

mono,  
stereo,



5.1

...and beyond.

## The Surround Zone

*Surround Sound and Stereo Production Solutions*



## USER MANUAL

Version 1.0



[www.soundfield.com](http://www.soundfield.com)

## Contents

Introduction .....	2
SoundField History .....	3
SoundField Technology - How Does It Work? .....	4
Keys To Proper Placement Of SoundField Microphones .....	6
The Surround Zone - Explanation Of Controls .....	7
• Input Section	7
• The Surround Section	7
• Stereo Section	12
The SoundField Product Range .....	15
Optional SoundField Accessories .....	17

## Introduction

The SoundField Surround Zone plug-in brings all the benefits of SoundField Technology to the digital domain. The plug-in is designed to accept the four B-Format signals (W, X, Y & Z) generated by any of the current SoundField microphone models in the range. The unique four capsule array in every SoundField microphone captures three dimensional sound at the same 'central point' thereby eliminating all the time and phase related anomalies created by multiple spaced microphones. Once in the SoundField B-Format domain the point of acoustic origin is defined and all output variations i.e. mono, stereo, M/S, 5.1, 6.1 etc. are derived from this 'central point'. This provides the user with completely phase accurate surround sound and stereo recordings that are backward/forward compatible.

All plug-in features can be utilised either retrospectively in the studio after the recording has taken place or 'live' and provides the user with the most powerful stereo and surround sound recording/post-production package available.

## SoundField History

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 Ken Farrar’s contribution 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 surround 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 pick-up 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.

## SoundField Technology - How Does It Work?



*SoundField's Patented  
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, ST250 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 - front/rear, left/right, up/down - the fourth being the central point from which the other three components are referenced.



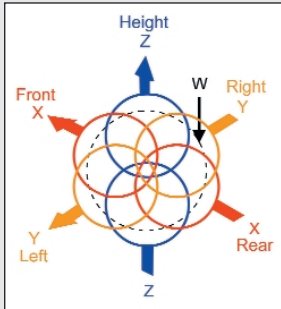
The signals from the four capsules are fed to the microphone's control unit where it is converted into four channels of SoundField B-Format, known as W, X, Y and Z.



**MKV B-Format Outputs**



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



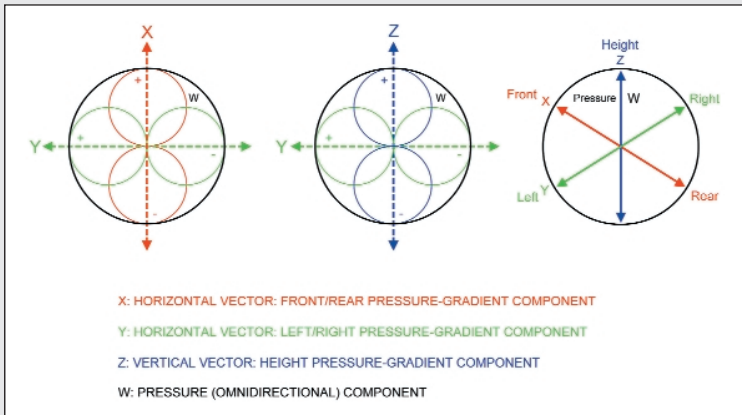
SoundField B-Format Illustration

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 pick-ups, all centred at a single point in space, and are labelled W (pressure), X (front/rear), Y (left/right), and Z (up/down). These signals contain all of the information required to reproduce 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, ST250 or SPS422B these components can be preserved for subsequent production and processing of current and all future surround formats.



## Keys To Proper Placement Of SoundField Microphones

As with real estate, the most important factor when using any microphone is “location, location, location.” Getting the mic in the right place is the first step in making a good recording. With SoundField microphones, it is too easy to be lulled into complacency by the excellent stereo and surround sound pick-up they provide. The temptation is to put it up, turn a few knobs, and go with it. However, with a little more attention to detail this “good” sound will always become even better.

Be sure to set the appropriate Orientation mode (Side Address  or End Fire ) to tell the controller how the microphone is facing. Then, before ever opening the mic up to stereo, it is important to listen to the microphone as a monophonic pick-up. Set the Pattern control to Omni and the Width control to 0° and listen to the overall sound. Pay particular attention to the balance within the sound source - i.e. the balance among the performers, the relationship of direct-to-reverberant sound, extraneous noises, etc. If it doesn't sound right, move the microphone around until it does. You also can adjust the Pattern control to focus more on the sound source (and less on the surrounding environment) if necessary.

Remember that the essence of SoundField microphones is based on the Mid/Side technique, where the Mid microphone provides the basic sonic balance. Therefore, once it sounds good in mono, it always will sound great in stereo; the converse, however, is not necessarily true. Only after you are satisfied with the mono pick-up, should you open-up the microphone into stereo. Set the Pattern control to the polar pick-up you think will be a good starting point and adjust the Width control for your desired stereo image. You can adjust both controls to achieve exactly the right stereo perspective for your recording. Pay particular attention to the direct-to-reverberant sound. Remember that too much reverb makes a recording sound “mushy” and vague. The beauty of SoundField microphone systems is their unequaled clarity and articulation. Don't waste this by including too much extraneous sound - unless, of course, that is what you want to do! Also keep an eye on the level meters to be sure that you are not likely to overload the microphone's electronics.

## Explanation of Controls

### Input Section:



- The input LEVEL control adjusts the input gain of all four B-Format channels simultaneously and ranges from  $-30\text{dB}$  to  $+10\text{dB}$ .

- The B-Format INPUT signals are displayed via the four 16 segment bargraphs.

- The INVERT mode maintains the correct three-dimensional perspective in both surround and stereo when the microphone is suspended upside down above the sound source. Not selecting this mode with the mic suspended will result in the Left/Right width information and Up/Down height information being inverted.

- The END FIRE mode maintains the correct three-dimensional perspective in both surround and stereo when the mic is used in the horizontal position pointing at the sound source 'like a flash-light'. Not selecting this mode when the microphone is horizontally pointed will result in the Up/Down height information and the Front/Back depth information being reversed.

*Please note - if INVERT or END FIRE has been applied at the 'live' recording stage on the SoundField hardware control unit do not apply these features again in post-production. This will neutralise the intended effect.*

### The Surround Section:



*The Surround Zone 5.1 page*

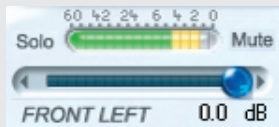


The surround sound section has six different surround sound modes plus an info page for each of these six modes, referred to as the ARRAY pages. The six modes include three 5.1 presets, a 6.1, a 7.1 and an 8 channel preset.

The following controls are identical for all six surround modes:

- Independent Channel Gain

Each discrete output channel has an independent gain control in the form of a slider and ranges from -30dB to +10dB. A 16-segment bargraph meter is provided for level monitoring of each individual output channel. SOLO and MUTE buttons are also provided for each individual channel.



- Master Output Gain

The master output gain allows you to simultaneously increase or decrease the gain of all discrete output channels, and ranges from -30dB to +10dB. The resulting changes in gain will be displayed on all individual output channel bargraphs.



- The SoundField Controls

The ROTATE, TILT and ZOOM controls are unique to SoundField Technology and give the user a 'you are there again' post production experience with the opportunity to re-position the microphone. It can be rotated, tilted up or down, or zoomed in or out from the sound source.



*Rotate, Tilt and Zoom*

- ROTATE allows the user to rotate a captured three dimensional soundfield a full 360 degrees without losing any spatial information or introducing any artefacts, audible or otherwise.
- TILT allows the user to tilt a captured three dimensional soundfield by  $\pm 45$  degrees without losing any spatial information or introducing any audible artefacts.
- ZOOM gives the effect of zooming in or further away from the sound source i.e. it alters the front/back balance without introducing any artefacts, audible or otherwise.

- REAR PATTERN



The REAR PATTERN control allows the user to vary the polar pattern of the rear surround channels on all but the 8-channel surround mode. Cardioid or hyper-cardioid may be selected to optimise localisation or figure-of-eights for a more enveloping sound depending on application and personal preference.

- FRONT & REAR WIDTH

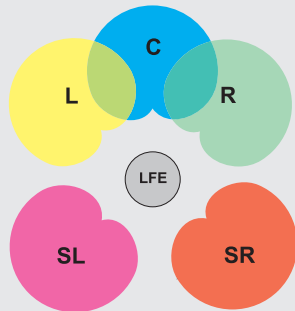


These controls allow the front and rear stage width to be varied. For example, a wider front image may be desirable for a large orchestra, whilst for a centre-front positioned soloist a more narrow angle may be preferable.

- SURROUND MODES

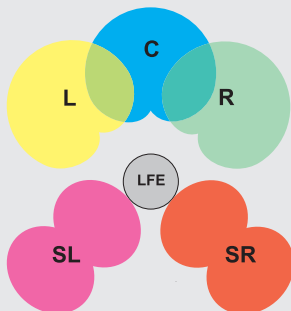
The Surround Zone plug-in offers the option of six different surround modes, three 5.1 pre-sets, a 6.1 , a 7.1 and an 8-channel pre-set. The two first 5.1 pre-sets, 5.1 cardioid and 5.1 figure-of-eight, are variations on the same decoding scheme.

1. The 5.1 cardioid pre-set provides a standard five cardioid microphone array, plus a truly omni-directional LFE-channel.



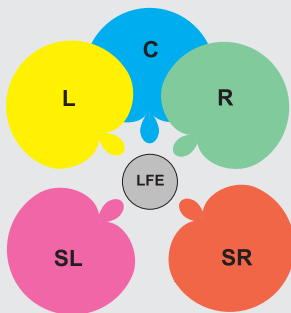
This pre-set has been level adjusted to suit standard 5.1 playback, however, individual levels can be adjusted to suit requirements. This pre-set is ideally suited for recordings where localisation is important such as movie sound effects.

2. The 5.1 figure-of-eight pre-set provides three frontal cardioids (L/C/R) and two rear figure-of-eights (LS/RS), plus a truly omnidirectional LFE-channel.



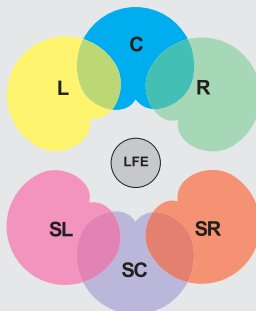
This pre-set only differs from the 5.1 cardioid in the rear-focus control setting and has also been level adjusted to suit standard 5.1 playback, levels can however be user adjusted to suit requirements. This pre-set is ideally suited for creating an enveloping surround feel, whilst maintaining a stable front image.

3. The third 5.1 pre-set: 5.1 hyper, provides a five hyper-cardioid microphone array, plus a truly omnidirectional LFE-channel.



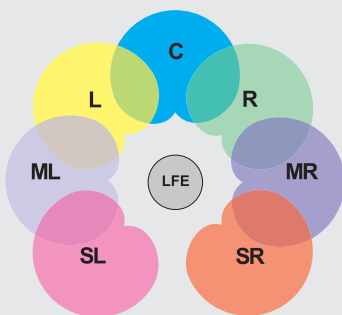
This pre-set has been level adjusted to suit standard 5.1 playback, levels can however be user adjusted to suit requirements.

4. The 6.1 pre-set provides a six cardioid microphone array, plus a truly omnidirectional LFE-channel.



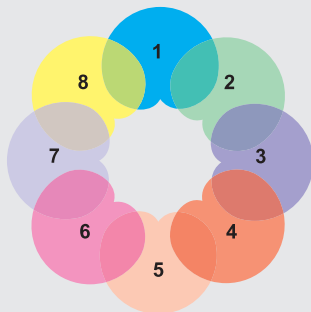
The output is fully compatible with standard 5.1 playback systems yet adds the enhancement in localisation a rear-centre channel brings. This pre-set has been level adjusted to suit standard 6.1 playback, however, individual levels can be adjusted to suit requirements.

5. The 7.1 pre-set provides a seven-cardioid microphone array, plus a truly omni-directional LFE-channel.



The output is fully 5.1 compatible yet adds the enhancement of two extra playback channels. Aimed at demonstrating the benefits in localisation and envelopment of an increased number of loudspeakers. This pre-set has been level adjusted to suit standard 7.1 playback, individual levels can be adjusted to suit requirements.

6. The 8-channel pre-set provides an eight-cardioid microphone array and is aimed at playback over a regular eight-channel loudspeaker array. Individual levels can be adjusted to suit requirements.



On screen information for each of the surround modes can be obtained by clicking the array page tab followed by the relevant surround mode tab.

*Note: All LFE-channels are low-pass filtered using a 2nd order filter with a cut-off frequency of 90Hz. Users requiring a different LFE cut-off frequency can achieve this by using a DAW provided filter.*

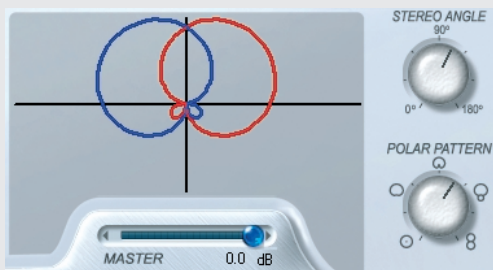
## STEREO SECTION

The stereo section provides the user with highly flexible and configurable stereo outputs. Features include variable stereo width and polar pattern control, which are visually represented on the Stereo page. Also provided is a fully variable high-pass filter (20Hz to 250Hz), an M/S decoder and the SoundField controls, ROTATE, TILT and ZOOM.



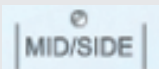
*The Surround Zone Stereo page*

### • STEREO ANGLE & POLAR PATTERN



The Stereo Angle control allows the user to set the angle between the coincident stereo pair either 'live' or after the recording has taken place. For example a small stereo angle can be utilised to emphasise a soloist, where as a wide angle can be used to create a wide stereo image such as that required for an orchestra. The Polar Pattern control is continuously variable ranging from Omni through Sub-Cardioid, Cardioid, Hyper-Cardioid to Figure-of-eight and sets the polar patterns used for the stereo pair. Both parameters are reflected in real-time in the visual representation window.

- MID/SIDE ENCODER



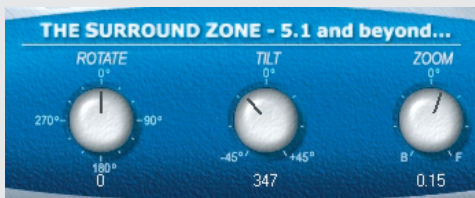
When the Mid/Side button is enabled the stereo outputs will be M/S encoded. The Left output channel provides the Mid signal and the Right output channel provides the Side signal.

- HIGH PASS FILTER



This filter is included in the Stereo Section to remove any unwanted Low frequency rumble, such as wind noise. The filter is only enabled when the filter button is illuminated and is a 3rd order Butterworth high-pass filter.

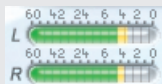
- SOUNDFIELD CONTROLS



The effect of the SoundField controls in stereo mode differs slightly from their operation in surround mode as described in the Surround Sound section.

- **ROTATE** re-defines the centre of the stereo image by rotating the soundfield anywhere between 0 degrees and 360 degrees.
- **TILT** tilts the soundfield up or down by  $\pm 45$  degrees.
- **ZOOM** offers the effect of zooming in or further away from the front sound source as defined by the ROTATE angle.

- MASTER OUTPUT GAIN



The master output gain controls the gain of both stereo output channels simultaneously. All changes are displayed on the 16 segment Left/Right output bargraphs.

A stereo array page with further information can be accessed by clicking on the array page tab followed by the stereo mode tab.

- LOAD, SAVE & BYPASS



## LOAD & SAVE

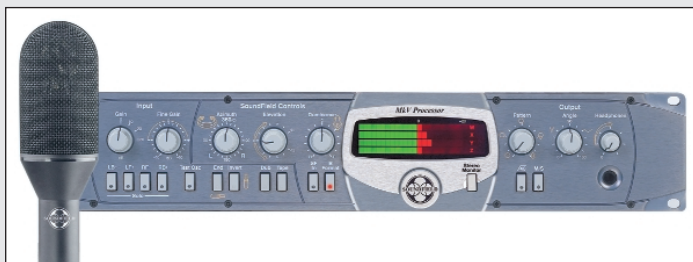
The load and save operations allows for settings created by the user within the plug-in, i.e. GAIN settings, ROTATE settings etc. to be saved and recalled to and from any Surround Zone Plug-In. The settings are saved in a file with the Surround Zone extension \*.srz, clicking on save or load will bring up the corresponding load and save boxes native to the operating system.

## BYPASS

When the bypass control is enabled the plug-in will be disabled and the B-Format input signals (W, X, Y and Z) will respectively appear unaltered on outputs 1 to 4 of the plug-in.

## The SoundField Product Range

### MKV Microphone System



- The MKV is a multi-capsule microphone and calibrated 2U processor capable of generating mono, stereo, M/S and surround. It offers unparalleled control of the microphone with features like Rotate, Tilt and Zoom and even the ability to 'Solo' each microphone capsule. In addition to B-Format outputs the processor is also equipped with B-Format inputs enabling the user to completely re-mix stereo recordings from previously recorded B-Format material. Input/outputs are balanced XLR at line level.

### SPS422B Microphone System



- The SPS422B is a multi-capsule microphone and calibrated 1U processor capable of generating mono, stereo, M/S and surround. All mic parameters are adjustable via the processor's front panel which can be situated up to 100m away. These include Gain, End Fire, Invert, High-Pass, Polar Patterns, Stereo Width and Headphone monitoring. All outputs are at line level on balanced XLR's.

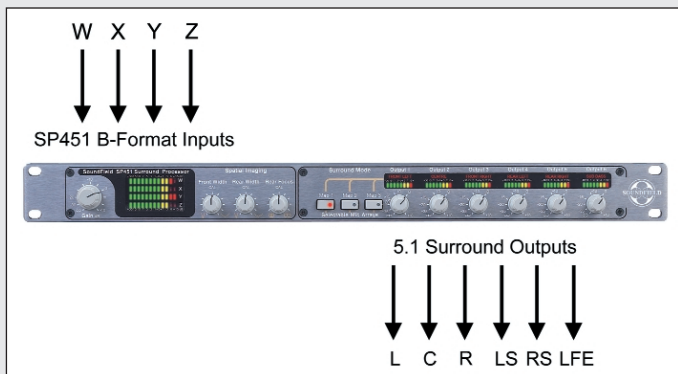


## **Battery Power!** **The ST250 Portable System**



- The ST250 is unrivalled in its capability to record surround or stereo in the field on battery power. Particularly suited to film/nature recording the unit can also be mains powered. The ST250 outputs Stereo Left/Right, M/S, Mono or four channel B-Format for surround. Outputs are at mic level on balanced XLR.

## **SP451 Surround Processor**



- The SP451 offers a rugged 1U rackmount hardware alternative to the Surround Zone plug-in. It is favoured by those wishing to bypass computers and DAW's and commit up to eight tracks of surround sound directly to digital recorders 'live' as the performance takes place. It can also be used 'stand alone' in post-production where from pre-recorded B-Format material it will output a 5.1 surround mix and stereo mix simultaneously. It generates up to three surround mic arrays with differing polar pattern combinations for instant comparison. Front panel controls include individual 5.1 channel levels and metering with variable Front Width, Rear Width and Rear Pattern for each mic array. The SP451 has B-Format inputs (W, X, Y & Z) and eight surround outputs. Input/outputs are balanced XLR at line level.

## Optional SoundField Accessories

## Part No.

Shock Mount Assembly	HW2909
Spare Elastic Supports for HW2909 (full set)	755-007
Leather Microphone Case	490-090
Foam Windshield	762-001
ST250 Control Unit Shoulder Pouch	430-382
Dual Membrane Studio Vocal Pop Screen	VPS150
SoundField Microphone Stand Adaptor	MSA-245

### FLIGHT CASES

MKV Flight Case	FCMKV
SPS422 Flight Case	FCSPS422
ST250 Zero Field Case	440-188
2U Foam Suspended Rack/lift-off front/back accommodates MKV or SPS422B/SP451, mic/cabling and accessories	SUS-2UFC
Foam Suspended Rack/lift-off front/back accommodates MKV/SP451, mic/cabling and accessories.	SUS-3UFC

### RYCOTE KIT

<ul style="list-style-type: none"><li>• Rycote Suspension with Pistol Grip</li></ul>	430-385
<ul style="list-style-type: none"><li>• Rycote 140mm Windshield</li></ul>	430-384
<ul style="list-style-type: none"><li>• Rycote Mounting Kit</li></ul>	440-182
Optional Rycote Windjammer (to fit 430-384)	430-398
Optional High Wind Cover (to fit 430-384)	430-400

### CABLES AND CONNECTORS

5 Metre Microphone Cable	NN2882
10 Metre Microphone Cable	NN2883
20 Metre Microphone Cable	NN2884
50 Metre Microphone Cable/plastic drum	NN2885
100 Metre Microphone Cable/metal drum	NN2886
Mic Splitter Cable 12 PIN Male to Female XLRs	NN2877
Mic Splitter Cable 12 PIN Female to Male XLRs	NN2878
ST250 B-Format Output Cable	NN2914
12 PIN Panel Mount Connector - Male	410-059
12 PIN Panel Mount Connector - Female	410-045
12 PIN In Line Connector - Male	410-043
12 PIN In Line Connector - Female	410-044
SoundField 12 Core Mic Cable/Metre	310-353

## Notes

**Important Notice:** Please note that by installing this plug-in you have agreed to the SoundField software license agreement. A copy of this software license agreement is available on the Surround Zone plug-in installer CD-ROM and on our website: [www.soundfield.com](http://www.soundfield.com)

Subject to change without notice. All trademarks are the property of their respective owners.  
© 2003 SoundField Ltd. All rights reserved. Printed in England.

**SOUNDFIELD is a registered trademark of SOUNDFIELD LTD.**

# SOUND



Charlotte Street Business Centre • Charlotte Street  
Wakefield • West Yorkshire WF1 1UH • ENGLAND  
tel: +44 (0) 1924 201089 • fax: +44 (0) 1924 290460  
email: [info@soundfield.com](mailto:info@soundfield.com) • web: [www.soundfield.com](http://www.soundfield.com)