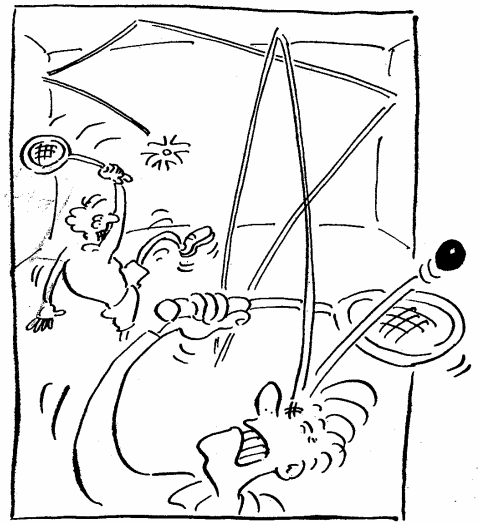
6.2.2

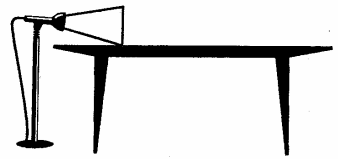
SUITABLE SPACES FOR SOUNDBEAM



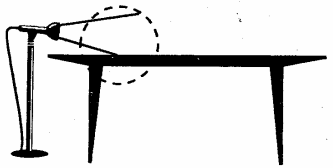
Experience shows that Soundbeam works best in a relatively open, uncluttered space - about 6 metres by 6 metres should be plenty - although, of course, it is often used successfully at short ranges in a much smaller area.

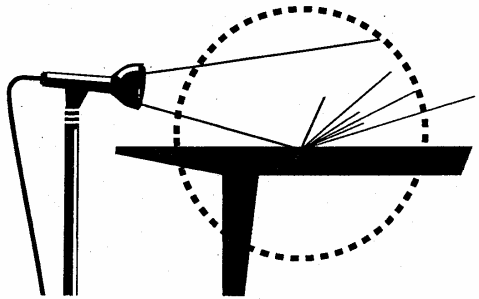
In the same way that hard, shiny wall surfaces produce reverberant acoustics, with sounds bouncing off walls many times, so ultrasonic pulses will perform double or multiple bounces in acoustically reflective surroundings. Normally, only the echoes of ultrasonic pulses from objects within the area prescribed by the RANGE setting are received directly back by the Sensor.

However, in a small reflective room, or between two large parallel reflective surfaces, the pulses moving beyond the length of beam set on Range control are much more likely to get into double or multiple bounces and a few of these may well be fielded by the Sensor in its microphone mode, thus causing the wild, unpredictable - and infuriating - behaviour described above. A small shift of the beam's direction, tilting up and swivelling left or right while watching the LED (small flashing light on Soundbeam's Front Panel), will usually cure this - additionally, try a slight adjustment of the RANGE setting.



One other possible cause of unwanted sounds from the Keyboard can result from forgetting the effect of the beam's divergence - the fact that as it lengthens it also widens. If the Sensor is placed on - or even close to - the floor, and the beam is directed horizontally, the 16° divergence of the beam will mean that, if the Range is increased, the edge of the beam may well touch the floor - and thus trigger a Keyboard note.





6.3.0

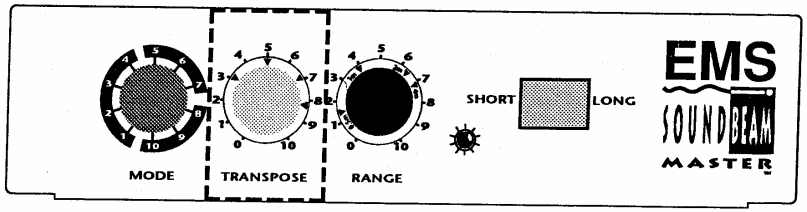
THE ANALOGUE TO DIGITAL CONVERTER - with TRANSPOSE CONTROL

The A-TO-D CONVERTER's function is chiefly to translate the analogue language of gates and voltages - in which it receives information from the Distance Detector about interruptions of, and movements within, the beam - into the digital language used by the Microprocessor for the operations that it has to perform on that information, before turning it into Midi instructions for the Keyboard.

6.3.1

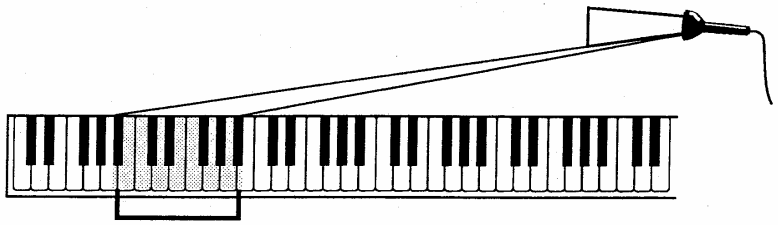
TRANSPOSE

This, the central control of the three on Soundbeam's front panel, governs the upper and lower limits of the Keyboard's response to movements in the beam - as specified by the MODE setting. It shifts this response from sounding a **low** set of notes on the Keyboard at TRANSPOSE 0 to sounding a **high** set at TRANSPOSE 10.

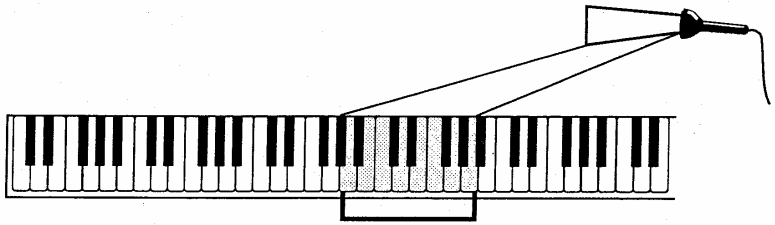


There is a centre 'click' position - at 5 - on this control which corresponds to the original (non- transposed) pitch range of the selected Mode, or of any sequence of 16 notes played from a Keyboard using the start-up in Mode 10 process. (see 6.4.9.) In addition to the numbered positions, 4 pointers around the TRANSPOSE dial indicate approximate positions for

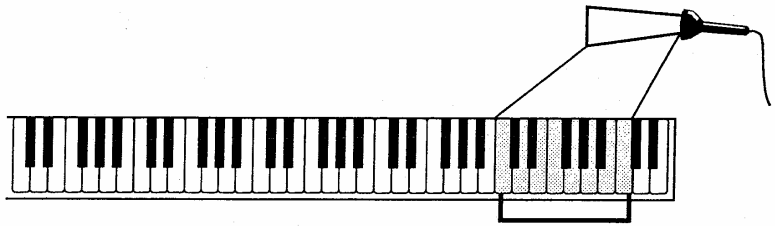
a) transposition **down** *one* octave
b) (the click position) - original pitch
c) transposition **up** *one* octave
d) transposition **up** *two* octaves



For example, if RANGE is set at 0, MODE at 1 and TRANSPOSE at 0, then moving a hand towards the Transducer from the end of the beam furthest away from it will play an 8 note major scale starting on $A\#_1$ and ending on $A\#_2$.

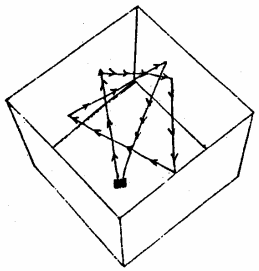


Now change the TRANSPOSE Control setting to 5 and the same hand movement in the beam will still produce an 8 note major scale, but this time starting on A_3 and ending on A_4...



..while setting TRANSPOSE at 10 will mean that that the hand movement in the beam will produce an 8 note major scale from C_6 to C_7.

ee Appendix B pages 48 - 49 for a table of the effects of various ettings of TRANSPOSE on all 10 Modes and for a description of the onvention used to describe notes pitched in different octaves.



In addition to the numbered positions marked on the panel around the Range control there are also four marker positions. These indicate beam ranges (at both settings of the LONG/SHORT switch of - respectively - 0.5m, 1m, 2m and 4m.

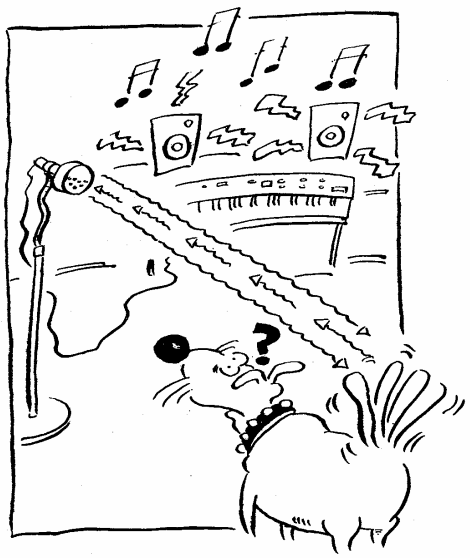
Unlike the beam of a torch, whose light gets gradually fainter the further away it is from the bulb, Soundbeam's is equally effective at any part of its length, and there is, in addition, a sharp cut-off point at the end of the beam furthest from the Sensor.

This is NOT because, somehow or other, the ultra-sonic pulses are stopped in their tracks at the desired distance, but because the Distance Detector, directed by the setting on Range control, limits the length of time allowed, after the emission of a pulse, for picking up an echo. To put it another way, the Range control setting decides how far the pulse will be allowed to travel before the Sensor stops listening for a returning echo - and changes back into a loudspeaker.

The ultra-sonic pulses actually DO continue to travel onward, away from the transducer and beyond the distance set by RANGE, and this, occasionally gives rise to wild and unpredictable behaviour by Soundbeam, when, without there being any apparent interruption of the beam, random Keyboard notes are triggered. The reasons for this can usually be found in the nature of the space in which Soundbeam is being used.

6.2.0

THE DISTANCE DETECTOR and RANGE CONTROL



The function of the Distance Detector is

A. to mark any interruption of the beam signalled by the detection of an echo, and to light up the red LED (Light Emitting Diode) on the front panel of Soundbeam Master for as long as the interruption continues;

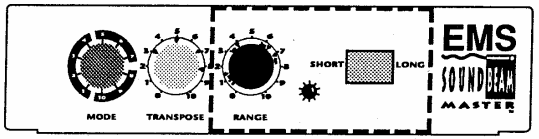
B. to note the interval between the sending of the ultra-sonic pulse and the return of an echo from it;

and

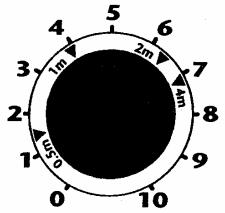
C. to send a switching signal which will be used to turn a Keyboard note on and a voltage proportional to B (which will be used to determine the musical pitch of that note) to the Microprocessor.

6.2.1

THE RANGE CONTROL



This is the right-hand rotary knob on Soundbeam's front panel and it controls the length of the beam - subject to the limits imposed by the LONG/SHORT switch. The further Range Control is turned clockwise, the further the Sensor sends its pulses of ultra-sound and the greater the distance at which it can pick up reliable information from "echoes" of those pulses, if any kind of reflecting body interrupts the beam.



RANGE

The LONG/SHORT switch (also on SBM FRONT panel), when set to the SHORT position, greatly reduces the power used for sending the pulses of ultra-sound - and this results both in a quietning (to near silence) of the clicks of the pulse emissions, and in a reduction of the maximum effective distances to which the pulses can be sent. With the LONG/SHORT switch set at LONG, the maximum distance at which the Sensor can gather reliable information will be 6 metres or more (Range 9+) - while, with the switch at SHORT, the maximum reliable distance will be nearer 4 metres (Range 7+). At both switch positions the Range setting 0 will give a minimum beam length of 25cms.

6.4.0

THE MICROPROCESSOR - with MODE CONTROL

The MICROPROCESSOR`s, guided by the software controlled by MODE, enables you to choose one of several different possible interpretations of the information about interruptions of the beam which arrives from the A-to-D Converter - and then translates your choice into instructions in Midi for sending on to your Keyboard.

6.4.1

MODE

This 10 position rotary switch, the left hand of the three controls on Soundbeam's front panel, offers a number of different articulations, performance controls, and scale or arpeggio interpretations of information from the beam - as well as a means, (switching on in Mode 10), of defining your own 16 note sequence.

6.4.2

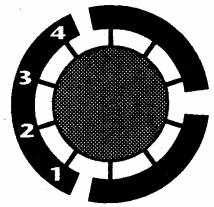
ARTICULATIONS

To start with, there are 3 different ways of using movements in the beam to play notes on the Keyboard. We call them "Single Shot", "Sustain" and "Re-trigger".

6.4.3

SINGLE SHOT (Modes 1,2,3,4)

In these 4 Modes, once you have triggered a Keyboard note - that's to say made it start to play - by interrupting the beam with your hand, perhaps, or an arm, a leg, your finger, nose, toe, umbrella or whatever, you will have to remove them (the objects just mentioned) from the beam, before you can trigger any other Keyboard note.

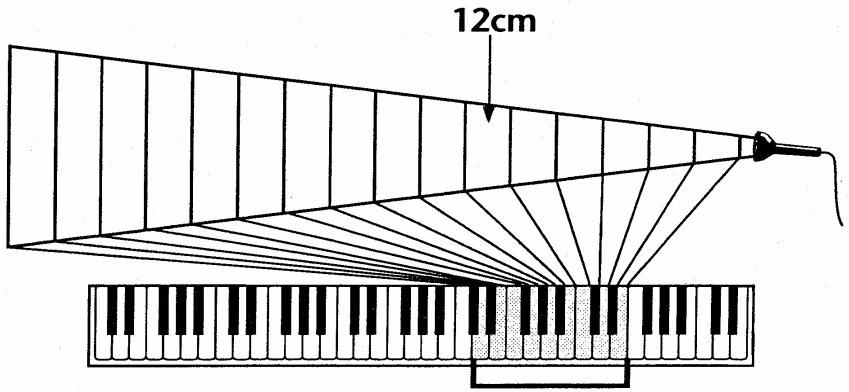


MODE

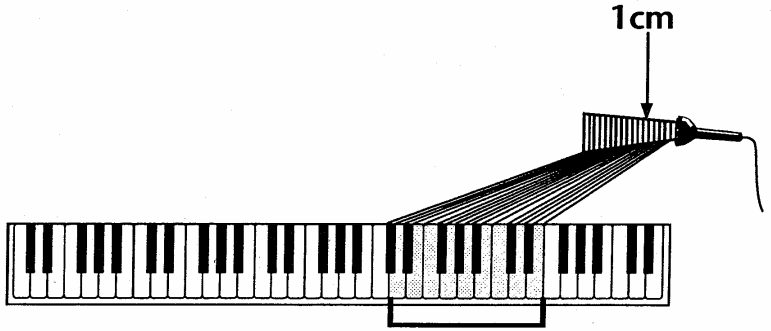
If the Keyboard is set to play ***SUSTAINED*** sounds - (long, held-on sounds like those of organ, sax, bowed strings and so on) - then the note triggered by an interruption of the beam will continue to sound as long as the interruption lasts. When the interruption ceases - when you remove your hand, arm, leg, finger, nose, toe, umbrella and so on from the beam - the sound will cease too.

Of course, if the Keyboard is currently set to play SHORT sounds (such as plucked strings, xylophone or harp, for example), the note may well die away long before the interruption of the beam ceases.

If we increase the RANGE setting to 7 - lengthening the keyboard related beam to about 3 metres - the part of the beam related to just one of the 16 notes will now occupy something like 12cms of the beam's length.



If we reduce the RANGE setting to 0 - shortening the keyboard related beam to about 15cms - the part of the beam related to just one of the 16 notes will now occupy approximately 1cm of the beam's length.



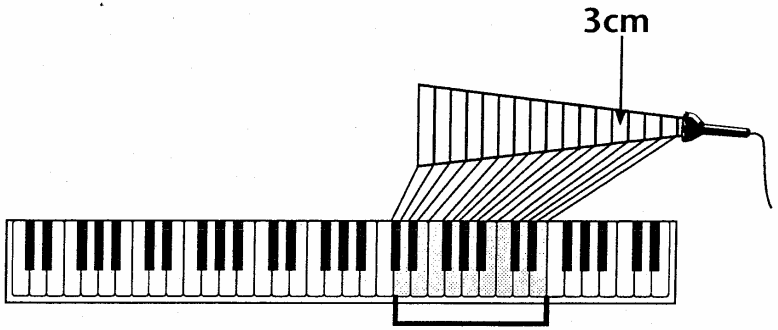
6.1.2

THE BEAM AS AN IMAGINARY KEYBOARD IN SPACE

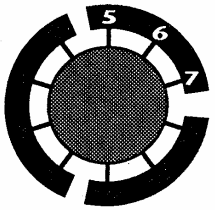
For Soundbeam's purposes as a means of enabling movements in the beam to play a series of notes on an electronic musical instrument, the beam is divided (after a short space, about 20cms, immediately in front of the Sensor) into equal fractions of its length. Any part of the beam - if it is interrupted at that point - will generate the note assigned to that particular fraction of the beam's length by the Microprocessor.

The effect of making the beam longer or shorter is simply to lengthen or shorten the size of a notional keyboard related to that beam - in other words, to expand or contract the space related to each unit of the scale or note sequence currently specified by the MODE setting.

Let's suppose, for example, that Soundbeam's RANGE is set to 3.5, giving a beam length of 1 metre. At the same time, MODE is switched to 2, which interprets interruptions of the beam as 16 notes of a chromatic scale. Each of these 16 notes will be related (by Soundbeam's Microprocessor) to one of 16 equal lengths of the beam.



The part of the beam related to each note - the particular section of the beam where an interruption will cause that particular note to sound - will occupy roughly 3cms of the beam's total length.



MODE

6.4.4

SUSTAIN (Modes 5,6,7)

In these 3 Modes, as in the "Single Shot" modes, once you have triggered a Keyboard note by an interruption of the beam, you will have to exit from the beam and make a fresh interruption from outside it to trigger a fresh note on the Keyboard. As before, if the Keyboard is set to produce ***SHORT*** sounds (plucked strings, xylophone, harp), the notes will quickly die away.

However, if the Keyboard is set to produce ***SUSTAINED*** (organ, sax, bowed string) sounds, an interruption of the the beam will trigger a note that will go ON - (and ON and ON and ON!) - sounding even after the interruption of the beam has ceased.

A SECOND interruption of the beam, at a different distance from the Sensor, will add a SECOND note which will also continue to sound - (together with the first one) - after the second interruption has ceased. In the same way a THIRD note resulting from a THIRD interruption of the beam - and a FOURTH, FIFTH and so on - will be added to the chord the Keyboard is playing.

At any time, you can SILENCE all the notes that you have triggered so far by interrupting the beam, (with your hand, perhaps), very close to the Sensor. (This apparently magical gesture won't work on some early models of Soundbeam at ranges of less than about 1metre.

6.4.5

HOW MANY NOTES CAN YOU PLAY AT THE SAME TIME?

If you go on triggering new sustained notes by repeated interruptions of the beam, you will sooner or later reach the maximum number of notes which your Keyboard - (or the particular Voice you are using) can play simultaneously.

Electronic musical instruments are described as being "4 voice polyphonic", "8 voice polyphonic" and so on. "4 voice polyphonic" means that the maximum number of different notes that can be heard simultaneously in a chord is 4. Likewise, 8 is the maximum number of notes which can be sounded together on a Keyboard described as "8 voice polyphonic" - and so on.

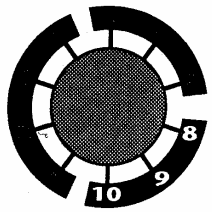
So, if your Keyboard is "8 voice polyphonic", if you have set it to play a sustained sound and if (in Mode 5, 6 or 7) you have already interrupted the beam 8 times, the Keyboard will by now be playing an 8 note chord. If you interrupt the beam for the 9th time, the 1st note you triggered (with your 1st interruption of the beam) will stop sounding and will be replaced by the note you have just triggered (with the 9th interruption). Any note triggered by a 10th interruption of the beam will will replace the 2nd note of the original chord and so on until the 16th interruption of the beam completes the total replacement of the first 8-note chord by a second.

Not all Keyboards use this system nowadays but there will always be a limit to the number of notes that you can have in your chords.

6.4.6

RE-TRIGGER (Modes 8,9,10)

In these three Modes, once an interruption of the beam has been made, and a Keyboard note has been triggered, movements in the beam towards and away from the Sensor will trigger other notes (of whichever scale or sequence is indicated by the current MODE setting) without any further exits or re-entries of the beam being necessary. These modes make perhaps the most dramatic and visually effective interpretations of movements in the beam.

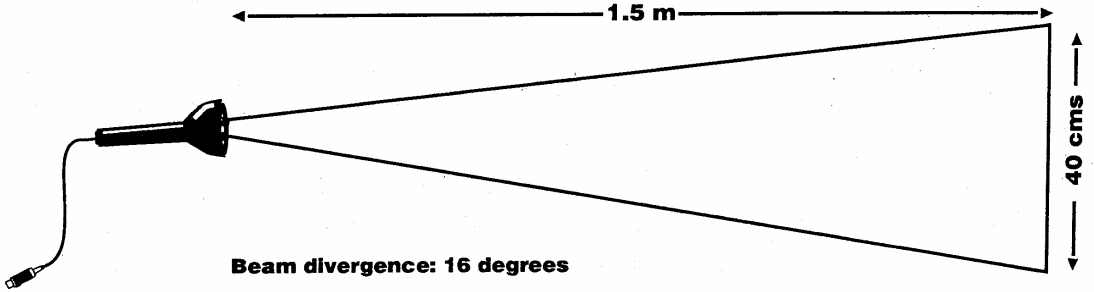


MODE

6.1.1

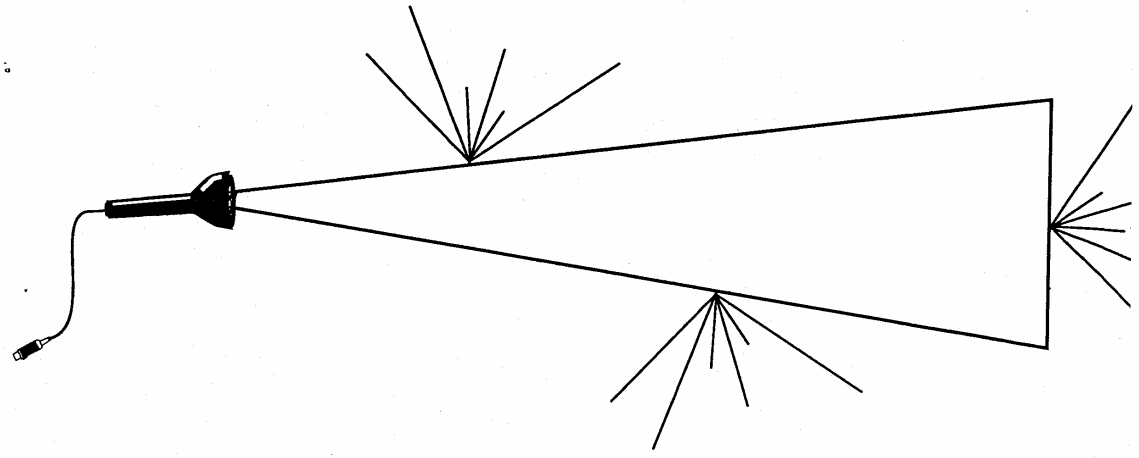
THE BEAM

A stream of ultrasonic pulses spreads out from the Sensor in the shape of a torch beam - except, of course, that Soundbeam's is invisible. It's conical in shape, circular in section and has a divergence of 16°, expanding from a diameter of 4cms at the sensor grill, through one of 10cms at the end of the beam's shortest range to, for example, 90cms diameter at a distance of about 4 metres.



Beam divergence: 16 degrees

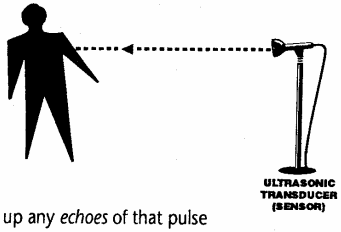
The sharp cut-off at the end of whatever length of beam the Range control has set does mean that Keyboard sounds can be triggered by tiny, almost imperceptible movements towards Soundbeam's Sensor from beyond the cut-off point - as well as by movements towards the central axis of the beam from outside its equally sharply defined lateral boundaries.



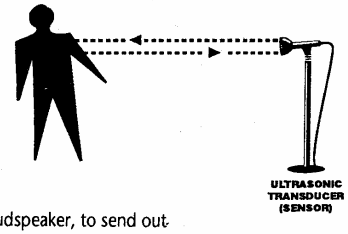
6.1.0

I. THE TRANSDUCER

The Transducer - the sensor - creates Soundbeam's invisible, ultra-sonic beam. It does this by being, first, a loudspeaker, and sending out an ultra-sonic pulse.

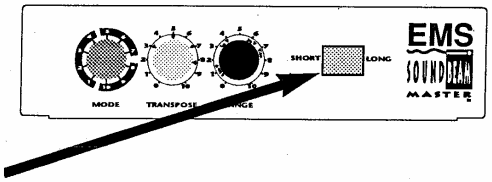


Next, it changes into a microphone, to pick up any *echoes* of that pulse which may be reflected from an object in its path

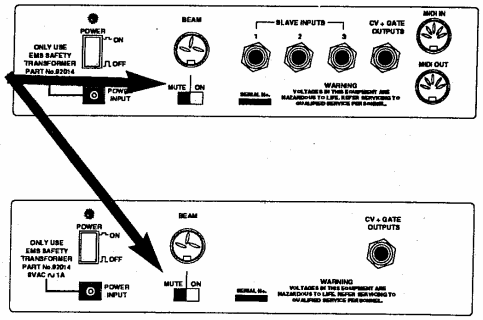


before changing back, once more, into a loudspeaker, to send out another ultra-sonic pulse, and so on.

The amount of power needed to send ultra-sonic pulses a distance of between 4m and 6m or more causes the Sensor to emit a fairly loud ticking sound, which many people find irritating - particularly at the close beam ranges at which many users and carers like to work. The SHORT position on the LONG/SHORT switch (SBM and SBS FRONT panels) - by reducing this power - also greatly reduces the loudness of the tick and incidentally, of course, the maximum range of the beam (to about 4m).



The MUTE/ON switch (SBM and SBS BACK panels) enables the Sensor to be switched off - particularly when being used in the LONG range position, with the louder tick - without the loss of Mode 10 input sequences or the need to re-adjust Range and Transpose settings that may result from switching off the main devices.



6.4.7

SCALES AND ARPEGGIOS

In addition, each of the 10 Modes offers a different interpretation - (of the information derived from interruptions of the beam) - in terms of the number of notes and the sequence of intervals related to equal divisions along the length of the beam (see 6.1.2. The Beam As An Imaginary Keyboard In Space.)

These range from an 8 note major scale (in Mode 1), through a 64 note chromatic scale (Mode 3) to a 16 note pentatonic scale (Mode 10). There is a complete list of them in the Mode Table on page 47.

6.4.8

MODULATION WHEEL AND PITCHBEND

In Modes 1, 2, 3, 5 and 6, the control of Modulation Depth (vibrato) and, in Modes 4 and 7, Pitchbend (sliding pitch change) can be applied - by movements towards or away from the Sensor - to any notes triggered by interruptions of the beam. In either case, you will have to use the controls on your Keyboard to set the maximum amount of variation from the original pitch that you want to be able to apply.

In the five Modulation modes, movement either towards or away from the Sensor - after the original interruption - will have the effect of increasing the amount of modulation, which will stop as soon as the interruption ceases or if the interruption returns to its initial position.

In the two Pitchbend modes, movement towards the Sensor will raise - and movement away will lower - the pitch of the note sounded by an interruption of the beam.

6.4.9

MODE 10 AND USER-DEFINED NOTE SEQUENCES

Soundbeam can be programmed so that a sequence of any 16 pitches of your choice can be triggered by interruptions of the beam.

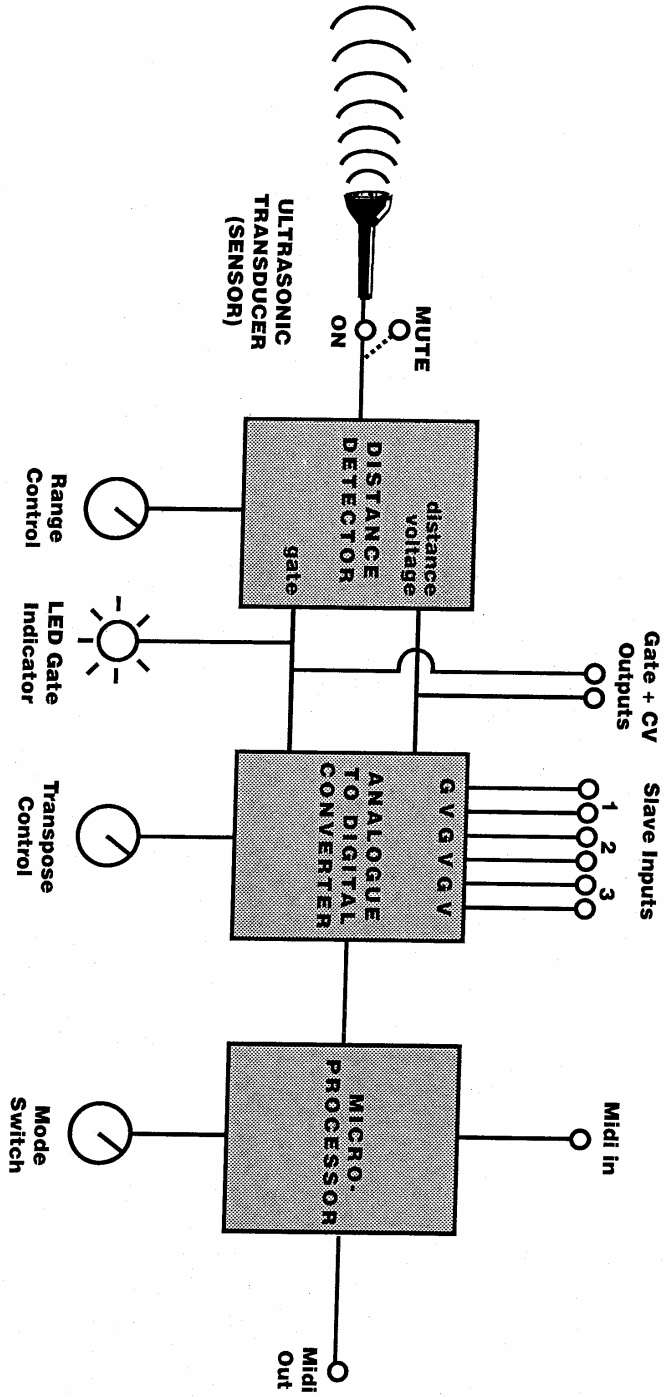
Switch Soundbeam off, select Mode 10 and switch on again. Now play your chosen 16 notes on the Keyboard, and after the 16th has been reached, the whole sequence will be played back (by Soundbeam) in the same order. If Transpose control is set at the notched position (Transpose 5), interruptions of the beam will trigger notes within the range of the pitches you have selected on your Keyboard. Other Transpose control positions will shift the whole set of these pitches up or down by as little as one semitone, or (in semitone steps) by as much as 26 semitones - 2 octaves and a tone - up, or 23 semitones - 2 octaves less one semitone - down. From now on, for as long as Mode 10 is selected, and whenever it's re-selected, the same sequence of notes will be generated by movements in the beam. The sequence will be lost when Soundbeam is switched off.

N.B. IF SOUNDBEAM IS INADVERTENTLY SWITCHED ON IN MODE 10, NO SOUNDS CAN BE GENERATED BY INTERRUPTIONS OF THE BEAM UNTIL 16 NOTES HAVE BEEN PLAYED FROM THE KEYBOARD INTO SOUNDBEAM'S MEMORY VIA THE "MIDI IN" SOCKET.

See
- the tables of MODES with all the articulations, scales, arpeggios and extra controls (**APPENDIX A**)
- the table of the effects of different settings of TRANSPOSE on the notes of each of these modes (**APPENDIX B**)
- a brief explanation of MIDI (**APPENDIX C**)

PAGES 49 - 51

SYSTEM BLOCK DIAGRAM



6. EXPLANATIONS

If you have just started to use Soundbeam - and want to make the best use of it - you'll need to know something of how it works. These EXPLANATIONS, in simple language (with the minimum of technical terms), take you step-by-step through Soundbeam's processes, outlining the effects of the various controls.

6.0.0

Soundbeam Master consists of four main sections -
(see diagram on facing page)

I. THE TRANSDUCER

- we shall call it the sensor - sends out the beam of ultra-sonic clicks, and detects *echoes* reflected from any object which interrupts it.

2. THE DISTANCE DETECTOR

works out the distance from the Sensor of any interruption of the beam - while Range control defines the beam's length.

3. THE ANALOGUE TO DIGITAL CONVERTER

translates all this, as well as similar information from up to three Soundbeam Slaves - and the setting from Transpose control - into a digital (computer) code.

4. THE MICROPROCESSOR

accepts your choice from the possibilities offered by Mode control as to how to use the information from the beam - and re-translates the resulting instructions into Midi - the language your Keyboard understands.

7. SOUNDBEAM AND SAFETY

We are sometimes asked whether Soundbeam is "safe". This is a question which can be interpreted - and answered - in a number of ways.

IS IT ELECTRICALLY SAFE?

Soundbeam has been designed and built specifically with electrical safety in mind. Great care has been taken by the designers to arrange that the mains current is properly isolated from the working parts, and the manufacturing process includes stringent controls and tests to ensure that the user is properly protected from danger. Furthermore the pulsed voltage which is used to drive the transducer in the Sensor (connected via the beam socket) has been specially tested by Rowland Laboratories of Merton, London SW19, England, who have determined that this voltage complies with the shock hazard requirements stipulated in BS 415 (1990).

However, please note that **UNDER NO CIRCUMSTANCES SHOULD THE CASE BE REMOVED.** Refer all servicing to Robin Wood in Cornwall, England, or other qualified personnel.

IS ULTRA-SOUND SAFE?

The ultra-sonic signals that Soundbeam sends out - little pulses of air pressure at frequencies much higher than we can hear - are neither very strong nor very concentrated. They are similar to the kind commonly used in burglar alarms and camera range finders. The Health and Safety Executive say that ultra-sound sent through the air is not thought to have any damaging effect on human tissue or hearing, and there are no regulations restricting its use. You should check with your local Health and Safety Executive office if you need any further information.

ARE THERE ANY OTHER HAZARDS?

Well - er - yes, there are. The following is from a letter sent to us by a consultant physician at a hospital in Bristol - user of Soundbeam, incidentally - whom we had asked about potential problems with Soundbeam's safety.

"It is inconceivable that the machine could do any harm to any one. The hazards consist of falling over the flex and deafening or driving people insane with the music!..."

8. USING SOUNDBEAM - HINTS AND SUGGESTIONS

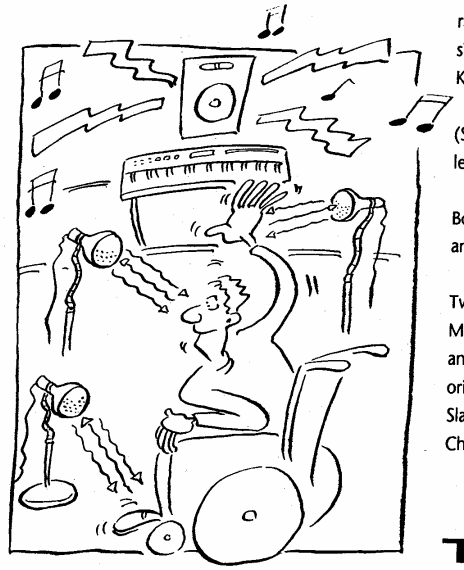
In order to assess how effective a resource Soundbeam is, in order to judge the success of your work with the machine, you need to have an idea about what it is that you are trying to achieve with it.

Here is a list of a few possible objectives - it is by no means an exhaustive list and you will have your own aims to add to it:

- to encourage body-awareness
- to build confidence about moving in space
- to develop extended movement
- to develop fine motor control and discrimination
- to explore cause and effect
- to encourage listening, attention, concentration
- to stimulate imagination through movement and sound
- to discover composition and improvisation
- to build communication skills
- to make music
- to foster a sense of achievement
- to have fun

It's unlikely that you would use Soundbeam for any one of these reasons to the exclusion of all the others, but the emphasis of your work will have a bearing on how you use the machine, and the success of your work will depend upon whether or not you are using the machine appropriately in order to harmonise with this emphasis.

There are no hard and fast rules about using Soundbeam, but as a general guideline, you need to be aware of when your movements are interrupting the beam ***where the beam starts, where it stops***, and ***where the 'invisible sounds' are in the beam and in relation to the player***. Switching on and hoping for the best is not a good strategy; the dancer will not have a satisfactory experience if the operator spends a long time changing the sounds, modes and beam angles.



RESULTS OF STAGE 4

Follow the same test and fault-finding routine as you did in Stage 1 (pages 13 - 14). Note that while Soundbeam Slave has its own Range control, the Transpose and Mode controls of Soundbeam Master govern the playing of your Keyboard by movements in Soundbeam Slave's beam.

This means, for instance, that one set of **large** movements in a long range beam from Soundbeam Master's sensor could be used to play one Keyboard Voice via Midi Channel 1 (Set Range control on SBM Master Front Panel to, say, 9, giving a beam length of 5-6m).

At the same time, a second set of quite **small** movements in a short range beam could be used by Soundbeam Slave to play a second, simultaneous but different and independent Voice on the same Keyboard via Midi Channel 2.

(Set Range control on SBM Slave Front Panel to, say, 6, giving a beam length of 1-2m).

Both Keyboard voices/sounds would be subject to the same MODE and TRANSPOSE settings (on Soundbeam Master Front Panel).

Two more Soundbeam Slaves can be connected to Soundbeam Masters in the same way as described above using SLAVE INPUTS 2 and 3 (on Soundbeam Master Back Panel). Midi instructions originating from movements in the beams of these two Soundbeam Slaves will be sent to the Keyboard on - (rather confusingly!) Midi Channels 3 and 4.

TO SUM UP

Up to **FOUR** simultaneous but separate and independent sets of MOVEMENTS in the **FOUR** beams of Soundbeam Master and its 3 connected **SOUNDBEAM** SLAVES can play **FOUR** simultaneous but different and independent KEYBOARD VOICES

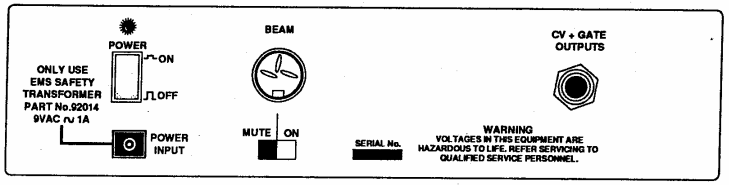
STAGE 4 - CONNECTING SOUNDBEAM SLAVE TO SOUNDBEAM MASTER

(so that movements in a SECOND beam can send a SECOND set of instructions via a SECOND Midi channel to a SECOND Keyboard voice/sound)

STEP 1
Switch Soundbeam Master OFF at POWER switch (SBM back panel).

STEP 2
Connect the Sensor to Power Input (SBS BACK panel) using the 3 pin lead supplied

STEP 3
Push connector ("S'BEAM") of a Soundbeam Safety Transformer (AC) Power Supply lead into POWER INPUT (SB SLAVE Back panel).



STEP 4
Push 3 pin plug/Transformer of the Soundbeam Safety Transformer (AC) Power Supply lead into your room's 13 amp Mains supply socket.

STEP 5
Use jack-to-jack Lead ("Slave to Master") to connect CV+GATE socket (SBS BACK Panel) to SLAVE INPUT 1 (SBM BACK panel).

STEP 6
Check that MUTE/ON Switch (SBS BACK panel) is at ON

STEP 7
Switch Keyboard ON. Select a voice/sound to be played by movements in Soundbeam Slave's beam - on Midi Ch.2.

STEP 8
Switch Soundbeam Master ON (POWER - SBM BACK panel).

STEP 9
Switch Soundbeam Slave ON (POWER - SB SBS BACK panel).

EXAMPLE 1

QUESTION

"There seems to be a confusing clutter of sounds in the beam. Do you think the children can make the link between movement and sound?"

SUGGESTION

There are two ways in which the density of sounds in the beam can be controlled. Firstly, with a short RANGE, the sounds are squashed closely together. This can work well if you want very small movements to produce a flurry of notes, but if it doesn't seem to be working you might have more success by setting the machine to give a simpler and less embellished response. Longer RANGE settings will stretch the invisible keyboard out so that a simple movement is more likely to produce a single sound.

A second and probably more productive way round this problem is to use the MODE control to determine the number of notes in the beam. You could select MODE 1 to divide the beam into eight sections (playing just eight notes) - or you could arrange for the whole length of the beam to trigger a single note by using MODE 10, (See MODE 10 loading routine on page 38). If you press the same note 16 times, you will get ONE note in the beam, and it is a lot easier to make the causal link (movement = sound) with this kind of set-up. (Remember that when you have played your sixteen notes the Keyboard should play back ***exactly*** what you played. If this doesn't happen, switch off, make a slight adjustment to the angle of the beam, check that TRANSPOSE is set to 5 and RANGE is set to about 1, and try again). Percussion sounds work well, and you can use the Transpose (span) control to find different sounds.

You can follow this procedure to introduce Soundbeam in a structured, step-by-step way, so that the beam becomes progressively more complicated and interesting. Switch off, select mode 10, and switch on again. Now play eight of one note, and eight of another. This gives you two notes in the beam (or you could play fifteen of one, and one of another, or ten of one and six of another, as long as it adds up to sixteen. Stage three would be to put three notes in, stage four, four notes, and so on.

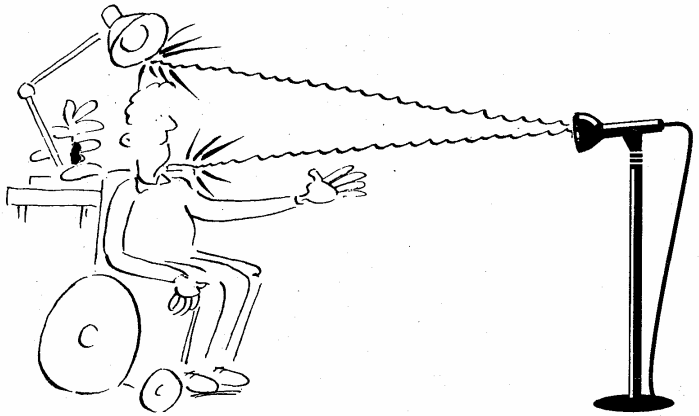
EXAMPLE 2

QUESTION

"I have a student with minimal movement. How can I get Soundbeam to respond reliably when I try to 'fine-focus' it?"

SUGGESTION

Soundbeam reacts not only to human movement but to any object which is within its range, static or moving. Furniture, walls, floors and windows will all reflect Soundbeam's ultrasonic beam back to the Sensor. Try experimenting with the angle of the beam, so that it is working in a plane which is free from other surfaces. For example, if the beam is pointed at right angles to a flat surface (such as a wheelchair tray) you increase the risk of getting an erratic response. One possibility might be to use a horizontal beam rather than a vertical one, so that the users finger, say, is moving ***across*** the beam rather than ***along*** it. Think, too, about the number of notes you want to have in the beam (see EXAMPLE 1 on the previous page).



EXAMPLE 3

QUESTION

"Whilst I am setting the beam up for the child to use, it pings and bleeps. How can I let the child know when it's her making the sound, and when it's me adjusting the beam."

SUGGESTION

Turn the keyboard volume level right down and use the red light on the front of the MASTER to help you to position and focus the beam.

RESULTS OF STAGE 3

A **This time when you switch Soundbeam Master on (Step 7) there will be no immediate "quick scale - from low notes to high ones -". However, as soon as you have played the 16th note of the sequence, the Keyboard will play the whole lot back to you, quite quickly, in the same order and, while Soundbeam is in Mode 10, any movements in the beam will play only the notes of this series.**

IF NOT

1. Some KEYBOARDS will have a MIDI THRU' socket, as well as sockets marked MIDI IN and MIDI OUT. Make certain that MIDI LEAD B is connected at one end ("KB Midi Out") to the Keyboard's MIDI OUT socket - NOT to MIDI THRU - as well as, at the other end ("SBM Midi In"), to Soundbeam's MIDI IN socket (SBM BACK panel).
2. Check Keyboard is switched ON.
3. Check Keyboard is switched to MIDI (if applicable).
4. Check Keyboard is in play mode and volume control is at proper level.
5. Switch Soundbeam OFF at POWER switch (SBM BACK panel).
6. Now, switch Soundbeam ON again and play the 16 notes once more. You should hear each one as you play it, and directly after you have played the 16th note, the Keyboard - directed by Soundbeam (which has cleverly memorised the lot!) - will quickly play back the whole series .

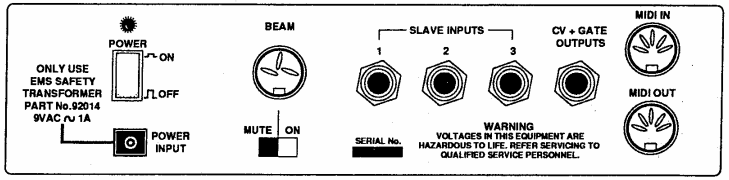
B **You can now use adjustments of Transpose (Span) control to move the whole sequence of notes up and down in pitch. Whatever transposition you choose, the intervals - that is, the number of semitones between each note in the series - will stay the same as in the original, non-transposed version. A return to the 'click' setting 5 will always give you the series at the original pitches you played in.**

YOU ARE NOW READY
TO EXPLORE THE WHOLE RANGE OF
POSSIBILITIES THAT SOUNDBEAM
- IN PARTNERSHIP WITH YOUR KEYBOARD -
OFFERS YOU.

GOOD LUCK!

STAGE 3 - CONNECTING YOUR KEYBOARD'S MIDI OUTPUT TO SOUNDBEAM MASTER (WITH MIDI LEAD B)

(so that the Keyboard can send Soundbeam a sequence of notes to remember)



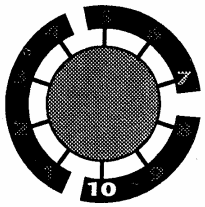
STEP 1
Switch Soundbeam OFF at POWER switch (SBM BACK panel).

STEP 2
Connect 5 pin DIN plug ("KB Midi Out") to 5 pin MIDI OUT socket on Keyboard.

STEP 3
Connect 5 pin DIN plug ("SBM Midi In") to 5 pin MIDI IN socket (SBM BACK panel).

STEP 4
Switch Keyboard ON.

STEP 5
Set MODE (SBM FRONT panel) to 10 (at last!).



MODE

STEP 6
Set TRANSPOSE (SBM front panel) to 'click' position 5.

STEP 7
Switch Soundbeam ON (SBM BACK panel).

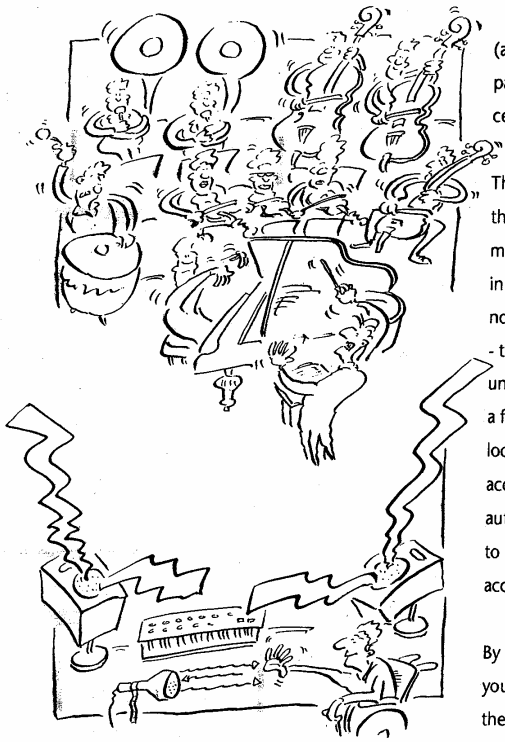
STEP 8
Play 16 single notes one after the other - in any melodic sequence you choose - or at random - on the keyboard.

EXAMPLE 4

QUESTION

"How can I use Soundbeam so that by moving and dancing, students will be playing along to records or tapes, or with other instruments?"

SUGGESTION



The ease with which this can be done will depend on the music that you want to accompany; if it has a lot of key changes, careful adjustment of the transpose control will be required (alternatively, certain sections of the beam could contain the notes of particular chords, so that you would need to be in a defined portion at certain times during the piece).

The 'resident' mode 10 pentatonic scale - (power up in modes 1 - 9 then select mode 10) - will work well as an accompaniment to a lot of music. For example, if your Keyboard has auto-accompaniment, look in the manual to find out how to select ***minor seventh keys.*** Play the note C on the Keyboard. Now hold your hand in the lowest beam note - the one furthest from the box - and adjust TRANSPOSE up or down until this note reaches C. The rest of the scale will now be 'in tune'. It's a fiddly procedure but not difficult to master after a few tries. Now, look in your Keyboard manual to find out how to play Cmi7th by auto accompaniment. (NB If your Keyboard has a MIDI switch which turns auto-accompaniment off, you will need two keyboards to do this: one to be controlled by the beam, and the other to play the accompaniment.)

By using SLAVES, you can have different sounds playing together. If you are working with groups of mixed mobility, the Range controls on the MASTER and SLAVES can be adjusted so that each beam is appropriate to the individual students needs and abilities. Beam 1 may be just a few cms long and is played with a finger, beam 2 is several metres long and is played by leaping around but both students are contributing equally to the overall sound.

EXAMPLE 5

QUESTION

"How can I give my students a feeling of having made something, of having produced something original? Soundbeam doesn't remember what you play - you make a movement and a sound, but then its gone."

SUGGESTION

Soundbeam has no facility for recording a performance. The only memory the machine has is in Mode 10, where you can invent an original scale or melodic pattern and save it in the beam. However it's true that **what you do** with this original sequence once you have stored it will be lost unless you use a tape recorder of some kind to save it, ***and we strongly recommend that you do this.*** It means that the student has a tangible record of his or her own original composition and performance. One of the attractions of the machine for many users is that you don't need a computer to use the machine. However, if you want to, you ***can*** use computers with Soundbeam, which will allow you to build up a multi-layered piece which can be saved and changed in various ways depending on the software you use. Some Keyboards allow you to do this too.

EXAMPLE 6

QUESTION

"The synthesiser carries on playing, even when you move out of the beam. What can I do?"

SUGGESTION

If the red light on the front of the MASTER is on, adjust RANGE down towards zero until the red light goes out. If the red light is not on, and you are in sustain modes 5, 6 or 7, clear the chord by breaking the beam directly in front of the Sensor. If the sound keeps going, your keyboard is misbehaving - switch it off, and then on again.

RESULTS OF STAGE 2

A **The Keyboard will play a quick scale - from low notes to high ones - to show that it's working properly.**

IF NOT

1. Check the Keyboard is
   a. switched ON.
   b. loud enough to be heard.
   c. switched to receive and send MIDI (refer to your Keyboard manual).
2. Check MIDI LEAD A is properly connected to SBM BACK panel MIDI OUT at one end and to Keyboard MIDI IN at the other.
3. Check that MODE (SBM FRONT panel) is NOT at 10!
4. Switch Soundbeam OFF and then ON again.

B **The Keyboard should now respond with musical sounds to any body movements you like to make in the beam. Try moving your hand between 25 and 40cms or so in front of the Sensor. If Soundbeam's MODE switch is at 8, you should hear the Keyboard playing UP - and DOWN - a scale as your hand moves TOWARDS - and AWAY from - the Sensor.**

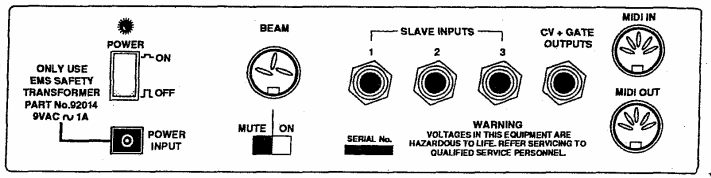
If this is the first time you have used Soundbeam, you can now begin the exploration of its possibilities, and try the musical effects of body movements in the beam on different settings of MODE, TRANSPOSE and RANGE - before moving on to STAGE 3.

STAGE 2 - CONNECTING SOUNDBEAM MASTER'S MIDI OUTPUT TO YOUR KEYBOARD

(MIDI LEAD A) *(so that Soundbeam can send instructions to the Keyboard to tell it what notes to play)*

STEP 1
Switch Soundbeam OFF at POWER switch (SBM BACK panel).

STEP 2
Connect 5 pin DIN plug ("SBM Midi Out") to 5 pin MIDI OUT socket (SBM BACK panel).



STEP 3
Connect 5 pin DIN plug ("KB Midi In") to 5 pin MIDI IN socket on Keyboard.

STEP 4
Switch Keyboard ON.

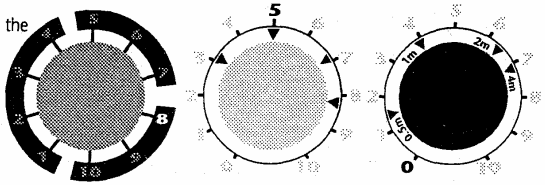
STEP 5
Choose a sound you like, and play a few notes on the Keyboard just to make sure it's working properly. Adjust the volume to suit.

STEP 6
There may be a switch, somewhere on your Keyboard, to direct it to receive and send MIDI messages. If there is, it should be switched ON. More probably there won't, and it will "default" to Midi (Channel 1). You should consult the Keyboard's manual and the Midi section on pages 40 - 41 of this one.

STEP 7
Ensure that any auto accompaniment selectors on your Keyboard are switched to the OFF position.

STEP 8
Make sure (SBM FRONT panel) that;

a. MODE is at 8 - NOT 10! and that nothing obstructs the beam up to a metre or so in front of the Sensor,
b. TRANSPOSE is at 5,
c. RANGE is at 0.



STEP 9
Switch Soundbeam ON at POWER switch (SBM BACK panel).

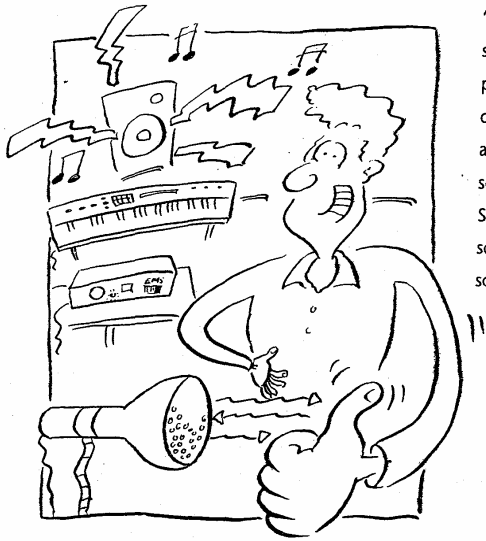
EXAMPLE 7

QUESTION

" I am using Soundbeam for large movement work in a big space. Why is the response that you get using Soundbeam in a hall somehow less compelling than in a smaller space?"

SUGGESTION

The volume levels that you can get out of most Keyboards with built in speakers are not impressive. Consequently if you are using Soundbeam in, for example, the school hall, there is a danger that the sounds won't be heard, or that other activities will distract you. We suggest that in larger spaces you use additional amplification. (Your keyboard manual should tell you how to set this up; if not, Robin will be able to advise you). Also, think about trading up to a better-quality sound source. Your Keyboard will probably be fun to use and will hopefully contain some interesting and evocative sounds, but good quality sound modules (or 'expanders') allow really professional sounds to be generated by students. Surprisingly, although these machines offer sophisticated programming options, so that you can design, shape and combine your own original sounds, they are in many cases actually *easier* to *start* using than a lot of keyboards. Good quality sounds are crucially important to the experience of using Soundbeam, and it really is worth thinking about moving on from something that has been designed for a teenager's bedroom to something designed for the concert hall.

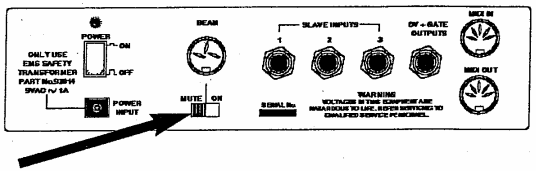


EXAMPLE 8

QUESTION

"What is the function of the MUTE/ON switch on the back of Soundbeam Master?"

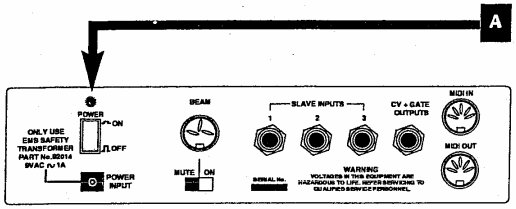
SUGGESTION



This allows you to switch off the power needed to drive the transducer in the Sensor - without having to switch off the main apparatus.

It means that you don't have to lose any settings you may have fine-tuned, or any sequence of notes you may have put in from the keyboard in Mode 10. It could be particularly useful if you are working for long periods with the Sensor's rather loud "click", resulting from the LONG setting of the LONG/SHORT switch.

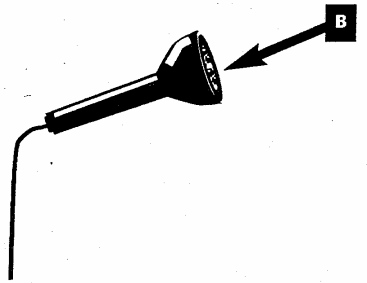
RESULTS OF STAGE 1



A **Red LED (Light Emitting Diode) - a small red light - (SBM BACK panel) lights up.**

IF NOT (fault-finding steps)

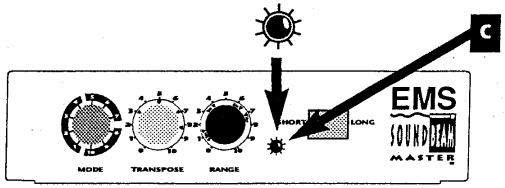
1. Check that room MAINS SUPPLY is switched ON - and that power is actually being supplied. (If in doubt, you could try another electrical appliance).
2. Check POWER switch (SBM BACK panel) is ON.
3. Check that the Power Supply lead connector is pushed fully home into POWER INPUT socket (SBM back panel).
4. Repeat STAGE 1.



B **Quiet purr emanates from Sensor.**

IF NOT

1. Check MUTE/ON switch (SBM BACK panel) is at ON.
2. Check that you have used the Soundbeam Safety Transformer (AC) Power Supply lead - labelled S'BEAM - and NOT your Keyboard's - or any other - (DC) Transformer Power Supply lead.

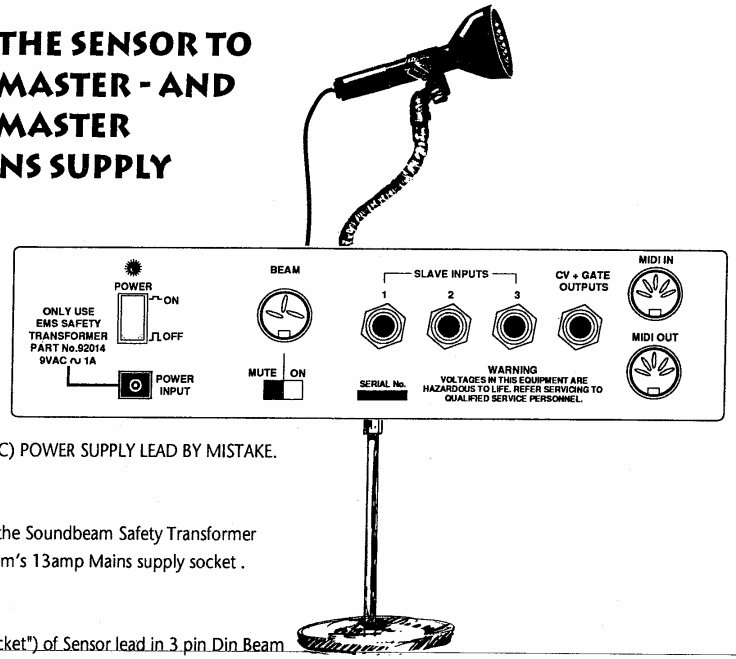


C **Red LED - another small red light - (SBM FRONT panel) - flashes on and off when hand is moved about 30 cms in front of sensor - i.e. when hand is moved in and out of beam.**

IF NOT -

1. Make sure nothing is obstructing the beam less than, say, a metre in front of the Sensor.
2. Check RANGE (SBM FRONT panel) is at 0 - the shortest range of the beam. This should enable you to cut the beam with your hand anywhere up to 40 cms or so away from the Sensor and make the light flash on and off. If red light still stays on - and RANGE is at 0 - try turning it up just a little to between 0 and 1.

STAGE 1 - CONNECTING THE SENSOR TO SOUNDBEAM MASTER - AND SOUNDBEAM MASTER TO YOUR MAINS SUPPLY



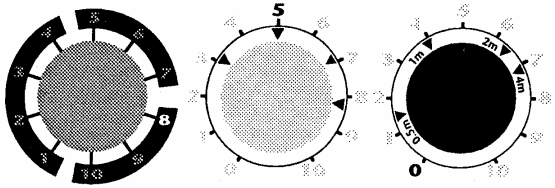
STEP 1
Push the connector ("S'BEAM") of the Soundbeam Safety Transformer (AC) Power Supply lead into the POWER INPUT Socket (SBM BACK panel). TAKE GREAT CARE NOT TO USE YOUR KEYBOARD'S TRANSFORMER (DC) POWER SUPPLY LEAD BY MISTAKE.

STEP 2
Push 3 pin plug/Transformer of the Soundbeam Safety Transformer (AC) Power Supply into your room's 13amp Mains supply socket .

STEP 3
Insert 3 pin DIN plug ("Beam Socket") of Sensor lead in 3 pin Din Beam socket (SBM BACK panel).

STEP 4
Set MUTE/ON Switch (SBM BACK panel) to ON.

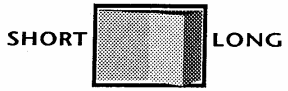
STEP 5
On SBM FRONT panel



a. Set MODE to 8

b. Set TRANSPOSE to 5

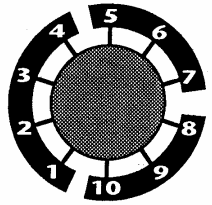
c. Set RANGE to 0

d. Set Long/Short switch to Short. 

STEP 6
Switch ON at room's MAINS SUPPLY.

STEP 7
POWER switch ON (SBM BACK panel).

APPENDIX A



MODE

MODE TABLE

	Articulation type	Number of notes	Interval sequence	Extra control
Mode 1	Single Shot	8	Major scale	Modulation
Mode 2	Single Shot	16	Chromatic scale	Modulation
Mode 3	Single Shot	64	Chromatic scale	Modulation
Mode 4	Single Shot	16	Chromatic scale	Pitchbend
Mode 5	Sustain	32	Chromatic scale	Modulation
Mode 6	Sustain	32	Modal scale	Modulation
Mode 7	Sustain	16	Major 7th arpeggio	Pitchbend
Mode 8	Retrigger	32	Whole tone scale	-
Mode 9	Retrigger	16	Major scale	-
Mode 10	Retrigger	16	Pentatonic scale	-

or

Switch on in Mode 10 - Input user defined 16 note sequence

APPENDIX B

THE EFFECT OF TRANSPOSE CONTROL SETTINGS ON MODE SCALES AND ARPEGGIOS

The Table shows the lowest and highest notes in each of the ten Modes for three settings of TRANSPOSE. The numbers in brackets below each note are the Midi note numbers for each of these. (For an explanation see MIDI - **APPENDIX C** pages 49-51).

MODE	RANGE IN SEMITONES	TRANSPOSE 0	TRANSPOSE 5	TRANSPOSE 10
MODE 1	12	$A\#_1$ - $A\#_2$	A_3 - A_4	C_6 - C_7
		(34 - 46)	(57 - 69)	(84 - 96)
MODE 2	15	$A\#_1$ - $C\#_3$	A_3 - C_5	C_6 - $D\#_7$
		(34 - 49)	(57 - 72)	(84 - 99)
MODE 3	63	$A\#_{-1}$ - $C\#_5$	A_1 - C_7	C_4 - $D\#_9$
		(10 - 73)	(33 - 96)	(60 - 123)
MODE 4	15	$A\#_1$ - $C\#_3$	A_3 - C_5	C_6 - $D\#_7$
		(34 - 49)	(57 - 72)	(84 - 99)
MODE 5	31	D_1 - A_3	$C\#_3$ - $G\#_5$	E_5 - B_7
		(26 - 57)	(49 - 80)	(76 - 107)
MODE 6	53	$A\#_{-1}$ - $D\#_4$	A_1 - D_6	C_4 - F_8
		(10 - 63)	(33 - 86)	(60 - 113)
MODE 7	46	$A\#_0$ - $G\#_4$	A_2 - G_6	C_5 - $A\#_8$
		(22 - 68)	(45 - 91)	(72 - 118)
MODE 8	62	$A\#_{-1}$ - C_5	A_1 - B_6	C_4 - D_8
		(10 - 72)	(33 - 95)	(60 - 122)
MODE 9	26	$A\#_0$ - C_3	A_2 - B_4	C_5 - D_7
		(22 - 48)	(45 - 71)	(72 - 98)
MODE 10	36	$A\#_0$ - $A\#_3$	A_2 - A_5	C_5 - C_8
		(22 - 58)	(45 - 81)	(72 - 108)

5. MAKING THE CONNECTIONS

The procedure for connecting up Soundbeam to your Midi Keyboard has been set out here in a number of STAGES and - within each STAGE - a number of (very simple) STEPS. At the end of each STAGE, a RESULTS column tells you what **ought** to happen, and - if it doesn't - an IF NOT column lists a series of (fault-finding) steps which should help to pinpoint possible causes of failure.

When things do go wrong, the first reaction is usually to blame the machine. However, most - in fact, so far, all but one or two - of the occasional telephone cries for help that we receive, turn out to be caused by quite simple mistakes in the start-up procedures rather than by a faulty Soundbeam - which has, after all, been rigorously tested by EMS before it gets to you.

If - at any rate to start with - you follow EXACTLY the STAGES, STEPS and the IF NOT (fault-finding) steps described below, you should soon get Soundbeam working. Even when you've become quite used to doing it - with, perhaps, a few shortcuts - a return to strictly following the procedures set out in this booklet will soon track down - and probably put right - most failures which are likely to occur.

NOTES

a. In all the STAGES and STEPS described below the words Soundbeam, SBM BACK panel and SBM FRONT panel refer specifically to Soundbeam Master.

b. Each end of each lead is clearly labelled with the connection for which it is intended.

c. Words in inverted commas and brackets in the instructions below match those on lead labels.

d. **WARNING! VOLTAGES IN THIS EQUIPMENT ARE HAZARDOUS TO LIFE. ON NO ACCOUNT TRY TO REMOVE SOUNDBEAM'S COVER. REFER SERVICING TO ROBIN WOOD, OR OTHER QUALIFIED SERVICE PERSONNEL.**

Finally, if you HAVE followed STRICTLY all the IF NOT (fault-finding) steps, and the RESULTS of the STAGE you have reached are still not as described, don't hesitate to telephone us for **HELP!**

Robin Wood	(Truro)	01726 883265
Tim Swingler	(Norwich)	01603 507788
Mark Newbold	(Bristol)	0117 923 7075

BAFFLED BY A SILENT SOUNDBEAM?

If you can't get Soundbeam to work after this, try the more detailed instructions - **MAKING THE CONNECTIONS** - on the next page.

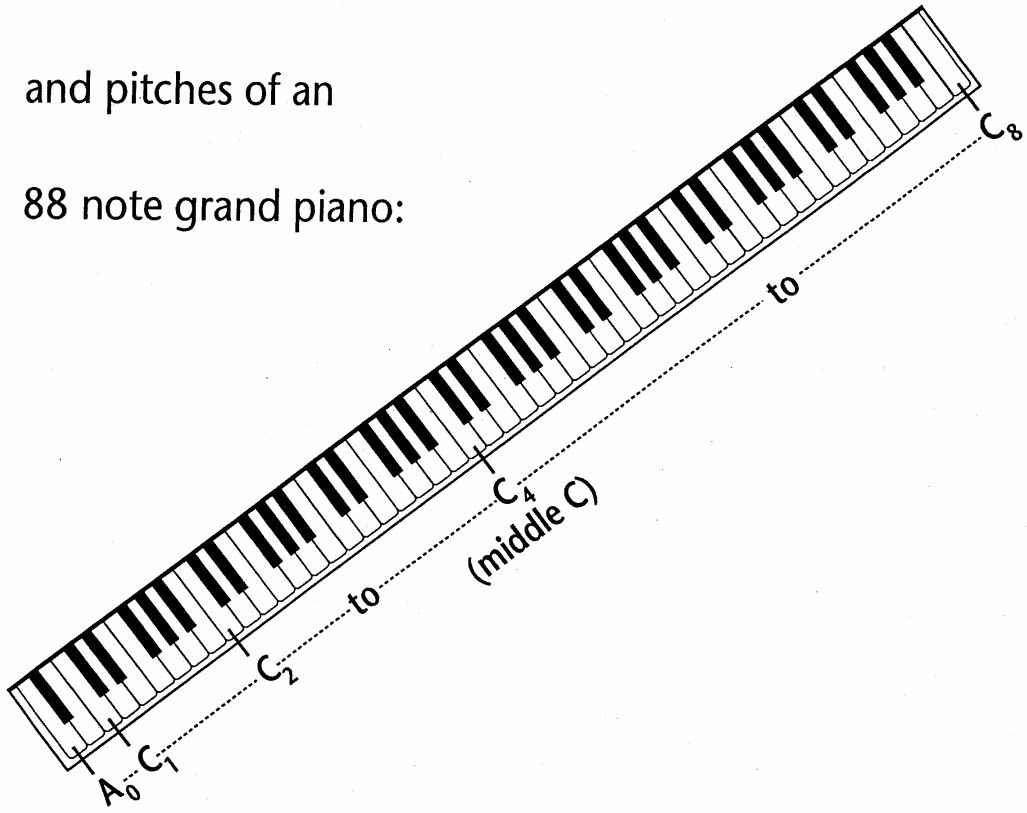
This is the current

US convention

for describing the notes

and pitches of an

88 note grand piano:



APPENDIX C

MIDI

Midi (Musical Instrument Digital Interface) is the name of the digital code agreed between manufacturers of electronic musical instruments - so that, for example, a Casio keyboard can be connected to play a Roland expander and a Yamaha sampler.

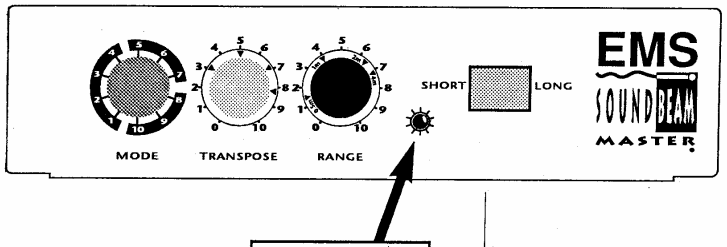
Notes are given Midi code numbers from 0 to 126 - the 88 notes of the keyboard of a grand piano being numbered from 21 (A_0) to 60 (C_4 - middle C) to 108 (C_8). There are also coded instructions such as "Note On" (for playing a note), "Note Off" (for stopping a note sounding), "Velocity" (for indicating loudness or softness), and for applying Pitchbend and Modulation wheel control and so on.

Each instruction - called a Midi message - starts with a "route number" (Midi Channel number) indicating one of 16 possible (simultaneous) Midi channels. Instruments such as Keyboards can be set to act only on Midi messages travelling via a specified Midi channel.

For example, Midi messages from Soundbeam Master, resulting from movements in the beam of its (the Master's) own sensor, are sent via Midi Channel 1. You may, perhaps, have to set your Keyboard to receive - and act upon - Midi messages via this channel. More likely, your Keyboard will "default" - (without your having to do anything) - to Channel 1. You should consult your Keyboard Handbook.

Midi messages deriving from movements in each of the beams of the three Soundbeam Slaves are sent via Midi Channels 2, 3 and 4, and these may need setting up - again, in consultation with your Keyboard handbook.

All is now ready for you to start experimenting with the musical effect of your own - or someone else's - movements in the beam. There are thousands of possible permutations of Soundbeam's Range, Transpose and Mode control settings with your Keyboards selection of voices/sounds.



THIS WILL LIGHT UP WHENEVER THE BEAM IS INTERRUPTED

NOTES

MODE settings decide how the 'trigger' and distance information received from the beam is to be interpreted. The possibilities are:

a. Articulation. (Single shot, modes 1 - 4; Sustain, modes 5 - 7; Re-trigger, modes 8 - 10),

b. various scales or arpeggios, and

c. the application of Pitchbend or Modulation-wheel control.

(for details of Mode control see pages 32 - 37)

TRANSPOSE settings function as a semitonal tuning control. They govern the top and bottom limits of the notes on the Keyboard which will be played by interruptions of the beam.
(For details see page 30 - 31)

RANGE control settings, in conjunction with the LONG/SHORT switch (SBM FRONT panel), determine the length of the beam - from 25cms at 0 up to, perhaps, 4m (at Range 7+) with the switch at SHORT, 6m or more (at Range 9+) with the switch at LONG.

(For details see pages 25 - 29).

N.B. If, by mistake, you switch Soundbeam on in Mode 10 it will stay obstinately silent until it has been fed with 16 notes played on the Keyboard. *(You'd be surprised how many people get caught by this one!)*

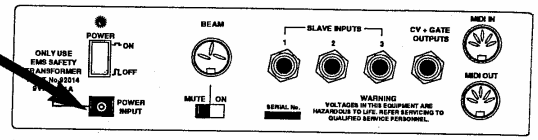
SOUNDBEAM SLAVES Instructions for connecting and using these on pages 19 - 20.

4. QUICKSTART

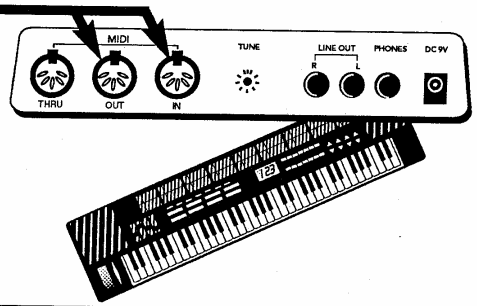
SOUNDBEAM MASTER

ASSEMBLY AND OPERATION

1. Connect Soundbeam Master to the Mains, using plug-in power unit supplied. TAKE CARE to use only the Soundbeam Safety Transformer (AC) Power Supply lead - labelled "S'BEAM" - provided. Your Keyboard will probably use a very similar looking (DC) one, **BUT CONNECTING YOUR KEYBOARD'S POWER SUPPLY TO SOUNDBEAM MASTER OR SLAVE WILL CAUSE FAILURE AND PERHAPS DAMAGE.**



2. Connect the two 5-pin Midi leads from Soundbeam Master to your keyboard.
   (N.B. Soundbeam Master Midi OUT to Keyboard Midi IN
   Soundbeam Master Midi IN to Keyboard Midi OUT)



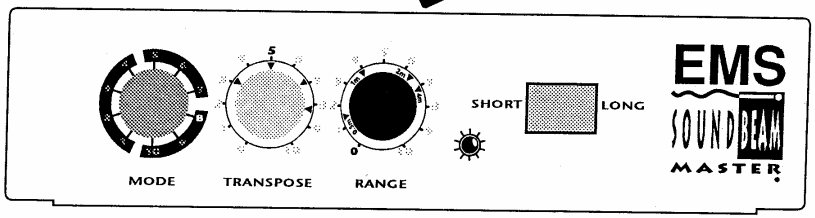
3. Connect the Sensor to the Power Input (SBM BACK panel) using the 3-pin lead supplied.

4. Set the MUTE/ON switch (SBM BACK panel) to ON.

5. Set MODE to 8.

6. Set TRANSPOSE to 5.

7. Set the RANGE to 0.



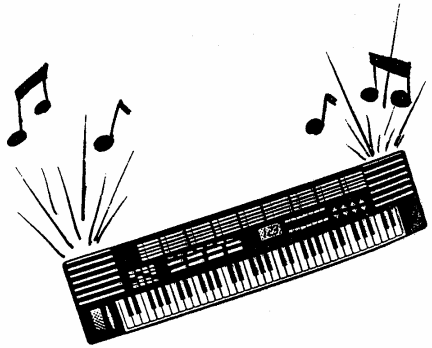
8. Switch the Keyboard ON, play a few notes and adjust the volume as necessary.

9. Select the desired voice/sound on Keyboard.

10. Check that the Keyboard is switched to Midi Channel 1 - if necessary. Your Keyboard may 'default' to Midi Channel 1 without any further action on your part. If in doubt, consult your Keyboard manual - and see **EXPLANATIONS** (Midi - page 50).

11. Switch Soundbeam Master on - you should hear a quick scale of notes from the Keyboard, telling you that the system is up and running.

PHEW!



CHORDS

All Midi messages - even chords (several notes played simultaneously) of the Midi note numbers resulting from simultaneous interruptions of the 4 beams of a complete Soundbeam set-up sent via 4 separate Midi channels - are actually sent serially, one after the other. However, these messages travel at very high speed. For example, the three Midi instructions needed to sound a single note on a Keyboard or expander are:

"ACTION" on Channel 1 (Status + Midi Channel Number)

"AT THE SPECIFIED PITCH" (Midi Note Number)

"AT THE SPECIFIED DYNAMIC" (Midi Velocity Number)

These three instructions together take up less than one thousandth of a second in a Midi message - and this means that the 7 or 8 notes of a chord played on one Keyboard will still sound together, even when the notes have been sent, one after another, along the Midi lead to a second instrument.

CONNECTIONS

Electronic musical instruments such as your Keyboard, which send and accept Midi messages, usually have 2 Midi socket connections:-

MIDI IN which receives instructions from other instruments (Keyboards, for example, or Midi controllers such as Soundbeam) and

MIDI OUT which sends instructions from your Keyboard to other instruments. There may also be an output labelled

MIDI THRU which delivers - for onward transmission to another instrument - the instructions received at MIDI IN (undelayed by having been used for operations within the instrument of which it is an output).

MIDI MODES

There are three Midi modes - not to be confused with Soundbeam's MODES - which affect the way that electronic musical instruments respond to Midi messages - although not all Midi instruments will have all three options.

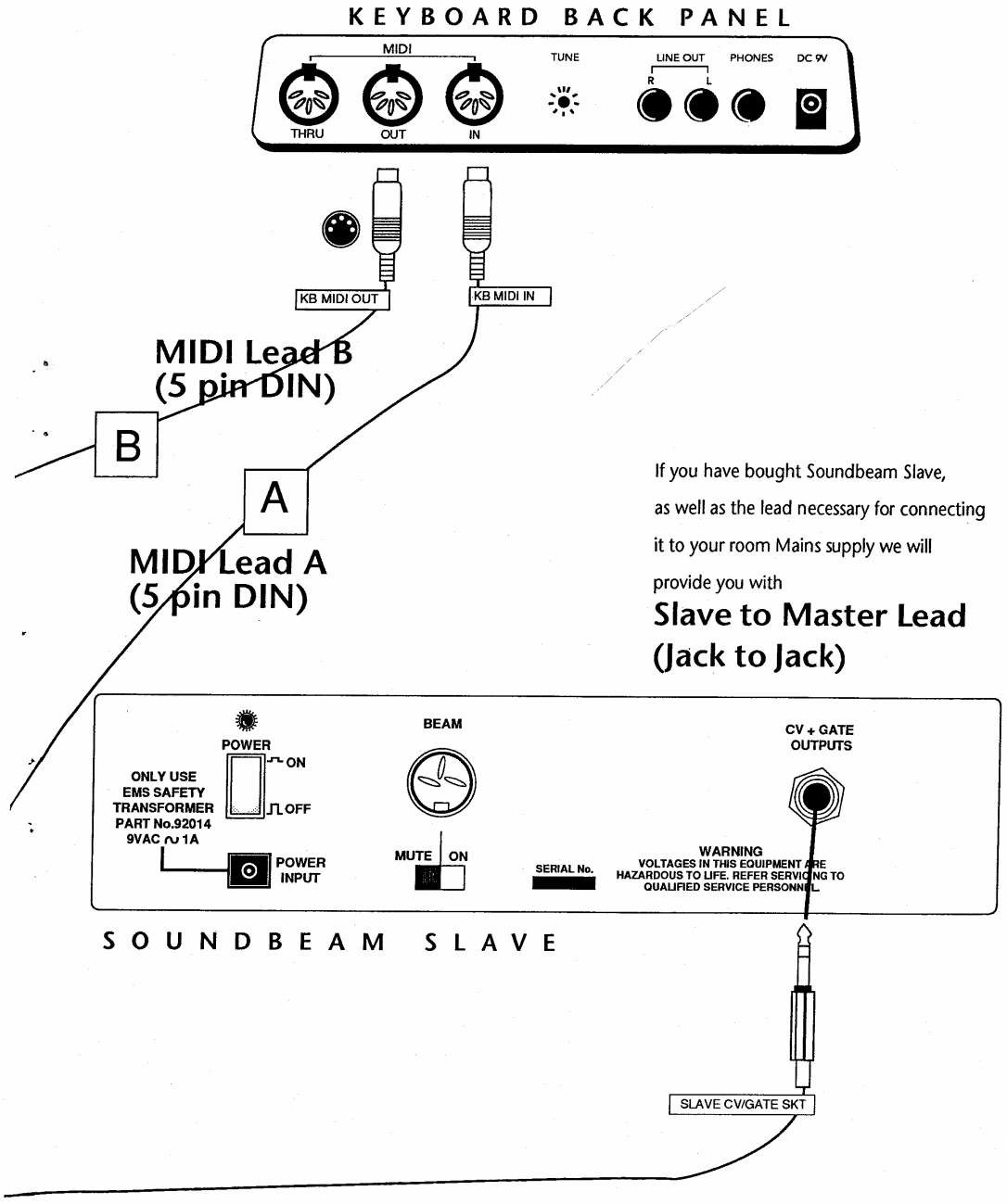
In OMNI mode the instrument listens to all Midi channels at once. No matter how many different Midi messages on how many different Midi channels are sent down the Midi lead and arrive at your Keyboard's MIDI IN socket, the instrument will try to play them all!

In POLY mode, on the other hand, the instrument can tune in to accept - and act upon - just one specific Midi channel. In this case, no matter how many different Midi messages on how many different Midi channels are sent down the Midi lead to arrive at your Keyboard's MIDI IN socket, the instrument will only listen for - and act upon Midi messages on the Midi channel you have selected.

In MONO mode, the instrument will only accept monophonic messages - i.e. not more than one note at a time - so chords are out.

Note

SOUNDBEAM will work successfully with nearly all MIDI Keyboards. If you bought your Keyboard from us - or are using one that has been recommended by us - it will be fully compatible with **SOUNDBEAM**. However, no two Keyboards will *communicate* in exactly the same way, product lines are frequently replaced, and there may be instances in which the performance of the system is compromised. If you find that you have problems, please contact us for help. In the last resort we might be able to recommend a more suitable Keyboard.



If you have bought Soundbeam Slave, as well as the lead necessary for connecting it to your room Mains supply we will provide you with

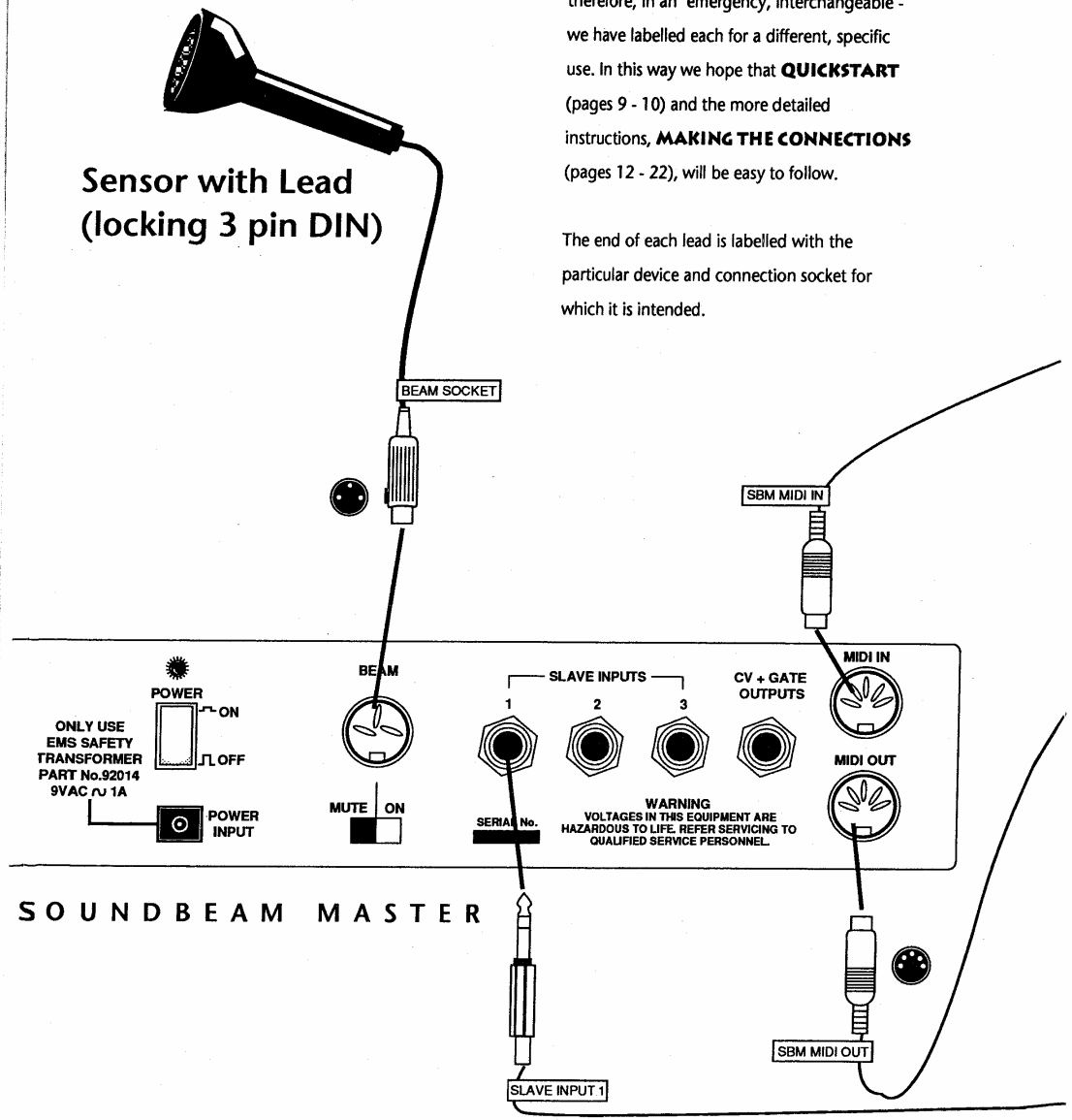
Slave to Master Lead (Jack to Jack)

3. LEADS FOR SOUNDBEAM

In addition to the lead necessary for connecting your Soundbeam Master to your room Mains supply, you need two Midi leads.

Although these two leads are identical - and therefore, in an emergency, interchangeable - we have labelled each for a different, specific use. In this way we hope that **QUICKSTART** (pages 9 - 10) and the more detailed instructions, **MAKING THE CONNECTIONS** (pages 12 - 22), will be easy to follow.

The end of each lead is labelled with the particular device and connection socket for which it is intended.



APPENDIX D

OTHER SOUNDBEAM POSSIBILITIES

COMPUTERS

Soundbeam's Midi output can be connected directly to those computers - Atari STs, STEs and TTs, Apple Macs and some Pc compatibles - which have Midi inputs and outputs, and there are obviously many possibilities to be explored in this direction. We are now offering Soundbeam users a new software package, MidiMap - a dedicated version of DJSoft's *Universal Midi Controller* specifically adapted for use with Soundbeam. In conjunction with Microdeal's sampler cartridge and software *Replay 16* - or with hardware samplers, sequencers and expanders - it enables interruptions of the 4 beams of a Soundbeam Master and 3 Slave set-up to trigger and control, not simply different pitches of the same sound, but a wide variety of different sounds, timbres, spoken words and note and chord sequences - as well as strategically placed silences! In addition, movements in the beam can be used to call up one of the (up to 8) possible alternative sets of (up to 32) sound events for each of the (up to 4) beams in use. This could be of particular value in the design of dance or other kinds of music theatre with a Soundbeam related "soundtrack".

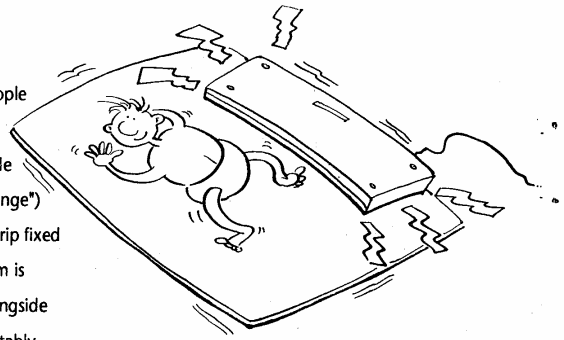
CONTROL OF LIGHTING

Manufacturers of stage lighting have for some time now arranged for many of their control boards and switch boxes to be accessible to Midi, making it possible for movements in the beam to be used to control the colour, brightness and location of lighting. The XRL 8/16 Midilite (from XRI Systems tel. 021 327 4708) currently provides a modestly priced interface between Soundbeam's Midi output and the lighting controls.

EXHIBITIONS

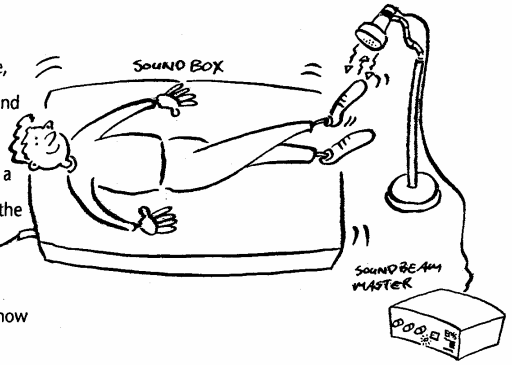
Soundbeam is particularly useful for exhibitions and displays of various kinds, since it enables visitors, entering and moving in its beam, to trigger (unknowingly) a variety of sounds - or lighting effects - relevant to the exhibit. For example, if the Sensor is placed high overhead and the beam directed downwards, visitors of different heights will trigger different sounds - as will movements close to - and far from - the source of a horizontally directed beam.

SOUNDBEAM AND THE HEARING IMPAIRED



There are a number of solutions to the problem of enabling people with hearing impairment to enjoy the use of Soundbeam. The simplest, for small children, is a "resonance board" - easily made (according to Lilli Neilson, quoted in the magazine "Information Exchange") from a piece of 150cm x 150cm x 4mm plywood with a 2cm x 2cm strip fixed to the edge of the underside. If the Keyboard connected to Soundbeam is placed (upside down, perhaps, with the speakers facing the board) alongside the child on the resonance board, then the child's movements (in a suitably directed beam) will generate sounds which it will experience pleasurably as physical vibrations on his or her body. If you can't get one made and don't want to make it yourself, we can supply you with our own version - Soundboard.

We have also developed more elaborate solutions. One - Soundbox - is a resonant wooden box, with a decoratively painted, easily cleanable surface, about 120cm x 90cm x 13cm, which contains a number of loudspeakers and a resonant cavity. Signals generated by Soundbeam - and, of course, from other sources such as tape machines, CD players and so on - can be fed to a graphic equaliser and then, via an amplifier, to the speakers which vibrate the upper surface of the Soundbox, on which the child is lying or sitting. The therapeutic and psychological effect of audio-vibrations - in particular, low frequencies (used with caution) - on many of those with "special needs" is now widely acknowledged.



A third solution, Soundbed, is simply a much larger version (198cm x 96.5cm x 47.5cm x 28cm) of Soundbox - suitable for adolescents and adults.

REMEMBER

your most important bits of musical equipment are still your own ears... what sounds right to them will (probably!) be right.

HAPPY EXPLORATIONS!

When you begin to feel that your keyboard is getting a bit more user- friendly and that some kind of enjoyable music making with it is possible, it will be time to get your Soundbeam Master out of its box, connect it up and begin to try out this amazing new way of using your own body-movements in the beam (without touching the keyboard) to make music!

GETTING TO KNOW YOUR KEYBOARD

(you can skip this bit if you already have)

Spend as much time as you possibly can exploring and playing about with it - the design of modern electronic musical instruments means that playing music is much easier than it used to be - and it's fun!

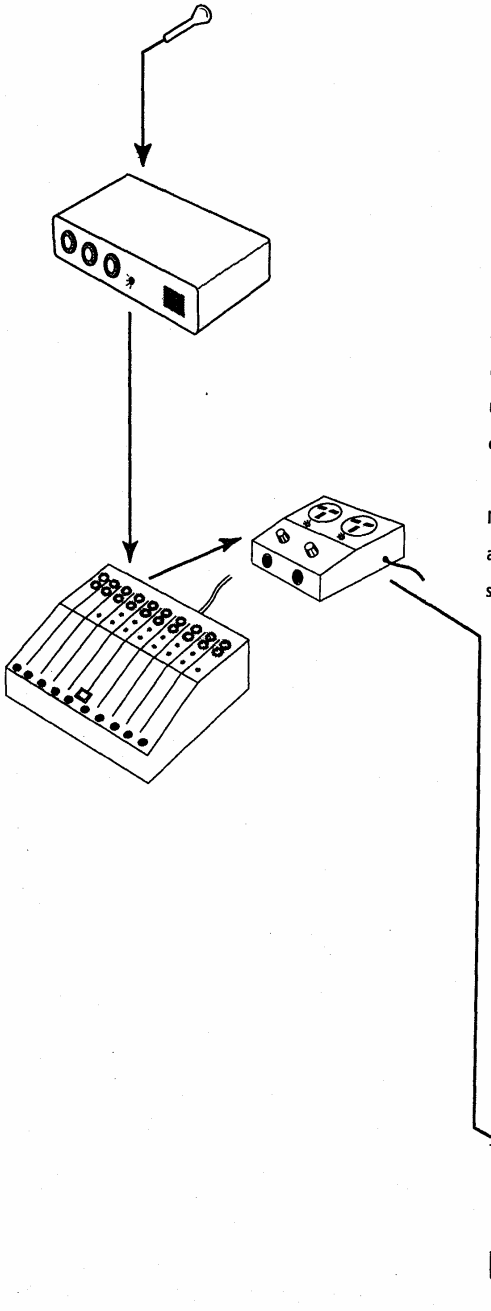
If the instrument belongs to the school or institution where you work, perhaps you could take it home for a few days or at weekends, so that you can try it out at your leisure.

Begin by finding out how to use the press buttons, sliders, switches, wheels and other controls to make as many as you can find of the various sounds it has to offer.

Try to differentiate between the ***SHORT*** sounds (piano, xylophone, guitar) which die away very quickly however long you hold down the keys - and the long ***SUSTAINED*** sounds (organ, violin, saxophone) which go on sounding until you take your finger off the key. Make a note of those - of both kinds - that you like best.

Nowadays, most electronic keyboards can play a number of different percussion rhythms - fast or slow - and these can often be used to give a lively rhythmic framework to whatever melodic ideas you are developing with hand or other body movements in the beam.

You can also usually put accompanying chords to these rhythms simply by adjusting the appropriate controls (consult your instrument's handbook) and then touching one of a dozen or so notes at the bottom (left hand) end of the keyboard. Later you'll find that some keyboards can be set up so that body movements in Soundbeam can be used to change these chords too.



SWITCHING FOR MULTI-SENSORY ENVIRONMENTS

Soundbeam Switcher 8 has been developed by The Soundbeam Project in association with XRI Systems. Connected to one of a number of commercially available mains controllers, it enables children and other users of multi-sensory environments to select and control, by means of their own movements in the beam, any of up to 8 switchable devices in a multi-sensory environment. Alternatively, the number of switches controlled by movements in the beam can be reduced to 4, 2 or 1.

In addition, a smaller, simpler device - Soundbeam Switcher - will allow an interruption of the beam - anywhere along its length - to switch, via a single input mains controller, a single 13 amp output.

APPENDIX E

SOUNDBEAM - THE STORY SO FAR

Soundbeam was originally developed as the result of a search by Edward Williams - partly inspired by accounts of the Thereminvox, designed in Russia in 1918 by Leon Theremin - for a way of enabling dancers' own movements to play electronic musical instruments, at a distance and without physical contact, and so to generate and control the sound and music which accompanies them.

Early in 1984, Richard Monkhouse, with the collaboration of Robin Wood of EMS, was commissioned to design a prototype distance-to-voltage converter, "The Lone Ranger", based on ultra-sonic camera range-finding technology. Trials with the voltage outputs of this device connected to the inputs of an EMS VCS3 synthesiser successfully proved its capability for controlling the frequency of oscillators and the various other parameters subject to voltage-control on that particular instrument. Soon after this, a further step was dictated by the development of Midi, the digital code which enables electronic musical instruments to control - or be controlled by - each other.

Soundbeam, renamed at the suggestion of Sally Silverman, a teacher of blind, multiply handicapped children, who quickly recognised its potential in the field of Special Needs, - and manufactured by EMS in Cornwall, England - was introduced, early in 1989, on the EMS stand at the Frankfurt Musikmesse. In September 1990, Tim Swingler took on the responsibility for promotion, courses, workshops and sales.

Since then we have continued to improve Soundbeam's design - the current model is our Mark 4. In addition we have introduced Soundboard, Soundbox and Soundbed, all designed for people with hearing impairment, Switcher 8 and Switcher for controlling multi-sensory devices, and our new dedicated software package MidiMap.

2. GETTING STARTED

Now that you have acquired Soundbeam you will probably want to start using it straight away. However, it's important to realise that Soundbeam is simply a new way of **playing** an electronic musical instrument - and to begin with, if you haven't already done so, you should try to get to know the particular musical instrument that YOU are going to use.

Whatever it is, - keyboard, expander module, sampler, drum machine or any other electronic musical instrument - **it will have to have a Midi input if it is to be used with Soundbeam -** **SO CHECK THIS FIRST!**

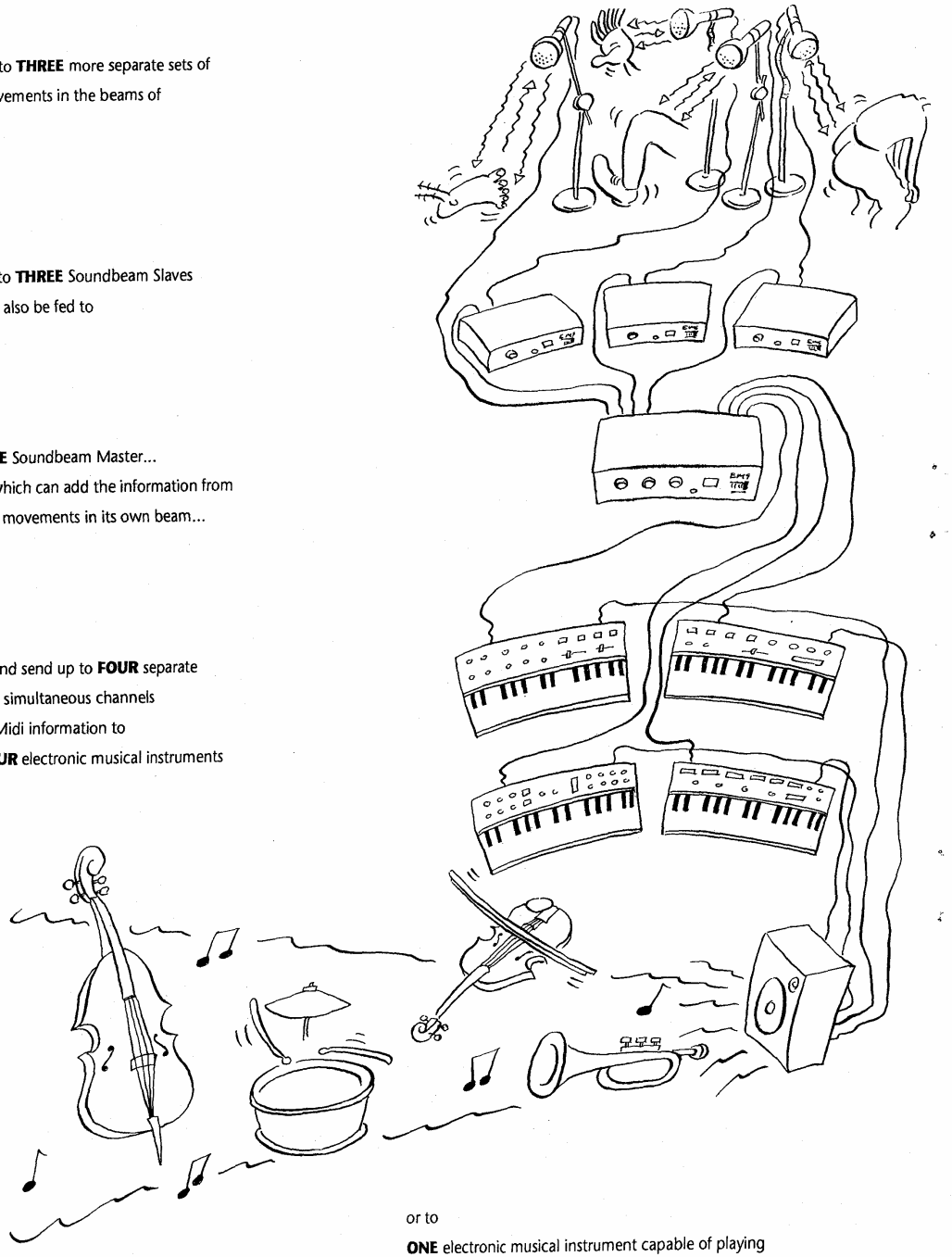
WARNING! Soundbeam's plug-in power unit (Safety Transformer Part No. 92014) must only be used with Soundbeam. Some Keyboard power units look similar but are NOT interchangeable. TAKE CARE!

Up to **THREE** more separate sets of movements in the beams of

up to **THREE** Soundbeam Slaves can also be fed to

ONE Soundbeam Master...
...which can add the information from the movements in its own beam...

...and send up to **FOUR** separate but simultaneous channels of Midi information to **FOUR** electronic musical instruments



or to
ONE electronic musical instrument capable of playing
FOUR simultaneous but separate sequences of notes or sounds.

APPENDIX F

THE SOUNDBEAM PROJECT

Formed in 1991 to develop, promote and sell the current version of Soundbeam its successors and other related products. Its members are -

MARK NEWBOLD
Tel. 0117 923 7075

Technical information, performance, demonstrations

Unit 3, Highbury Villas, St. Michaels Hill, Kingsdown, Bristol, Avon, BS2 8BX, England

EDWARD WILLIAMS
Tel. 0117 973 8024
Fax. 0117 974 2039

Music/dance research and performance, management, administration, finance

10 Cornwallis Crescent, Bristol, Avon BS8 4PL, England

SALLY SILVERMAN
TEL. 0117 950 8670

Consultant, special needs

Avon Services for Special Education, Elmfield House, Greystoke Avenue Westbury-on-Trym, Bristol, Avon BS10 6AY, England

JUDITH WILLIAMS
Tel. 0117 973 8024
Fax. 0117 974 2039

Administration, accounts, finance

10 Cornwallis Crescent, Bristol, Avon BS8 4PL, England

TIM SWINGLER
Tel. 01603 507788
Fax. 01603 507877

General information, courses and workshops, promotion, sales

463 Earlham Road, Norwich NR4 7HL, England

ROBIN WOOD
Tel. 01726 883265
Fax. 01726 883283

Technical consultant, research and development, manufacture and quality control, stock and credit control, despatch

Trendeal Vean Barn, Ladock, Truro, Cornwall TR2 4NW, England

THE SOUNDBEAM PROJECT®

APPENDIX G

WHO'S WHO

RICHARD MONKHOUSE

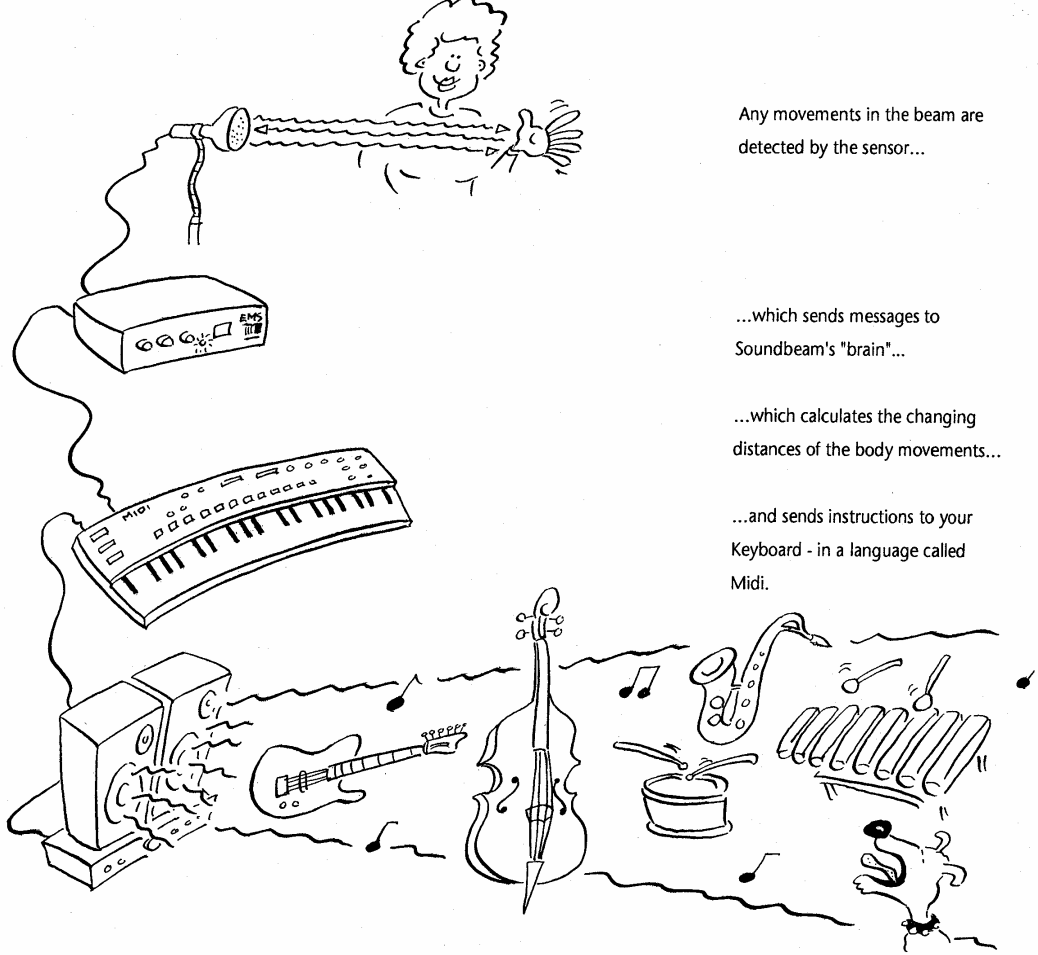
having designed his own computer before the word "micro" had been invented, joined the EMS R&D team in 1971, subsequently working on the development of a video synthesiser and doing light shows for Tangerine Dream. More recently he has done computer animation, designed a low cost Geiger counter, illustrated a 3D atlas of the Universe and designed shows for the London Planetarium. He currently teaches part-time at Imperial College, London.

MARK NEWBOLD

moved from Huddersfield to work for Edward Williams as a technical assistant in his Bristol studio. He has had a good deal of experience with Soundbeam both in dance performance and in exhibition set-ups as well as in demonstrations of its use with people - particularly children - with special needs. Responsible for much of the design of the electronic components of Soundbox and Soundbed as well as - with the collaboration of Robin Wood - for Soundbeam Switcher.

SALLY SILVERMAN

works for Avon Services for Special Education. Her speciality is the teaching of blind, multiply handicapped children. She helped to found, and now helps to edit, the magazine *Information Exchange* and has been the inspiration and driving force behind the setting up of Bristol's new Woodside Family Centre for sensorily impaired children and their families - where Soundbeam, Soundbox and Soundbeam Switcher 8 are currently in use.



Any movements in the beam are detected by the sensor...

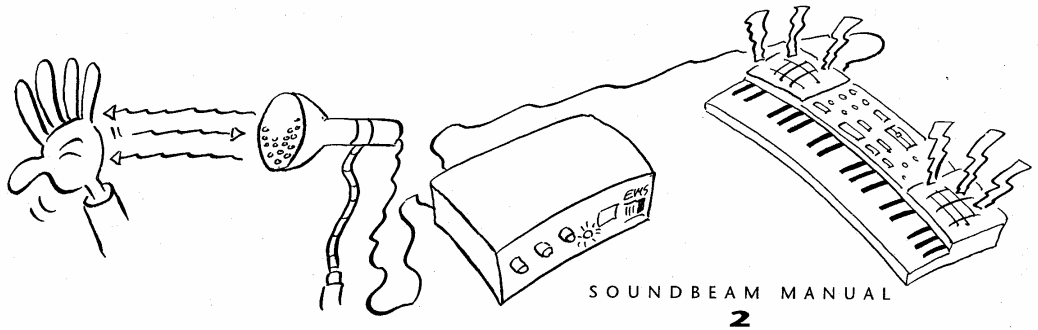
...which sends messages to Soundbeam's "brain"...

...which calculates the changing distances of the body movements...

...and sends instructions to your Keyboard - in a language called Midi.

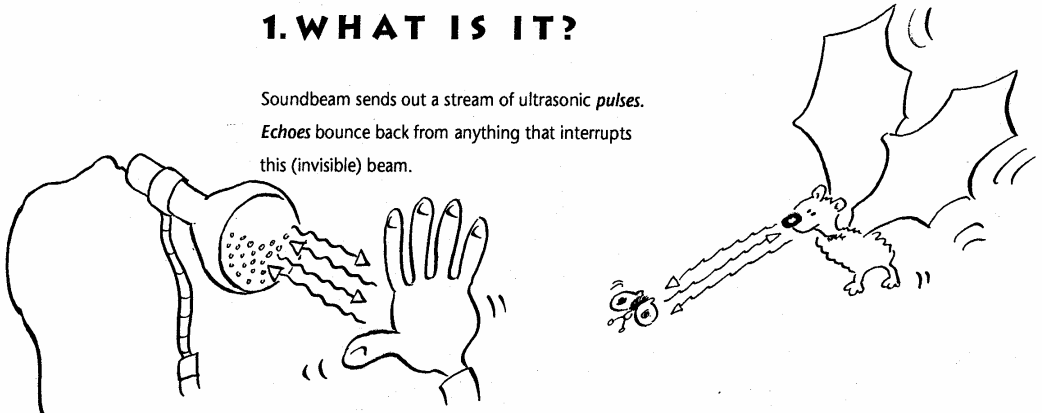
If you have not got an instrument with Midi you'll need to get one

ONE set of movements in the beam of Soundbeam Master makes **ONE** channel of information to send to **ONE** electronic musical instrument...

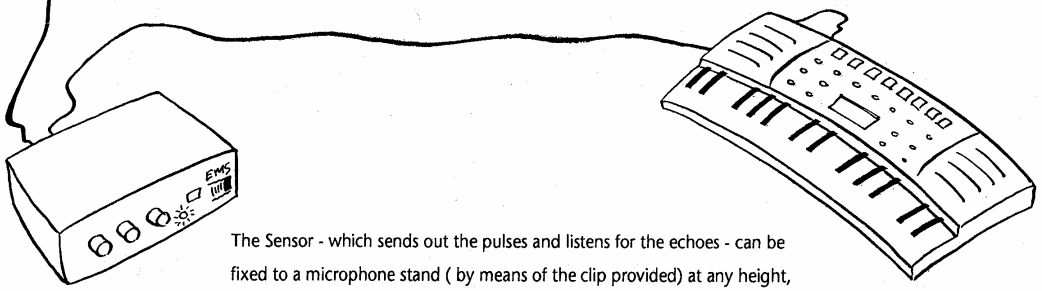


1. WHAT IS IT?

Soundbeam sends out a stream of ultrasonic ***pulses.*** ***Echoes*** bounce back from anything that interrupts this (invisible) beam.

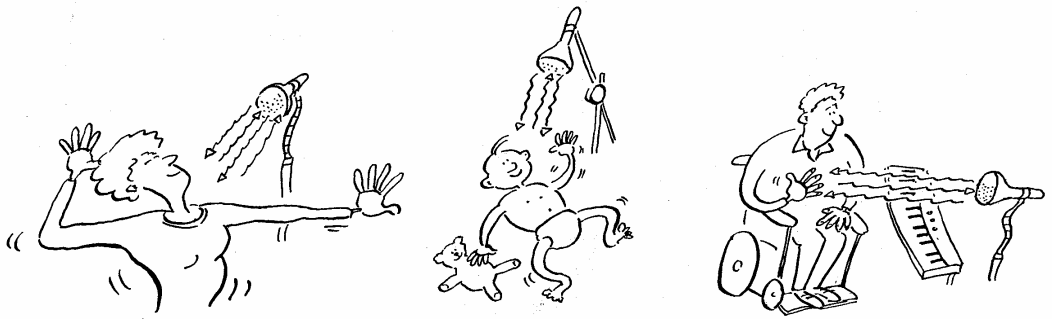


Soundbeam detects the interruption, measures the time the pulses take to get there and the echoes to get back, interprets all this information in terms of notes of various pitches and finally sends instructions for playing these notes to an electronic musical instrument.



The Sensor - which sends out the pulses and listens for the echoes - can be fixed to a microphone stand (by means of the clip provided) at any height, for easy pointing in any direction.

The beam can be as short as 25cms or as long as 6m.



TIM SWINGLER

was trained in psychology and as a teacher. Before joining The Soundbeam Project he was Development officer for Norwich Community Music. He is one of the founders of the National Community Music Association.

EDWARD WILLIAMS

has composed music for many documentary and wildlife films and TV programmes - including the music for the BBC/ David Attenborough series *Life on Earth*. He helped to found *Uncle Jambo's Pendular Vibrations* - now revived as *Elektrodome* - for music and multi-media performances with live electronics.

JUDITH WILLIAMS

has worked part-time for the Citizens Advice Bureau in Bristol and, as well as handling administration and accounts for The Soundbeam Project, keeps the books for Stuart and Williams, the makers of the cricket bowling machine, *Bola.*

ROBIN WOOD

joined Peter Zinoviev's EMS in 1969 as engineer/salesman. He left in 1980 to set up his own workshop and recording studio, first in London and later, from 1984, near Truro in Cornwall, England. As well as his work for The Soundbeam project , he continues to make , sell and repair EMS instruments such as the Vocoder 2000, the VCS3 and the Synthi AKS.

APPENDIX H

TECHNICAL SPECIFICATION

Range	0.25 - 6 metres
Beam Divergence	16°
MIDI Output	Channel 1 - 4, Mod Wheel and Pitchbend
Distance Voltage Swing	3 volts
Gate Voltage	+5 volts
Power requirements	9V ac 1 amp 50/60 Hz
Power consumption	6 watts
Dimensions	250 x 240 x 68mm
Weight	1.8kg

CREDITS

Soundbeam was designed for Edward Williams by Richard Monkhouse with Robin Wood and is currently manufactured for The Soundbeam Project by Robin Wood at EMS, Cornwall, England.

Manual designed by Penny Delmon
Illustrated by Penny Delmon and Mike Preece
Printed by Sebright, Bristol

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