User's Guide

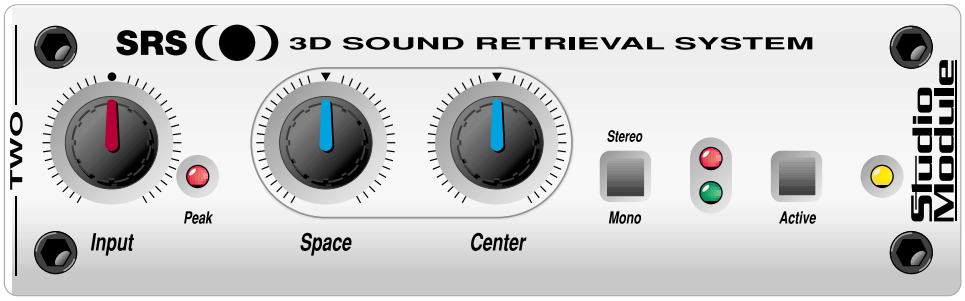
for the

CRATE PRO AUDIO

SM2-SRS (●)®

Studio Module

Sound Retrieval System



with 3D Sound

CRATE Pro Audio

SM2-SRS Sound Retrieval System

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ATTENTION

RISQUE D'ELECTROCUTION
NE PAS OUVRIR

ATTENTION: POUR REDUIRE D'ELECTROCUTION NE PAS ENLEVER LE COUVERCLE. AUCUNE PIECE INTERNE N'EST REPRABLE PAR L'UTILISATEUR. POUR TOUTE REPARATION, S'ADRESSER A UN TECHNICIEN QUALIFIE.

CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER.
NO USER-SERVICEABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

VORSICHT

ELEKTRISCHE SCHLAGGEFAHR
NICHT OFFENEN

VORSICHT: ZUR MINIMIERUNG ELEKTRISCHER SCHLAGGEFAHR NICHT DEN DECKEL ABENHMEN. INTERNE TEILE KONNEN NICHT VOM BENUTZER GEWARTET WERDEN. DIE WARTUNG IS QUALIFIZIERTEM WARTUNGSPERSONAL ZU UBERLASSEN.

THIS EQUIPMENT HAS BEEN DESIGNED AND ENGINEERED TO PROVIDE SAFE AND RELIABLE OPERATION. IN ORDER TO PROLONG THE LIFE OF THE UNIT AND PREVENT ACCIDENTAL DAMAGES OR INJURY, PLEASE FOLLOW THESE PRECAUTIONARY GUIDELINES:

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT OPEN CHASSIS.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE.

WARNING: AVOID PROLONGED EXPOSURE OF THE EQUIPMENT TO EXTREME HEAT.

CAUTION: NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

EXPLANATION OF GRAPHICAL SYMBOLS:

= "DANGEROUS VOLTAGE"
"DANGER HAUTE TENSION"
"GEFAHLICHE SPANNUNG"

= "IT IS NECESSARY FOR THE USER TO REFER TO THE INSTRUCTION MANUAL"
"REFERREZ-VOUS AU MANUAL D'UTILISATION"
"UNBEDINGT IN DER BEDIENUNGSANLEITUNG NACHSCHLAGEN"

SM2-SRS Sound Retrieval System

Introduction:

Thank you for selecting the Crate SM2-SRS Sound Retrieval System. This compact and easy to operate device actually restores the three dimensional nuances lost in traditional recording/playback techniques, virtually transforming a *recording* into a *live performance!* No additional speakers or special encoding/decoding is needed; the SM2-SRS uses ambient cues, hidden in the original recording, to create a 3-D sound stage – without the typically unforgiving "sweet spot" of traditional stereo. Listeners are bathed in rich stereo sound, as if at a live performance, regardless of their position in the listening room.

The SM2-SRS features two controls to tailor the 3D stereo sound stage: SPACE and CENTER. The SPACE control adjusts the level of the three dimensional portion of the sound field, while the CENTER control allows you to bring back some of the original central image. Take a little time to become familiar with the effect produced by each control. Listen to each with the other turned all the way down and note the effect on the signal. Once you understand the "sound" of the controls you can then find a good balance between each that will produce the most pleasing and natural sound.

Another feature of the SM2-SRS is its ability to create a simulated stereo signal from a mono input. This can have a dramatic effect in both live performances and recording sessions, and can add an exciting element to monophonic VCRs and computer games.

A technical description of the theory and technology behind the SM2-SRS is given on the following pages, explaining what SRS is, how it works, and why it is needed. It is important to point out a few things about what the SM2-SRS is *not:* it is *not* an "aural exciter" or a "sonic maximizer" (™/® where applicable), and it does *not* add or remove harmonics.

In order to achieve maximum performance from your SM2-SRS and to better understand its applications, please read this user's guide prior to its use.

And "Thank You" from

SM2-SRS Sound Retrieval System

What is SRS?

SRS Labs, Inc. develops, markets and licenses unique, leading-edge audio technologies for use in the consumer electronics, computer multimedia, electronic game, automotive and professional sound industries. The company's flagship technology, SRS, the Sound Retrieval System®, replaces stereo as the method of accurately reproducing sound and is rapidly becoming the standard for 3-D audio technology. It creates a three-dimensional sound image from any audio source with only two conventional stereo speakers. Whether the signal is mono, stereo, or surround sound encoded, SRS expands the audio material and immerses the listener in an exciting three-dimensional sound field. This unique process has been awarded four U.S. patents with 260 claims and 20 issued foreign patents, with 50 pending patents in countries around the world.

SRS, the Sound Retrieval System, was invented by Arnold Klayman after years of research on the psychoacoustics of sound and the dynamics of the human hearing system. SRS differs from stereo and traditional sound expansion techniques because it is based on the human hearing system. It retrieves the spatial information from recordings and restores the original three-dimensional sound field. As a result, the reproduced sound is much closer to a live performance. Like live performances, SRS has no critical listening position (sweet spot). Listeners can move around the room and continue to be immersed in full three-dimensional sound. Speakers are no longer the discernible source of sound. SRS does not require special encoding or decoding, and does not rely on artificial time delay or phase manipulation of the program material.

Why is SRS needed?

The SRS technology is based on the characteristics of the human hearing system. To understand SRS, you must understand a few of the components of sound and how your ears and brain use them to construct three-dimensional audio images.

If you rub your fingers together in front of your forehead and then slowly bring your hand around to the side of your head just out from your ear keeping the same distance between your fingers and your head, you will note a slight rise in volume and more emphasis on certain mid and high frequencies. In this experiment, rubbing your fingers serves as a stable volume and frequency sound source. Your ears will hear and register to your brain the identical sound very differently, depending on whether the sound comes from in front of you or from the sides. The side sound is much louder and higher in pitch because of your pinna – the external, fleshy portion of your ear.

When the sound wave arrives from the front of your head, the pinna will reflect many frequency components away from the ear canal. Side sounds that enter the ear canal are not reflected by the pinna as much as frontal sounds, so the intensity and the arrival time of the side sounds are different from the frontal sounds. The ear then transfers all of this information to the brain. These spatial cues supplied by the pinna to your brain are call HRTFs or Head-Related Transfer Functions. Because they depend on the volume and direction of the sound, the transfer functions of the sound waves from the pinna and ear canal are constantly changing. They change because the sounds they register constantly change. This transferred information gives your brain the necessary details to understand what you are hearing and from which direction you are hearing it.

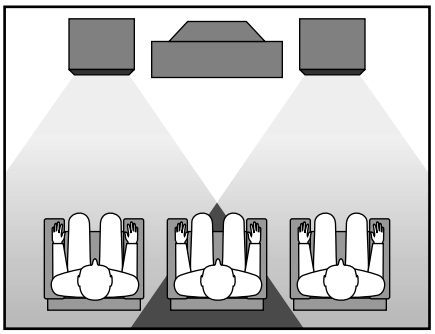
Because a microphone does not have a pinna, recordings made with microphones will always misinterpret the proper frequency representation of side sounds, regardless of how many microphones are used. The original ambience and dynamic feeling of live sound are therefore masked or lost. SRS takes into account the constantly changing transfer functions of the human hearing system and restores the proper frequencies and proportions of direct and indirect sound waves so that what the listener hears is closer to the original performance.

How Does SRS Work?

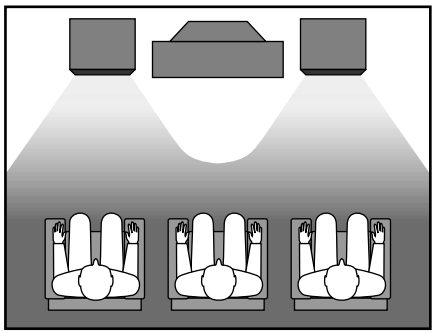
As mentioned above, a microphone does not possess the ability to interpret the direction a sound is coming from the same way that the human ear does. Traditional stereo reproduces a flat, two-dimensional sound field. However, when the audio source is recorded, directional audio cues are still present in the recording. These cues such as ambient or reverberant sounds are simply masked in traditional stereo playback.

By breaking down the stereo signal into its various signal components, it is possible to isolate and restore these spatial cues, which include ambient sounds, such as crowd noise at a ballgame. SRS technology extracts this information and processes it through a patented frequency response correction curve. This curve restores the appropriate location of the ambient sounds relative to the direct sounds, such as a soloist or dialogue.

By isolating then enhancing these spatial cues, several things occur: the stereo image is enhanced by restoring the ambience of the live performance thus creating a much wider listening area. You can walk about the room and still retain a sense of direction of all the musical instruments. The “sweet spot” disappears and you no longer have to sit precisely between two loudspeakers. Audio realism is restored.



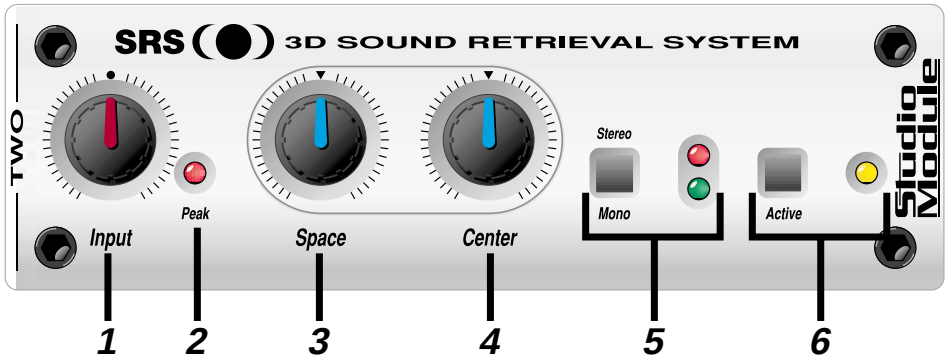
Stereo has a narrow sweet spot



SRS 3D Sound expands the stereo sweet spot

(printed with permission from SRS Labs, Inc)

Features - The Front Panel:



1. Input Level Control: Allows adjustment of the level of the signal going into the unit. For best signal to noise ratio, adjust this control until the Peak LED (#2) flashes on strong signal peaks. The center detent position is "unity gain."

2. Peak LED: Lights when the input signal is within 6dB of clipping.

3, 4. Space and Center Controls: When using the unit in the "3D mode", these controls allow variations of the sound enhancement. The Space control adjusts the level of the "3D portion" of the sound, the Center control adjusts the level of the "central portion" of the sound. (Please see the Introduction on page 3.) A good starting position for both controls is at 12:00 (center detent) – from there, experimentation with these controls will produce the best results.

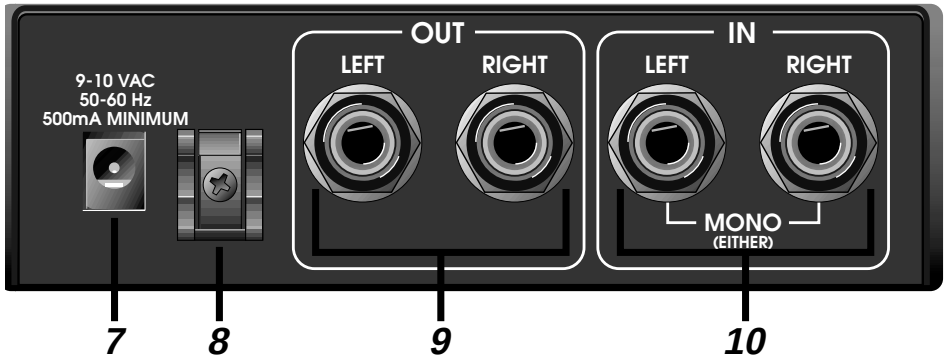
Note: These controls are inactive when using the unit in mono mode (refer to #5).

5. Stereo/Mono Switch and LEDs: Set this switch to match the input signal: when converting a mono signal to stereo, set the switch to MONO (switch in, green LED lit); when enhancing a stereo signal, set the switch to STEREO (switch out, red LED lit).

6. Active Switch and LED: The unit will only affect the signal when this switch is in – the adjacent LED will light when active. This is useful when comparing the processed signal (switch in) to the original signal (switch out).

Note: The output level of the unit may be affected by the settings of the Space and Center controls. This should be kept in mind when comparing the original signal with the processed signal.

Features - The Rear Panel:



7. Power Supply Jack: Plug the small metal barrel connector of the AC power adapter here.

8. Cord Cinch: Use this clip to secure the cable of the power pack to the chassis of the SM2-SRS.

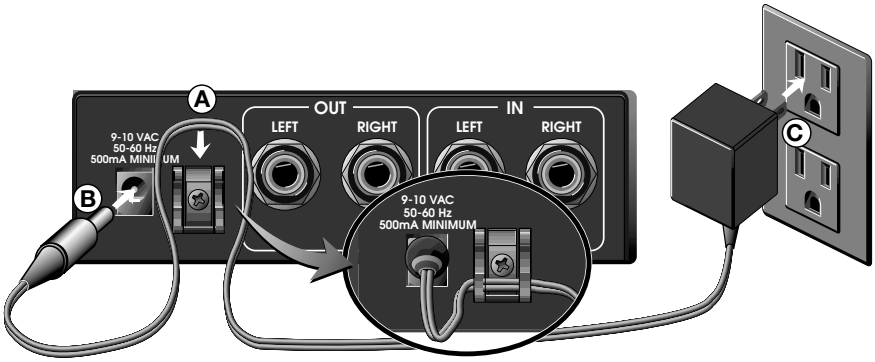
9. Output Jacks: These balanced 1/4″ jacks* carry the left and right output signals from the SM2-SRS to their destinations.

10. Input Jacks: These balanced 1/4″ jacks* receive the input signal(s) into the SM2-SRS. When using a mono input signal, either jack may be used as the input.

Note: Refer to pages 8 – 18 for hookup information.

*tip = signal +, ring = signal –, sleeve = ground

Applications – Connecting the AC Power Adapter:



A) Slide the power adapter cable into the cord cinch as shown above, leaving a few inches of cable between the cinch and the cable's small metal barrel connector.

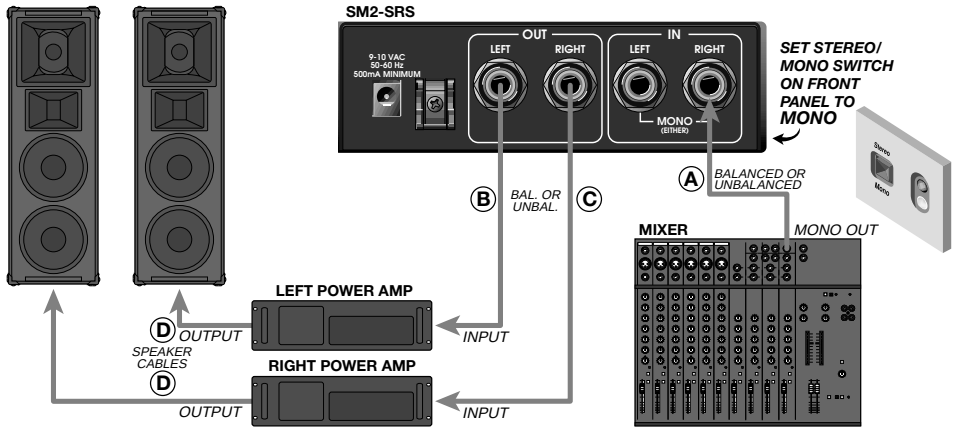
B) Plug the barrel connector into the power supply jack.

C) After all other connections are made, plug the power pack into a suitable source of AC line voltage. (See the sticker on the power adapter for voltage requirements.)

NOTE: Since the SM2-SRS is "always on" when the power pack is plugged in to a live outlet, it is advised that you unplug the power pack (or turn off the AC source) when not using the unit for extended time periods.

Applications – Live P.A.:

Turning a Mono Mix into Stereo



A) Connect mixing board **Mono Out** to either SM2-SRS **Mono In** jack

B) Connect SM2-SRS **Left Out** to *left* power amp

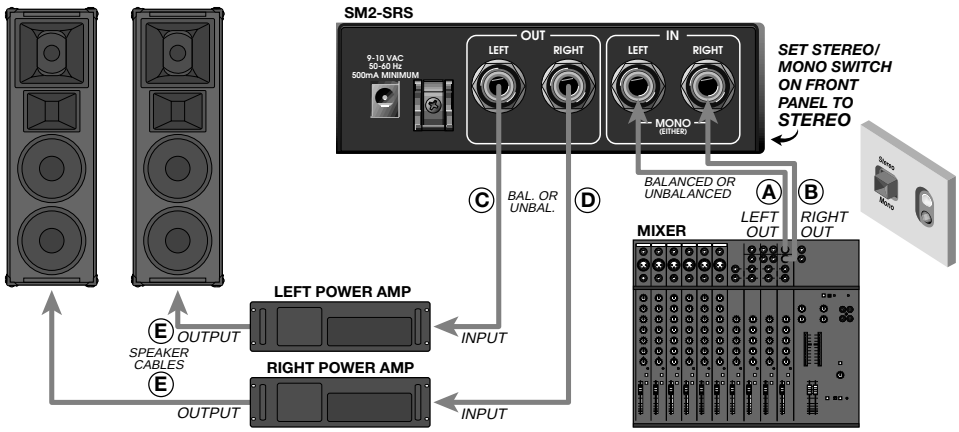
C) Connect SM2-SRS **Right Out** to *right* power amp

D) Connect power amp **Speaker Outputs** to speakers - left to left, right to right

Note: Set SM2-SRS Stereo/Mono switch to ***MONO.***

Applications – Live P.A.:

Adding 3D Sound to a Stereo Mix



A) Connect mixing board **Left Out** to SM2-SRS **Left In** jack

B) Connect mixing board **Right Out** to SM2-SRS **Right In** jack

C) Connect SM2-SRS **Left Out** to *left* power amp

D) Connect SM2-SRS **Right Out** to *right* power amp

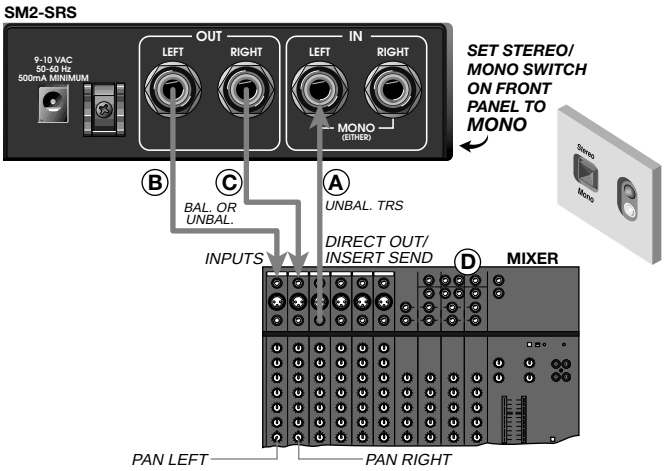
E) Connect power amp **Speaker Outputs** to speakers - left to left, right to right

Note: Set SM2-SRS Stereo/Mono switch to ***STEREO.***

Use the Space and Center controls to adjust the 3D sound stage.

Applications – Recording:

Turning a Mono Channel Signal into Stereo



A) Connect mixing board **Direct Out** or **Insert Send** of selected channel to either SM2-SRS **Mono In** jack

B) Connect SM2-SRS **Left Out** to **Hi-Z In** of a second mixer channel – set the pan pot of this channel to the extreme *left*

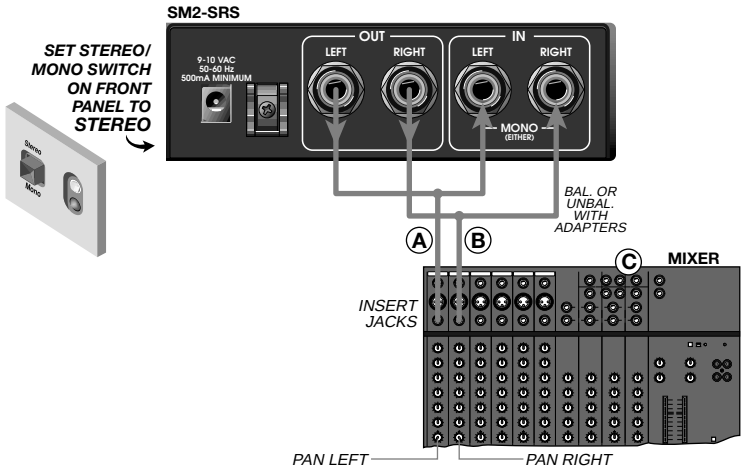
C) Connect SM2-SRS **Right Out** to **Hi-Z In** of a third mixer channel – set the pan pot of this channel to the extreme *right*

D) Connect mixer's left/right outputs to the rest of your system as usual for a *stereo* mix

Note: Set SM2-SRS Stereo/Mono switch to ***MONO.***

Applications – Recording:

Adding 3D Sound to a Stereo Channel Signal



A) Connect mixing board "left" channel **Insert Send** to SM2-SRS **Left In** jack, SM2-SRS **Left Out** to mixing board "left" channel **Insert Return** (use proper Y-adapters/cables and see mixer's manual to determine correlation of Send and Return with ring and tip)

B) Connect mixing board "right" channel **Insert Send** to SM2-SRS **Right In** jack, SM2-SRS **Right Out** to mixing board "right" channel **Insert Return**

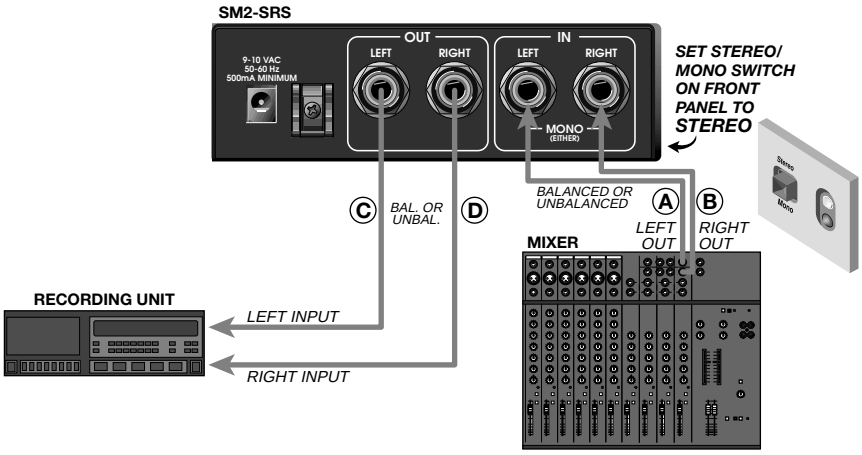
C) Connect mixer's left/right outputs to the rest of your system as usual for a *stereo* mix

Note: Set SM2-SRS Stereo/Mono switch to ***STEREO.***

Use the Space and Center controls to adjust the 3D sound stage.

Applications – Recording:

Adding 3D Sound to a Stereo Output Mix



A) Connect mixing board **Left Out** to SM2-SRS **Left In** jack

B) Connect mixing board **Right Out** to SM2-SRS **Right In** jack

C) Connect SM2-SRS **Left Out** to *left* input of recording device

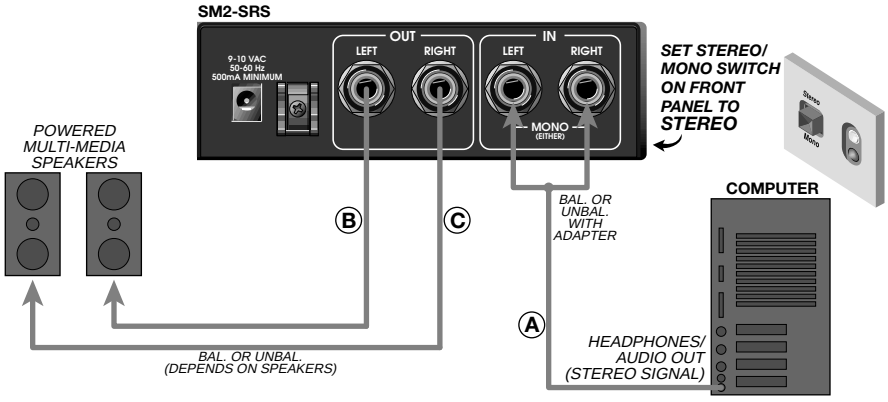
D) Connect SM2-SRS **Right Out** to *right* input of recording device

Note: Set SM2-SRS Stereo/Mono switch to ***STEREO.***

Use the Space and Center controls to adjust the 3D sound stage.

Applications – Computers/Multi-Media:

Adding 3D Sound to Stereo Games/Presentations



A) Connect computer **Headphones/Audio Outputs** to SM2-SRS **Left In** and **Right In** jacks (use proper Y-adapters/cables)

B) Connect SM2-SRS **Left Out** to left-side powered multi-media speaker **Input** jack

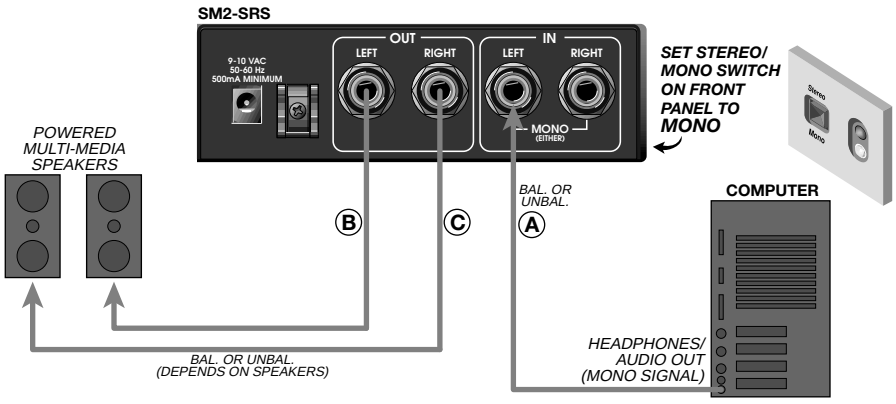
C) Connect SM2-SRS **Right Out** to right-side powered multi-media speaker **Input** jack

Note: Set SM2-SRS Stereo/Mono switch to ***STEREO.***

Use the Space and Center controls to adjust the 3D sound stage.

Applications – Computers/Multi-Media:

Turning Mono Games/Presentations into Stereo



A) Connect computer **Headphones/Audio Outputs** to either SM2-SRS **Mono In** jack (use proper Y-adapters/cables)

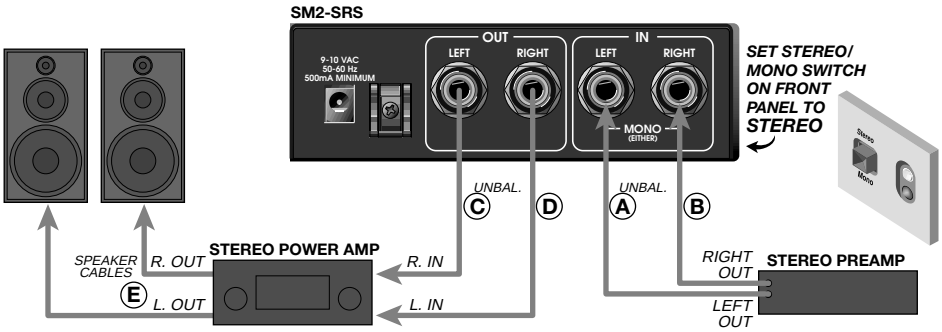
B) Connect SM2-SRS **Left Out** to left-side powered multi-media speaker **Input** jack

C) Connect SM2-SRS **Right Out** to right-side powered multi-media speaker **Input** jack

Note: Set SM2-SRS Stereo/Mono switch to ***MONO.***

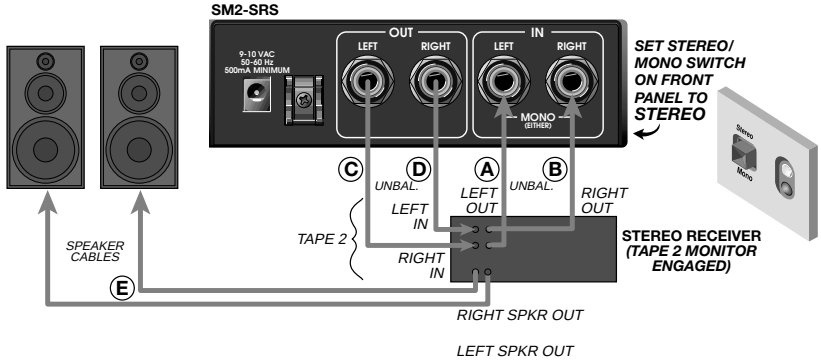
Applications – Home Stereo:

Adding 3D Sound to Your Stereo



A,B) Connect stereo preamp **Left/Right Outs** to SM2-SRS **Left/Right In** jacks
C,D) Connect SM2-SRS **Left/Right Outs** to stereo power amp **Left/Right In** jacks
E) Connect power amp **Speaker Outputs** to speakers - left to left, right to right
*Note: Set SM2-SRS Stereo/Mono switch to **STEREO.***
Use the Space and Center controls to adjust the 3D sound stage.

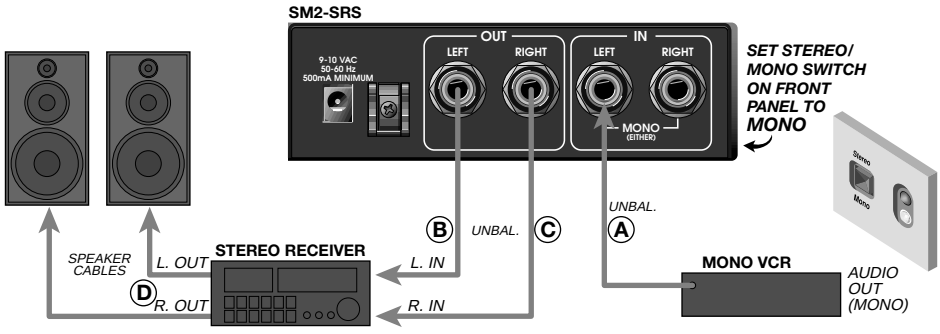
Alternate method - Using the tape loop of a receiver



A,B) Connect tape loop **Left/Right Outs** to SM2-SRS **Left/Right In** jacks
C,D) Connect SM2-SRS **Left/Right Outs** to tape loop **Left/Right In** jacks
E) Connect power amp **Speaker Outputs** to speakers - left to left, right to right
*Note: Set SM2-SRS Stereo/Mono switch to **STEREO.** Engage tape monitor on receiver.*
Use the Space and Center controls to adjust the 3D sound stage.

Applications – Home Stereo:

Turning a Mono VCR Signal into Stereo



A) Connect VCR **Mono Audio Outputs** to either SM2-SRS **Mono In** jack

B) Connect SM2-SRS **Left Out** to receiver **Left In** jack

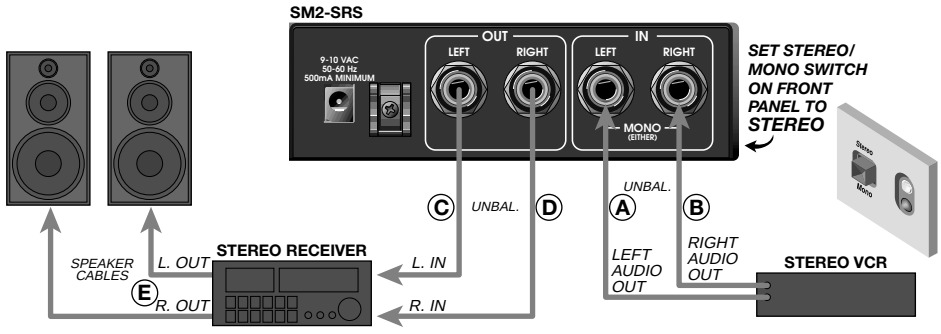
C) Connect SM2-SRS **Right Out** to receiver **Right In** jack

D) Connect power amp **Speaker Outputs** to speakers - left to left, right to right

*Note: Set SM2-SRS Stereo/Mono switch to **MONO.***

Applications – Home Theater:

Adding 3D Sound to Home Theater



A) Connect VCR **Left Audio Out** to SM2-SRS **Left In** jack

B) Connect VCR **Right Audio Out** to SM2-SRS **Right In** jack

C) Connect SM2-SRS **Left Out** to receiver **Left In** jack

D) Connect SM2-SRS **Right Out** to receiver **Right In** jack

E) Connect power amp **Speaker Outputs** to speakers - left to left, right to right

Note: Set SM2-SRS Stereo/Mono switch to ***STEREO.***

Use the Space and Center controls to adjust the 3D sound stage.

User Notes:

SM2-SRS Sound Retrieval System

Technical Specifications:

Frequency Response		HRTF (Head Related Transfer Function)
Inputs		Two 1/4″ phone jacks (balanced) 20k ohm load impedance 28dBv (19.5V RMS) max input level
Outputs		Two 1/4″ phone jacks (balanced) +4dBv (1.23VREM) nominal output level 20dBv (7.75V RMS) max output level
Gain	Bypassed	0dB
	Active	0dB
Signal to Noise Ratio		Greater than 95dB
Input Level Control		Provides input level adjustment from -∞dB to +4dB
Space Control		Adjusts level of 3D portion of image
Center Control		Adjusts level of central portion of image
Mono/Stereo Switch	Mono (in)	Converts mono input to simulated stereo output
	Stereo (out)	Applies SRS processing to stereo source
Active Switch		Unit is activated when switch is depressed, LED lit
Power Supply Requirements		9-10 VAC, 500mA
Size and Weight		1.6″ H x 5.6″ W x 5.5″ D; 1.5 lbs (without power adapter)

Specifications subject to change without notice.

Studio Module

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