

SoundField SP451 Surround Processor

User Guide

Version 1.02

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INTRODUCTION

The SP451: What Is It?

The SoundField SP451 Surround Sound Processor, working together with the SoundField MKV, ST350 and SPS422B provides a complete, accurate, and easy to use surround sound microphone system. The SP451 utilises SoundField B-Format signals generated by SoundField microphone systems to simultaneously deliver phase accurate 5.1 surround sound and stereo. If used in conjunction with the MKV or the SPS422B processors then conventional stereo, Mid/Side or mono outputs are also available - all with absolute phase compatibility. Unlike other surround-sound miking systems, the conversion between surround, stereo and mono formats incurs no phase error because the SP451 utilises the four B-Format component signals from a SoundField microphone - which are referenced to a single point in space - to derive a virtual microphone array. The resulting soundfield can be adjusted and customised at any stage in a project, either before, during, or after the recording session. Each of the SP451's five main output channels provides an extremely high quality, full bandwidth audio signal. A sixth output, incorporating a low-pass filter crossover point of 120Hz, provides the sub-bass (LFE) channel for a subwoofer. Each of the six outputs may be independently adjusted in level and are individually metered. Two additional outputs, numbered 7 and 8, provide Left/Right stereo outputs when utilising standard 5.1 MAP cards. These two further outputs are also essential to accommodate 6.1, 7.1 or individually configured surround systems. For further expanded multi-channel audio applications such as 10.1, 12.1 etc, multiple SP451 processors may be linked together.

History of The SoundField Microphone System

In 1933, British scientist Alan Blumlein was issued a patent that stands today as a landmark in the development of stereophonic recording and reproduction. Among its numerous declarations, it defined the basis for all coincident microphone techniques, including the Mid/Side and crossed bidirectional configurations. (The latter, in fact, is commonly referred to as a "Blumlein Stereo" pair.)

In the 1970s, British mathematicians Michael Gerzon, Peter Craven and colleagues expanded upon the stereo concepts pioneered by Blumlein to develop the concept of a microphone system that could reproduce a full three-dimensional soundfield. Both Blumlein and Gerzon realised that only when a soundwave is captured at a single point in space can it be reproduced faithfully and without the phase distortion anomalies inherent in spaced microphone techniques.

Early SoundField prototype models were developed using Gerzon's theory in conjunction with the National Research Development Corporation of Great Britain and Calrec Audio. Chief Designer at Calrec, Ken Farrar, and colleagues played a leading role in turning Gerzon's theory into a real product and his work was later recognised by his appointment as a Fellow of the Institution of Electrical Engineers (F.I.E.E.). In 1993, the company SoundField Ltd. was formed specifically to manufacture and further develop the range of products and their application in both stereo and multi-channel audio environments. SoundField Ltd. is the owner of all patent and intellectual property rights relating to SoundField Technology.

Today, the SoundField range enjoys a reputation as the ultimate microphones for recording both stereophonic and the new developing multi-channel formats. These unique microphones employ a patented tetrahedral array of closely spaced and time compensated subcardioid capsules to capture

the complete three-dimensional soundfield at a single point in space. This single point source pickup principle avoids all of the time - or phase-related anomalies generated by spaced microphone arrays. Thus, surround recordings made with SoundField microphones can be collapsed to stereo - or stereo recordings to mono - without the phase problems that result in “comb-filtering” (phase cancellation) distortions. Furthermore, a single point source system is the only one that allows a truly phase coherent sub-channel to be derived. Spaced microphone arrays are unable to be reduced without introducing significant phase errors unless some of the microphone signals are discarded, which consequently results in loss of essential audio information.

HOW DOES IT WORK?

SoundField B-Format:



The SoundField Four Capsule Array

The capsules are placed tightly together to eliminate the phase problems associated with 'spaced' multi-microphone set-ups.

From a single point source sound is received from all directions, reproducing a realistic listening experience.

The four outputs from the capsules of SoundField microphones (called SoundField A-Format) are converted by the MKV, ST350 and SPS422B processors into four components known as SoundField B-Format. These convey all of the information of the entire soundfield, and are the three directional vectors - fore/aft, left/right, up/down - and absolute pressure.

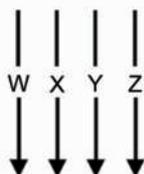


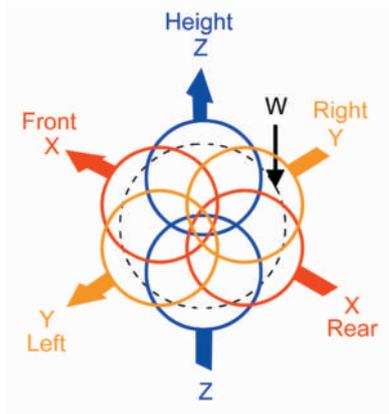
The signals from the four capsules are fed to the microphone's control unit where it is converted into four channels of SoundField B-Format, known as W, X, Y and Z.

Mono, Stereo, Mid-Side, 5.1 and all future surround formats can be derived from this information.



MKV B-Format Outputs





B-Format Illustration

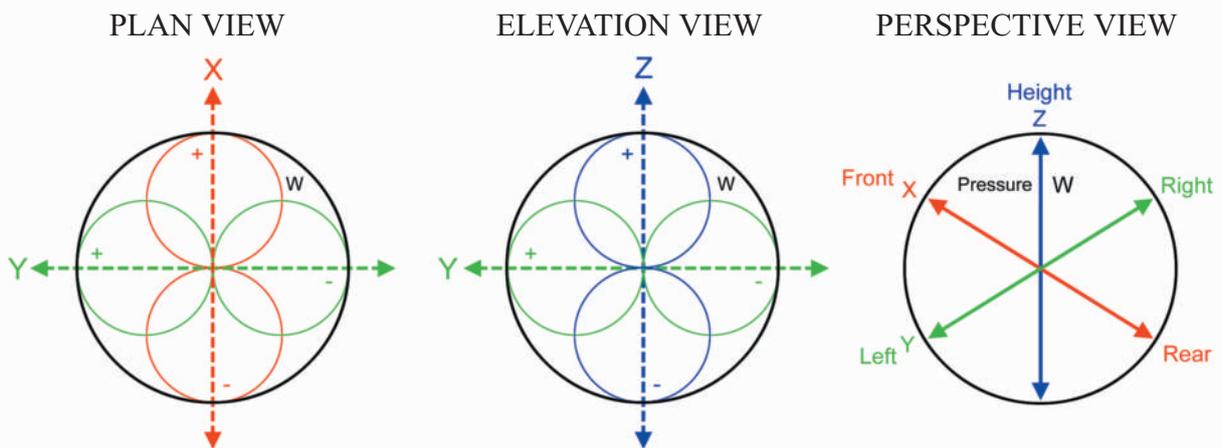
B-Format is three dimensional acoustical information and consists of three figure of eight polar patterns called X, Y and Z plus one omni called W.

X gives Front to Rear depth information, Y gives Left to Right horizontal information and Z gives vertical height information. From the omni W sub-bass (LFE) is extracted.

SoundField are the only microphones in the world that generate B-Format.

The four channels of the B-Format signal are represented by three bidirectional and one omnidirectional pickups, all centred at a single point in space, and are labelled W (pressure), X (fore/aft), Y (left/right), and Z (up/down). These signals contain all of the information required to describe a soundwave and are the essential elements needed to create any conventional mono, stereo, or surround format where the microphone positions and polar patterns can be fully variable. By recording the four B-Format outputs from a MKV, ST350 or SPS422B these components can be preserved for subsequent production and processing of current and all future surround formats.

THE FOUR PRIME COMPONENTS GENERATED BY SOUNDFIELD MICROPHONES



- X: HORIZONTAL VECTOR: FRONT/REAR PRESSURE-GRADIENT COMPONENT
- Y: HORIZONTAL VECTOR: LEFT/RIGHT PRESSURE-GRADIENT COMPONENT
- Z: VERTICAL VECTOR: HEIGHT PRESSURE-GRADIENT COMPONENT
- W: PRESSURE (OMNIDIRECTIONAL) COMPONENT

CONTROLS

Input Section



- B-Format input metering with level control
- Front Width adjusts the angle of Front Left/Right mics by ± 45 degrees
- Rear Width adjusts the angle of Rear Left/Right mics by ± 45 degrees
- Rear Focus enables adjustment of the rear pair microphone polar patterns

Gain

This control adjusts the input level of all four B-Format channels simultaneously and is variable from full attenuation to a gain of +10dB. Normally this control should be used at or close to its 0dB position. Four 12-segment bargraph level meters are provided to monitor the levels of the W, X, Y and Z signals following the input gain control.

Front Width

When the Front Width control is set to its CAL position, the angular positions of the Front Left and Right virtual microphones are at -45 and $+45$ degrees (relative to Centre) respectively. This control narrows or widens these angles symmetrically. The resulting range is from 0 degrees (Mono) to a very wide and exaggerated perspective of ± 90 degrees relative to the Centre.

Rear Width

When the Rear Width control is set to its CAL position, the angular positions of the Rear Left and Right virtual microphones are at -135 and $+135$ degrees respectively. As above, this control narrows or widens these angles symmetrically, with a range from 180 degrees (a monophonic Rear Centre) to ± 90 degrees relative to the Rear Centre position.

Rear Focus

When set to its CAL position, the polar patterns of the virtual Rear microphone pair are as established by the MAP card. If the MAP card defines the rear mic positions as cardioids (default with the included card), the Focus control may be used to vary the patterns of these virtual mics from omni, through cardioid, to figure of eight. This degree of control can be very useful for adding additional spatial information to the rear surround channels, especially in ambient or free-field environments.

Output Section



- Three MAP card selector switches with LED status allow instant comparison of up to three different mic arrays
- Full band, discrete Left/Centre/Right/Rear Left/Rear Right and Sub-Bass outputs are provided, each with individual bargraph metering and level control
- Two additional rear panel outputs numbered 7 and 8 are provided. These output Left/Right stereo when standard 5.1 MAP cards are utilised and are essential to accommodate 6.1 and 7.1 MAP cards

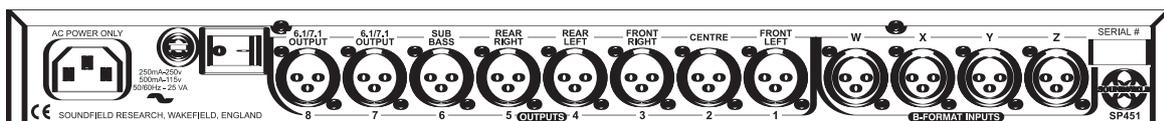
Surround Mode – MAP (Microphone Array Pattern) Selector

The SP451 can accommodate up to three MAP cards, each of which generates a different surround microphone array with pre-defined combinations of polar patterns. For details of currently available MAP cards please contact info@soundfield.com. The MAP cards fit on the main SP451 PCB via multipin sockets and are quick and simple to install. Three illuminated switches select which of the three MAP card slots is active. If no MAP card is fitted into a slot, it will not be possible to select that option. The default, automatically selected during power up, is Slot One, which is fitted as standard with the 5.1 (cardioid) card.

Output Levels

The six Output controls adjust the respective levels of the outputs 1 to 6. An eight-segment LED level meter shows the post-gain control signal level. The alpha-numeric displays above the meters are determined by the MAP card being used, and show which surround channel is being controlled. The gain range of the controls is from full attenuation to +10dB of gain. The levels of outputs 7 and 8 are fixed at 0dBu (equivalent to setting the output potentiometers to '0' on the variable levels of outputs 1 to 6).

Rear Panel



THE SOUNDFIELD SP451 PROCESSOR AND SURROUND SOUND

A SoundField microphone system and the SP451 processor are very easy to use. The four B-Format outputs from the microphone system may either be fed directly to the SP451 during live productions or recorded to a multi-track recorder and then played back into the SP451 for post-production processing. The SP451 uses these signals to create a 5.1 surround microphone array. These six channels are routed to the mixing console for program production.

The five microphones of this virtual array represent the conventional Front mic positions at Left (-45 degrees), Centre (0 degrees), and Right (+45 degrees); the surround positions are at Rear Left (-135 degrees) and Rear Right (+135 degrees). The LFE (sub-bass) output is derived from its own virtual omni microphone.

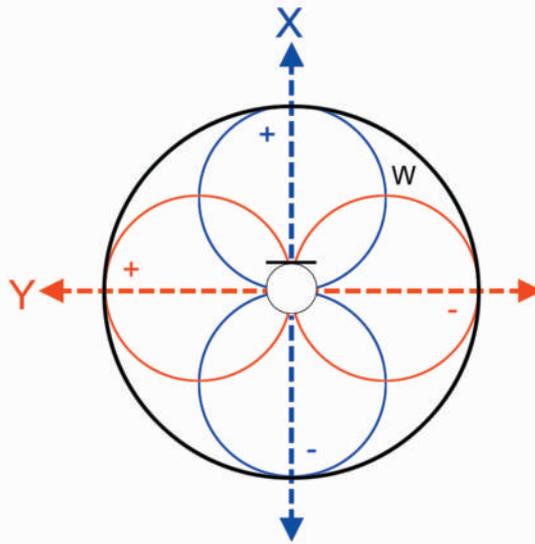
By processing the B-Format signals via the SP451, the mixing engineer has the ability to create the optimum surround mic array configuration. Equally important, the same B-Format signals can be processed in a variety of ways to meet the broad range of needs imposed by differing audio delivery formats. Thus, a stereo music recording for CD production, a mono feed for AM radio, and a surround soundtrack for video or DVD all can be created either independently or simultaneously. All this can be done either in “real time” or during any stages of post-production, affording the mixing engineer the ability to create the ideal sonic perspective under the controlled conditions of the production studio, rather than forcing a decision during the original recording session that later may prove to be less than ideal.

In order to avoid the confusion and complexity that could result from an infinitely variable system (we all are familiar with the “too many knobs” syndrome) the SP451 processor uses plug-in MAP (Microphone Array Pattern) cards to define the basic default polar patterns and angles of the virtual microphone array, and provides the user with just the front panel controls needed to optimise this initial array for any specific application quickly and easily. For example, the Front and Rear microphone pairs in a 5.1 array may be adjusted ± 45 degrees from their default angles, to suit any desired music and/or video reproduction system for surround sound. Also, the polar patterns of the rear microphone pair can be adjusted with the Rear Focus control, through standard cardioids for localisation of sound sources to figure of eight for more spacious effects. When using 5.1 MAP cards outputs 7 and 8 provide Left/Right stereo, the width of which is decided by the Front Width control. This facility was requested by broadcasters using the SP451 ‘stand alone’ in a post production situation with the necessity to generate both 5.1 surround and stereo mixes simultaneously.

All of the outputs are at line level and represent the discrete outputs from the microphones of the virtual array. No further SoundField processing is required once the signals leave the SP451.

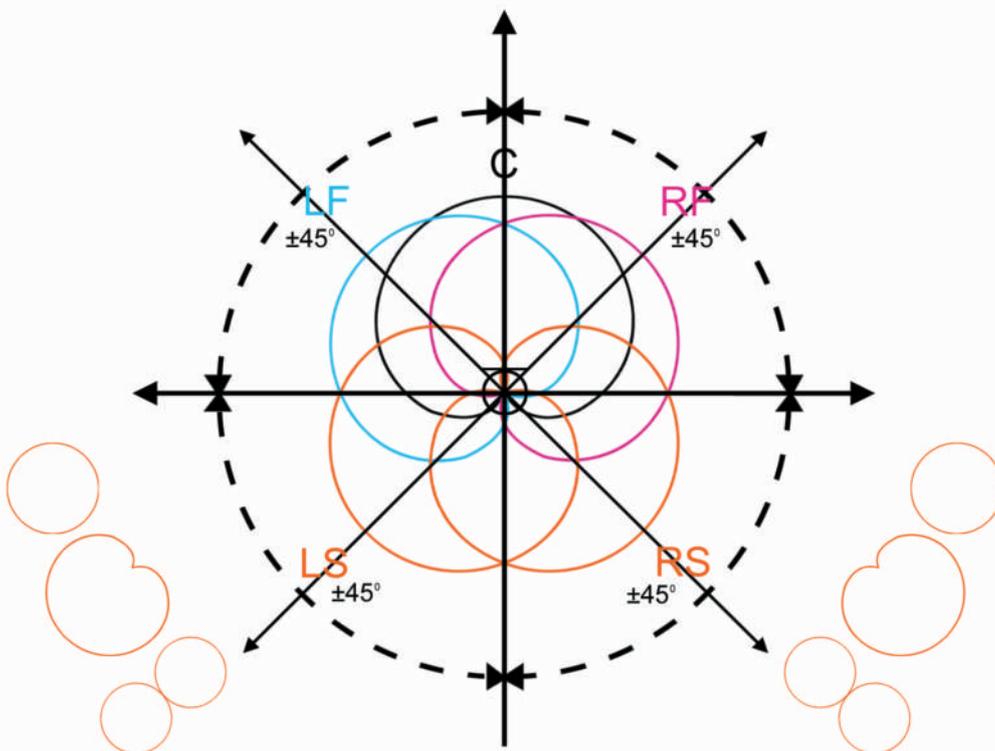
The Rear Focus control enables the polar patterns of the Rear microphone pair to be varied from omnidirectional through cardioid (the default) to figure of eight. This provides significant adjustment of the imaging and “spaciousness” of the surround channels.

THE SOUNDFIELD SURROUND SOUND CONVERSION



B-Format Components

By adjustment of the SP451 processor controls, five Virtual Microphones create a surround output of LF, C, RF, LS, RS and LFE with full adjustment of Front and Rear width (including angles), Rear Focus (polar patterns) and sub-bass (LFE) Depth.



The SP451 has three MAP card slots, with one card provided as a standard - this cardioid L/C/R, SL/SR surround card will satisfy the majority of listening situations. To provide additional versatility up to two further MAP cards can be fitted to accommodate virtually any current or future mic array standards. Three buttons on the front panel allow the user to make instant comparisons between up to three mic arrays.

Forward-looking Capability

Because surround sound formats are still evolving, the SP451 has an additional two outputs numbered 7 and 8 in order to accommodate expanded formats such as 6.1 and 7.1. Furthermore, since the B-Format signals inherently embody the complete three-dimensional soundfield information at the microphone position, any conceivable future surround format can be addressed without the need to change the original SoundField microphone system.

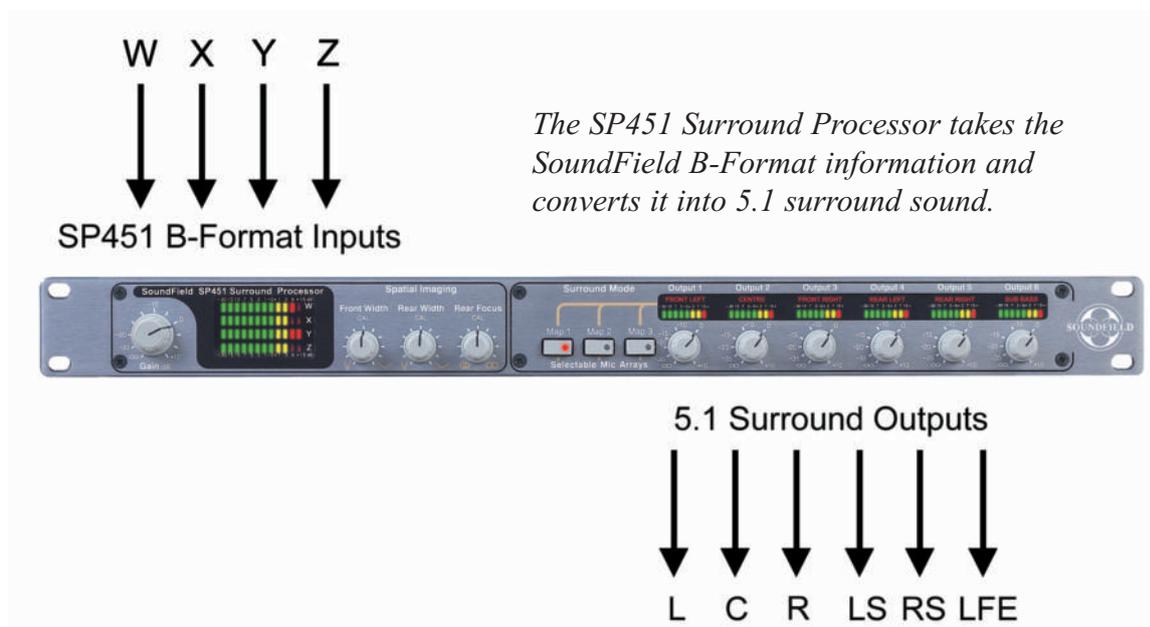
OPERATION OF THE SP451

Connections

All of the audio inputs and outputs are line-level and fully balanced via XLR connectors located on the rear panel. (These operate at a nominal 0dBu level and are wired Pin-2-hi.) Mains power is connected via a fused IEC socket; the replacement fuse type should be 250mA for 240V or 500mA for 115V use. The unit may be changed between these two operating voltages by a rear voltage selector switch. Always fit the correct value fuse for the operating voltage selected. After power-on the unit remains muted for a few seconds to prevent switching transients from reaching the monitoring system.

B-Format Inputs W, X, Y and Z

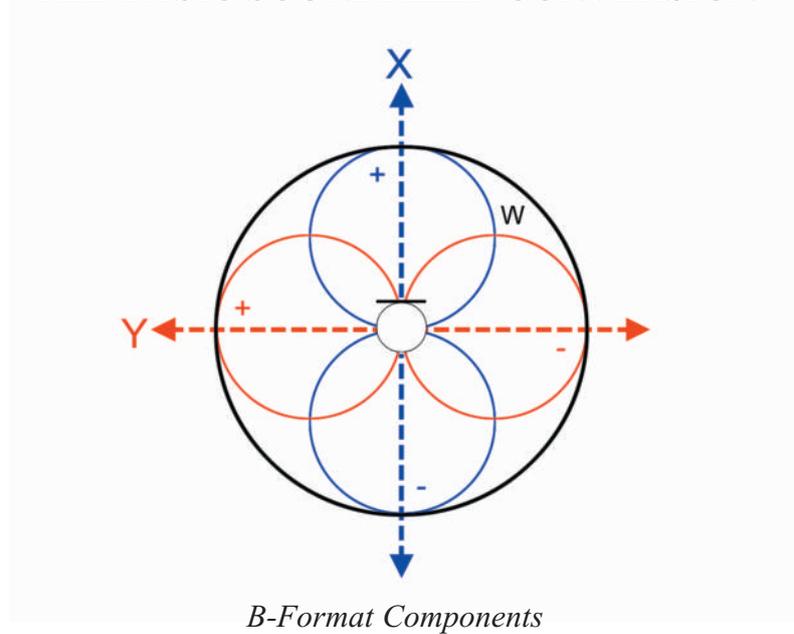
The four balanced B-Format XLR inputs marked W, X, Y and Z should be connected directly to the B-Format outputs of a SoundField MKV or SPS422B processor or to a recorder where the B-Format component signals have been recorded discretely. In the latter case, it is imperative that no signal processing is applied to these signals before they are input to the SP451.



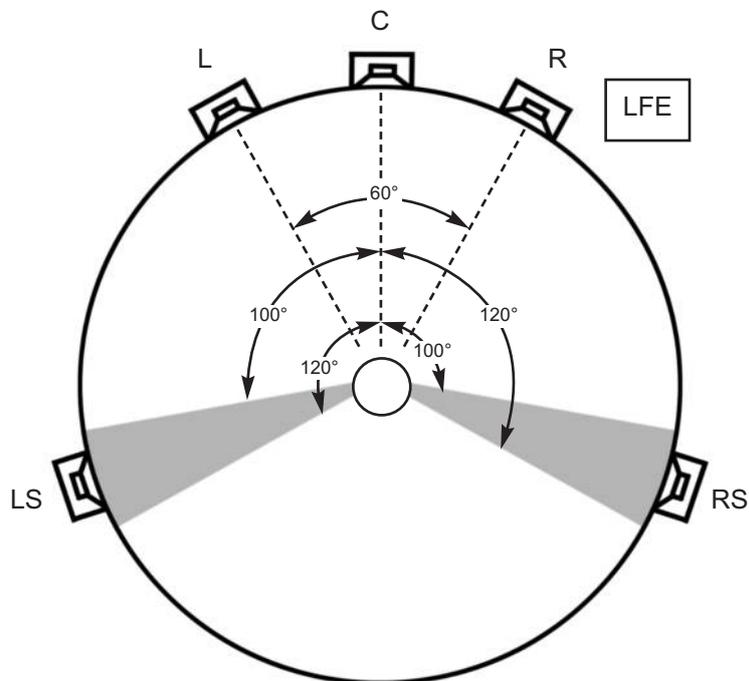
Outputs 1 to 8

Balanced XLR outputs 1 to 6 normally are configured to carry the Front Left (L), Centre (C), Front Right (R), Rear Left (LS) and Rear Right (RS) signals respectively. The sub-bass (LFE) output provides the low-pass filtered (<120Hz) signal which is derived from the omni (W) B-Format information. An additional two outputs (7 and 8) provide Left/Right stereo with standard 5.1 MAP cards or are utilised for the extra outputs required for 6.1 and 7.1 MAP cards.

THE BASIC SOUNDFIELD CONVERSION

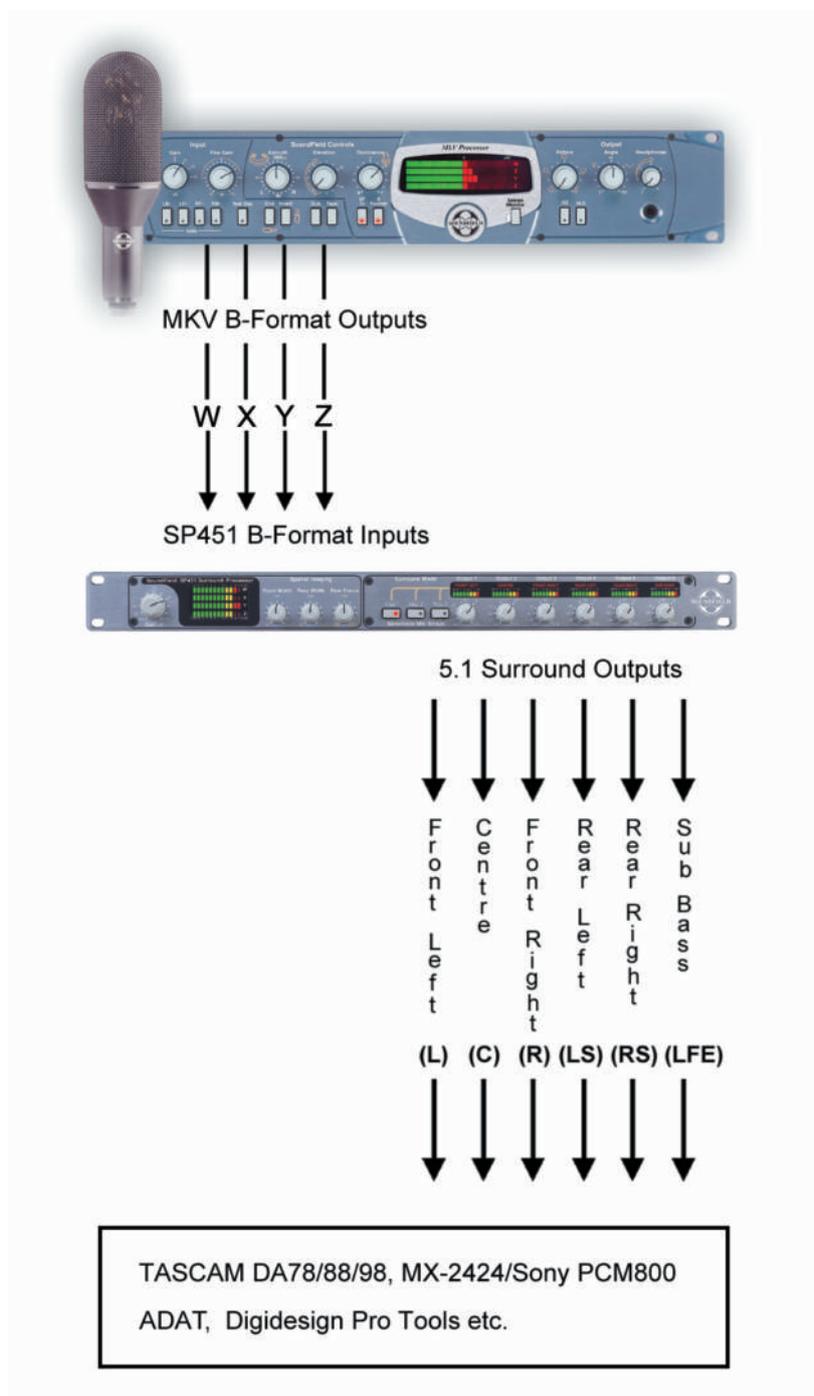


By adjustment of the SP451 surround processor controls, a soundfield, comprised of five Virtual Microphones, can be created and reproduced by appropriately placed loudspeakers, with full adjustment of Front and Rear width, LFE depth, and overall perspective. Recommended loudspeaker placement is shown in the ITU-R BS.775-1 illustration below:



ITU-R BS.775-1 recommended reference loudspeaker arrangement

INTERFACING THE SP451 WITH THE MKV MICROPHONE SYSTEM FOR LIVE SURROUND RECORDING



In this configuration the MKV/SP451 combination will deliver six discrete channels of 5.1 surround sound. It is a very quick and effective way to record surround. After some practice and once you know how to get the best from your system, it will yield consistent results. Although not vital, it is a big advantage to be able to monitor in full surround when choosing your mic position. It is important to bear in mind when recording this way that the result is, in effect, a 'finished product'. One way to retain post-production capability is to also record the B-Format at the same time as the six channels of surround. Of course, to do this you will require ten tracks to record on. Again, a stereo master can also be recorded directly from the left/right outputs of the MKV processor.

RECORDING B-FORMAT WITH THE MKV MICROPHONE SYSTEM FOR SURROUND POST-PRODUCTION WITH THE SP451



MKV B-Format Outputs

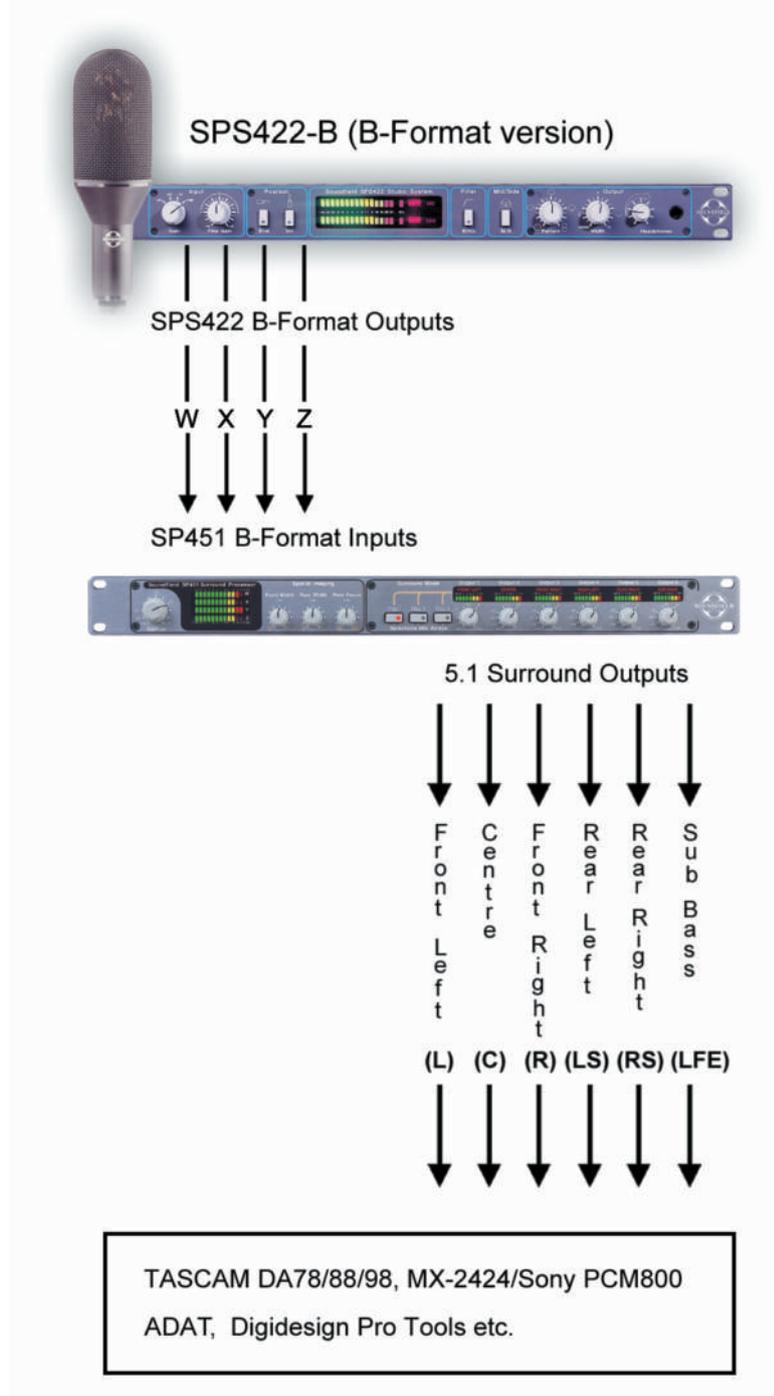
W X Y Z

TASCAM DA78/88/98, MX-2424/Sony PCM800
ADAT, Digidesign Pro Tools etc.

The advantage of recording an acoustic event in B-Format is that it can be de-coded by the SP451 processor into the current 5.1 surround format or any future 6.1, 7.1, etc format (with the appropriate MAP card fitted into the SP451) and therefore is ideal for ‘surround archiving’. When the four tracks of B-Format are played back through the SP451 in a post-production environment, many parameters of the selectable mic array can be adjusted after the event. These include changing the width of both the front and rear pairs of microphones, mixing sound sources occurring at the front of the mic array towards the rear and the choice and instant comparison of up to three different mic arrays. Also, by patching the MKV processor into the signal path it is possible to rotate the mic array, either clockwise or anti-clockwise, through a full 360° horizontal plane.

It is also common to record the Left/Right stereo outputs from the MKV processor onto a further two tracks of the multitrack. In this way both a ‘surround master’ and a ‘stereo master’ can be derived from a single DTRS cassette. Some sound engineers, if they have the facility, will as insurance also simultaneously record two ‘spot mics’ on a further two tracks. These are usually focused on ‘quieter’ sound sources which may be too low in level in the natural acoustic balance of the performance, and if necessary can be introduced to the mix in post-production.

INTERFACING THE SP451 WITH THE SPS422-B MICROPHONE SYSTEM FOR LIVE SURROUND RECORDING



In this configuration the SPS422-B/SP451 combination will deliver six discrete channels of 5.1 surround sound. It is a very quick and effective way to record surround. After some practice and once you know how to get the best from your system, it will yield consistent results. Although not vital, it is a big advantage to be able to monitor in full surround when choosing your mic position. It is important to bear in mind when recording this way that the result is, in effect, a 'finished product'. One way to retain post-production capability is to also record the B-Format at the same time as the six channels of surround. Of course, to do this you will require ten tracks to record on. Again, a stereo master can also be recorded directly from the left/right outputs of the SPS422-B processor.

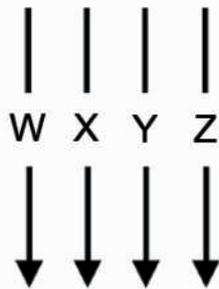
RECORDING B-FORMAT WITH THE SPS422-B MICROPHONE SYSTEM FOR SURROUND POST-PRODUCTION WITH THE SP451



SPS422-B (B-Format version)



SPS422 B-Format Outputs



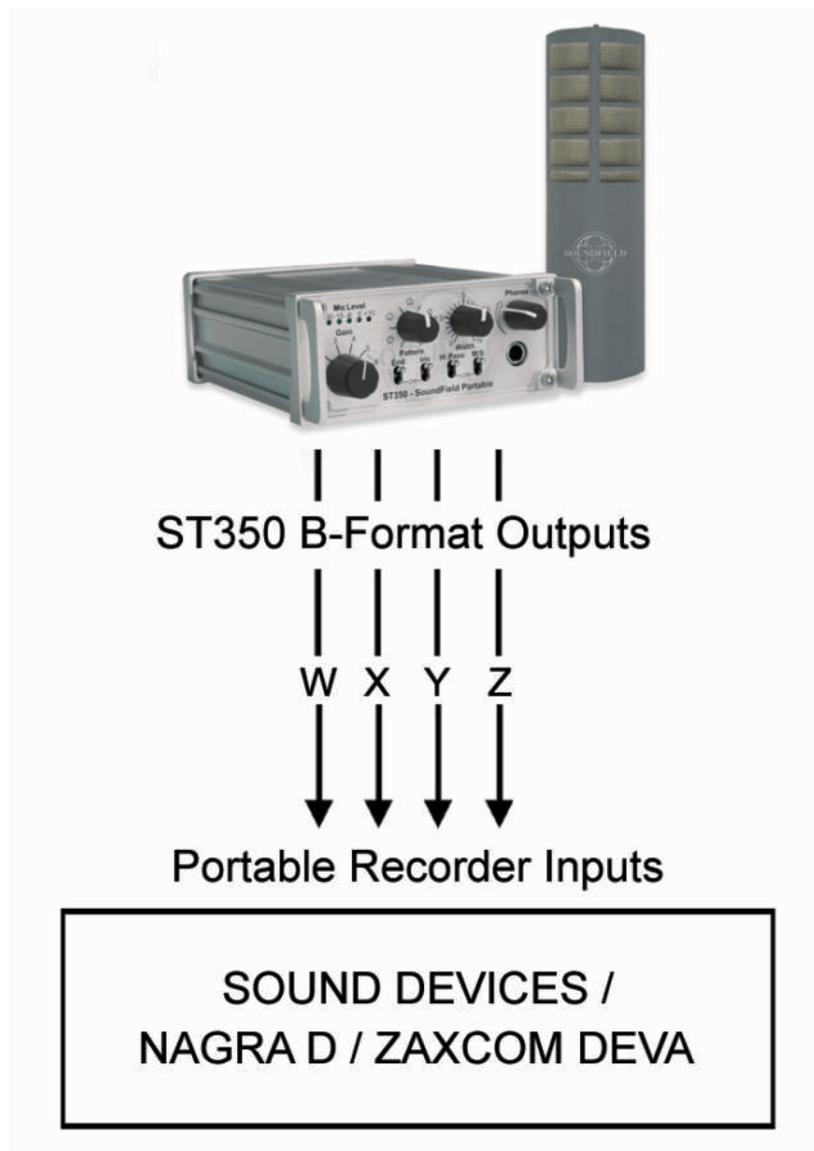
Line level inputs of digital multitrack

TASCAM DA78/88/98, MX-2424/Sony PCM800
 ADAT, Digidesign Pro Tools etc.

The advantage of recording an acoustic event in B-Format is that it can be de-coded by the SP451 processor into the current 5.1 surround format or any future 6.1, 7.1, etc format (with the appropriate MAP card fitted into the SP451) and therefore is ideal for 'surround archiving'. When the four tracks of B-Format are played back through SP451 in a post-production environment, many parameters of the selectable mic array can be adjusted after the event. These include changing the width of both the front and rear pairs of microphones, mixing sound sources occurring at the front of the mic array towards the rear and the choice and instant comparison of up to three different mic arrays.

It is also common to record the Left/Right stereo outputs from the SPS422-B processor onto a further two tracks of the multitrack. In this way both a 'surround master' and a 'stereo master' can be derived from a single DTRS cassette. Some sound engineers, if they have the facility, will as insurance also simultaneously record two 'spot mics' on a further two tracks. These are usually focused on 'quieter' sound sources which may be too low in level in the natural acoustic balance of the performance, and if necessary can be introduced to the mix in post-production.

RECORDING B-FORMAT WITH THE ST350 MICROPHONE SYSTEM FOR SURROUND POST-PRODUCTION WITH THE SP451

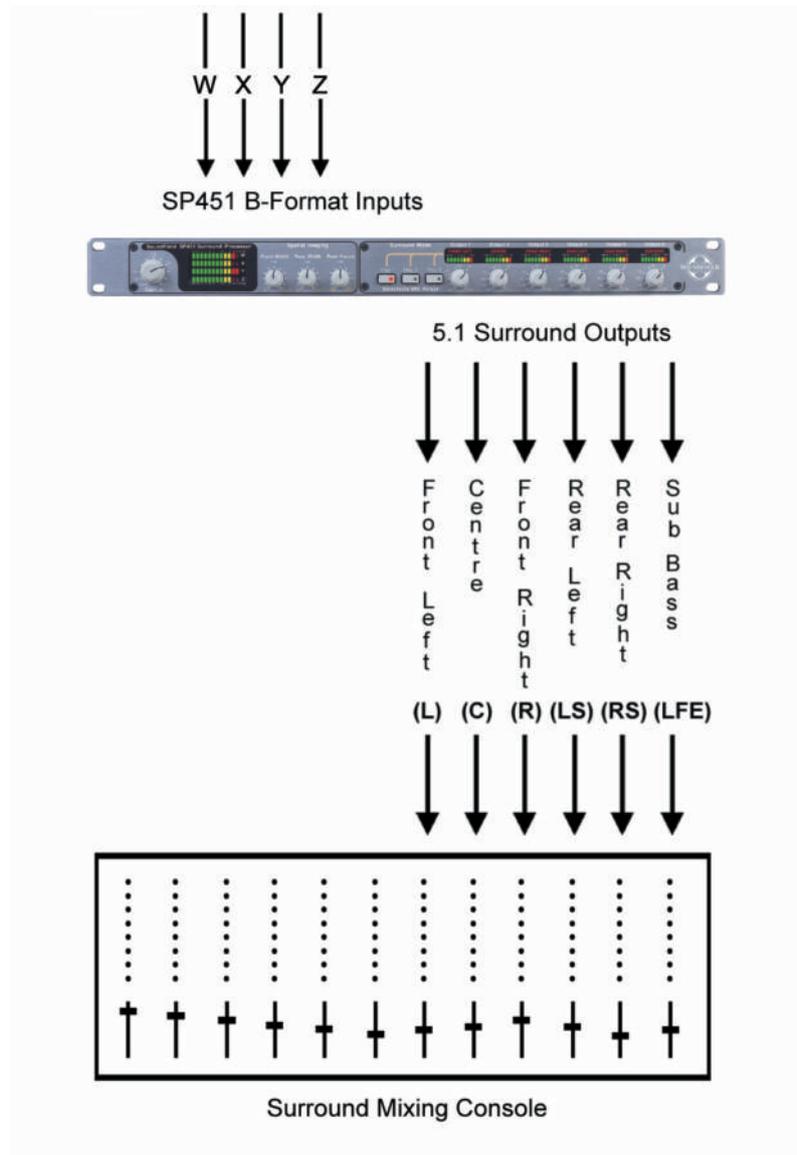


The ST350 shares many of the features of the other SoundField systems, but is unique in that it can record full surround without mains power. The ST350 will run from any DC source between 9V and 18V capable of providing 7W. For example, a 14.4V, 2.4Ah battery will provide approximately 3 hours of operation. Commonly used compatible multi track portable recorders at this time are Sound Devices, Nagra D, Zaxcom Deva and Aaton Cantar. The portable recorders then output the B-Format signals at line level directly into the SP451 Processor for surround sound post-production.

The advantage of recording an acoustic event in B-Format is that it can be de-coded by the SoundField SP451 Surround Processor into any surround format such as 5.1, 6.1, 7.1, etc and is therefore ideal for 'surround archiving'.

THE SP451 IN SURROUND POST-PRODUCTION

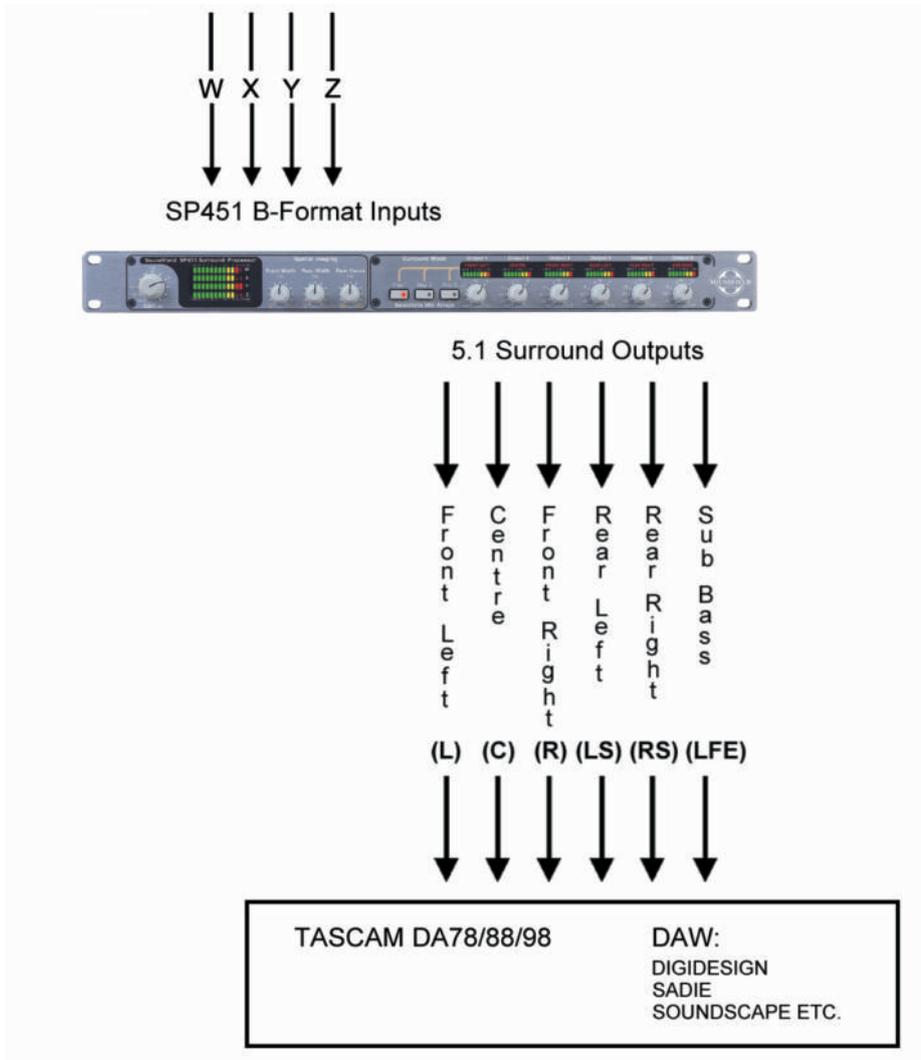
Example One - Using the SP451 with a Surround Mixing Console



When outputting from an SP451 to a surround mixing console many further post-production options become available. Three dimensional 'soundscape' recordings from a film set or drama studio can have further audio signals introduced into the surround environment either for stationary placement or as moving sound sources via the console joystick. Sound effects can also be added in this way to outside atmospheric ambience recordings captured with the portable ST350. The SP451 retrospectively provides the ability to vary the width of the front and rear pair of microphones, adjust the balance between sounds occurring at the front and rear of the 5.1 array with 'Rear Focus' and adjust the level of each individual microphone. In addition, any one of up to three different 5.1 mic arrays may be selected via the MAP 1, 2 and 3 switches. If necessary, dynamic processing, reverb, EQ or time based effects can be added at this stage immediately prior to the finished product being mastered for DVD, DTS, Dolby Surround etc. MKV owners may also patch their MKV control unit into the B-Format signal paths before the SP451 thereby creating the ability to rotate the 5.1 mic array through a full 360 degree horizontal plane, either in a clockwise or anti-clockwise direction.

THE SP451 IN SURROUND POST-PRODUCTION

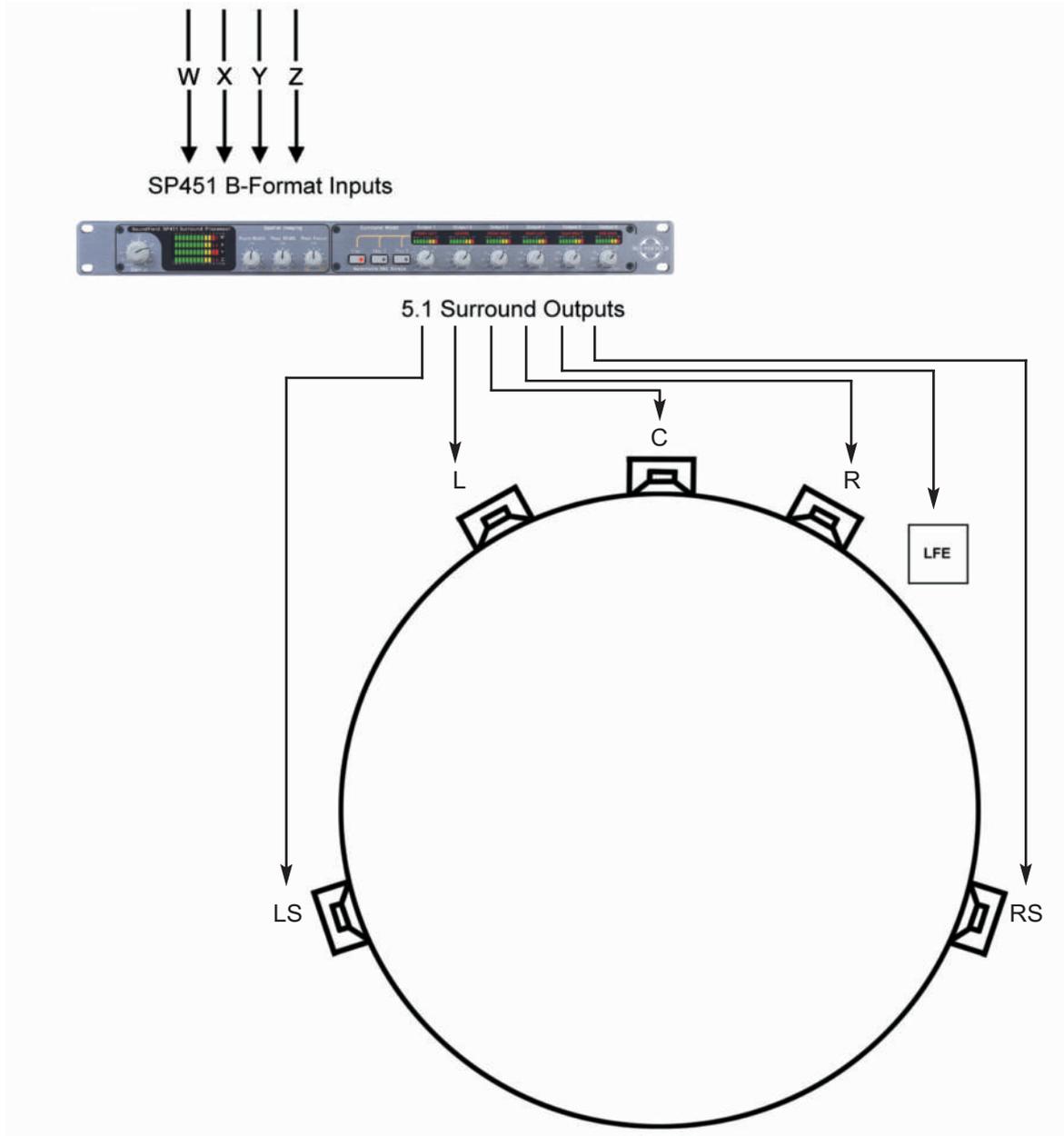
Example Two - Using the SP451 with a Multitrack Recorder or Digital Audio Workstation (DAW)



When configured in the above way the SP451 retrospectively provides the ability to vary the width of the front and rear pair of microphones, adjust the balance between sounds occurring at the front and rear of the 5.1 array with 'Rear Focus' and adjust the level of each individual microphone. In addition, any one of up to three different 5.1 mic arrays may be selected via the MAP 1, 2 and 3 switches. If required the SP451 outputs can be patched through surround dynamics or reverb processors prior to the digital multitrack. If a DAW is employed then this will also incorporate the facility for further mixing, plug-in dynamics and reverb processing etc. plus extensive editing. MKV owners may also patch their MKV control unit into the B-Format signal paths before the SP451 thereby creating the ability to rotate the 5.1 mic array through a full 360 degree horizontal plane, either in a clockwise or anti-clockwise direction.

THE SP451 IN SURROUND POST-PRODUCTION

Example Three - Using the SP451 as a Pre-Amp for a Surround Monitoring System

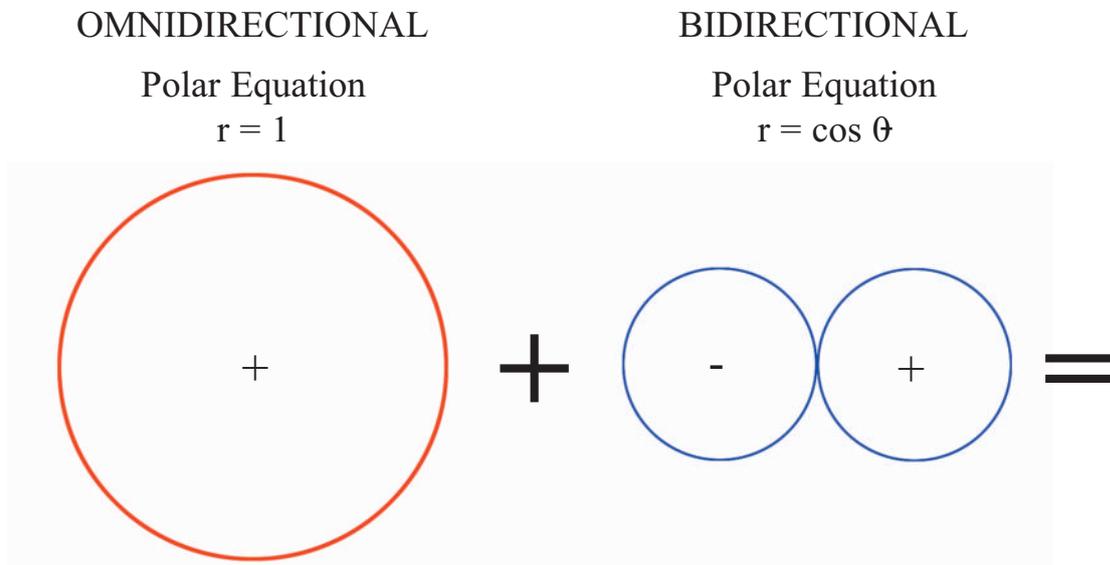


Typical 5.1 monitoring set-up conforming to ITU speaker placement recommendations (see page 13)

The SP451 will also perform well as a pre-amp for a surround monitoring system. When used in this way it will provide individual volume controls for each monitor plus the usual Front Width, Rear Width and Rear Focus controls. Three different 5.1 mic arrays can be monitored via the MAP 1, 2 and 3 front panel switches. MKV owners may also patch their MKV control unit into the B-Format signal paths before the SP451 thereby creating the ability to rotate the 5.1 mic array through a full 360 degree horizontal plane, either in a clockwise or anti-clockwise direction.

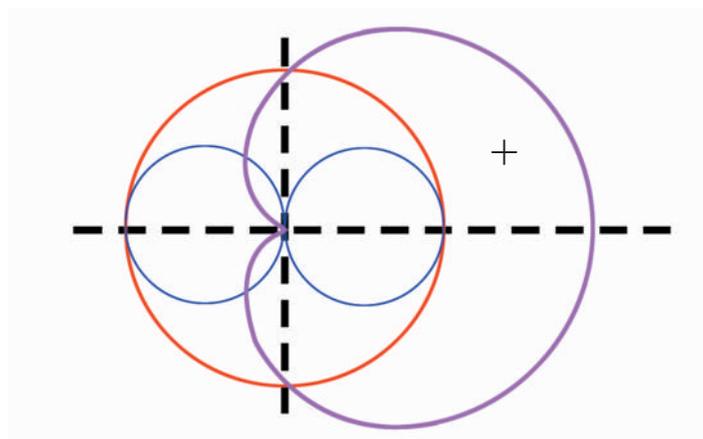
THE SOUNDFIELD AND CONVENTIONAL STEREO

Basic microphone theory tells us that, for example, by combining omnidirectional and bidirectional signals of equal amplitude, the result will be a cardioid pattern.



CARDIOID

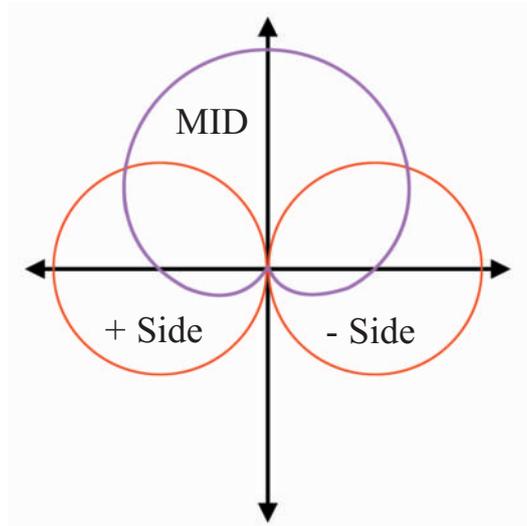
Polar Equation
 $r = a + b \cos \theta$



Derivation of a Cardioid polar pattern by combining Omnidirectional and Bidirectional microphone patterns

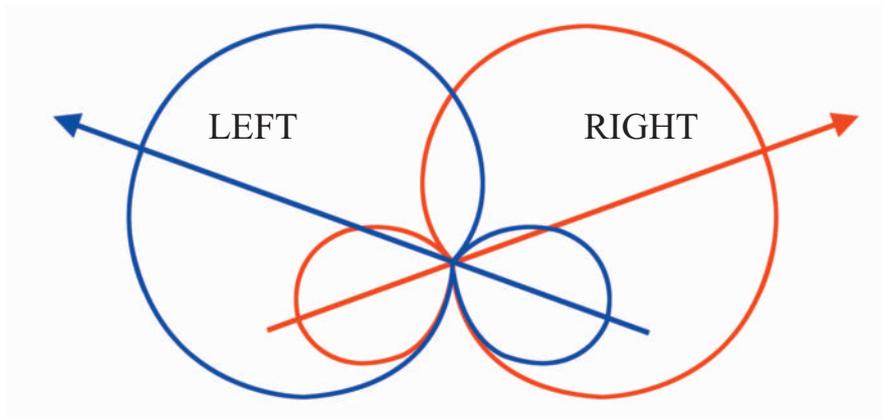
In the same manner, all of the other first-order polar patterns can be created by combining varying ratios of omnidirectional to bidirectional signals. This is the basis of the Mid/Side technique from which SoundField microphones have evolved.

THE MID-SIDE TECHNIQUE Combining Polar Patterns



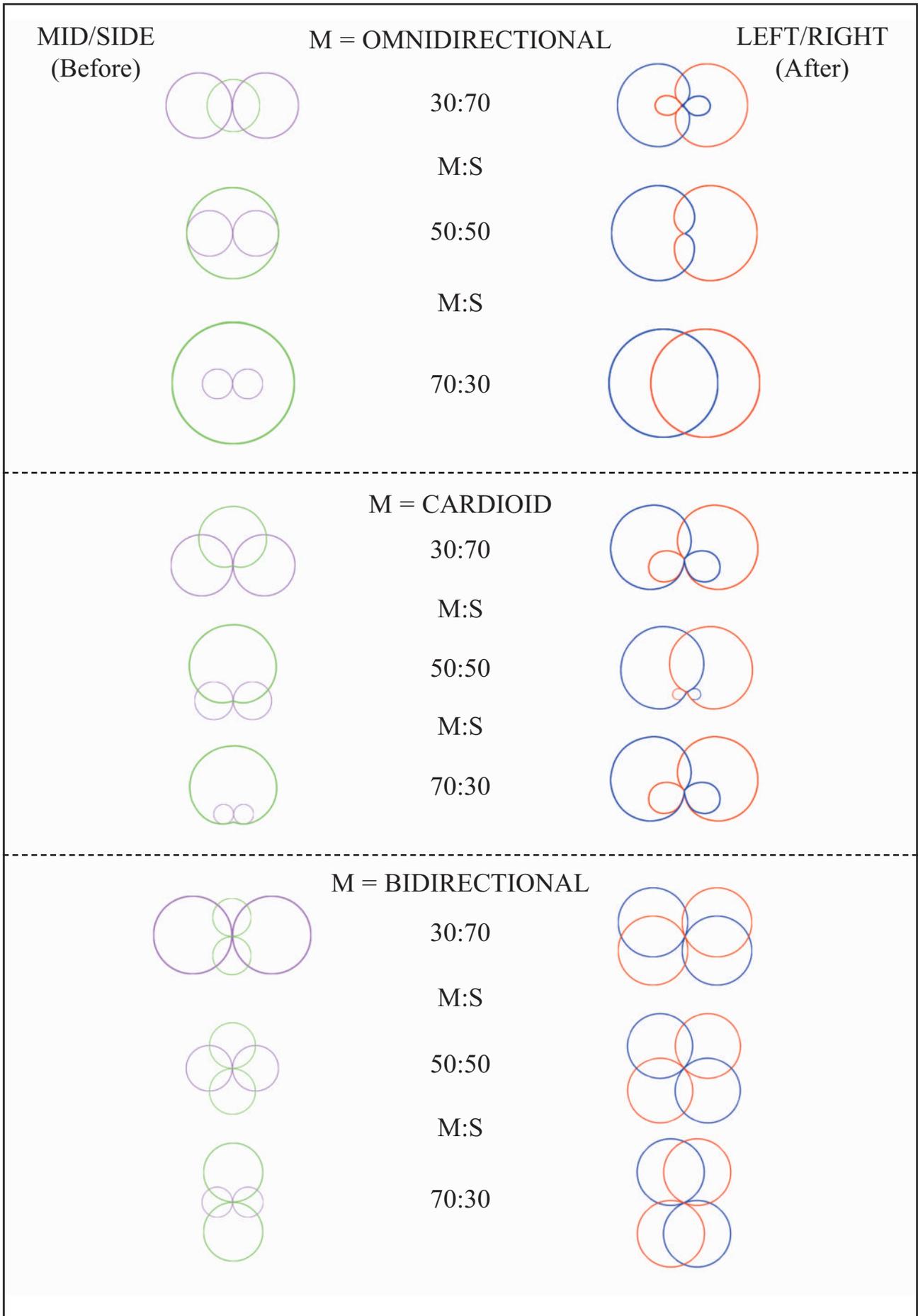
LEFT = MID + SIDE
M + S

RIGHT = MID - SIDE
M - S



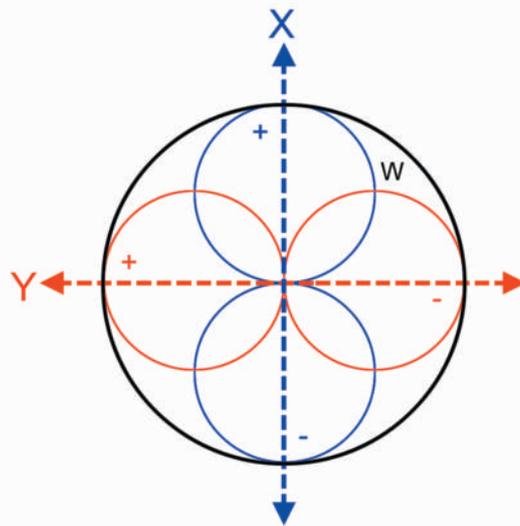
*Basic Conversion of MID/Side Components
to Conventional Left/Right Signals*

(Note that Mid microphone may be any polar pattern)



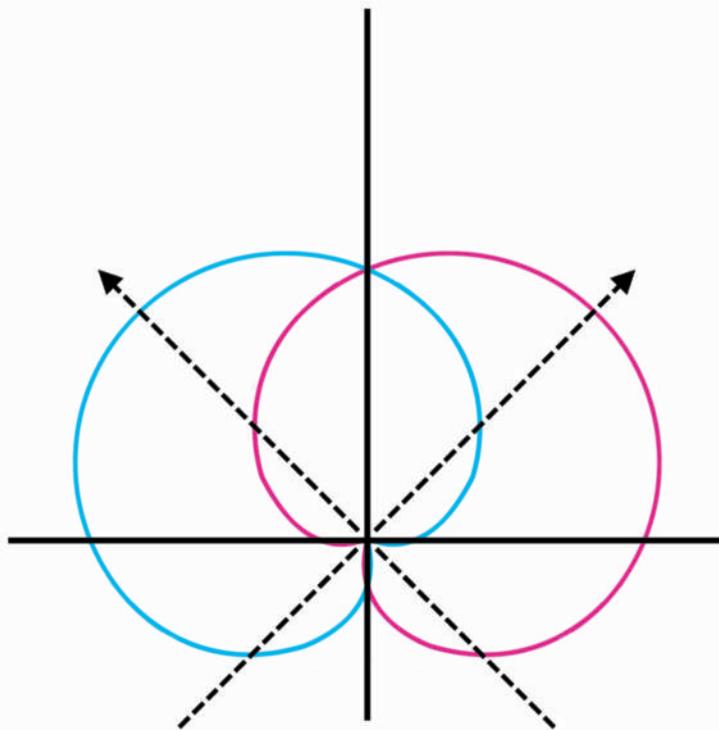
Because of the information preserved by the B-Format signals, SoundField microphone can create a virtual pair, or array, of microphones, comprised of any polar pattern, with any included angle between them, and pointed in any direction.

THE BASIC SOUNDFIELD CONVERSION



B-Format Components

By adjustment of the Pattern and Width controls, SoundField Microphones can generate a coincident-stereo Virtual Pair of microphones, with any polar pattern and any included angle from 0 to 180 degrees.



TECHNICAL SPECIFICATION

(Measurements taken using +4dBu balanced input where applicable)

INPUT IMPEDANCE	20K Ω (bal)
MAXIMUM INPUT LEVEL	+22dBu
LINE INPUT CMR	Better than -40dB (20Hz - 22kHz)
OUTPUT IMPEDANCE	100 Ω
MAXIMUM OUTPUT LEVEL	+22dBu
BANDWIDTH	<10Hz to 30kHz
DISTORTION	<0.05% at 1kHz (unity gain)
POWER REQUIREMENTS	115Volt or 230Volt at 50-60Hz, 76.5VA
FUSE RATING	T250mA for 230Volt, T500mA for 115Volt
	CONFORMING TO BS EN 60127-2:1991 SHEET III
FUSE TYPE	20mm x 5 mm, Class 3 Slo-Blo, 250Volt working
CASE SIZE	482mm (w) x 44mm (h) x 256mm (d)
WEIGHT (inc. packaging)	4.0 KGS

WARRANTY

Limited Liability

SOUNDFIELD LTD., HEREIN AFTER KNOWN AS THE MANUFACTURER, GUARANTEES THIS EQUIPMENT FROM DEFECTS IN MATERIAL AND WORKMANSHIP UNDER NORMAL USE AND SERVICE FOR A PERIOD OF ONE YEAR. THIS GUARANTEE EXTENDS TO THE ORIGINAL PURCHASER ONLY AND DOES NOT APPLY TO FUSES OR ANY PRODUCT OR PARTS SUBJECTED TO MISUSE, NEGLIGENCE, ACCIDENT OR ABNORMAL CONDITIONS OF OPERATION. THE GUARANTEE BEGINS ON THE DATE OF DELIVERY TO THE ACTUAL PURCHASER OR TO HIS AUTHORISED AGENT OR CARRIER. IN THE EVENT OF FAILURE OF A PRODUCT COVERED BY THIS GUARANTEE, THE MANUFACTURER OR THEIR CERTIFIED REPRESENTATIVES WILL REPAIR AND CALIBRATE EQUIPMENT RETURNED PREPAID TO AN AUTHORISED SERVICE FACILITY WITHIN ONE YEAR OF THE ORIGINAL PURCHASE AND PROVIDED THAT THE GUARANTORS EXAMINATION DISCLOSES TO ITS SATISFACTION THAT THE PRODUCT WAS DEFECTIVE, EQUIPMENT UNDER THIS GUARANTEE WILL BE REPAIRED OR REPLACED WITHOUT CHARGE. ANY FAULT THAT HAS BEEN CAUSED BY MISUSE, NEGLIGENCE, ACCIDENT, ACT OF GOD, WAR OR CIVIL INSURRECTION; ALTERATION OR REPAIR BY UNAUTHORISED PERSONAL; OPERATION FROM AN INCORRECT POWER SOURCE OR ABNORMAL CONDITIONS OF OPERATION, WILL NOT FALL UNDER THIS GUARANTEE. HOWEVER, AN ESTIMATE OF THE COST OF THE REPAIR WORK WILL BE SUBMITTED BEFORE WORK IS STARTED. THE MANUFACTURER SHALL NOT BE RESPONSIBLE FOR ANY LOSS OR DAMAGE, DIRECT OR CONSEQUENTIAL, RESULTING FROM MACHINE FAILURE OR THE INABILITY OF THE PRODUCT TO PERFORM. THE MANUFACTURER SHALL NOT BE RESPONSIBLE FOR ANY DAMAGE OR LOSS DURING SHIPMENT TO AND FROM THE FACTORY OR ITS DESIGNATED SERVICE FACILITY. THIS GUARANTEE IS IN LIEU OF ALL OTHER GUARANTEES, EXPRESSED OR IMPLIED, AND OF ANY OTHER LIABILITIES ON THE MANUFACTURERS PART. THE MANUFACTURER DOES NOT AUTHORISE ANYONE TO MAKE ANY GUARANTEE OR ASSUME ANY LIABILITY NOT STRICTLY IN ACCORDANCE WITH THE ABOVE. THE MANUFACTURER RESERVES THE RIGHT TO MAKE CHANGES OR IMPROVEMENT IN THE DESIGN AND CONSTRUCTION OF THIS UNIT WITHOUT OBLIGATION TO MAKE SUCH CHANGES OR IMPROVEMENTS IN THE PURCHASER'S UNIT. ANY DISPUTE ARISING FROM THIS WARRANTY SHALL BE SUBJECT TO THE LAWS OF ENGLAND.

What to do if a fault is found

If a fault develops in the unit, notify SoundField Ltd. or their nearest service facility giving full details of the difficulty. On receipt of this information, service or shipping instructions will be forwarded to you. No equipment should be returned under the warranty without prior consent from SoundField Ltd. or their authorised representative.

SHIPPING AND QUALITY ASSURANCE

Authorised returns should be prepaid and must be insured. All SoundField products are packaged in specially designed containers for the best possible protection. If the unit is returned the original container should be used. If this is not possible, a new container can be obtained from SoundField Ltd.; please specify the model number when requesting a new container. If the specially designed container is not used ensure that a suitable rigid container of adequate size is used, wrap the instrument in paper and surround it with a good thickness of shock absorbing material.

Claim for damage during transit

The instrument should be thoroughly inspected immediately upon delivery to the purchaser. If the instrument is damaged in any way a claim should be filed with the carrier immediately. A quotation to repair shipment damage can be obtained from SoundField Ltd or their certified representative. Final claims and negotiations with the carrier must be completed by the customer.

Applications problems

SoundField Ltd. will be happy to answer any applications questions to enhance your use of this equipment. Please address all correspondence to:

SoundField Ltd.
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Charlotte Street
Wakefield
West Yorkshire
WF1 1UH
ENGLAND
Tel: +44 (0) 1924 201089
FAx: +44 (0) 1924 290460
email: info@soundfield.com
www.soundfield.com

Quality Assurance and Service Policy

Over the years SoundField products have gained an enviable reputation for their quality of design, performance and reliability, however, in the unlikely event that problems are encountered with this unit, please contact SoundField Service at the appropriate address above or alternatively inform one of our world wide network of distributors who will be able to assist with any of your queries.