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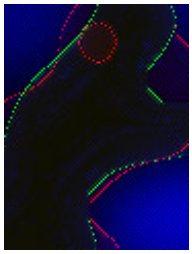

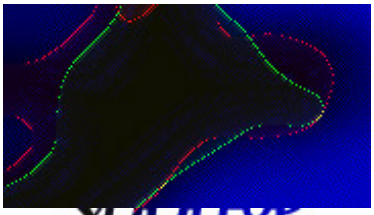

contact sponge

sauna 02/the exploratorium: The second sauna iteration took place at the Exploratorium/SF, in February 2002, as part of the Sponge curated evening "Teleopolis."

This evening examined the role of media and its effects on the urban environment. As part of preparations for Sauna02, Sponge set up a test site to experiment with techniques for creating mediated immersion without the need for physical enclosure, as in Sauna01. This Sauna, consisted of a single fabric cylinder, suspended 10' off the ground, under which the public could pass by.

A single parabolic speaker/reflector mounted in the top of the cylinder, enabled Sponge to beam a carefully focused "shower" of sound onto the passerbys below. Semicircular walls further served to intensify the sonic experience, creating an semi enclosed acoustic zone that as well marked a boundary for pedestrian traffic flow.

The effect of the walls combined with the parabolic created the simulation of something akin to a comb filter, with reflections from the parabolic carving out different harmonic relationships. A single motion sensor, mounted on the wall, enabled visitors to affect the rate of the delays as well as the timbre of the sound being projected through the parabolic.

Here, activity in and around the cylinder served to excite or dampen the sound, much like the physical modeling processes used to simulate the physical processes of acoustic instruments.

quicktime: 1.1mb

Sauna intro phase2 01 02 03 discussion support gallery

contact sponge

Resource Center

Sound in Science Centers

Controlling ambient noise

Robert Fry

At the time he wrote this in fall 2001, Robert Fry was an exhibit developer at the Exploratorium in San Francisco, working in the Sound and Hearing group. Shortly after, he moved to Explora in Albuquerque, New Mexico. In addition to being an exhibit developer, Robert is a sculptor who works with sound.

Science centers are concerned with experiential learning, but the places we inhabit often provide an atmosphere of acoustic chaos. If visitors have to wade through a distracting cacophony, there's no guarantee that they'll be able to concentrate enough to absorb the content of exhibits. On the other hand, unexpected and unusual aural phenomena delight and surprise. People often mention boinks, pings, clangs, whooshes, wow-wows, and clack-clacks when they describe their visits to the Exploratorium. We don't want a library-like stillness in a science center – what we want is an acoustic environment that enhances the visitor experience without undermining it.

At the Exploratorium, we achieved a reduction in the ambient sound level by implementing a number of simple solutions that specifically address our noisiest exhibits. Among them are the following:

Motors

Problem:
The electric motor produces broadband sound, compiled from many frequencies. Exhibit furniture and hard surfaces can amplify and reflect annoying frequencies, and turn a motor into a rattling nuisance.

Solutions:
Isolate the motor with a rubber mat, acoustic foam, or rubber isolators, which are widely available in different densities that absorb different vibrations. Balance the motor to mitigate high-energy vibrations.

Baffling

Problem:
Some exhibits generate noise because of the way they function, or because of how visitors interact with them.

Solutions:
Acoustic baffling can result in a marked reduction in the perceived loudness of a noisy event. One solution is to make graphic panels, walls, or furniture surfaces of acoustically transparent perforated steel or aluminum layered over acoustically absorptive foam or fiberglass. Baffling does not imply absolute containment. Booths, kiosks, and chambers deaden the ambient space between exhibit events.

Speakers

Problem:
Exhibits with sound are often built with speaker boxes aimed straight out toward the general space, so sound spills around the visitor. Also, speakers purchased off the shelf rarely have been designed to reduce rearward spill.

Solutions:
Contain the acoustic spill in any direction that is not toward the visitor. If speakers are housed inside exhibit furniture, place absorptive material throughout the interior of the exhibit furniture. Be sure to test, because too much absorption can reduce sound quality.

Supplemental holes may be drilled into exhibit furniture or speaker boxes, creating what amount to "f holes" in a violin and directing sound energy where it's desired.

Sound bells and parabolic reflectors contain and focus speaker-produced sounds. However, it is difficult to focus low-frequency sound vibrations, and the sound produced by the most effective versions lacks the texture of warm, low tones. Supplemental base speakers filtered to drive only the lowest tones can help overcome this drawback. Surface-mounted base drivers also can transmit tactile frequencies without much audible noise; these can be mounted in a floor pad beneath the visitor while suspending a parabolic speaker overhead.

If a parabolic speaker is mounted over a tile or concrete floor, its purpose will be defeated. A rubber mat, carpet, or other soft matting can help. Porous rubbers work better than smooth, soft better than firm; unfortunately, the most absorptive are also typically the least durable.

Architecture

Problem:
Acoustically reflective surfaces – including concrete floors, metal ceilings, and large expanses of glass and wood – lengthen the amount of time it takes for a given noise event to decay.

Solutions:
Get at least one

surface in the space to absorb sound waves. Treating the ceiling leaves you with most latitude for customizing the space. Treat walls only if the situation positively requires it, because acoustic panels are fragile, difficult to clean, and aesthetically bereft. Carpet is the most common acoustic absorber, but isn't always effective. Short-nap carpet absorbs noise at very short wavelengths (6000 Hz and above), but if it is not backed by another effective absorber it will likely reflect wavelengths longer than the depth of the fibers, especially if glued directly to substrate concrete.

Background

Acoustic transparency
The "transparency index" (or TI) is a measurement of the amount of sound energy that passes though a material at a given frequency or range of frequencies. Many perforated metals and plastics have a high TI. Usually, though not always, those sheets that have a relatively high percentage of open area are most transparent. The exception is when the holes are large and the surface between the holes becomes large with respect to wavelengths as well.

Acoustic absorption
Acoustically absorptive material is usually measured in NRC, the "noise reduction coefficient," a value between 0 and 1. A good absorber is likely to measure at .80 – meaning 80 percent of the sound energy is attenuated.

Perception
Low frequency spill is generally perceived as much quieter than high. Most people find that frequencies in the 2500 to 4000Hz range are those to which we are most physically sensitive; low frequencies require much more power to be perceived as equally loud as high.

Noisy classrooms
In 1975 Arline Bronzaft and Dennis McCarthy published a groundbreaking study of schoolchildren in New York. This and other articles can be found at http://www.nonoise.org and http://interact.uoregon.edu/MediaLit/WFAE/home/index.html

Jump to top of page.

Make Your Own Parabolic Reflector Windscreen

By Randolph Scott Little

Wind noise is a nearly perpetual factor in natural sound recording. The recordist's challenge is to minimize the magnitude of such noise relative to the desired signal being recorded. Technique, as alumni of the MLNS Natural Sound Recording Course know, is of paramount importance. Choose a direction and location so as to avoid most background wind-induced noise by minimizing noisy vegetation in line with the desired signal, situating the microphone in a lee and aiming into the remaining wind. Of course the microphone itself should be equipped with its own windscreen at all times while recording in the field.

Parabolic reflectors, aimed into the wind, create a small lee for the microphone. That is good, but you can do even better by adding a windscreen over the entire reflector. The value of this additional windscreen becomes significantly greater whenever the wind direction is not precisely on the axis of the reflector and whenever slight fluctuations in wind direction occur, which is practically always. Unlike microphone windscreens, which are commercially available accessories, windscreens for parabolic reflectors are generally not available. One exception is the Telinga Windcoat which is made for the Telinga Pro 21-inch reflectors. However, making one's own parabolic reflector windscreen is reasonably easy and wonderfully effective. This article describes how to do just that, using my 36-inch reflector with 12-inch focal length as an example.

The Principle of a Windscreen

The principle of a windscreen is to obstruct gross movement of air without significantly impeding the transmission of sonic pressure waves through the barrier. You are probably already familiar with two common approaches to this problem. Perhaps the simplest method is to embed the microphone in a volume of suitable expanded urethane foam, which is certainly practical and inexpensive and which will suffice for mild wind conditions. However, as the thickness of the foam increases much beyond about one inch, transmission of the desired sound pressure waves becomes excessively impaired; so some other approach must be found for stronger wind conditions. A three-dimensional variation of the old studio "pop filter" is commonly used. The pop filter is a device placed between a vocalist and the microphone to prevent bursts of breath, created when uttering plosives (p- and t-sounds, for example) and fricatives (f-sounds, for example), from striking the microphone and causing an unnatural "pop" sound. This device consists of a swatch of fabric resembling that of nylon stockings, this swatch being stretched tight by a surrounding frame which is used to hold it as a screen in front of the vocalist's mouth. The idea, obviously, is to allow sound to pass virtually unimpeded while blocking or deflecting any plosive air-stream. It works very well for the intended purpose, though its two-dimensional form renders it much less useful as a general windscreen. The

"blimp" windscreens for shotgun microphones are an excellent example of three-dimensional application of the pop filter principle. The blimp structure supports a taut fabric mesh that allows sound to pass freely while maintaining still air in the space surrounding the microphone. This same principle can be applied to the parabolic reflector.

A Parabolic Reflector Windscreen

As a long-time user of a 36-inch diameter aluminum parabolic reflector with 12-inch focal distance, I will report on my experimental design, construction, and use of windscreens for that reflector. While the measurements will necessarily differ for reflectors of other dimensions, readers should be able to adapt my design technique to suit the dimensions of their particular reflector.

The basic idea is to start with a large circular piece of suitable material, remove a section like a slice of pie, stitch the remaining material back together to form a cone, and sew an elastic cord around the base of the cone so that it will just stretch over the rim of the reflector. Two key dimensions, the radius of the circle and the angle of the pie-slice, can readily be determined by direct measurement on your parabolic reflector with your microphone in its working position. Those key dimensions can also be calculated; readers uninterested in the mathematical details may wish to skim rapidly past the next section.

Mathematical Design

The surface of a parabolic reflector is the set of points satisfying the mathematical relation:

$$y^2 + z^2 = 4kx$$

where the coordinate system is such that the x-axis is the "line of sight" of the system, the origin point (0,0,0) is at the very base of the reflector, and the focus is at the point (x,y,z) = (k,0,0), *i.e.* the focal length is k. Since this paraboloid of revolution has radial symmetry around the x-axis, we can also express the surface as the set of points satisfying the formula:

$$r^2 = 4kx$$

where r is radial distance from the x-axis. We will use this latter formula to deduce some further facts of our reflector's geometry which will be helpful in designing the windscreen.

The windscreen will be in the shape of a right circular cone, the base being the rim of the reflector and the apex being the outermost end of the microphone. We know that base diameter will be 36 inches, but how high will this cone have to be? The microphone, a Sennheiser MKH404 cardioid pattern condenser microphone, is mounted facing into the reflector with its diaphragm at the focal point, *i.e.* at x = 12 inches. Where is this in relation to the plane of the reflector's rim? Here is where we put the parabolic formula to work. Given a k-value of 12 and plugging in an r-value of 18 allows us to solve for the depth of this reflector which we will call X. Accordingly, $X = 18^2 \div (4 \bullet 12) = 6.75$ inches. In other words the focal point lies 5.25 inches beyond the plane of the rim of this reflector.

As an aside, we call this a "shallow" reflector because its focal point lies considerably beyond its rim; as opposed to a "deep" reflector such as the Sony PBR-330 which has a 13-inch diameter and about a 3-inch focal length. An inward-pointing cardioid microphone is appropriate for a shallow dish; whereas, an omni-directional microphone is appropriate for a deep dish.

Returning to the design of our windscreen, we want the apex of the cone to be at the rear of the microphone, so as to enclose the entire microphone within the lee of the fabric. Actually, the rear of the microphone's cable connector is where the apex should be. This is 5.5 inches from the diaphragm, so the total height of the cone will be 5.25 + 5.5 = 10.75 inches. With base radius of 18 inches and cone height of 10.75 inches, the slant height, *i.e.* the distance from the rim to the apex can be calculated by the Pythagorean theorem as:

$(18^2 + 10.75^2)^{0.5} = 21$ inches.

Remember this key dimension, the radius, while we determine the angle of the pie-section to be removed.

We know that the base of the conical windscreen must coincide with the rim of the parabolic reflector; therefore, the radius of the base of the cone must be 18 inches. The angle of the section to be removed is simply:

$$360° \cdot (21 - 18) / 21 = 51.4°$$

Conceptually, we will take a 21-inch radius (42-inch diameter) circle of fabric, make two radial cuts that are 51.4° apart to remove a pie-like section, and sew the remaining edges back together to make a cone. Practically, however, we must increase the diameter of the circle by 3 inches (now 45-inch diameter) so the windscreen can be stretched beyond and around the rim, and we must remember to leave enough of one edge of the pie-like slice so we can make a decent seam.

Pattern Making

Now, although we have calculated the key dimensions, we recommend making a pattern out of heavy paper, then fitting the pattern to the reflector as a final check before actually cutting any fabric.

Assuming that you don't happen to have any 45-inch wide construction paper, cut several grocery shopping bags apart, lay them out flat, and tape them together so that you can cut a 45-inch circle from the assemblage. Then cut a single radial line from the rim to the center of the circle. Notice that by overlapping the two cut edges the flat circle becomes a rising cone. Place it over your reflector (with microphone in place) and overlap the two cut edges until the cone fits snugly along the rim of the reflector. Mark this amount of overlap by drawing a radial line, defining the conceptual pie-like section mentioned above. Now draw another line parallel to the first but about one inch into the pie-like section. After the remainder of the pie-like section is removed, this inch-wide strip will provide enough overlap to sew a good seam for forming the desired conical shape. Note also to leave a small hole at the very center for passage of the microphone cable and connector; a small ring of scrap fabric can be sewn around this hole for reinforcement.

Materials

Two important characteristics of any fabric selected for windscreen material are "stitchability" and dimensional stability. By stitchability I mean it must be possible to sew a seam in the material and have that seam hold firmly under moderate tension. By dimensional stability I mean the fabric must not stretch appreciably under tension. I would add a third characteristic, more important than the other two, that the fabric should be acoustically constant at all frequencies of interest; but the acoustic properties of fabrics are not generally available.

Speaker grill cloth generally exhibits the first two characteristics, and could

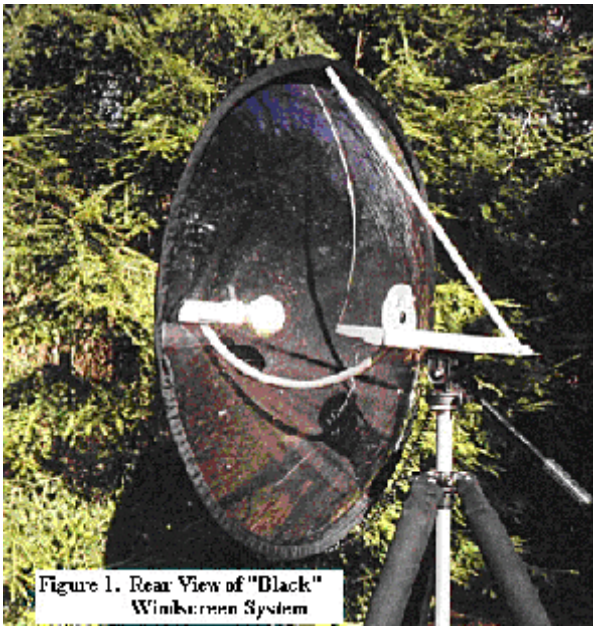

Figure 1. Rear View of "Black" Windscreen System

Figure 2. Front View of "Black" Windscreen

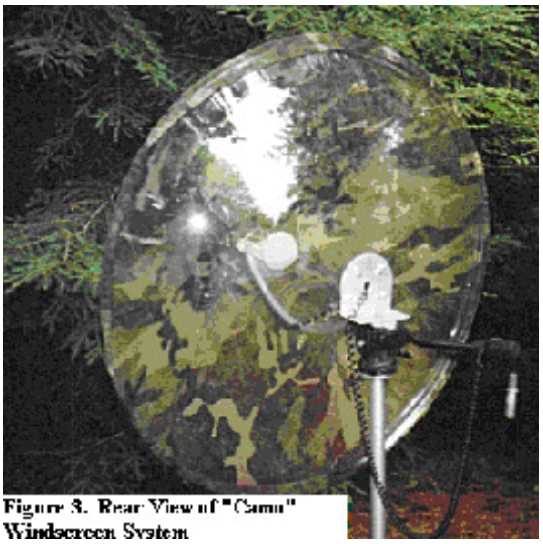

Figure 3. Rear View of "Camo" Windscreen System

Figure 4. Front View of "Camo" Windscreen

reasonably be expected to be superior to other fabrics in that important third characteristic. I constructed one windscreen (see Figures 1 and 2) of black speaker grill cloth. One source of acoustic speaker grille cloth is Wendell Fabrics Corporation, Post Office Box 128, Blacksburgh, South Carolina 29702, Telephone (864)839-6341, Fax (864)839-2911. They offer a line of high quality acoustically transparent grille cloth under the trademark name of Mellotone. Their website: http://www.wendellfabrics.com/grille.html offers examples of the different types of available fabrics, some of which have

elastic characteristics. Prices for Mellotone® acoustic range from $10.50 - $22.50 per square yard with a 5 yard minimum purchase. Another source of grille cloth is Meniscus Audio Group:
4669 S. Division Ave.
Grand Rapids, Michigan 49548
616-534-9121
Their website:
<www.meniscusaudio.com/accessories.html>
They provide 60 inch- wide stretchable cloth in five colors, including black and brown, for $2.25 per foot.
Mosquito netting or camouflage netting of similar texture also come to mind as potentially useful materials for this purpose, perhaps offering a better visual blend into natural surroundings than speaker grill cloth. I constructed a second windscreen (see Figures 3 and 4) of "Standard Mesh Woodlands Netting" obtained from Cabela's, One Cabela Drive, Sidney, Nebraska 69160. Cabela's Fall 2000 Master Catalog lists this material as "Heavy-Duty Camouflage Mesh -- Advantage, Timber Mesh ". Other patterns, "Realtree X-tra Brown, and Realtree Hardwoods" are also available. Note that some camouflage cloth materials have a more open weave than others. Be sure to ask for camouflage netting, its weave fine enough to exclude insects. In addition to ordinary sewing thread for the seams, you will also want several yards of round elastic cord, such as Stretchrite® 3960 made by Rhode Island Textile Company, Pawtucket, Rhode Island 02862, to serve in lieu of a drawstring.

Assembly

After cutting the 45-inch circles of material and removing the pie section, roll the outermost inch of material over on itself and use regular black sewing thread to form a pocket through which later to string the elastic cord.
Next, hold the partially completed windscreen in place over the parabolic reflector and check the proper placement of the radial seam to ensure a tight, tent-like fit. Start the seam far enough from the center to leave room for the microphone connector to be fed through the center opening, and stop the seam just short of the pocket which was previously sewn around the outer edge. Now sew that seam and double-check for a tight fit over the reflector, re-sewing if necessary to get it right.
The elastic cord can now be strung through the circumferencial pocket. Tie the ends of the elastic cord together so that, when the windscreen is stretched over and behind the rim of the reflector, it is held tautly in place.
Finally, cut a washer-like ring of scrap windscreen material and sew it around the central hole for the microphone cable as a precautionary reinforcement.

Usage Notes

After several seasons of use, I have been quite pleased with both windscreens, with no second thoughts about the design or the materials. Although I would still like to make controlled measurements to determine the signal and wind attenuation as a function of frequency, subjectively I can report negligible signal attenuation and significant wind attenuation. These advantages are so noticeable that I now routinely use the "camo" windscreen even in calm air, where it offers the additional advantages of keeping pesky flying insects away from the microphone and helping to blend the recording outfit into the environment.

The speaker grill cloth windscreen offers considerable additional wind attenuation. Whereas on a windy day I would seek a better venue, now I put on the “black” windscreen and get on with the recording. In fact, “camo” over “black” is a great combination for otherwise impossible situations.

So, for all of you parabolic reflector users, I highly recommend tailoring your own windscreen and extending your good recording opportunities.

Acknowledgments

Thanks and acknowledgment to my wife, JoAnn, for suffering my foolish notion that cheesecloth would be a suitable material (it isn’t; don’t even think about using cheesecloth) and rounding up the proper materials, to Greg Budney for suggesting sources for said proper materials and to Greg Clark for developing the clear plastic reflector used in the illustrations.

About the author:

Randy Little has been one of the mainstay instructors at 14 sound recording workshops, starting with his first in 1987. His favorite recording is one of a Hermit Thrush from the Adirondack Mountains in Upstate New York. This recording was included on an LP disc as one of “The World’s Most Beautiful Bird Songs”.

IDUSTRIAL SERIES SPEAKERS

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The **MM-4** is a very compact, wide-range loudspeaker for distributed or stand-alone applications. In contrast to conventional distributed systems, the **MM-4** does not require a transformer, dramatically reducing distortion and easing installation requirements. The **MM-4** comprises a single 4-inch cone driver with a 16 ohm voice coil mounted in a sealed enclosure. In distributed applications, the **MM-4** connects directly to the amplifier output. Drawing 300 Watts maximum, the **MM-4** produces 110 dB peak SPL. Four **MM-4**’s in parallel require a direct drive power amplifier capable of 600 Watts continuous output (49 Vrms) into 4 ohms. The **MM-4** enclosure is fabricated of paintable, black anodized extruded aluminum, and acts as a sink to dissipate heat from the driver voice coil. The **MM-4** can be ordered custom-painted in any color to match décor. It is fitted with a perforated steel grill. Two connector versions are available. A looping EN3 connector suitable for outdoor installations is standard. For interior applications, a Phoenix-style sealed and keyed connector is an option. For mounting, an available "U" bracket affixes to the cabinet with two 3/8"-16 screws and is drilled to fit an OmniMount bracket. A flush-mount kit is available for ceiling- or wall-mount applications. The **MM-4CEU** is a two-channel, single rack space unit that provides frequency and phase response correction circuitry tailored to the **MM-4** loudspeaker. Through a SpeakerSense connection to the power amplifier output, the **MM-4CEU** continuously monitors the power applied to the driver, activating integral peak and RMS limiters to protect the driver from over-excursion and overheating, respectively. The **MM-4CEU** incorporates multiple-pole frequency response equalization circuitry that is tailored specifically to the **MM-4** loudspeaker’s acoustical characteristics. This circuitry assures that the **MM-4**’s response remains within ±4 dB from 180 Hz to 16 kHz (free field). Integral phase response correction circuits maintain a system phase response of ± 45 ° from 700 Hz to 17 kHz. The **MM-4CEU** incorporates Meyer Sound’s exclusive MultiSense circuit, allowing a single **MM-4CEU** to monitor multiple amplifier channels at once and activate its protection circuits based upon the system branch with the highest signal level. MultiSense allows adjusting the levels of individual zones using the power amplifier level controls.

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Manufacturer's Data/Spec Sheet

Model	Description	List Price	NSL Price
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SB1

The Meyer **SB-1** Parabolic Sound Beam is the first device to propagate sound waves that decrease as little as 3 dB SPL per doubling of distance for more than 300 ft, across a five-octave frequency range, with a consistent and narrow beam width. Exploiting the well-known directional behavior of a parabolic reflecting surface, the **SB-1** provides the unprecedented ability to precisely focus high-frequency fill energy over great distances from a point-source system without the use of delayed fill loudspeakers. The **SB-1** comprises a fiberglass parabolic reflector dish with a bullet-shaped pod containing a 4-inch compression driver and an aspherical horn, mounted at the focus of the parabolic surface and aimed at the center of the dish. A 12-inch band-limited cone driver is embedded inside the center of the dish facing the pod to steer and focus the sound produced from the horn. Mounted in a companion yoke, the dish housing serves as the parabolic aiming mechanism and contains the amplification, signal processing, and control electronics for both drivers. The high-frequency pod can be disassembled and packed for shipping inside the dish. The **SB-1**'s integrated electronics and amplifier system utilizes the Intelligent AC power supply and the TruPower Limiting (TPL) system. The Intelligent AC supply auto-selects the correct operating voltage (facilitating international use), suppresses high voltage transients, provides soft-start power-up (eliminating high inrush current), and sustains operation during low-voltage periods. TPL protects the driver components from damage due to overdriving and assures maximum peak output while minimizing power compression. The **SB-1** is RMS (Remote Monitoring System) compatible.

Features of the Meyer Sound Labs Industrial Series SB1:
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Manufacturer's Data/Spec Sheet

Model	Description	List Price	NSL Price
SB1P	Parabolic Long-Throw Sound Beam	$16,220.00	CALL for OUR LOW PRICE

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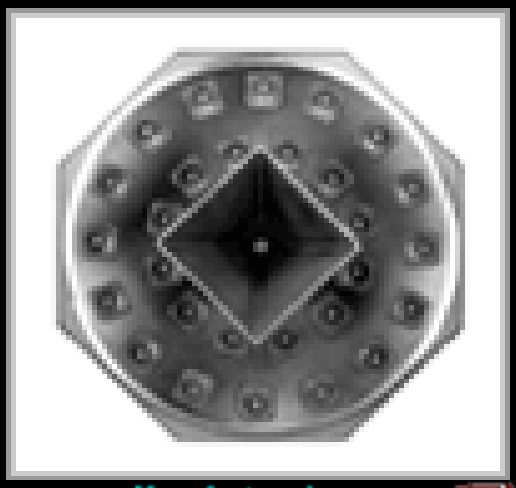
SB2

The **SB-2** is a biamplified sound reinforcement loudspeaker housed in a parabolic dish enclosure. Capable of high sound pressure levels with precisely defined narrow coverage, the **SB-2** offers a unique solution for large-scale distributed paging and music systems. While distributed loudspeakers are often employed in an attempt to overcome reverberation and improve intelligibility, large venues pose problems of scale that conventional loudspeakers designs cannot address. The **SB-2** provides an effective solution to these problems. Featuring a tight 20° coverage pattern with high output capability, the **SB-2** offers the ability to cover individual zones with highly intelligible, full-range sound while avoiding overlapping. A hybrid, two-way system, the **SB-2** uses a waveguide to achieve directionality at high frequencies and a parabolic array of cone drivers at mid-to-low frequencies. Because the **SB-2** achieves very tight directional control in the critical mid frequencies, it enables designers of distributed systems to circumvent the usual tradeoffs between even sound pressure levels and minimized combing. Its tight directional control also minimizes reverberation, maximizing intelligibility. And with its high peak SPL output, the **SB-2** can throw over much longer distances than conventional loudspeakers. The **SB-2** comprises 28 4-inch cone drivers, a 2-inch throat (4-inch diaphragm) compression driver, an integral complementary **MOSFET** power amplifier with 1240 watts burst capability, optimized signal processing circuitry, and compatibility with **RMS** (Remote Monitoring System).



Adobe Manufacturer's Data/Spec Sheet

Features of the Meyer Sound Labs Industrial Series SB2:
• Precise, narrow coverage over a wide frequency range • Ultra-low distortion maximizes intelligibility • Sharply defined pattern dramatically minimizes reverberation • Articulated mounting yoke provides for precise, adjustable aiming. Applications • Large airports, arenas and malls • Distributed paging and music systems • Independent zone coverage systems

Model	*Description*	*List Price*	*NSL Price*
SB2P	Parabolic Wide-Range Sound Beam	$12,500.00	CALL for OUR LOW PRICE

Northern Sound & Light
11 Shingiss Street
McKees Rocks, Pennsylvania 15136

NSL

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Richmond Sound Design - 16-channel HD playback & matrix with cue list
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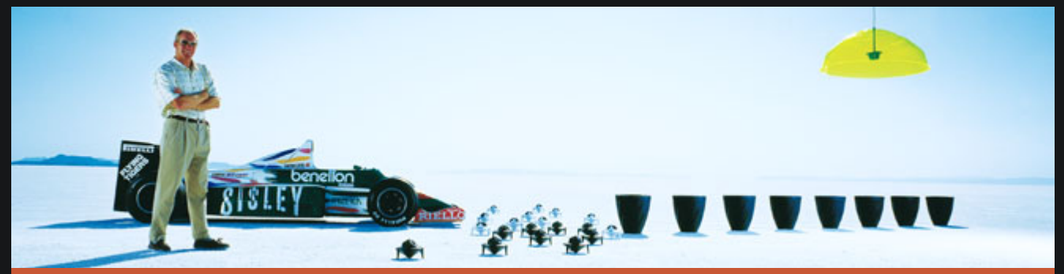
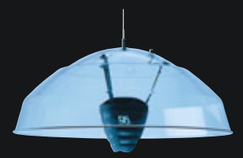
SOUNDTUBE® ENTERTAINMENT

UNLIKE ANY OTHER AUDIO COMPANY.
WE APPROACH TECHNOLOGY FROM A UNIQUE PERSPECTIVE.



"SoundTube's Formula One heritage inspires every aspect of our product innovation and customer service."- DW

Founded on the principles of true innovation, design and performance, SoundTube Entertainment has set new standards for commercial speaker performance. These audio advances are the result, in part, of the vast design and technology resources made available to SoundTube Entertainment from David Wiener Ventures, the company that created SoundTube. — ***Lead. Or follow.***



FP633

30" dia. dome, 5.25" 2-way mono driver.

For contained music and messaging in most venues, the FP633's full range sound and increased bass provide a wider hot spot for multiple listener applications.

FPS30

30" dia. dome, 2 x 2" stereo drivers.

Three dimensional effects, a dramatic hot spot, clear, crisp stereo separation and tightest focus make the FPS30 the most effective sound focusing speaker available.

FPS20

20" dia. dome, 2 x 2" stereo drivers.

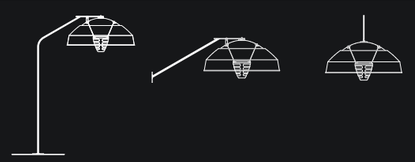
The smallest patented stereo parabolic dome available, the FPS20 blends well in any environment. Easily transported or shipped, the FPS20 is designed to minimize visual impact.

FP Series Tech Specs

Model	FP633	FPS30	FPS20
System Type	5.25" 2-way	2 x 2" drivers	2 x 2" drivers
Frequency Response (-3dB)	100 Hz - 20 kHz	100 Hz - 20 kHz	100 Hz - 20 kHz
Power Capacity	60 watts	25 watts	25 watts
Nominal Impedance	4 Ohm mono	8 Ohm. 4 Ohm mono	8 Ohm. 4 Ohm mono
Connections	5-way binding post	20' lead wire	20' lead wire
Height	15.00 in/ 38.10 cm	15.00 in/ 38.10 cm	7.88 in/ 20.02 cm
Diameter	30.50 in / 77.50 cm	30.50 in / 77.50 cm	19.75in / 50.17 cm
Weight	9.50 lbs / 4.31 kg	6.50 lbs / 2.95 kg	3.00 lbs / 1.36 kg
Colors	clear	clear	clear

Mounting Accessories:
Floor stands, kiosk mount kits, wall brackets, hanging cables. Custom and security mounts available upon request.

Amplification:
For added convenience and ordering ease, SoundTube offers three amplifiers for any Dual-Parabolic dome application.

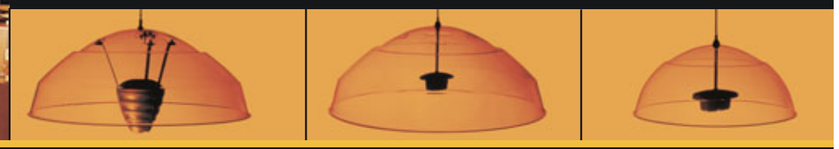


Complete technical and architectural specifications by product are available from our web site: www.SoundTube.com
SoundTube® Entertainment manufactures a complete line of open-ceiling, in-ceiling, high power, outdoor and sound-focusing speakers.

SoundTube® Entertainment Inc. | a david wiener ventures company
6430 N. Business Park Loop, Park City UT 84098 USA p: 1.435.647.9555 f: 1.435.647.9666 e: sales@SoundTube.com w: SoundTube.com

FP FocusPoint™ Speaker Series

What if you could deliver sound *exactly* where you need it?



INNOVATIVE SPEAKERS DESIGNED FOR JUST ONE THING. PERFORMANCE.

SOUNDTUBE® ENTERTAINMENT

With SoundTube Dual-Parabolic™ Speakers You Can Deliver Your Message Right On Target

SoundTube – Leading The World In Focused Sound Technology

SoundTube Entertainment, the world leader in speaker innovation, has created patented Dual-Parabolic sound-focusing speaker technology.

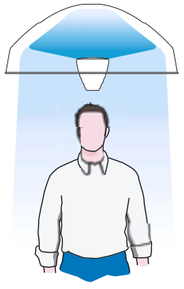
Now it's possible to direct your message, music, sound effects or promotion to an exact spot – anywhere a person stands. In check-out lines, in front of store displays, at educational exhibits or listening stations, FocusPoint Dual-Parabolic Speakers allow you to truly "target" your audience with clean, accurate sound, getting your exact message or campaign across.

Technical Services & Custom Options

SoundTube's customer service and technical support make system engineering simple, and the SoundTube Custom Shop can create custom features, colors, installation hardware and other details to meet any performance or application requirement.

Model Shown: FP633 30" Dual-Parabolic Dome

- Patented Dual-Parabolic™ dome for maximum sound focus
- ZeroReflection™ enclosure technology for superior sound
- Single point mounting for ceilings, walls & kiosks
- Components engineered for maximum clarity
- Custom colors and SoundSleeves available



Patented Technology – Only SoundTube Has Dual-Parabolics™

SoundTube's fully patented Dual-Parabolic Speakers harness the laws of physics to more accurately focus sound waves. Similar to spotlights and satellite dishes, the geometry of SoundTube Dual-Parabolic Speakers forces sound waves to exit the dome in a linear and controlled column-like form.

Dual-Parabolic performance means SoundTube FocusPoint Speakers maximize sound concentration to a single spot. Whether for individual or multiple listeners, SoundTube Dual-Parabolic Speakers control sound in a way never before imagined.

Insta-Stall™ by SoundTube – Fast, Easy & Clean Installations

Used with any audio system, SoundTube's Insta-Stall technology simplifies every aspect of installation and provides a variety of accessories for wall, ceiling, floor and kiosk applications. There's never been an easier way to install 24-hour messaging.

Effective Sales & Educational Presentations

SoundTube Dual-Parabolic Speakers maximize message effectiveness by allowing critical information and messages to be delivered in exactly the same way, every single time. Now, manufacturers can promote their products or services with "their" message – not an interpretation offered by an under-trained salesperson. And the message can include voice, music and sound effects all at the same time. 24 hours a day. Seven days a week. In any language.

SoundSleeves™ - Add High-Impact Graphics

SoundSleeves are acoustically transparent covers that can be custom printed with any combination of graphics, logos and photo images. Available in any quantity, SoundSleeves create high-visibility brand exposure. And SoundSleeves slip right on, so you can change designs to accommodate changing promotional, seasonal or educational programs.

Dual-Parabolic Speakers vs. Earphones

Hygiene & Theft

SoundTube Dual-Parabolic Speakers eliminate concerns associated with hygiene, theft and vandalism – whether in a retail, exhibit space or attached to a kiosk.

Volume Control

Unlike headphones, which blast sound directly into the human ear, with possible danger due to excessive volume, SoundTube's Dual-Parabolic Speakers play away from the head and have a built in sound limiter of 95 dB – well below OSHA's national standards. In even the loudest of applications, Dual-Parabolic Speakers project safe and sufficient volume for listeners to understand the exact message or music without disturbing people nearby.

Visual Excitement

SoundTube Dual-Parabolic Speakers also add exciting visual styling highlights to any environment. In this age of high-tech and interactive entertainment, SoundTube styling creates an atmosphere of advanced technology that enhances the image of your interior – something no earphone or conventional speaker can provide.

Use FocusPoint Speakers in: Retail and POP, Museums, Trade Show Displays, Kiosks, Airports, Showrooms, Security, Ticketing, Multimedia, In-Store Messaging, Corporate Displays & Entries, Theme Parks and Hidden Installs.