



MANUAL

for

SOUNDBOX

MINIBOX

THE SOUNDBEAM PROJECT

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IMPORTANT!!!

CONNECTING SOUNDBOX / MINIBOX TO YOUR AMPLIFIER OR SOUNDBEAM 5.

Your Soundbox/Minibox will have been supplied with a grey cable with an XLR plug on one end for connection to the Soundbox/Minibox and three bare wires at the other end for connection to your amp or Soundbeam 5.

DO NOT under any circumstances attempt to attach a mains plug to the cable. There is no mains power running Soundbox/Minibox, it gets its power directly from the amplifier or from Soundbeam 5's internal amplifier.

The bare wires are connected as follows:

1. The wires with BLACK insulation should be connected to the two RED speaker output terminals on the amplifier or SB5.
2. The remaining wire should be connected to *either* of the BLACK speaker output terminals on the amplifier or SB5.

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i. SOUNDBOX, MINIBOX

are vibro-acoustic devices which enable people, including those with hearing impairment and other disabilities, to experience the physical vibrations of music through their bodies.

The music can result from the user's movements in Soundbeam controlling an electronic keyboard, sound module or sampler. It can also come from a microphone, CD player, MP3/ipad/smartphone or radio.

Since there are many different kinds of hearing impairment, the physical experience of the vibrations of low to mid frequencies which results from contact with these vibroacoustic devices should be complemented by a pair of ancillary speakers to deliver the complete acoustic range of sound to the user.

Soundbox and Minibox can be connected to the speaker outputs of any ordinary hi-fi stereo amplifier. A domestic graphic equaliser can help to adapt to the frequency sensitivities of individual users.

Soundbox and Minibox are manufactured for The Soundbeam Project in the UK, using formaldehyde-free MDF and timber from renewable sources.

Vibroacoustic Therapy

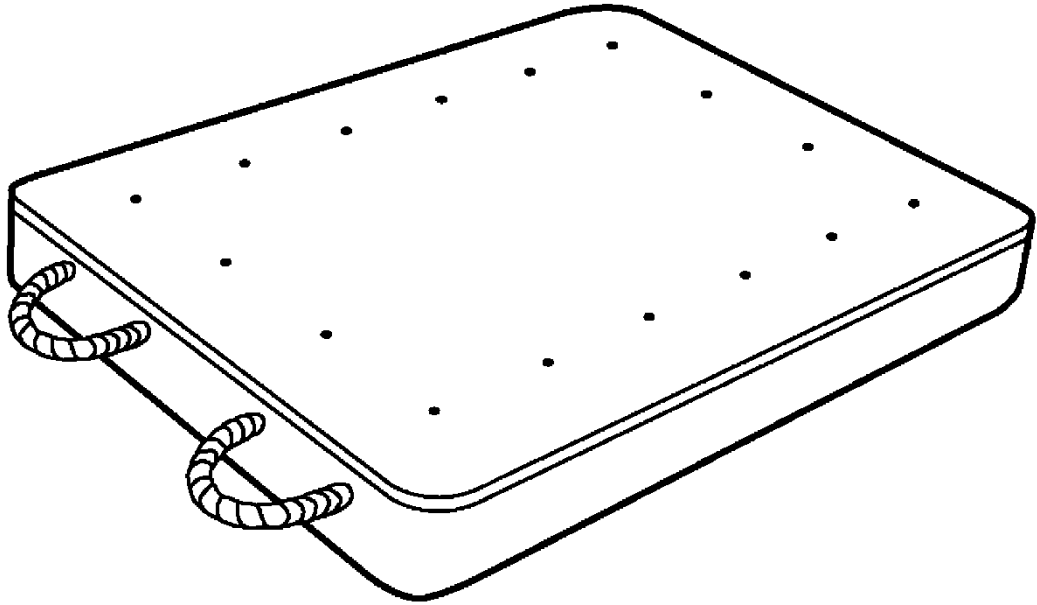
As well as enabling those with hearing impairment to share in the pleasure that music gives, these devices can be used to combine the physical vibrations and the aural experience of relaxing music with pulses of various low-frequency sine tones, to produce marked therapeutic effects. These are, for example, the reduction of high muscle tone, enhancement of the blood supply, correction of unwanted stereotypic behaviour, as well as reductions in arousal level and in heart rate.

Vibroacoustic therapy requires the additional use of either a pulsed, low-frequency oscillator or a suitable mixer for combining the low-frequency pulses with the selected music of suitable mixes.

NB. Intending users of vibroacoustic therapy should note the list of Contra-indications on page 18.

SOUNDBOX

Description



- **Soundbox** is a small, 2 speaker vibroacoustic box.
- Soundbox was originally designed to enable children with hearing impairment to enjoy using *Soundbeam*. It's surface is low enough for quite small children to be able to crawl on to it (or sit or lie on it) without coming to any harm if they roll off.
- Wheel-chair users can also use it to experience the physical vibrations of music. (See p.15)

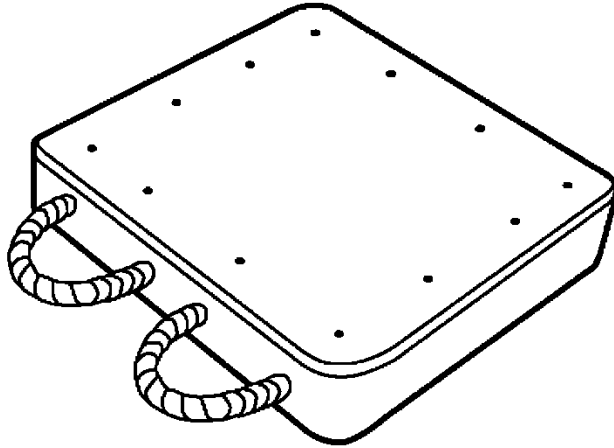
Dimensions: 1220mm (L) x 910mm (W) x 140mm (H)

Weight: 35kgs

Power handling: - Max. 40 watts

MINIBOX

Description



- **Minibox** is a smaller version of Soundbox

Dimensions: 610mm (L) x 610mm (W) x 130 (H)

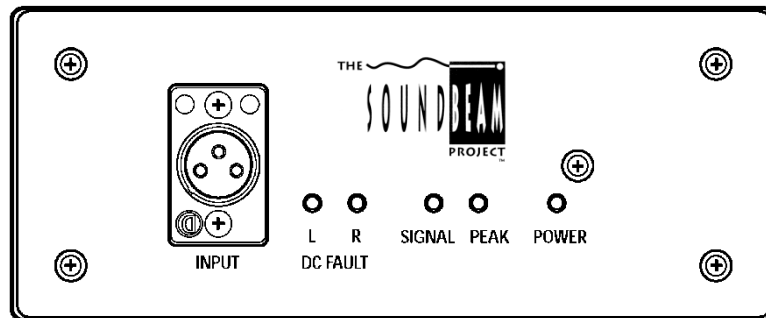
Weight: 20kgs

Power handling: Max. 40 watts

i. The Speaker Protection Unit

In order to safeguard the speakers from damage by accidental overloading, a Speaker Protection Unit is supplied with Soundbox and Minibox, which automatically cuts off the power when the possibility of overloading, and therefore damaging the speakers, seems imminent. This silences the speakers briefly, or until the volume to the speakers is lowered to a safe level.

This is installed in the side of Soundbox or Minibox and enables a supervisor or carer, though not the users themselves, to monitor what's happening.



The Amplifier Output is connected to the 3-pin XLR socket marked 'INPUT'.

The two **Orange** LED's marked 'DC FAULT – L and R' will light up if, as the result of a fault in the Amplifier, there is a danger of DC (Direct Current) destroying the Speakers. The output to the Speakers is switched off permanently.

The **Green** LED marked 'SIGNAL' lights up when moderate levels are being sent to the speakers.

The **Red** LED marked 'PEAK' lights up whenever the Speakers are overloaded. Brief, temporary peaks cause the output from the amplifier to be switched off for one second. Continuous overloading causes the output to be switched off until the volume is lowered.

The **Amber** LED marked 'POWER' lights up when power is being supplied to any of the device.

ii. Setting up the Soundbox, Minibox

1. Use the 3 pin XLR connector of the audio lead supplied (labelled B) to the 'INPUT' of the SPU on the Soundbox/Mini Soundbox.
2. Connect to your Soundbeam 5 or amplifier - Connect one each of the **two black wires** to each of the **red speaker terminals** on your Soundbeam 5 or amplifier and the **green cable** to just one of the **black terminal** (either black terminal is fine).



5. Switch on the power supply to your amplifier or Soundbeam 5. If using an MP3 player/ipad/smartphone or CD connect the chosen device to the amplifier using the headphone socket or line out of your device to a line in on your amplifier or line in on the Soundbeam 5.

iii. Using Soundbox and Minibox

1. Sound, Hearing and Vibration

The normal range of human *hearing* is from around 16Hz* - about an octave below the lowest C on a grand piano - to over 16,000Hz (16 kHz*) - 6 octaves above middle C.

**Herz (shortened to Hz) is the term applied to the number of cycles of air pressure waves per second - what used to be called 'vibrations per second'. A frequency of 1,000 cycles per second is written 1kHz. Low frequencies are heard as low notes, high frequencies as high ones.*

The lower frequencies of music can also be *felt* as physical vibration. Lying on, sitting on, or touching Soundbox or Minibox enables the physical vibrations of the low frequencies of music to be felt. They can be felt most strongly below about 250 Hz (roughly an octave below middle C on the piano), although may be perceptible up to 600Hz (F above middle C) and even, perhaps, as high as 1kHz (E flat, a seventh higher).

The speakers used in Soundbox and Minibox, have a range of 15Hz – 10kHz (more than 5 octaves above Middle C). However, since hearing impairment varies so greatly in its effects on different people - and in order to give the users of vibro-tactile equipment the fullest musical experience which is possible for them - the whole potential audible range of frequencies, up to 18 - 20 kHz, should be made available to them. This is possible by using separate loudspeakers or a pair of good quality headphones as an aural complement to the physical vibrations

You will need an amplifier – any ordinary hi-fi stereo amplifier will do. There should be two pairs of outputs, one for the vibroacoustic equipment, the other for ancillary speakers or headphones. Soundbeam can supply a suitable one.

Where suitable equipment is available, induction loop hearing aids can usefully supplement the physical experience of music, speech and other sounds for hearing-impaired people.

Note. The fundamental frequencies of instrumental and (male) vocal music heard by the listener are often the result of inferences by the ear, based on difference tones derived from combinations of the higher harmonics of a note's harmonic spectrum. However low in pitch and loud they may seem, they are often actually very low in energy, and not, therefore, much use for vibro-tactile purposes with Soundbox.

Dr Gordon Dalgarno suggests that the kind of 'sub-harmonic synthesiser' used in discos (commercially available at about £225) can greatly strengthen the energy of the low frequency vibration.

2. **Soundbox or Minibox with Soundbeam®**

Soundbeam® is a device which converts movement into music. It enables body movements - hands, arms, legs, feet and heads - in a beam of ultra-sonic pulses to articulate and control electronic musical instruments such as sound modules, synthesisers or samplers.

Soundbox were originally designed to enable people with hearing impairment to make music with Soundbeam® whilst also experiencing the physical vibration of mid to low frequencies of music and other sounds. This would provide a more profoundly satisfying experience of music than the conventional aural one. The use of these devices offers a vibrotactile complement to any part of the full range of frequencies they might actually be able to *hear* via a separate pair of speakers.

All work very effectively with **Soundbeam®**. The user's movements control the changing frequencies of musical vibrations felt by the user's body. The most pleasurable physical vibrations will be derived from low frequency (low pitch) sounds, from about 27 Hz to 440 Hz - roughly, the four octaves from A1 (the A at the bottom of the piano keyboard) to A4 (the A above Middle C). Choose this range of notes on your keyboard, sound module or sampler, and don't forget that **Soundbeam's** 'Transpose' control can be used to lower the pitch of any MIDI sound source by as much as three octaves.

3. **Making the Connections**

- i) Connect Soundbeam® to a suitable input to amplifier or connect some powered speakers to Soundbeam 5's line out socket. Direct the Soundbeam® Sensor at whichever part of the user's body he or she is able to move for this purpose.
- ii) For the vibration to be effective, chose a sound which is pitched fairly low. Alternatively, use the Soundbeam® Transpose settings to lower the pitch of the sounds by up to two octaves.
- iii) The output from your Soundbeam 5 can be mixed with the output from an MP3 /ipod player or CD player with the resulting mix connected to the inputs of your amplifier. Alternatively use a CD player with its own separate amplifier and speakers. You will find that well chosen back-ground music will encourage the Soundbeam user's flow of improvisation.

4. Sound and Music from an MP3, ipad, Smartphone or via a microphone

An early result of our users' own experience of our vibroacoustic equipment was the discovery that, for many people, there were additional benefits beyond simply enjoying making and experiencing music with **Soundbeam®**. These benefits came from playing MP3's or ipads of various kinds of music - sometimes rhythmically stimulating, more often relaxing - via the amplifier. This kind of vibro-acoustic musical experience has now become, for many – including sufferers from autism - a valuable, even essential enjoyment, offering beneficial changes both in health and behaviour.

So, besides the sounds produced by movements in **Soundbeam®**, you can use a microphone, a radio, a MP3/ipad/smartphone or CD connected to the amplifier to play music, speech and other sounds. Occasionally, a pitch-shifter (sound processor, Soundbeam can supply one) will be useful in enabling the music to be transposed down by as much as two octaves, thus increasing the content of physically sensed vibration.

5. What Kind of Music?

Many carers in schools and other institutions have found that carefully selected music (slow pulsed New Age music for relaxation, or quicker, more strongly pulsed music for stimulation) will give a great deal of very evident pleasure to users with Special Needs (or, indeed, to anyone else). It will often also exert a useful calming influence, reducing challenging or unwanted stereo-typical behaviour.

A variety of sounds have all been used successfully with hearing-impaired children and adults, as well as others with various disabling symptoms. For example, appropriate children's songs, birdsong, wind, water and other natural sounds, the user's own voice, the voices of others, as well as any music with a fairly well defined rhythmic pulse.

For others, the whole range of music of their own choice can be recorded to provide an entirely new and profound musical experience. Simply connect the output/headphone socket from your MP3/ipad/smartphone or CD player to the amplifier's input.

6. Speech Therapy

For users with speech problems, the use of a microphone connected to the amplifier can allow them to hear and *feel* their own vocalisations, particularly if a sound processor (Soundbeam can supply one) can be used to lower the pitch of the vocal sounds to frequencies suitable for generating perceptible physical vibrations.

7. Practical Steps – Getting Comfortable

A rug placed on the surface of the device may help to make users more comfortable. If necessary, bean bags filled with polystyrene beads (which are good conductors of vibration) can be used. Other kinds of cushion or mattress might tend to dampen the vibratory effect. A foam rubber pillow can be placed so as to prevent the user's head being in direct contact with the vibrating surface.

The best part of the body for experiencing the physical vibrations of sound is probably the middle to lower back, though any part of the body will enable the user to feel some vibro-tactile effect.

For many users with Special Needs, it will be important, to start with, for the carer to sit close to them on Soundbox with the volume of the amplifier turned so low as to allow no sounds to be heard until the user has been made comfortable and the carer has explained what is happening and allayed any fears or nervousness. If a disabled adult is using it for the first time, you might sit beside them until he or she feels secure and comfortable. In the case of a child, sitting on the device with the child on your lap, could achieve the same result.

8. Sound Levels

Only quite low levels are needed to produce pleasurable and relaxing *physical* effects on users of vibratoacoustic equipment. In any case, begin by getting the user comfortable, with the amplifier's volume control at zero. Then slowly increase the volume until comfortable levels of sound and vibration are heard and felt, observing reactions. This will help you to decide when and for how long the user will be happy lying on the device alone (**but not unattended**). Almost invariably the first levels will soon turn out to be too high for the user's comfort and will need to be turned down.

9. Wheelchair Users

Experience at Lambert School, Stratford-on-Avon and elsewhere has shown that wheelchair users can experience satisfactory vibro-tactile musical sensations via the structure and wheels of their chair when positioned on the Soundbox or Minibox.

10. Bass and Treble Balance.

A graphic equaliser or bass and treble controls (Soundbeam 5 has this function) can be used to vary the levels at different frequencies so as to suit the needs of each individual user. For most users the lower frequencies will probably be the most physically enjoyable.

11. How Long?

The optimum length of time for a vibroacoustic session will vary greatly from user to user. While most clients at Horizon Trust Department of Vibroacoustic Therapy find periods of 20 - 30 minutes adequate, the period also recommended by Olav Skille. Some of the subjects of Professor Phil Ellis' research at Lambert School, Stratford on Avon, England, have enjoyed 45 minutes or more.

The carer should watch the user's face carefully for any signs of discomfort.

***No one should be left unsupervised for long periods on
an activated Soundbox or Minibox***

v. Vibroacoustic Therapy with Soundbox and Minibox

Although our vibroacoustic equipment was originally designed to enable hearing impaired people to enjoy using Soundbeam, it is also suitable for use in Vibroacoustic Therapy.

This newly emerging technique, the subject of several years research by Benenzon (Argentina), Ruutel (Estonia), Skille (Norway), Wigram (UK), Chesky and Butler (US) involves the application of a mixture of relaxing music of the therapist's or user's choice, with various specific low frequency sine tones ie 'pure' tones without harmonics. It has particular success in reducing muscle tone and in relieving the symptoms of various specific conditions.

The result of research by these clinicians during the last 30 years or so into the techniques and effects of Vibroacoustic Therapy are well documented in published specialist papers (for references see Introduction to Vibroacoustic Therapy).

This research has revealed three important factors. These are, in essence:-

- *that the physical experience of vibration by various low frequency sine wave tones ("pure" fundamental tones, with no upper harmonics) - between, say, 30Hz and 120Hz - delivered in pulses of varying lengths and at varying intervals of time, can be an effective therapeutic treatment for a variety of specific conditions;*
- *that the various low frequency sine tones will have localised effects within the body, ranging from 25Hz to 45Hz in feet, ankles, calves, knees, upper thighs and sacrum, through 45Hz to 60Hz in coccyx, sacrum and lumbar region, to 60Hz to 80Hz in thoracic cavity, shoulders, neck and head, though these localised frequencies will not necessarily have any particular therapeutic significance; and*
- *that the effectiveness of sinusoidal low frequency vibration for therapeutic purposes is greatly enhanced by being combined with relaxing music experienced both aurally and/or through the vibro-tactile experience of musical vibrations.*

When Soundbox and Minibox are being used simply to help the hearing impaired to enjoy using Soundbeam, or as a relaxing and even, possibly, a mildly therapeutic way of experiencing music, we have been careful to warn against exposing users to the vibratory element of music without supervision, and against possible dangers and contra-indications to some categories of user.

However, users of Soundbox and Minibox who may be planning to use them for Vibroacoustic Therapy will need to make a serious appraisal of their approach to these vibro-tactile devices and to the procedures and safeguards and the need for a measure of professional therapeutic expertise which may become necessary.

Treatments for relief from some of the symptoms of such conditions as *asthma, autism, cystic fibrosis, parkinsonism, spasticity, high blood pressure, sports injuries* or *pain* from various causes may well need to be specified, and even supervised, by therapists or others with the necessary skills and training. Potential risks may increase slightly, and must also be assessed.

Although Vibroacoustic Therapy is still comparatively new and there are, as yet, comparatively few experienced practitioners working with it, there is growing evidence that it is an effective new therapeutic technique for many hitherto painful and intractable conditions.

Further Information

The booklet, '**An Introduction to Vibroacoustic Therapy**' (published by The Soundbeam Project), summarises the background, techniques and procedures of vibroacoustic therapy. It lists the conditions that have been shown to respond to Vibroacoustic Therapy and the situations in which it is contra-indicated, as well as some of the relevant literature and published research papers.

"Music Vibration and Health" - Tony Wigram and Cheryl Dileo (Eds) - Jeffrey Books, 538 Covered Bridge Road, Cherry Hill, NJ 08034, USA. – is a comprehensive and authoritative survey of the subject.

The Internet

A great deal of useful information about Vibroacoustic Therapy is available on the Internet. Amongst many others Olav Skille's Website is particularly useful. Skille has had many articles published, including a 'Manual of Vibroacoustics' (1986).

Training

Vibroacoustic Therapy is a treatment with a specific theoretical basis and techniques of application, and it will be an advantage for those seeking to use, Soundbox or Minibox for this purpose to acquire training. Short training courses in Vibroacoustic Therapy are run by Hertfordshire Partnership NHS Trust (formerly Horizon NHS Trust). For specific details contact:

Irma Mullins, Hertfordshire Partnership NHS Trust. Tel: 01923 663628

References

Skille, O. (1986) Manual of vibroacoustics. Steinkjer, Norway: ISVA Publications.

Wigram, T. (1996) The effects of vibroacoustic therapy on clinical and non-clinical populations. Doctoral dissertation, St George's Medical School, London.

Contra-indications

There are some circumstances in which people should NOT use, Soundbox or Minibox for Vibroacoustic Therapy

Vibroacoustic Therapy has been used as a treatment within Hertfordshire Partnership NHS Trust (formerly Horizon NHS Trust), for a number of years, with clearly observable beneficial results. The following contra-indications are observed:-

- 1. ACUTE INFLAMMATORY CONDITIONS.** These include conditions where inflammation is exacerbated, such as the acute phase of rheumatoid arthritis. Other such conditions are earache, toothache and back pain caused by a prolapsed intravertebral disc (slipped disc).
- 2. CLIENTS PRESENTING WITH PSYCHOSES.** Psychotic clients may be unable to perceive, or understand the precise stimulus that they are receiving. It is possible to treat them, but only when someone is present who understands their condition and can explain what is happening to them.
- 3. PREGNANCY.** Trials involving pregnant women have not taken place, as the effect on a unborn foetus is not known. Pregnant women should not, therefore, be treated.
- 4. HAEMORRHAGING OR ACTIVE BLEEDING.** Due to the physical effect of Vibroacoustic Therapy, this treatment is contraindicated in any condition where there is a possibility of bleeding, e.g. following a recent operation; cardiovascular attack; or where blood is present in the urine (this excludes menstruation).
- 5. THROMBOSIS.** Clients suffering from thrombosis, or any suspected embolism, will not be treated with Vibroacoustic Therapy, as this may have an adverse effect.
- 6. HYPOTENSION.** Blood pressure should be monitored in clients known to have low blood pressure.
- 7. PACEMAKERS.** Vibroacoustic Therapy should *not* be used with clients fitted with pacemakers, since these are adversely affected by strong magnetic fields

NB. A high proportion of the clients of Hertfordshire Partnership NHS Trust are known to have epilepsy and have shown no adverse effects when treated with Vibroacoustic Therapy (Wigram, 1996).

NB - PRECAUTIONS

Where someone is currently being treated for an acute medical condition, advice should be sought from a medical practitioner before undertaking Vibroacoustic Therapy.

Warning

**Very low frequencies begin to be dangerous below 14 Hz,
and are extremely dangerous at 7 Hz**

ACKNOWLEDGEMENTS and ENQUIRIES

Soundbox and Minibox were designed for

THE SOUNDBEAM PROJECT

by **John Barker** and **Mark Newbold**
with subsequent modifications
by **Stephen Bidgood** and **Paul Bridges**.

The Soundbeam Project gratefully acknowledges encouragement, advice and help from:

Alan Bickerstaffe - Special Care Research Project, Hilltop School, Maltby, Sheffield.

Gordon Dalgarno - Research Fellow, Department of Electronics, University of Keele.

Professor Phil Ellis – Professor, The Department of Performing Arts, University of Sunderland.

Olav Skille – Pioneer of Vibroacoustic Therapy, Data Consultant to Levanger Kommune, Norway, Advisor on Vibroacoustic Therapy to SINTEF UNIMED, Norway, formerly Rektor of Lyngrabben Skole, Norway.

Tony Wigram - Head of the Dept. of Vibroacoustic Therapy at Harperbury Hospital, Radlett, Herts (now Hertfordshire Partnership NHS Trust) and Associate Professor of Music Therapy at the University of Aalborg, Denmark.

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Some Recommendations

'The Soundbed has something to offer children whatever their sensory disability. We have connected it to Soundbeam, to a cassette recorder and to a synthesiser. The vibration that comes through the bed is quite powerful, and is enjoyed by children who have very little vision or hearing. Older pupils come in to the Unit to spend a few moments sitting on the edge of the bed, feeling the music through their hands and bottoms. We have a tiny boy with no sight and little hearing or voluntary movement. It really is a pleasure to see the reaction on his face when we put him on the Soundbed for a settling time after lunch'.

LEIGHTON REED - ROYAL SCHOOLS FOR THE DEAF, MANCHESTER, ENGLAND.

'Originally we bought the Soundbox (smaller version of Soundbed) as just another piece of equipment for our Sensory Room but we're so pleased with it that we're designing a whole new Sound Room with the Soundbox as its main attraction.

A combination of fun and therapy, our children enjoy a range of active and passive interactive experiences.

One child, injured in a road accident, talks joyfully of the pleasures of "bottom wobbles". An autistic boy who is usually hyper-active gave his mother her first rest for weeks when he relaxed, even slept, on the Soundbox for over an hour and countless children with sensory impairments enjoy the "feel" of music for the first time.

We've added some sound to light units, bubble tube, effect units and tactile panels to the room now and we look forward to exploring the Soundbox and the Soundbeam unit even further'.

GARY WARRINGTON - THAMES VALLEY ADVENTURE PLAYGROUND

'The Soundbed has provided a natural extension within my own work in exploring music/communication using vibro-tactile stimuli. Its large surface area facilitates the opportunity not only for shared activity, but also for the individual to explore and experience vibro-tactile input upon the body. Used within our music/communication programme, I have found the Soundbed to be a very useful tool'.

TONY HEYES - POOLEMEAD RNID SCHOOL FOR THE DEAF, BATH