USB STUDIO D

Users Manual

swissonic

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Statement of conformity

To whom it may concern

This letter is our statement of conformity to the appropriate CE certifications. Based on testing performed in September 1999, our products, Swissonic AD96 and Swissonic DA96 meet all pertinent worldwide regulations, including CE. This certification is based on test reports generated by EMC-Testcenter Zürich AG, Zurich, Switzerland. Copies of the reports are available upon request.

Uznach, December 1, 1999

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CE

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Quick Start

Make sure that the value written on the unit's voltage selector (near the power entry jack) matches your line voltage. Connect the unit to mains and to the USB port on your computer. Turn on the unit. After a few seconds, the operating system should detect the unit and show it in the device list (It may ask for the system CD first). USB Studio runs with the drivers provided by the operating system (Windows 98 or 2000 or Mac System 9).

Check that all pots are turned all the way left, and the pushbutton switches on the front panel are disengaged. Connect your monitoring system input to the «Mon out» RCA jacks on the back (alternatively, use the headphone output on the front). Play some sound over the audio device in your computer. Turn the «Computer» pot all the way up, then adjust the monitoring level using the «Monitor» and/or «Headphone» pot.

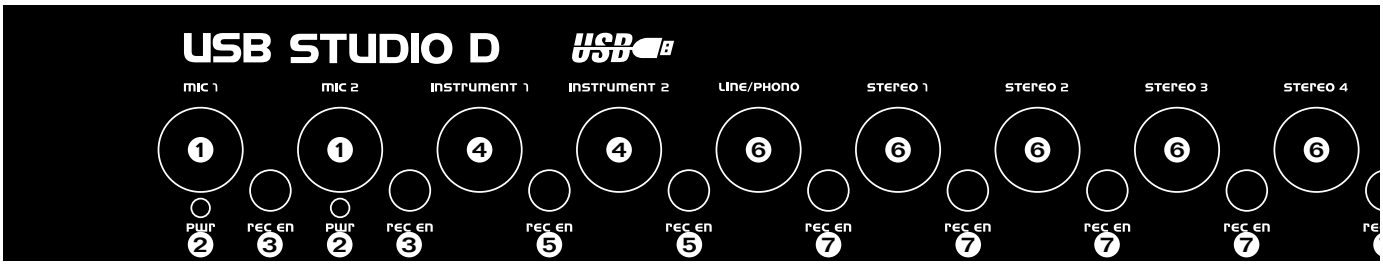
Connect a signal source to one of the unit's analog inputs on the back. Turn the input's level pot up making sure the «MON OL» Led is off, or just very briefly lights during loud transients. You should hear the source through the monitors. Push the «REC EN» switch of the respective input, then bring the «Rec Level» pot up. Watch the level on the Led bar. Now, you should be able to record the signal in your computer.

To hook up a digital source to the USB Studio D, plug it in the TOSLINK or RCA connector on the back. Make sure the input selection switch on the rear is in the right position (Opto or Coax). The LOCK led on the front panel should light. By turning up the «Digital In» pot, you should be able to hear the signal in the monitors, or, when the REC EN switch is pushed in, record it over the USB interface. The digital out takes the signal from either the REC or the MON mixes, as set by the switch on the front panel. Make sure the level is low enough not to light the OL Led.

Overview

Designed for recording studio quality sound, the USB Studio combines the flexibility of an 11-channel stereo mixer with the ease of use of the USB interface. Two professional quality mic pres allow the connection of (and do justice to) any mic. High impedace instrument inputs, a phono preamp and four stereo inputs complete the device. The USB Studio D adds support for optical and coax S/PDIF digital i/os. True 20-bit converters and matching signal processing circuits place the USB Studio in a class of it's own.

- 11-channel, 2-bus stereo mixer
- Two professional quality microphone preamplifiers with 48V phantom power and phase inversion switches
- Insert jacks allow the use of external compressors or effect units
- Two high impedance instrument preamplifiers
- Combined level/gain pots on mic and instrument inputs simplify setup while maximising SNR
- High quality RIAA phono preamplifier
- Four stereo line inputs
- 20-bit AD/16-bit DA conversion to/from USB interface
- 20-bit AD/DA conversion to/from S/PDIF input/output
- 8-Led peak level meters for recording level
- Can do sample rate conversion between the digital I/Os and the USB interface
- Level controlled monitor output
- High quality headphone output
- 1HU rugged all steel case with internal power supply



Front Panel

1 Mic 1/2 level pots. Adjust the level of the respective Mic input. The preamp gain is automatically adjusted as well, to optimise SNR and distortion. When turned all the way to the left, the channel is turned off completely.

2 Mic 1/2 phantom power Leds. When lighted, show that 48V phantom power is switched on for the respective input. Some mics could be damaged by phantom power, so make sure it's turned off before connecting one of those.

3 Mic 1/2 record enable switches. When switched off, the respective input is routed to the monitor bus. When on (in) the input is added to the rec bus. When monitoring, both Mic inputs are panned in the center. When recording, Mic 1 goes to the left channel and Mic 2 to the right.

4 Instrument 1/2 level pots. As for the Mic inputs, these also change the preamp gain, and can turn the channel completely off.

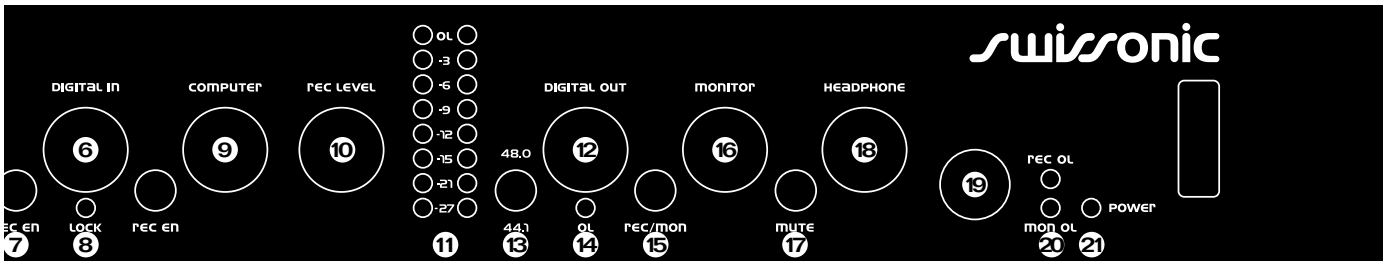
5 Instrument 1/2 record enable switches. When switched off, the respective input is routed to the monitor bus. When on (in) the input is added to the rec bus. When monitoring, both instrument inputs are panned in the center. When recording, Instrument 1 goes to the left channel and Instrument 2 to the right.

6 Line/phono, stereo inputs, digital in level pots. These are stereo pots adjusting the level of the respective inpus.

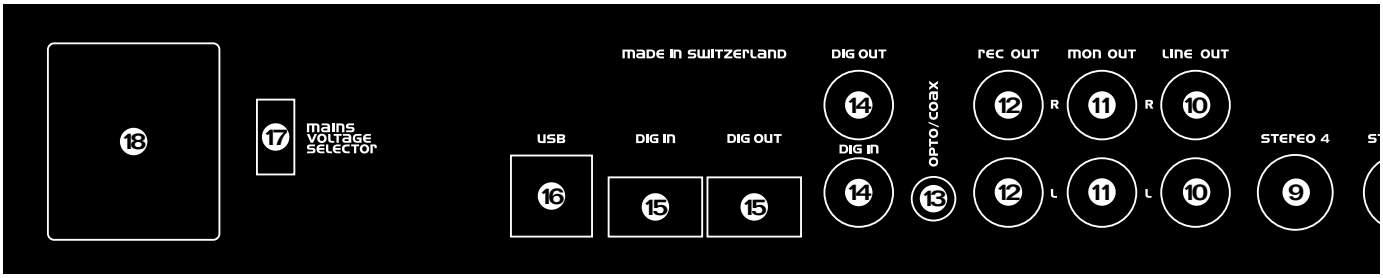
7 Line/phono, stereo inputs, digital in record enable switches. When switched off, the respective input is routed to the monitor bus. When on (in) the input is added to the rec bus.

8 Digital in lock led. When lighted, this shows that a valid source has been connected to the digital input, and that the unit has locked to that.

9 Computer level pot. This pot adjusts the level of the signal coming through the USB interface. It is always routed to the monitor bus.



10 Record level pot. Adjusts the level of the signal going to the computer via the USB bus interface. The actual level is shown on the led bar next.
11 Recording level led bar. A peak level meter of the signal that is recorded through the USB interface. The red Led is only 1dB below clipping, so it should never light, or distortion will occur.
12 Digital out level. Adjusts the level of the signal going to the digital out interface.
13 Sample rate selector for digital output. Selects the sample rate of the digital output when the unit is not locked to a S/PDIF source. When the unit is locked to a S/PDIF source, the digital output will run at the same rate as the input.
14 Digital out overload Led. This Led lights when the peak level at the digital output is less that 6 dB below clipping. So, it should only be allowed to light briefly during the loudest transients.
15 Digital out source switch. This switch sets whether the digital output is taken from the record (switch out) or the monitor bus (switch in).
16 Monitor level pot. Adjusts the level of the signal at the monitor output jacks on the back.
17 Monitor mute switch. Mutes the monitor output when pressed in.
18 Headphone level pot. Adjusts the level at the headphone output next.
19 Headphone jack. The headphone signal is taken from the monitor bus. The output is capable of pretty high levels, so be careful.
20 Record and monitor bus overload leds. These Leds show when the level of the respective busses is dangerously close to clipping (less than 6dB headroom). If these light, one of the inputs' level pots should be turned down.
21 Power switch and Led.



Rear Panel

1 Mic 1/2 input jacks. Balanced XLR Mic inputs. 1 = ground, 2 = plus, 3 = minus.

2 Mic 1/2 phantom power switches. When pushed in, enable 48V phantom power on the Mic inputs, and light the corresponding front panel leds.

3 Mic 1/2 invert switches. Invert the polarity of the corresponding input when pushed in. Useful for solving phasing problems.

4 Mic 1/2 insert jacks. Used for effect loops before mixing. The insert jacks are wired with tip = send, ring = return. The send signal is taken after the level pot.

5 Instrument 1/2 input jacks. These are high impedance mono (TS) inputs.

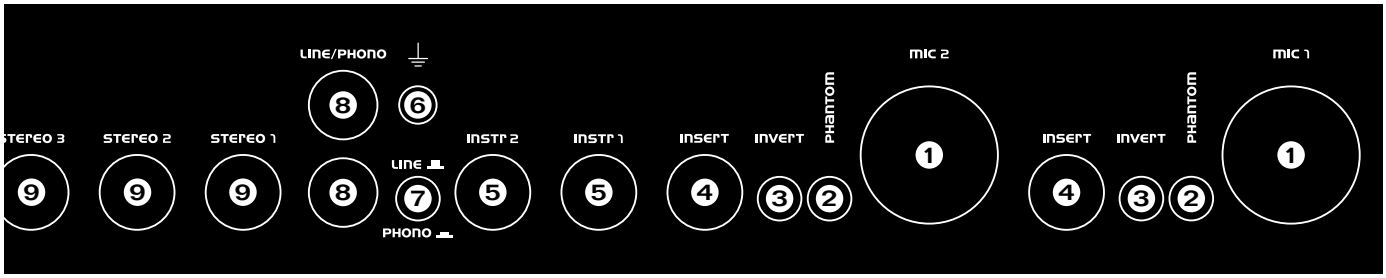
6 Turntable grounding terminal. A 4 mm banana jack used to connect the chassis/shield of the turntable.

7 Phono/line selection switch. When released, the phono/line input is configured as a RIAA phono preamp. When pushed in, it is a normal unbalanced line input.

8 Phono/line input jacks. L/R RCA inputs for phono/line.

9 Stereo jack inputs. Four 6,3mm stereo TRS unbalanced line inputs.

10 Line output jacks. The signal on the monitor bus before the monitor level pot is presented over these RCA jacks.



11 Monitor output jacks. Used to feed the monitor amp. The signal here is taken from the monitor bus, after the monitor level pot and mute switch.
12 Rec output jacks. The recording bus signal before the rec level pot is presented here.
13 Opto/coax switch. Select whether the digital in signal is taken from the coax or opto input.
14 Digital in/out RCA jacks. These are the 75 Ω coax digital i/os.
15 Digital in/out TOSLINK jacks. These are the optical connectors for digital i/o. Keep them covered when not in use.
16 USB connector. The USB cable to the computer plugs in here.
17 Voltage selector switch. Make sure you check the voltage selector switch setting before plugging the unit in, or damage can occur.
18 Power connector. The mains cable is inserted here. Also contains an integral fuse holder. For protection against fire hazard and unit damage, make sure you the correct type and rating of fuse is used for your mains voltage.

Microphone Inputs

USB Studio uses one of the finest ultra-low noise amplifier designs available. Its gain range allows the use of virtually any type of microphone. True 48V phantom power guarantees the USB Studio works with every microphone made. The phantom power supply can be turned on and off for each input via a back panel switch. A Led on the front panel is lighted when it's turned on.
The level control used is combined with a gain trim. Unlike a normal trim, it can be turned completely off. Full input dynamic range is retained in the circuit.
An invert switch is provided on the back panel to solve phasing problems when two mics are used in close proximity. If the sound seems weak or thin (especially a noticeable loss of bass) when both Mic or Mic and instrument inputs are used, try using one of the invert pushbuttons. This problem occurs when the same sound reaches two inputs out of phase because of their placement or wiring, and the outputs are cancel-ing instead of combining.

Insert Loops

USB Studio allows an external signal processor, such as a compressor or effect unit to be inserted between the output of the Mic channels and the mixer. A standard TRS insert style (tip = send, ring = return) Y-cord gets input and output from the Insert jack to the effects unit. The «send» signal is taken after the level pot. The return signal is added to the mix with fixed 0dB gain.

Instrument Inputs

The instrument inputs of the USB Studio are very high impedance, high gain range, low noise, unbalanced inputs suitable for piezo or magnetic instrument pickups. Unablanced microphone pickups can also be connected here. As with the Mic inputs, the level controls are combined with gain trims.

Phono/Line Input

The phono preamplifier used in the USB studio is suitable for use with moving magnet pickups. It has the standard 50 kΩ input impedace, and is provided with jumpers (JP17 and JP19) that increase the input capacitance from the nominal 40 pF to 250 pF, in order to optimise pickup matching. The circuit provides accurate RIAA equalisation. If the turntable is provided with an earthing connection, make sure it is tied with a thick wire to the grounding socket near the phono inputs. A switch on the back panel disables the phono preamp feature, enabling the input to be used as a normal stereo input.

Mixer operation

The USB Studio incorporates the function of a 2-bus stereo mixer. The two buses are called «rec» and «mon». As its name implies, the «rec» bus is normally used for recording, and the «mon» for monitoring. The signal on the two buses is provided in analog format on the back, on the «rec» and «line» output jacks.
Each input to the mixer has an «assign» switch, labeled Rec/Mon on the front panel. When the switch is in its «out» position, the input is assigned to the mon bus; when it's pressed in, it goes to the rec bus, and is disconnected from the mon bus.
The signal from the rec bus is taken through the Rec Level control and sent over the USB interface to the computer. The level of the signal sent is displayed on the led bar level meter.

Gain staging

The signal path from any input to any output of the USB Studio passes through two level controls: one at the input, and one at the output. So, the same overall gain can be obtained with different settings of the two controls. Selection of the best combination is what gain staging is all about. In order to optimize signal to noise ratio, the input gain should be as high as posible, but low enough so the internal circuits don't overload and distort the signal. To aid in this setting, two overload indicators are provided, one for each bus.
The input gain should be set so that with the loudest input, the overload led lights briefly during transients. This will ensure the signal is within 5dB of clipping. Then, for extra headroom, the input level should be backed a little, especially if the input comes from an unpredictable source. Once all inputs are thus adjusted, the output can be set to the desired level.

Monitoring

The signal from all the inputs that are not assigned to the rec bus and the playback (output) channel of the USB interface are added together on the monitor bus. From here, it can be output to the external monitor amp via the monitor level control and mute switch, or to the headphone output.
In normal operation, the sources assigned to the rec bus are played back by the computer after processing, and can be thus monitored during recording. However, some applications run so slowly, that the delay through the computer make such monitoring difficult, if not impossible. For these situations, USB studio is provided with a jumper option to enable the inputs to remain connected to the mon bus even while recording.

To enable this feature, move the two jumpers near each assign switch to their «on» position. They are: JP3 and JP4 for Mic1; JP7 and JP8 for Mic2; JP5 and JP6 for Instrument 1; JP9 and JP10 for Instrument 2; JP21 and JP22 for Phono; JP1 and JP2 for Stereo 1; JP11 and JP12 for Stereo 2; JP13 and JP14 for Stereo 3; JP15 and JP16 for Stereo 4; JP18 and JP20 for Digital in.

Digital Input and Output

USB Studio D's digital input and output are completely separated from the USB interface. They use very high performance, 20-bit AD and DA converters, and support both the optical and coaxial S/PDIF formats.
The digital input is treated like another input to the mixer, with its own level control and assign switch. A lock Led on the front panel shows when the unit has locked to the incoming signal and the input is enabled. A switch on the back selects between the coaxial and optical input. If the lock led does not light after signal is applied, there's a good chance the opto/coax switch is in the wrong position.
The digital output can be taken from either the rec or the mon bus, as selected by the switch on the front. An overload led lights when the signal to the digital out is near clipping, and needs to be reduced. Both the coaxial and optical outputs are driven simultaneously.
The sample clock of the digital input and output is independent from that of the USB interface. This way, the unit can perform high quality sample rate conversion between the USB and the S/PDIF channels.
The digital input and output always run at exactly the same sample rate. So, when the digital input is locked, the digital output uses the sample clock recovered from the input. When there is no input present, an internal clock generator drives the digital output. The sample rate of the internal generator is selected with the 44,1/48 switch on the front panel.

USB Interface

The USB interface implements two digital stereo channels over an USB bus: one channel towards the computer – the recording channel, and one from the computer – the playback channel.
The USB interface conforms to the generic audio device standard as defined in the USB specification, and as such, it doesn't need a special driver; all it's functions are controlled by the generic driver provided with the operating system.
When USB Studio is first plugged into the USB

interface of the computer, it should automatically be recognised, and drivers for it installed in the system. Usually, this requires the operating system CD. After the drivers are installed, the USB recording and playback peripherals should be listed in the audio device list.
To hear signal played though the playback device, turn the Computer and Monitor level controls up. Also, make sure the digital level control in the computer is up. To record something, apply the signal to one of the USB Studio's inputs, turn its level up, press the rec/mon switch, turn the Record level control up and record. The signal presence should be seen on the led bar.
If the computer doesn't recognise the unit properly, first make sure the connections are secure, and that the operating system supports the USB audio devices (Windows 98, 2000 and Mac System 9 do). Then, with both the computer and the USB Studio on, disconnect the USB cable at one end, wait a few seconds and plug it back in. Changing the USB topology (e.g. plugging the unit directly in an USB port on the computer rather that in an external hub) may help is some cases.
The drivers sometimes default to a low sample rate (like 22,05 kHz). Although USB Studio supports the lower sample rates, the loss in sound quality is important. We recommend that you use only 44,1 or 48kHz.

Specifications

Microphone Inputs

Input impedance	1 kΩ, Balanced
Gain range	Off to >+50 dB
Phantom power	+48±4 % VDC, IEC268-15
Max. input level	–5/–35 dBu, +20/+50 dB Gain
Equivalent input noise	–125 dBu, 20k BW, 50 dB gain, Rs=150 Ω
Frequency response	20–20000 Hz@–0,1 dB, all gains
THD+ Noise	0,005 %, Gain = 20 dB 0,01 %, Gain = 50 dB

Instrument Inputs

Input impedance	20 MΩ ll 60 pF
Gain range	Off to >+50 dB
Max input level	–5/–35 dBu, +20/+50 dB in
Equivalent input noise	–110 dBu, 20k BW, 50 dB gain, Rs = 600 Ω
THD+Noise	0,02 %, 20k BW, 50 dB gain, Rs = 600 Ω
Frequency response	15–40000 Hz@–3 dB

Phono Input

Input impedance	50 kΩ
RIAA correction error	<1 dB, 20–20000 Hz
Gain	34 dB@1kHz
THD+Noise	0,02 %@1kHz, 20k BW

Line Inputs

Input impedance	50 kΩ
Gain range	Off to 0 dB
Clipping level	>+20 dBu

Line Outputs

Output impedance	100 Ω
Clipping level	>+20 dBu Any one line input to any line output
THD+Noise	0,003 %, Level = max, rl = 600 Ω
SNR	100 dB, Ref = +10 dBu
Frequency response	20–20000 Hz@–0,1 dB

Headphone Output	
Output impedance	47 Ω
Clipping level	>+20 dBu
THD+Noise	0,01 %, 1 kHz, 20k BW, +10 dBu, rl = 50 Ω
Gain from monitor bus	Off to 0 dB

Digital I/O	
Format	S/P DIF
Interface	Coax or TOSLINK optical
Resolution	20 bits
Sampling rates	32/44,1/48 ±4 % kHz External clock 44,1/48 ±100 ppm kHz Automatically selected

Digital Output ADC	
SNR and Dynamic Range (20–20000 Hz)	98 dB, A-weighted 95 dB, unweighted
Total Harmonic Distortion + Noise	–90 dB, input lev. = –1 dBFS
Total Harmonic Distortion	0,003 % input level = –1 dBFS
Interchannel Phase Deviation	1 deg, 20–20000 Hz
Interchannel Gain Matching	0,1 dB, 20–20000 Hz
Passband	20–0,45 × sample frequency kHz @ –0,1 dB
Passband ripple	< 0,01 dB
Interchannel Isolation	90 dB @ 1 kHz

Digital Input DAC	
SNR and Dynamic Range (20–20000 Hz)	98 dB, A-weighted 95 dB, unweighted
Total Harmonic Distortion + Noise	–88 dB output level = 0 dBFS
Total Harmonic Distortion	0,003 % output level = 0 dBFS
Interchannel Phase Deviation	1 deg, 20–20000 Hz
Interchannel Gain Matching	0,1 dB, 20–20000 Hz
Passband	20–0,45 × sample frequency kHz @ –0,1 dB
Passband ripple	< 0,01 dB
Interchannel Isolation	90 dB @ 1 kHz

USB Port	
Format	Standard USB audio device
Sampling rates	8/11,025/12/16/22,05/ 24/32/44,1/48 kHz

USB ADC	
Resolution	20 bits
SNR and Dynamic Range (20–20000 Hz)	95 dB, A-weighted 90 dB, unweighted
Total Harmonic Distortion	0,01 % input level = –1 dBFS
Interchannel Phase Deviation	1 deg, 20–20000 Hz
Interchannel Gain Matching	0,1 dB, 20–20000 Hz
Passband	20–0,45 × sample frequency kHz @ –0,1 dB
Passband ripple	< 0,1 dB
Interchannel Isolation	90 dB @ 1 kHz

USB DAC	
SNR and Dynamic Range (20–20000 Hz)	92 dB, A-weighted 89 dB, unweighted
Total Harmonic Distortion + Noise	–85 dB output level = 0 dBFS
Total Harmonic Distortion	0,005 % output level = 0 dBFS
Interchannel Phase Deviation	1 deg, 20–20000 Hz
Interchannel Gain Matching	0,1 dB, 20–20000 Hz
Passband	20–0,45 × sample frequency kHz @ –0,1 dB

Power Supply Requirements	
Input Voltage	100–120; 220–240, VAC ±6 %
Power consumption	< 30 W
Fuse Ratings	0,16 AT (220–240V) 0,315 AT (100–120V)

Other	
Unit Size	4,4 × 48,3 × 15 cm
Unit Weight	3 kg
Operating Temperature Range	0–40 °C
Operating Humidity	0–90 %, non-condensing

Limited Warranty on Hardware

Swissonic AG warrant this equipment against defects in materials and workmanship for a period of twelve months from the date of original retail purchase. If you discover a defect, first write or call Swissonic AG at (0041) 55 285 86 10 to obtain a Return Merchandise Authorization Number. No service will be performed on any product returned without prior authorization. Swissonic AG will, at its option, repair or replace the product at no charge to you, provided you return it during the warranty period, with transportation charges prepaid, to Swissonic AG, P.O. Box 304, CH-8730 Uznach, Switzerland. You must use the product's original packing material for in shipment, and insure the shipment for the value of the product. Please include your name, address, telephone number, a description of the problem, and the original, dated bill of sale with the returned unit and print the Return Merchandise Authorization Number on the outside of the below the shipping address. This warranty does not apply if the equipment has been damaged by accident, abuse, misuse, or misapplication; has been modified without the written permission of Swissonic AG, or if the product serial number has been removed or defaced. All implied warranties, including implied warranties of merchantability and fitness for a particular purpose, are limited in duration to one year from the date of the original retail purchase of this product. The warranty and remedies set forth above are exclusive and in lieu of all others, oral or written, express or implied. No Swissonic distributor, dealer, agent, or employee is authorized to make any modification, extension, or addition to this warranty. Swissonic AG is not responsible for special, incidental, or consequential damages resulting from any breach of warranty, or under any legal theory, including lost profits, downtime, goodwill, damage or replacement of equipment and property and cost of recovering reprogramming, or reproducing any program or data stored in or used with Swissonic products. Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Uznach, Switzerland, December 1, 1999

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residental installation. This equipment generates, ises, and can radiate radio frequency emergency and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television equipment reception, which can be turning the equipment off and on, the user is encouraged to correct the interference by any combination of the following measures:

- Relocate or reorient the receiving antenna
- Increase the separation between the equipment and the receiver
- Plug the equipment into an outlet on a circuit different from that to which the receiver is connected

If necessary, you can consult a dealer or experienced radio/television technician for additional assistance.

PLEASE NOTE: only equipment certified to comply with Class B (computer input/output devices, terminals, printers etc) should be attached to this equipment, and it must have sheilded interface cables in order to comply with the Class B FCC limits on RF emissions.

WARNING: changes or modifications to this unit not expressly approved by the party responsible for compliance could voide the user's authority to operate the equipment.

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