements. Therefore, it may be deactivated only in appropriate installations.

3.7.9.5. Backup Switching

The SXL works seamlessly with the Bittner Audio Intelligent Backup Switch AX16. This device may be connected to the SXL via the system bus. Combined, the two devices offer a powerful solution for un-interrupted operation.

In case of error of an amplifier, the SXL is in direct control of the switching to the backup amplifier:

- The SXL copies every setting of the defective amplifier to the backup amplifier
- The SXL transmits the ID of the failed amplifier to the AX16
- The AX16 switches to the backup amplifier

This whole procedure will take only 250ms.

If the defective amplifier and the backup amplifier are not of the same model, the SXL will copy as many settings as possible. Different gain structures of the amplifiers are considered in advance and will – if possible – be made up for.

The "Force an Error" function of the web interface (refer to 3.7.8.2.6. AX16 Intelligent Amplifier Switch Seite 47) offers a comfortable way to test the combination of SXL, AX16 and amplifiers, as well as their wiring. Every possible type of defect may be tested.

3.7.9.6. Permanent Backup of Operation Modes

After powering-up and its initialization, the SXL configures all connected amplifiers. Therefore, it re-calls the stored files of a configuration. There are three different possibilities:

- A. A certain configuration is re-called
- B. The last active configuration is recalled
- C. All last active settings are restored

In the first two cases, the appropriate number 1 to 15 of the configuration is stored in the SXL. In case B, it will always be configuration 0, as it contains a copy of the last active configuration (refer to 3.7.8.2.4. Configurations Seite 45).

C is an extension of B, as possible changes (e.g. via the Ethernet) may also be restored after re-calling a configuration. It needs to be explicitly activated.

The necessary parameter **KeepActCfg** is accessible via Service Mode Level 1 (refer to 3.7.8.1.2. Entry Modes & Status Information Seite 40). It may be accessed under the **CONFIG** menu. While powering up (set value to **ON**), the value of the parameter **DefaultCfg** is automatically set to **0** at the same time.

To test this function, it is necessary to set the **DIAG LED** in such a way that it indicates the writing of data to the internal flash disk. Set the parameter **DiagScr** in the **DIAG** menu to the **KeepActCfg** value. Now, if any other parameter is being changed, it will be stored after at least 3 seconds on the intern flash disk. The **DIAG LED** will indicate this activity by a short illumination.

⚠️ Frequent storing of data to the flash disk will shorten its lifetime. It is therefore advisable to activate this function only if necessary.

3.7.10.   Software & Files

3.7.10.1.   Basic Functions

The SXL works with a flash disk. All files required for the operation of the device are being stored there.

These files are:

- Firmware
- Settings
- Configurations
- Web Interface

3.7.10.1.1.   TFTP

The files may be transferred and downloaded from any computer to the flash disk by using the **TFTP** program. TFTP stands for **Tiny File Transfer Protocol**. By default, it is a so-called command line application under Windows, Mac and Linux. Under Windows, it may be executed in the MS-DOS prompt or the Terminal on a Mac or under Linux. Its use under Windows is explained below:

TFTP is a mini version of FTP, well-known from the Internet. It is considered to be the "little brother" and easy to use. To look at the command structure, open the MS-DOS window and type the command **TFTP** and **ENTER**. This following line will be listed up:

```
TFTP [-i] Host [GET | PUT] Source [Destination]
```

-i	Indicates binary transfer mode (also known as octet). In binary mode, the file will be transferred Byte by Byte. Use this mode to transfer binary files.
Host	Indicates the local host or the remote host.
GET	Transfers data from the remote host to the file source of the local host.
PUT	Transfers data from the local host to the remote host.
Source	Indicates the source file.
Destination	Indicates where the file is transferred to.

For its use with the SXL applies the following:

- **Option –i** is always specified
- **Host** is the IP address of the SXL

The parameters **GET** respectively **PUT** indicate whether a file may be read (**GET**) from the flash disk of the SXL or it may be written (**PUT**) to the flash disk.

3.7.10.1.2.   MS-DOS

Working with the MS-DOS prompt requires some basic commands. Every entry of a command and possible options and parameters is always done in one line and completed with the key **ENTER**. After typing **Command /?** , a detailed description of a command and its syntax will be available.

Selecting a Drive

Selecting a drive may be completed by typing the letter which is visible in the Explorer.

Example: **d**: changes to drive D

Changing a Directory

Under Windows, the MS-DOS prompt indicates which directory has been chosen.
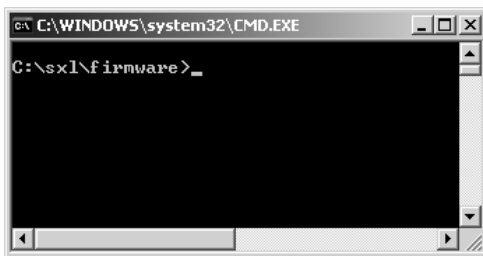
In the picture on the left hand side the directory **firmware** has been selected. This directory is a sub-directory of the **sxl** directory on **drive C**.

The command **cd** (= change directory) will change to other directories. Additional sub-directories may be reached with the same command line and **backslash **.

Example: **cd sxl** changes to the directory **sxl**.

⚠ In case a path may contain a directory with a space, the command line needs to be put in quotation marks.

Example: **cd "\sxl\new firmware"**

Listing of a directory

The command **dir** lists the files and sub-directories in a directory. The parameter **/o** arranges them in alphabetical order.

Example: **dir /o** lists the content of the current directory.
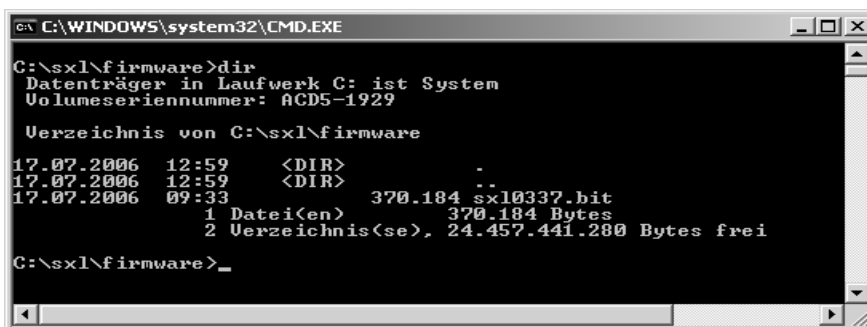
<u>Batch files</u>

If several commands need to be completed, it may be left to MS-DOS to execute them successively. This may be achieved with so-called **Batch** file. As the name indicates, it contains a batch of commands which are processed successively. It is easy to create a batch file using a text editor like Windows **Notepad**. The desired commands need to be typed successively. The file is saved with the ending .bat and may then be run by entering its name in the MS-DOS window.

⚠️ The Batch file for file transferring with the SXL should always be located within the same directory as the files to be transferred.

3.7.10.2.   Firmware

The firmware of the SXL is a file with nearly 400kB and built as follows:

sxl <firmware version> . bit

Example: **sxl0337.bit**

To change the firmware, open the MS-DOS prompt and change to the directory, the firmware has been saved in. To make sure that the firmware is located in this directory, list the directory with the command **dir**.

The following command will write the firmware to the SXL flash disk:

TFTP -i 192.168.115.101 PUT sxl0337.bit

The transmission will take only a few seconds and is indicated on the SXL's LCD. The status of the transmission will be visible after the operation has been completed.
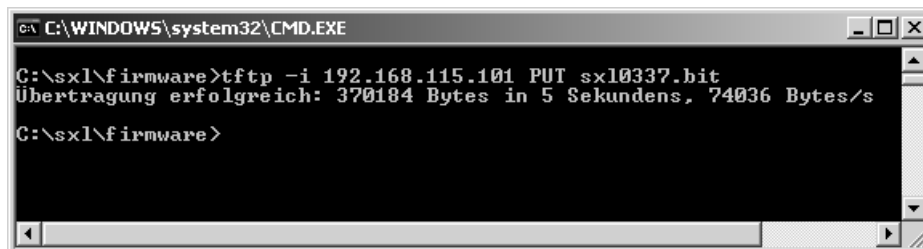
The SXL needs to be re-started. This may be comfortably done via the web interface. The re-start function is located in the **Advanced & Names** menu.

After re-starting it is also possible to check the firmware version under the same menu point.

Tip: The batch file **PUTFILE.BAT** has been created to ease the update of the SXL firmware. This file requires only the latest version of the firmware and the IP address:

Example: **PUTFILE.BAT 192.168.115.101 sxl0337.bit**

3.7.10.3.   Web Interface

The files of the web interface are installed similarly to the firmware. Although, several files need to be installed, only one command line is required.

As with the firmware the batch file **PUTALL.BAT** will ease the process. It contains the following commands:

for %%f in (*.htm *.sht *.gif *.css *.js) do tftp -i %1 PUT %%f

The parameter **%1** contains the IP address.

Example: **PUTALL.BAT 192.168.115.101** transmits all files of the web interface in the current directory to the SXL.

⚠️ It is not necessary to re-start the SXL after the transmission of one or several files of the web interface is completed. The changes are immediately available after a refresh.

3.7.10.4.   Backup of SXL files

Using the TFTP function, all settings and configurations of the SXL may be readout and saved as a backup on an external storage medium. These files may also be re-transmitted to the SXL in case of a problem.

3.7.10.4.1.   Global SXL Settings

The global settings of the SXL are being saved in a single file called **wattcp.cfg**. This file contains information like the IP address, the user name and the password.

⚠️ After recovery of the file, the SXL needs to be re-started.

3.7.10.4.2.   SXL Configurations

Every SXL configuration is stored in a single file. SXL configurations are identified as follows:

sxl <configuration number> . cfg

The configuration numbers range from 0 to 15.

Example: **sxl8.cfg** is the SXL configuration 8.

A .cfg file is only available if the SXL configuration has been saved under this specific number. It is not possible to save a non-existent file. This will be indicated by an error message. In addition, an empty temporary file is created which may be deleted any time.

After its recovery, an SXL configuration may be called immediately. There is no need to re-start the SXL.

3.7.10.4.3.   DSP Configurations

Every DSP configuration is saved in a single file. DSP configurations are identified as follows:

dsp <configuration number> . cfg

The configuration numbers range from 1 to 50.

Example: **dsp23.cfg** is the DSP configuration 23

A **.cfg** file is only available if the SXL configuration has been saved under this specific number. It is not possible to save a non-existent file. This will be indicated by an error message. In addition, an empty temporary file is created which may be deleted any time.

After its recovery, an SXL configuration may be called immediately. There is no need to re-start the SXL.

3.7.10.4.4.   Logbook

The SXL's logbook is stored in the file **sxllog.log**. As soon as this file reaches a certain size (128 kB), an internal copy is created and the actual logbook files are cleared. The copy will be stored under **sxllog0.log** and overwrites a possibly existing file with the same name. This so-called **rotation** avoids a flash disk overflow.

Both files have a storage capacity of approximately 2600 entries.

3.7.10.5.   Tips & Tricks

Batch Files

To ease the saving and the recovery of files, Bittner Audio created a series of batch files. These files may be downloaded from the Bittner Audio website (http://www.bittner-audio.com). The files also include detailed explanations for the use of particular batch files.

Copying of Configurations

In larger installations, the batch files for saving and restoring the data may also be used for copying configurations from one SXL to the next. To copy configuration files, the specific configuration(s) need to be created on one SXL, then saved to a computer and transferred to the next SXL. This procedure works for all as well as for single files.

3.7.11. Amplifier Functions - Overview

The following table shows the parameters available on different amplifier models.

If a parameter is not listed/available for an amplifier, the device will also not feature the corresponding hardware parts (e.g. relays, sensors, etc.) for it.

Functions marked with a **P** are controllable parameters. All other functions are status values.

		XR DSP	4X	8X
Amplifier Functions				
Standby Mode	P	●	●	●
Mains Supply		●	●	●
Model		●	●	●
Firmware Revision		●	●	●
Delay Power On	P	●	●	●
Online		●	●	●
Mode of Operation		●		
Number of Channels		●	●	●
Alive		●	●	●
Channel Functions				
Input Active*	P			
Input Inverted	P	●		
Mute	P	●	●	●
Gain	P	●	●	●
Clip		●	●	●
Protect		●	●	●
Input Level		●		
Output Peak Voltage		●	●	
Output Peak Current		●		
Temperature		●	●	
Monitor Output Bus A	P	●		
Monitor Output Bus B*	P			
Monitor Output Inverted*	P			
Monitor Gain	P	●		
Output Power		●		
Output Load Impedance		●		
Load Short		●		
Load Open		●		
Short Threshold	P	●		
Open Threshold	P	●		
Paging Input	P	●		
Headroom		●		
Input Sensitivity	P	●		
DSP	P	●		

* These functions were used in the CS-Series

3.7.12. Error Codes

Because of the limited space of the LCD, abbreviations have to be used. Therefore error codes are made up of:

- Device name (2 letters)
- Device number (2 figures)
- Parameters (3 letters)

The individual designations are separated by a point to increase readability. The parameter is abbreviated with its first 3 letters.

The error codes are:

Name of the Device	Number of the Device	Parameters		Explanation
NONE	01	NonePar	Non	Error-free
AMP	01 to 08	ACStat	ACS	Mains supply / fuse
AMP	01 to 08	Online	Onl	Communication System bus
AX16	01	ACStat	ACS	Mains supply / fuse
AX16	01	Online	Onl	Communication System bus
CHAN	01 to 16	Protect	Pro	Channel switched off
CHAN	01 to 16	Temprt	Tem	Temperature above 80°C
CHAN	01 to 16	ShortOut	Sho	Impedance below lower limit
CHAN	01 to 16	OpenOut	Ope	Impedance above upper limit
CHAN	01 to 16	LoadImp	Loa	Impedance could not be measured

Example: A communication error with amplifier ID 5 would show up as AMP.06.Onl.

⚠ Please note that the way of counting the device numbers starts with 1, contrary to the IDs that start with 0.

3.8.   AX16 - Intelligent Amplifier Switch

3.8.1.   General Information

The AX16 is an Intelligent Amplifier Switch that is capable switching both, 100V and high power low-impedance amplifiers (2-16Ω). The switching process is microprocessor controlled and takes less than 250 ms.

To maintain the volume of the system in case of a backup, the input levels are controlled through digital potentiometers and stored. As a result, the levels/volumes of all amplifier channels will remain at their set value.

If the AX16 is connected to a Bittner Audio SXL unit, the so-called Intelligent Switching Algorithm will be activated. This algorithm transmits not only channel levels but also all parameters of an integrated DSP to the backup amplifier.

The AX16 may also be used as a stand-alone switching device for other brands. The control is then established via contact closures. The integrated switch-over and fault detection contacts allow for easy communication with any control and monitoring system.

If connected to a Bittner Audio SXL via data port, the AX16 will become an essential part of the Bittner Audio network for intelligent remote control and monitoring.

Possible configurations:

- Switching of 14 amplifier channels
  to two backup channels (7:1)
- Switching of two groups of six amplifier channels
  to two backup channels per group (3:1)
- Switching of four groups of two amplifier channels
  to two backup channels each group (1:1)

Max. breaking capacity of each loudspeaker relays: 20A / 250V peak (or 100V for 100V loudspeaker systems).

3.8.2.   Features

- Microprocessor controlled 16 Channel Amplifier Backup Switch
- Controlled via contact closures (ALIVE contact) and SXL
- Operation modes:
- 1 times 7 Stereo Signal + 1 Backup Stereo Channel
- 2 times 3 Stereo Signal + 1 Backup Stereo Channel
- 4 times 1 Stereo Signal + 1 Backup Stereo Channel
- Digital volume controls
- 2 fault indication contacts: ALIVE and BACKUP OPERATION
- Output relays with max. 20 A/240V, 100V compatible
- LED Indicators for all switching modes
- PHOENIX connectors
- SXL data port
- 3 years warranty

3.8.3.   Front View

3.8.4.   Rear View
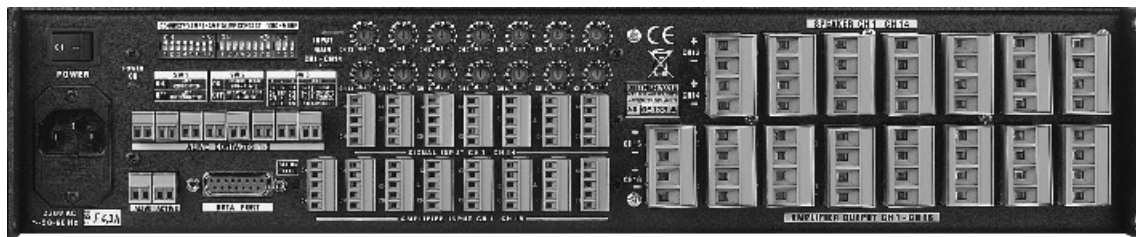
Connectors and Controls of the rear panel

Inputs	5-pin PHOENIX connector for channels 1-2, 3-4...13-14
Outputs	5-pin PHOENIX connector for channels 1-2, 3-4...15-16 each
Speaker Inputs	4-pin high power PHOENIX connector for channels 1-2, 3-4...15-16 each
Speaker Output	4-pin high power PHOENIX connector for channels 1-2, 3-4...13-14 each
Volume Controls	14
DIP Switch with 19 switches Block 1 - Switch 1 to 8: Block 2 - Switch 9 to 16: Block 3 - Switch 17 to 19:	 Amplifier connected / not connected Polarity Alive Contact Operation Mode 7+1,3+1, 1+1
Alive Contacts	8 contact inputs from amplifiers
Fault Indication Contacts	1 contact indicating amp failure 1 contact indicating AX16 failure
SXL Data port	15-pin Sub-D Connector
Power	Power switch, Euro plug , LED
Power fuses	1

3.8.5.   LED Indicators
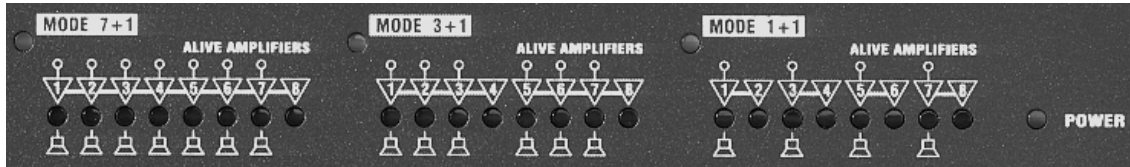
LED	Color	Function
POWER	green	Indicates that the unit is powered up.
Mode 7 + 1	red	Indicates the Mode 7+1
Amplifier 1-8	8x red	Indicates the active amplifiers
Mode 3+1	red	Indicates the Mode 3+1
Amplifier 1-8	8x red	Indicates the active amplifiers
Mode 1+1	red	Indicates the Mode 1+1
Amplifier 1-8	8x red	Indicates the active amplifiers

If one amplifier is switched to the backup amplifier, the LED of the amplifier and the LED of the backup amplifier will flash.

In the case that another amplifier fails and cannot be switched to a backup amplifier its LED will flash fast.
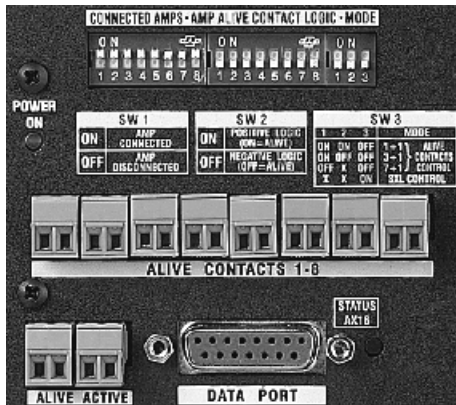
The AX16 is equipped with two LEDs on the rear panel of the unit for operation with the SXL:

LED	Color	Function
POWER	green	Indicates that the unit is powered up.
STATUS AX16	red	Blinks once every second under normal conditions, blinks fast in case of AX16 fault or if the mains voltage drops under 190 VAC.

3.8.6.   Starting

3.8.6.1.   Operation Modes

It is possible to connect two- or multi-channel amplifiers to an AX16. In the following sections the word **amplifier** stands for a 2 channels. Therefore the 4X series models count as 2, the 8X series models as 4 amplifiers.

3.8.6.1.1.   Switching Modes

The switching modes determine how many amplifier channels are being backed up. The switching modes are selected with DIP switches 1 and 2 of the block SW3 on the rear panel of the device.

Mode 7+1	Mode 3+1	Mode 1+1
Eight amplifiers (16 channels) may be connected. Seven amplifiers (14 channels) are being used as program amplifiers and one amplifier (2 channels) as the backup amplifier.	Two groups of four amplifiers (8 channels) each may be connected. Three amplifiers (6 channels) of each group are being used as program amplifiers and one amplifier (2 channels) as the backup amplifier.	Four groups of two amplifiers (4 channels) each may be connected. One amplifier (2 channels) is being used as program amplifier and one amplifier (2 channels) is being used as the backup amplifier.

⚠️ To activate the DIP-Switch SW3 settings the AX16 has to be re-powered.
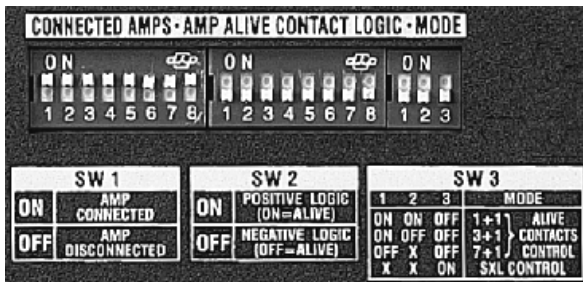
3.8.6.1.2.   Connected Amps

The DIP switches 1 to 8 of block SW1 tell the AX16 whether an amplifier is connected or not.

- ON: amplifier is connected
- OFF: no amplifier is connected

⚠️ These DIP switches are disabled if the AX16 is connected to an SXL.

3.8.6.1.3.   Logic of Alive Contact

The DIP switches 1 to 8 of block SW2 determine the control logic of the connected alive contacts in case of a failure:

- ON: positive logic (contact open if amp fails)
- OFF: negative logic (contact closed if amp fails)

⚠️ These DIP switches are disabled if the AX16 is connected to an SXL.

3.8.6.1.4.   Control Modes

The backup switching may be activated in two different ways, which are selected by DIP switch 3 of block SW3:

- ON: Control by a connected SXL
- OFF: Control by the ALIVE contacts of the connected amplifiers or any other potential-free contact

When using the contact inputs, a single contact will control one amplifier (2 channels). This contact is directly compatible with the ALIVE (fault detection) contacts of Bittner Audio amplifiers.

In addition, any other potential-free contact may be used. The switching will take place after the contact has been activated (amplifier defect will be indicated by either an opened or a closed contact). This logic operation (positive-negative) needs to be set with DIP Switch block SW 2 for each amplifier.

⚠ If connected to an SXL, the contact closures may not be used.

3.8.6.2.   Connection of Amplifier

3.8.6.2.1.   Signal and Amplifier Inputs

The signal inputs of the individual channels may be connected to the PHOENIX terminals **Signal Input CH1 – CH14**.

⚠ Since the back amplifier does not have its own input, only 14 inputs are needed on the AX16. The input signal of the backup amplifier is made up of the input channels of the faulty amplifier. This also guarantees that the level of the faulty amplifier is relayed on to the backup amplifier.
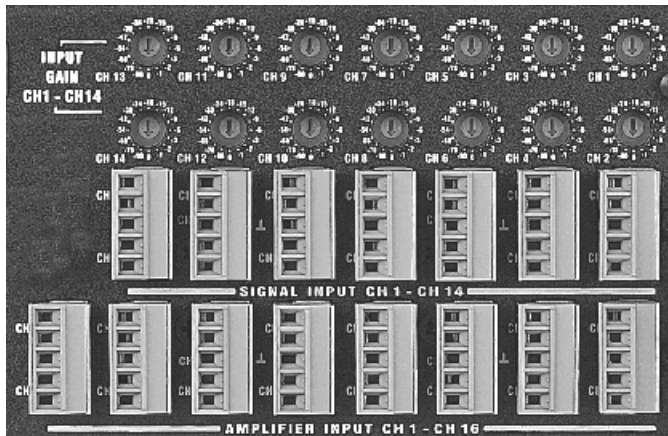
The input signals are then available on the PHOENIX terminals **Amplifier Input Ch1 – CH16**.

⚠ In case of failure, the backup amplifier will receive its audio signal from the AX16. This is the reason why 16 channels (AX16 -> amplifiers) are available.

3.8.6.2.2.   Amplifier Outputs and Loudspeakers

The amplifier power outputs (including the outputs of the backup amplifier) need to be connected to the PHOENIX terminals labeled **Amplifier Output CH1 – CH16** on the AX16. Depending on the selected mode, the power outputs are switched to the appropriate loudspeaker lines.
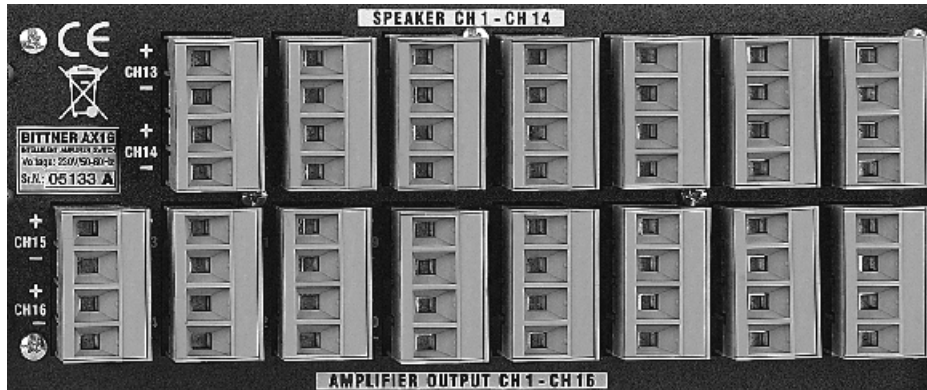
The loudspeakers may be connected to the terminals **Speaker CH1 – Ch14** on the AX16.

⚠️ In line with the input configuration 14 loudspeaker and 16 amplifier connectors are available.

3.8.6.2.3.   ALIVE contacts of the amplifier

If the device is only controlled by contacts, the corresponding contacts on the backside of the unit need to be connected. The PHOENIX terminals offer eight contact pairs.

⚠️ Every activated amplifier needs to be connected and so needs the backup amplifier, too. Any potential-free contact may be used for controlling.

3.8.6.3.   Data Port

The AX16 is equipped with a data port for the connection to a Bittner Audio SXL.

The connection of the AX16 to an SXL will integrate it into the Bittner Audio monitoring system.

Bittner Audio recommends the use of the AX16 in connection with an SXL to utilize every option of the intelligent controlling and monitoring system.

If an AX16 is connected to the SXL amplifier controlling device, the DSP parameters (if featured) will be transmitted to the backup amplifiers.

⚠️ The digital parameters of the AX16, if integrated into the SXL amplifier controlling system, need to be set to 0dB.

3.8.7.   Level Control

To maintain the level/volume structure of the system, independent of the backup switching condition, it is important to control the level not on the amplifier itself but on the backup switching unit. This ensures that the level of the faulty amplifier is being applied to the backup amplifier.

⚠️ Every potentiometer of the amplifier (including the backup amplifier) should be set to the same value (in standard operation maximum =Unity Gain).
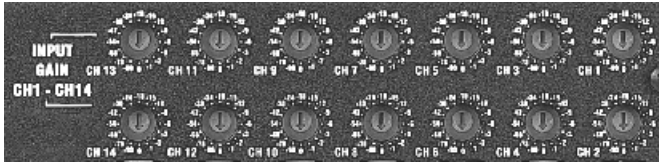
FYI: If an SXL controls the AX16, all levels will be intelligently adapted. This allows for the use of amplifiers of different power outputs in the same system.

3.8.8.   ALIVE and ACTIVE Contacts

The condition of an AX16 is indicated by its own ALIVE contact.

In addition, a status contact (ACTIVE) is available which triggers in case of the activation of the backup amplifier/mode.

⚠️ In case the mains supply fails, the AX16 (ALIVE contact will open) will fall back into a safety mode: all signals are directly switched to the amplifier inputs and the amplifier outputs are directly switched to the loudspeaker outputs. The digital potentiometers are bridged and the signals are switched without level control. This feature maintains operation (although somewhat limited) in case of a failure of the backup switching device.

3.9.   XT Series

3.9.1.   General Information

100 V transformers are an essential part of fixed installations. The possibility to connect many loudspeakers in parallel to a single amplifier and to have them galvanically separated is of undisputed significance. To save costs, however, low quality transformers are being used that offer only low fidelity in the lower and higher frequency range.

The XT transformers are being used in the Bittner Audio XV 100 Volt series. Bittner quality is available in every single component.
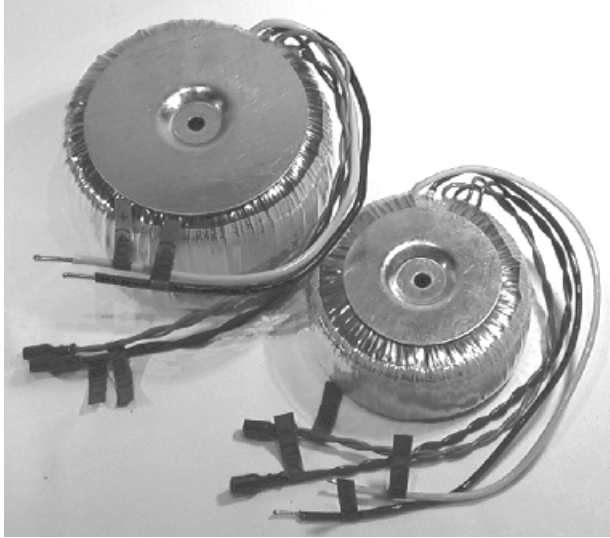
3.9.2.   Connections

The XT Transformer comes with 4 connection wires, each with a unique color. A sticker states the + pin.

100V
Two "thin" twisted pair wires

Low impedance (4 Ohms)
Two "thicker" wires

3.10. 8XT Series

3.10.1. General Information

Bittner Audio's high quality transformers are now not only available as single transformers, but come in an 8 channel chassis with only 2 RU.

Simply connect an 8X amplifier to an 8XT multichannel output transformer and you'll be ready to meet our European norms and standards.

3.10.2. Front View
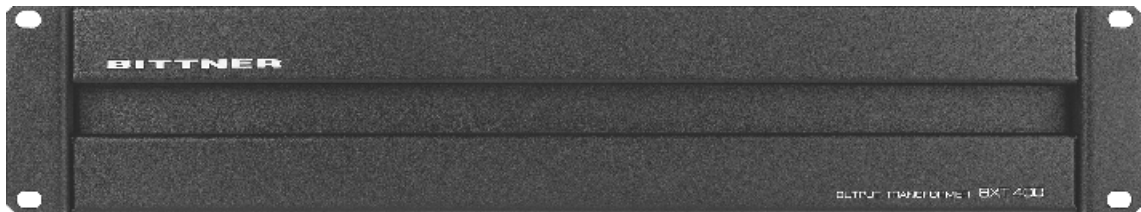
3.10.3. Rear View
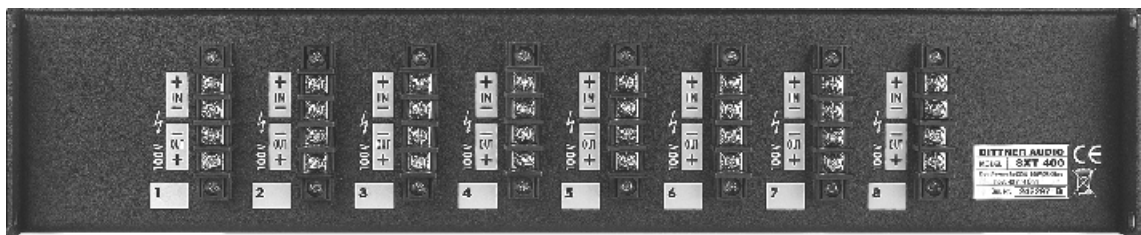
Connectors and Controls of the rear panel:

Inputs from Amplifier	2 -pin screw terminals
Outputs to Speaker	2-pin screw terminals

4. General Technical Information

4.1. Decibel

A decibel is a logarithmic scale commonly used to express differences in signal levels. It is useful in audio because it can express a wide dynamic range with relatively small numbers (or a small movement on a meter), and it more closely matches how we perceive sound.

The measurement quoted in dB describes the ratio between the quantity of two levels, the level being measured and a reference.

The absolute quantity of the signal is not relevant. This means that decibels are always comparing one quantity to another. For example, when we measure gain in dB, we are comparing the output level to the input level.

To describe an absolute value, the reference point must be known. There are different reference points defined.

dBV represents the level compared to 1 Volt RMS. 0dBV = 1V with no reference to impedance. dBu represents the level compared to 0,775 Volt RMS on an unloaded, open circuit.

dBm represents the power level compared to 1 mWatt. This is a level compared to 0,775 Volt RMS across a 600 Ohm load impedance.

1dBV equals +2.2dBu, +4dBu equals 1.23 Volt RMS, the reference level of -10dBV is the equivalent to a level of -7.8dBu.

Headroom is a measure (usually in dB) of how much higher the peaks of a signal can be compared to the nominal level without clipping. That is, it compares the peak level (in volts RMS) to the nominal level (in volts RMS). The difference between the two (in dB) is the headroom.

4.2. 100 V

100V-Systems are referred to as **constant-voltage distributed audio systems**. The constant voltage system is the most economical way to install a multi-speaker sound reinforcement system.

The term **100V system** relates to the maximum output voltage of the amplifier. 100V is the usual voltage in Europe, 70V in the United States. A higher voltage up to 200V can also be used for very long cable runs and higher power requirements.

To generate this high voltage, the amplifier is equipped with a step-up transformer, which transforms the regular output voltage, in the 15 to 30 Volts range, up to the necessary 100V (or 70V respectively).

A 100V-loudspeaker is equipped with a step-down transformer with a relatively high input impedance. The transformer's output impedance matches the included chassis' impedance (usually 8 Ohms). The ratio between the low output impedance of the amplifier and the transformer input impedance of the individual speaker is usually between 1:100 and 1:1000.

Directly proportional to the maximum output power of the amplifier, each 100V amplifier matches a certain minimum impedance than can be connected to this output. It does not matter how the connected impedance is achieved. A large number of smaller speakers (with high input impedance at their step-down transformers) or a small number of larger speakers (with lower impedance) can be connected to the 100V. Any combination of different 100V-loudspeakers is possible, as long as the total impedance of the 100V line doesn't fall below the minimum impedance of the amplifier's output.

The real output voltage of the amplifier during the transmission of music or speech is mostly far less that the maximum 100V, proportionally representing the input signal. The term '100V' defines the maximum voltage in the system in the same way as the term +6 dB defines the maximum level for a line signal.

4.3.   Useful Things

<u>Load-to-Power relation in 100V systems</u>

10 Ohm =	1000 W	20 Ohm =	500 W	25 Ohm =	400 W
40 Ohm =	250 W	50 Ohm =	200 W	100 Ohm =	100 W

<u>Crest Factor</u>

The Crest Factor of an amp represents the relation between the peak voltage and the RMS value. It can be taken as a measurement of the quality of the response of an amp.

$$\text{Crest Factor} = \frac{\text{Peak}}{\text{RMS}} = \frac{1}{\sqrt{2}} \times \text{Peak}$$

<u>Resistance - Capacitance - Inductance</u>

Ohm's Law:
$$U = I \times R \qquad I = \frac{U}{R} \qquad R = \frac{U}{I}$$

Power:
$$W = I^2 \times R \qquad W = \frac{U^2}{R} \qquad W = U \times I$$

Resistors in series:
$$R_{ges} = R_1 + R_2 + \dots + R_n$$

Resistors parallel:
$$R_{ges} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_n}}$$

<u>Voltages in dBu and dBV</u>

10	V	=	20	dBV	=	22	dBu
1,55	V	=	4	dBV	=	6	dBu
1	V	=	0	dBV	=	2,2	dBu
775	mV	=	-2,2	dBV	=	0	dBu
316	mV	=	-10	dBV	=	-7,8	dBu

<u>"dB"-Relations</u>

Voltage: $dB = 20 \log_{10} \frac{E_1}{E_2}$ Power: $dB = 10 \log_{10} \frac{P_1}{P_2}$

<u>Conversion of THD to "dB below signal level"</u>

THD %	dB below signal	THD %	dB below signal	THD %	dB below signal
100	0	0,5	-46	0,01	-80
10	-20	0,25	-52	0,005	-86
5	-26	0,1	-60	0,0025	-92
1	-40	0,05	-66	0,001	-100

<u>Voltage to Power</u>

Volts	Watt 4 Ohm	Watt 8 Ohm	Volts	Watt 4 Ohm	Watt 8 Ohm
63,2	1000	500	20	100	50
44,8	500	250	14,1	50	25
31,6	250	125	10	25	12,5
28,2	200	100	6,3	10	5
22,4	125	62,5	2	1	0,5

Measuring Amplifier Power

The output power of an amplifier is most of the time the only criterion to evaluate its performance and quality. For the sake of a quick comparison of different models and manufacturers we tend to forget other important factors like its ability to control EMF (Electro-motoric Force). Unfortunately this comparison at a glance is really misleading as most of the data presented have little or no value at all.

Bittner Audio always provided only one type of output power data: continuous output from 20 Hz to 20 kHz. This sine wave is not representing a real-world music signal, but it makes an excellent statement about the durability of the power supply and the efficiency of the amplifier.

Such a test easily reveals whether a transformer is too weak or that the power supply is converting too much energy into heat. If this is the case, the mains will be quickly overloaded or the amplifier gets so hot that it reaches its thermal capacity.

Continuous power output has been sufficient for many years to determine whether an amplifier is adequately powered for a given application. In fact, other testing procedures have been considered unprofessional and insufficient.

However, new developments require new methods of testing. High power amplifiers with an output of more than 1000 watts per channel are a commodity nowadays. Measuring an amplifier of for example 4000 watts will lead to serious problems if the traditional procedures are applied: driven with a sine wave into its nominal load (i.e. 4 ohms) it will draw more than 6000 watts or 25 A from the supplies. Most mains-fuses will blow during this test and it is most likely illegal to replace the fuse with the next higher value...

How can amplifiers of this magnitude be operated from regular mains at all? The answer is rather simple: even highly compressed music material like Rave/Dance or alarm signals are not comparable to a full power continuous output.

Therefore, most manufacturers decided to publish their data according to the following "real-world" testing procedure: the maximum output power of an amplifier will be measured with a 1 kHz sine wave with a 33.3 ms on-time followed by 66.6 ms off-time. This test is closer to music program and will indicate a higher power, however, there will be no excessive draw on the mains, and fuses will stay intact. As a continuous power output 1/8 or 1/3 load is chosen.

Although this is closer to reality it also delivers values that cannot be verified applying the traditional testing procedures: a 2000 watts per channel amplifier tested with a burst signal delivers a continuous power output of approximately 650 watts (1/3 load) or 250 watts (1/8 load).

Unfortunately, it is still not possible to compare the products of different manufacturers. Neither are similar methods applied, as it is not really clear what a burst signal is made of, nor are the conditions known under which the results have been achieved. Therefore, if continuous output power data are available, they are still a good means to evaluate performance and durability. Please keep in mind that professional power amplifiers should be tools that have been designed for untroubled continuous operation to justify the investment.

Bittner Audio will therefore provide all data in the accustomed fashion i.e. continuous output power to demonstrate the capacity and stability of the products. In addition, the output power will also be indicated using the described testing method of a 33.3/66.6 ms burst signal to allow an easier comparison of different models and brands.

However, care should be taken while dimensioning fuses and or uninterrupted power supplies (UPS). In this case we recommend applying the power consumption of 1/8 or in the worst case 1/3 load. This also holds for determining the cooling capacity of air conditioned technical rooms.

All described values, including the damping factor at 4 ohms (refer to section 5. Technical Data Seite 73).

Heat Dissipation and Air Conditioning

The values of heat dissipation, provided by most amplifier manufacturers are normally being used to answer the question, how much cooling of a closed rack is necessary. However, whether costly air conditioning is really necessary cannot be easily answered and may be subject to the following considerations:

- an amplifier is designed to operate normally at about 25 ℃ ambient temperature without additional cooling
- lid or bottom of the amplifier chassis, as well as the side panels may not be removed to ensure a constant and effective flow of air
- good ventilation of the rack is normally sufficient
- air conditioning may be necessary to provide cooling, if the hot air is not being vented from the amplifier rack
- amplifiers generate the most excess heat while being driven between 40 and 60 percent - no matter which amplifier class is being used. Therefore, it is reasonable and sensible to use the heat dissipation values of approximately 1/3 power.

Please note: 1/3 power is a very high value that may occur only in case of an alarm being set off. Therefore, in most applications, good ventilation will be more than enough to provide safe operation.

Sound Pressure and Amplifier Power

The dynamic range of hearing reaches from a low whisper to the discomforting roar of a jet engine. This range equals a ratio of 1:1024!

Experience shows that large numbers cannot be handled easily. Therefore, a system has been developed to handle these large ratios in easy decibels. This system of number relations may be used to handle both electrical and acoustical values. Please note the following definitions:

Doubling a voltage or a current - for example from 1 to 2 volts - corresponds to an increase of 6 dB. Dividing the same voltage by two will result in a decrease of 6 dB.

Example: If the output level of an amplifier is raised by 18 dB, the actual output voltage is 8 times higher than the original one, and will raise from 2 to 16 volts.

Doubling the power (or loudness) follows a different ratio. An increase from 1 watt to 2 watts represents a raise of 3 dB!

This indicates that an increase of 6 dB represents 4 times the original power (see formulas).

Example: If the output power of an amplifier is increased by 18 dB, it's been raised by a factor of 64 (!) => from 2 to 128 watts for example.

This also indicates that raising the loudness by 1 dB will require 27% more output power. Doubling the loudness (3 dB) will result in 100% more output power.

While selecting an appropriate power amplifier, please note: Doubling the output power of an amplifier increases the loudness (SPL) by 3 dB. Unfortunately, this does **not** mean, that the impression of loudness is doubled as well. The human ear shows a varying sensitivity over frequency. Therefore, on average, we require 10 dB increase of SPL (loudness) to feel a subjective doubling of the loudness. This, however, will then require 10 times the output power of an amplifier - i.e. a 1000 W amplifier will seem (!) to be only twice as loud as a 100 Watt amp.

5. Technical Data

			Basic				XV					XB	
			200	400	800	1200	200	400	600	1000	1600	400	800
Channels			2	2	2	2	2	2	2	2	2	2	2
Class			AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
Burst per Channel 1 kHz	W	8 Ω	100	180	290	500	---	---	---	---	---	210	300
		4 Ω	130	250	490	840	---	---	---	---	---	250	490
		2 Ω	---	---	---	---	---	---	---	---	---	---	---
Output Power per Chan. 20 Hz - 20 kHz, 0,1% THD	W	8 Ω	80	140	230	350	---	---	---	---	---	150	230
		4 Ω	100	200	400	600	---	---	---	---	---	200	400
		2 Ω	---	---	---	---	---	---	---	---	---	---	---
		100 V	---	---	---	---	100	200	300	500	800	---	---
Output Power per Chan. 1 kHz, 1% THD	W	8 Ω	87	150	244	424	---	---	---	---	---	180	250
		4 Ω	110	210	410	702	---	---	---	---	---	210	410
		2 Ω	---	---	---	---	---	---	---	---	---	---	---
Output Power bridged 20 Hz - 20 kHz, 0,1% THD	W	16 Ω	160	278	484	700	---	---	---	---	---	300	460
		8 Ω	210	370	700	1200	---	---	---	---	---	400	800
		4 Ω	---	---	---	---	---	---	---	---	---	---	---
Frequency Response Full Power	dB	20 Hz	0	0	0	0	0	0	0	0	0	0	0
		20 kHz	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
THD 20 Hz - 20 kHz 10 dB below Full Power	%		0.03	0.02	0.02	0.01	0.06	0.05	0.05	0.05	0.05	0.01	0.01
THD 1 kHz Full Power	%		0.03	0.03	0.03	0.03	0.08	0.08	0.07	0.07	0.07	0.025	0.025
Signal-to-Noise Ratio 20 Hz - 20 kHz	dB		102	103	103	103	101	103	103	105	107	103	105
Channel Separation	dB	greater	85	85	85	85	75	75	75	70	70	85	85
Input Sensitivity	dBu		-1	0	+3	+6	-1	0	+2	+3	+6	+2	+3
Input Clipping	dBu		22	22	22	22	22	22	22	22	22	22	22
Input Impedance	kΩ		20	20	20	20	20	20	20	20	20	20	20
Voltage Gain	dB		28.8	31.4	34.1	36.4	42.3	42.3	42.3	42.3	42.3	32.4	34.2
Damping Factor		4 Ω	400	400	400	500	---	---	---	---	---	500	500
Cooling Fans (temperature controlled)		front	0	0	0	0	0	0	0	0	0	0	0
		back	2	2	2	2	2	2	2	2	3	2	2
Idle Current	A		0.1	0.12	0.17	0.37	0.12	0.13	0.2	0.25	0.27	0.13	0.18
Power Consumption 1/8 Load (Speech)	A	8 Ω	0.3	0.5	0.8	1.2	---	---	---	---	---	0.6	0.9
		4 Ω	0.4	0.7	1.1	1.9	---	---	---	---	---	0.9	1.1
		2 Ω	---	---	---	---	---	---	---	---	---	---	---
		100V	---	---	---	---	1.6	2.0	2.3	3.8	4.8	---	---
Power Consumption 1/3 Load (compressed Music)	A	8 Ω	0.6	1.0	1.6	2.7	---	---	---	---	---	1.2	1.6
		4 Ω	0.9	1.4	2.6	4.2	---	---	---	---	---	1.9	2.7
		2 Ω	---	---	---	---	---	---	---	---	---	---	---
		100V	---	---	---	---	2.4	3.2	3.6	5.9	7.4	---	---
Power Consumption Full Power	A	8 Ω	1.5	2.3	3.9	6.7	---	---	---	---	---	2.8	4.0
		4 Ω	2.2	3.5	6.2	10.9	---	---	---	---	---	4.5	6.2
		2 Ω	---	---	---	---	---	---	---	---	---	---	---
		100V	---	---	---	---	4.1	5.2	6.1	9.9	13.5	---	---
Heat Dissipation (Idle)	W*		11	14	20	31	14	15	23	29	31	15	21
Heat Dissipation 1/8 Load (Speech)	W*	8 Ω	34	57	92	138	---	---	---	---	---	69	103
		4 Ω	46	80	126	218	---	---	---	---	---	103	126
		2 Ω	---	---	---	---	---	---	---	---	---	---	---
		100V	---	---	---	---	184	230	264	437	552	---	---
Heat Dissipation 1/3 Load (compressed Music)	W*	8 Ω	69	115	184	310	---	---	---	---	---	138	184
		4 Ω	103	161	299	483	---	---	---	---	---	218	310
		2 Ω	---	---	---	---	---	---	---	---	---	---	---
		100V	---	---	---	---	276	368	414	678	851	---	---
Heat Dissipation Full Power	W*	8 Ω	172	264	448	770	---	---	---	---	---	322	460
		4 Ω	253	402	713	1253	---	---	---	---	---	517	713
		2 Ω	---	---	---	---	---	---	---	---	---	---	---
		100V	---	---	---	---	471	598	701	1138	1552	---	---
DSP													
SXL Dataport													
Remote Power On									●				●
Alive Contact									●				●
Ground Fault Detection									●				
Height	RU		2	2	2	2	2	2	2	2	2	2	2
Depth	mm		320	320	320	454	382	382	382	382	382	382	382
Weight (net)	kg		10	12	13	15	15	17	19	33	38	12	13
Power Requirements	V		210-240				210-240					210-240	
	Hz		50-60				50-60					50-60	

*1 Watt = 3.412 BTU/Hour = 3600 Joule/Hour

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			XB		XR				4X		8X		
			1600	2500	1500	2000	2500	4000	700	1400	100	200	400
Channels			2	2	2	2	2	2	4	4	8	8	8
Class			H	H	H	H	H	H	H	H	AB	AB	AB
Burst per Channel 1 kHz	W	8 Ω	550	700	530	590	700	850	520	840	100	180	290
		4 Ω	960	1130	880	985	1130	1360	880	1240	130	250	490
		2 Ω	1250	1570	1220	1345	1570	1950	1200	1500	---	---	---
Output Power per Chan. 20 Hz - 20 kHz, 0,1% THD	W	8 Ω	450	560	430	470	560	700	420	680	80	140	230
		4 Ω	780	920	720	800	920	1120	710	1020	100	200	400
		2 Ω	1050	1320	1000	1100	1300	1600	980	1210	---	---	---
		100 V	---	---	---	---	---	---	---	---	---	---	---
Output Power per Chan. 1 kHz, 1% THD	W	8 Ω	460	580	440	490	580	710	435	695	87	150	240
		4 Ω	800	940	730	820	940	1130	730	1030	110	210	410
		2 Ω	1040	1310	1020	1120	1310	1620	1000	1250	---	---	---
Output Power bridged 20 Hz - 20 kHz, 0,1% THD	W	16 Ω	890	1120	850	950	1120	1390	820	1250	160	300	460
		8 Ω	1500	1850	1450	1620	1850	2250	1350	2080	200	400	800
		4 Ω	2080	2600	2010	2210	2600	2950	1860	2400	---	---	---
Frequency Response Full Power	dB	20 Hz	0	0	0	0	0	0	0	0	0	0	0
		20 kHz	-0.3	-0.3	-0.5	-0.5	-0.5	-0.5	-0.3	-0.3	-0.3	-0.3	-0.3
THD 20 Hz - 20 kHz 10 dB below Full Power	%		0.03	0.03	0.025	0.025	0.025	0.025	0.03	0.03	0.02	0.02	0.02
THD 1 kHz Full Power	%		0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.025	0.025
Signal-to-Noise Ratio 20 Hz - 20 kHz	dB		103	103	103	103	103	103	103	103	101	103	103
Channel Separation	dB	greater	80	80	80	80	80	80	80	80	85	85	85
Input Sensitivity	dBu		+6	+6	+6	+6	+6	+6	+6	+6	-1	0	+2
Input Clipping	dBu		22	22	14	14	14	14	22	22	22	22	22
Input Impedance	kΩ		20	20	12	12	12	12	20	20	20	20	20
Voltage Gain	dB		30.5	30.5	30.5	30.5	30.5	30.5	30.5	30.5	28.8	31.4	34.1
Damping Factor		4 Ω	750	900	750	900	900	1200	800	900	400	400	400
Cooling Fans (temperature controlled)		front	0	0	2	2	2	2	2	2	0	2	2
		back	2	2	2	2	2	2	2	2	2	2	2
Idle Current	A		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.35	0.37
Power Consumption 1/8 Load (Speech)	A	8 Ω	2.3	2.8	2.2	2.4	2.9	3.5	2.2	3.6	3.0	4.3	5.9
		4 Ω	3.9	4.7	3.7	4.1	4.9	5.9	3.7	6.2	4.7	6.8	9.2
		2 Ω	6.4	7.5	6.2	6.5	7.7	9.2	6.2	9.5	---	---	---
		100V	---	---	---	---	---	---	---	---	---	---	---
Power Consumption 1/3 Load (compressed Music)	A	8 Ω	4.6	5.5	4.3	4.8	5.8	7.0	4.3	7.3	4.7	6.7	9.2
		4 Ω	7.0	8.3	6.6	7.3	8.7	10.5	6.6	11.0	7.3	10.4	14.4
		2 Ω	9.8	11.5	9.5	10.0	11.9	14.2	9.5	14.7	---	---	---
		100V	---	---	---	---	---	---	---	---	---	---	---
Power Consumption Full Power	A	8 Ω	8.5	10.2	8.0	8.9	10.8	12.9	8	13.5	7.7	11.0	15.2
		4 Ω	14.3	17.1	13.6	15.0	17.9	21.5	13.6	22.6	12.4	17.6	24.4
		2 Ω	22.8	26.6	22.0	23.2	27.6	33.0	22.0	34.0	---	---	---
		100V	---	---	---	---	---	---	---	---	---	---	---
Heat Dissipation (Idle)	W*		21	21	21	21	21	21	42	42	34	40	43
Heat Dissipation 1/8 Load (Speech)	W*	8 Ω	187	218	179	195	241	273	374	622	345	494	678
		4 Ω	304	382	304	335	428	506	623	1302	540	782	943
		2 Ω	674	737	666	659	783	900	1362	2531	---	---	---
		100V	---	---	---	---	---	---	---	---	---	---	---
Heat Dissipation 1/3 Load (compressed Music)	W*	8 Ω	527	604	482	549	673	784	987	1753	540	770	1058
		4 Ω	690	823	668	735	915	1093	1360	2653	839	1196	1656
		2 Ω	1015	1111	1005	1002	1203	1378	2057	3906	---	---	---
		100V	---	---	---	---	---	---	---	---	---	---	---
Heat Dissipation Full Power	W*	8 Ω	1055	1226	980	1107	1364	1567	1000	1745	885	1265	1784
		4 Ω	1729	2093	1688	1850	2277	2705	1708	3158	1426	2024	2805
		2 Ω	3144	3518	3060	3136	3748	4390	3100	5400	---	---	---
		100V	---	---	---	---	---	---	---	---	---	---	---
DSP						●							
SXL Dataport						●				●		●	
Remote Power On				●		●				●		●	
Alive Contact				●		●				●		●	
Ground Fault Detection													
Height	RU		2	2	2	2	2	2	2	2	2	2	2
Depth	mm		454	454	454	454	454	454	454	454	454	454	454
Weight (net)	kg		13	13.5	13.5	13.5	13.5	15.5	13.5	15	18	20	22
Power Requirements	V		210-240		210-240				210-240		210-240		
	Hz		50-60		50-60				50-60		50-60		

* 1 Watt = 3.412 BTU/Hour = 3600 Joule/Hour

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6. Troubleshooting

Problem: The amplifier cannot be switched on.

- **Cause:** Power cord not connected properly. Mains power not available. Main power fuses defect.
- **Solution:** Check the power cords and the mains power supply. Check the main power fuses at the back panel of the amplifier.

Problem: Amplifier is switched on, audio signal supplied but LED SIGNAL doesn't illuminate.

- **Cause:** Audio input cable defect or not properly connected.
- **Solution:** Check the audio signal cables and the signal source.

Problem: SIGNAL LED is on, but no sound.

- **Cause:** Speaker cables are not connected properly, or loudspeaker defect. Speaker cables connected to the wrong channel.
- **Solution:** Check the speaker cables and the loudspeakers.

Problem: Both SIGNAL LEDs illuminate, but no sound.

- **Cause:** Speaker cables are not connected properly, or loudspeaker defect, polarity in SPEAKON connector not according to the norm.
- **Solution:** Check the speaker cables and the loudspeakers.

Problem: Amplifier is switched on, audio signal supplied but LED SIGNAL doesn't illuminate.

- **Cause:** Audio input cable defect or not properly connected.
- **Solution:** Check the audio signal cables and the signal source.

Problem: No communication to the control computer.

- **Cause:** Wiring incorrect.
- **Solution:** Check wiring in general, check polarity of the data cables, check additional ground connection for the data cables between devices.

Problem: No communication to the control computer, LED TXD blinks slowly

- **Cause:** Invalid address '16' is set.
- **Solution:** Check DIP-Switches on the back panel of the SXL, address 1 to 15 possible in one system, same address in one system will cause failure.

Problem: No communication to the control computer.

- **Cause:** Baud-Rate wrong.
- **Solution:** Check Baud-Rate of all connected devices.

Problem: No communication to the control computer, RS-485

- **Cause:** Termination of the data cable incorrect.
- **Solution:** Check termination or necessity of termination of the RS-485 wiring.

Problem: No communication with the individual amplifiers.

- **Cause:** Amplifier address incorrect.
- **Solution:** Check amplifier addresses (DIP-Switch at the back panel of the amplifier).

Problem: Level cannot be changed.

- **Cause:** SXL is in default status, no communication, level = -18dB
- **Solution:** Check communication to the control computer.