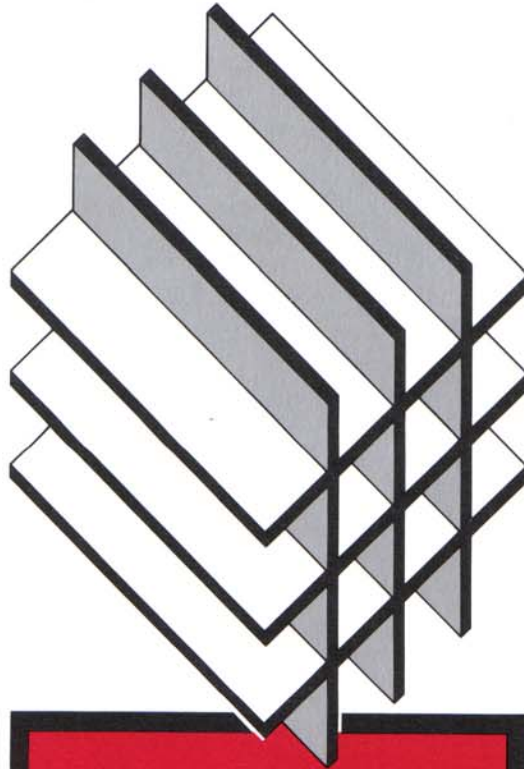


INSTRUCTION
MANUAL



MATRIX

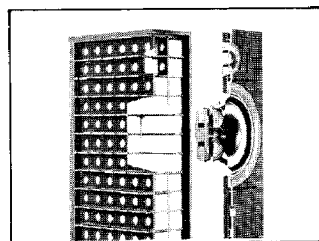
B&W

DIGITAL MONITORS

1

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This cut-away shows the B&W Matrix structure integrated within the cabinet assembly.



Optional stand available as illustrated

Introducing B&W Matrix 1

Your B&W Matrix 1 loudspeaker system incorporates the first radical improvement in enclosure design for many years. Invented by Laurence Dickie (B&W Chief Electronics Engineer) it is an ingenious new type of construction, concealed within the loudspeaker cabinet. This unique construction – the B&W Matrix – virtually eliminates cabinet vibrations, which in ordinary loudspeakers add their unwanted contribution to the final sound.

This is a monitor quality loudspeaker system capable of generating extremely high sound levels. At the same time, due to its wide and balanced frequency response, it will faithfully reproduce the quieter sounds of a solo instrument requiring considerably lower sound level for a faithful reproduction of the live performance.

Quite deliberately, the B&W Matrix series of loudspeakers are described as digital monitors. They have been designed for the age of the compact disc, with all the additional requirements that this material places on the loudspeaker system – such as increased dynamic range, increased transient information, lower noise floor, etc. B&W Matrix 1 is, however, just as much at home with good analogue material and essentially will faithfully reproduce whatever signals are fed to it.

The aim of this instruction manual is to increase your knowledge of the product and in doing so, to give you greater enjoyment from its use. Because any high quality loudspeaker is dependent both on the signals fed to it and the environment (i.e. the listening room) in which it is used, we have devoted separate sections to these subjects.

B&W products are distributed to more than forty countries throughout the world and we maintain an international network of carefully chosen distributors whose aim is to give you, the customer, the widest possible service. If at any time you should have any problem which your dealer cannot resolve, our distributors will be more than willing to assist you.

To conclude this introduction, we would like to thank you for your confidence in purchasing our products and to assure you of our continuing interest in ensuring that they give you lasting enjoyment and satisfaction.

The B&W Matrix series of Digital Monitors – design background

Laurence Dickie's timely breakthrough slotted perfectly into the ongoing development work of our Research Department – culminating in what we believe to be a very significant advance in loudspeaker technology.

Within the scope of this short section, it is possible to give no more than the briefest summary; but the complete Design Story of the B&W Matrix series of Digital Monitor loudspeakers has been published separately. We believe it will make interesting and informative reading, both for the professional engineer and dedicated enthusiast. It is available from your distributor at a nominal charge.

The B&W Matrix enclosure

The newly invented B&W Matrix enclosure, on which patent applications are pending throughout the world, is the heart of this loudspeaker and represents one of the few new

inventions related to loudspeaker enclosures for many years. The B&W Matrix or honeycomb structure which fills the air space inside the cabinet prevents the enclosure (as opposed to the loudspeaker drive unit) from radiating sound, almost completely. This has never before been achieved.

There are a number of ways in which this elimination of enclosure sound radiation benefits the reproduction of the complete loudspeaker system:

- (a) It reduces the colouration so frequently associated with box type loudspeakers, and so provides a more natural open sound. The point being that conventional enclosures add something of their own character, so to speak, to the relatively neutral uncoloured sound of the drive unit.
- (b) Because the sound radiated from the enclosure takes a long time to decay, its elimination improves transient performance, especially at low frequencies.
- (c) The radiating area of the sound source from the B&W Matrix enclosure is a smaller source than that of a conventional enclosure (because sound is not being radiated from the enclosure). Dispersion is therefore better, seating positions less critical and stereo information more accurate. In other words, the sound is perceived as coming from the space between the loudspeakers, rather than emanating from the loudspeakers themselves.

The loudspeaker drive units

Having made this major breakthrough in enclosure design, B&W used their ongoing research programme to incorporate totally new drive units within the Matrix series of loudspeakers. For the bass and bass/midrange units, a new material – homopolymer polypropylene – was chosen. A Ferrofluid design was employed for the high frequency transducer, giving an additional 8dB of clear dynamic range for the increased transient signals of the compact disc.

Crossover, filter network and protection circuits

In any product, when the designer improves one module, others have to be upgraded if the whole is to be superior. Take the example of a car for which a new, improved engine is developed; better brakes and suspension must then complement the improved performance from the power unit if the car is to be a totally better product. Likewise with the B&W Matrix series of loudspeakers: having improved both the enclosure and the drive units, corresponding improvements were necessary both in the components and design of the crossover. The APOC protection circuit on which B&W hold world patents, has also been upgraded. Its operation is fully explained under the appropriate section.

Design background – conclusion

In the few words which space allows in this booklet we have endeavoured to give a glimpse of the new technology embodied in your B&W Matrix loudspeakers. The Design Story publication sets out in engineering terms the measurements and detailed proof of what has been briefly written here. Within this Instruction Manual we have endeavoured to give you helpful and useful information so that you may obtain the best result from your new loudspeakers. We believe its perusal will assist towards this end.

Unpacking, installation and aftercare

Unpacking

We suggest that after unpacking your loudspeakers, you should retain the packaging against the possibility of wishing to transport them at a later date.

The loudspeaker carton contains:

- (a) One B&W Matrix 1 loudspeaker.
And in one carton only:
- (b) One copy of this instruction manual.
- (c) Two calibration certificates – one for each speaker.
- (d) One accessory bag with four 4mm audio connecting plugs.

Installation

The B&W Matrix 1 is designed as a free-standing loudspeaker system, for use with floor stands. Ideally, the stands should be of solid construction and (for correct alignment of the listening window) the recommended height is 480mm to 530mm (19in to 21in).

We manufacture a purpose-designed stand for B&W Matrix 1 loudspeakers (see description in Section 7: Accessories). Full fitting instructions are enclosed with each pair of stands.

Of course, B&W Matrix 1 loudspeakers will operate without stands, but acoustical performance is inevitably impaired. So it is very strongly recommended that stands should be fitted at the initial installation stage.

After fitting the stands, the next step is to connect your loudspeakers to your power amplifier, using suitable cable. Although the input impedance of B&W Matrix 1 is linear in both modulus and phase (i.e. it is essentially resistive), the type of interconnecting cable you use between your amplifier and the loudspeakers may have a very marginal effect. The currents involved when playing music at high sound levels are large and it is important that the gauge (i.e. the cross sectional area) of your cable is sufficient to carry these without appreciable voltage drop. Between 2mm² and 4mm² is a good guide, depending on length involved.

It is generally good practice to keep the amplifier/loudspeaker leads reasonably short and generally not over 10m (30ft) beyond which gauge and type of cable become much more critical.

Later sections deal with positioning your loudspeakers and the use of ancillary equipment.

Aftercare

The real wood veneer on your B&W Matrix 1 should be treated in the same way as you would treat a normal piece of furniture. If you use an aerosol, please spray on to a cloth and keep it away from the front of the loudspeaker, especially the grille cloth and drive units.

If you need to brush or clean the grille cloth, please first remove the grille assembly by grasping the outer frame and pulling away from the cabinet. The grille cloth may then be brushed with a normal clothes brush or similar.

Please avoid touching the drive units, especially the tweeter, as damage could result.

The listening room and positioning your loudspeakers

The degree of accuracy with which the original musical performance can be reproduced in your own home depends on a number of factors, including the quality of the original recording, the equipment used for reproduction and the acoustic properties of your listening room.

Regardless of other links in the chain, the listening room will to a greater or lesser degree imprint its character on the reproduced sound you hear. In simple proof of this statement, notice how the sound of the human voice changes according to environment.

Choice of listening room

Few people are fortunate enough to have a choice of listening rooms, but for those to whom this is possible (or anyone choosing a new home) the following may be helpful guidelines:

- (a) Any room with different dimensions for ceiling height, length and width will sound more even in response than rooms where all the dimensions are similar.
- (b) Solid walls are preferable and will show better reproduction of low frequency transients than some modern constructions where the inner walls are of plasterboard and slightly flexible.
- (c) Other than in houses with solid or concrete floor structures, a ground floor room is preferable to an upper floor.

Changing listening room acoustics

Quite small changes in the furnishing of a room can change its acoustic properties quite significantly. If you already have pictures on the wall, remove these experimentally and at once you will notice a considerable change in the sound from your loudspeakers! We are not suggesting that you should leave the room bare of pictures – quite the reverse, because pictures break up the otherwise plain wall surfaces and generally give fewer discrete high frequency resonances or flutter echoes.

Curtains are another element which can change the sound of your listening room in the mid/upper frequencies. Heavier curtains give more sound absorption of these frequencies and a softer, less reverberant quality to the upper octaves. Conversely if your room sounds too dead, thinner curtains will give more life or sparkle in these frequency regions. So far as sound in the low frequencies is concerned, this is largely controlled by the dimensions and construction of the room. However, large items of furniture do change room behaviour at low frequencies, and their placement may be worth experimenting with.

Placement of your loudspeakers

It was once said that correct placement of a cheap pair of loudspeakers could produce better sound than incorrect placement of a much more expensive product. Whilst this is somewhat of an exaggeration, it is still true that changing the position of your loudspeakers will have a greater influence on the sound than any other variable under your control.

The height of the stands for your B&W Matrix 1 system will determine the listening axis (i.e. centre of the 'listening window') when seated in normal living room furniture.

The spacing between your loudspeakers will depend on the size of your listening room and the distance of your seating from the loudspeakers. As a general rule they should not be closer than 1.5m (5ft) and the space between them should not exceed the distance of your seating for listening. Placement of the two loudspeakers and the listener on the

points of an equilateral triangle is not a bad rule to follow.

The position of the loudspeakers in relation to the walls of the listening room can have a noticeable effect on reproduction – especially at low frequencies. Generally, bass will increase relative to the middle and high frequencies as the loudspeakers are moved nearer the walls.

Placement hard against a wall, or worse still in the corner, will give rise to too much bass, with a boomy quality. In general, spacing from the walls of between 0.5m (2½ft) and 1.5m (5ft) is recommended, but it is well worth experimenting until you have the most acceptable sound. It is usually worth endeavouring to make the spacing between the two nearest walls uneven. As an example, the ratio of 0.5m (2½ft) to 1.5m (5ft) for the two walls can give excellent results.

We have been discussing the proximity of loudspeakers to the wall in the context of lower frequencies; but it is also worth mentioning that stereo information in a front-back plane will also improve if the rear wall is at least 0.5m (2½ft) from the back of the loudspeaker.

One choice as to which of the four walls to place your loudspeakers near will largely depend on your arrangement of furniture. But again, the option of the longer, as opposed to the shorter wall is well worth trying.

A final word about symmetry. For best balance of stereo information the boundary conditions relative to each of the two loudspeakers should be as acoustically similar as is possible.

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A

mplifier, control unit and
source equipment

The power amplifier

Due to its linear resistive impedance, B&W Matrix 1 is an easy loudspeaker for any amplifier to drive.

The recommended limits of power output for the driving amplifier are therefore:

MINIMUM	50W RMS
MAXIMUM	120W RMS
		(into 4Ω resistive).

In giving these limits it should also be stated that amplifier power output requirement is an almost impossible figure for the loudspeaker manufacturer to specify. It will depend entirely upon the type of music reproduced, size of listening room and sound level required by the listener(s).

Because B&W Matrix 1 is fitted with an especially sensitive form of APOC it would be totally reasonable not to show the upper limit of amplifier power and it is always better to have an amplifier with high power output, as this allows ample headroom for the reproduction of transients; whereas if the amplifier output is too low, clipping will occur. In effect, the loudspeaker will be fed with Direct Current and the general performance degraded.

B&W established their own Electronics Research Department for the express purpose of in-depth research into active loudspeakers, amplifiers and other items of electronic equipment. Already, products such as Active 1, MPA810 and CU810 have arrived on the market as a result of this research work. 1987 will see a further range of electronic components specifically designed to complement the performance of your loudspeakers. We suggest you ask your dealer for a comparative demonstration of these products.

The control unit

The control unit – although it deals with small voltages rather than large currents as in the case of the power amplifier – is an equally critical part of your listening chain.

Choose with care, in the knowledge that the ultimate test for audio components is critical listening.

At B&W's research department there are many different combinations of control units, amplifiers and source components such as analogue/CD players, tuners, etc. It is our experience that each unit (to say nothing of the interconnecting cable) is a variable, and the final listening chain is a combination of variables which should be carefully listened to before making a final choice.

CD player, analogue turntable and tuner

The comments in the previous paragraph apply equally to these items of equipment. CD players have now been on the market for some years and already considerable advances have been made. In its present state of development the CD player, when coupled with the best recordings made on this medium, can provide the most exceptional source material, totally worthy of the finest equipment with which it is associated.

6

T

he B&W Matrix 1 protection
circuit

This loudspeaker system is fully protected against excessive input signals. As soon as the safe upper limit for any of the drive units is approached, the protection circuit will come into operation. Overload of the bass, bass/midrange or tweeter will result in the tweeter being temporarily muted, with a consequent loss of high frequencies. As soon as this condition occurs you should reduce the volume or switch off the power amplifier. When the overload/fault condition has cleared, your loudspeaker will automatically be restored to normal operation.

7

L

oudspeaker accessories

In this section we propose to comment briefly on two essential accessories associated with your loudspeakers: stands and cables.

Stands

The choice of loudspeaker stands has a considerable influence on the performance of free-standing (as opposed to floor-standing) loudspeakers. This is in two principal areas – the stability of the loudspeaker and sound radiated by the stand. Both problems arise from the mechanical forces generated by the drive unit(s) and their associated coupling to the loudspeaker enclosure.

If we consider the problem of stability, any movement of the loudspeaker enclosure will cause a blurring of the stereo image and degradation in bass transient performance. The second problem is that sound radiated by the stand is of a highly non-linear nature and will tend to defeat the benefits of the B&W Matrix enclosure. The ideal loudspeaker stand should therefore be extremely rigid both in its own structure and in the coupling to the enclosure. It should also be acoustically 'dead' to avoid extraneous sound radiation.

We have developed a purpose-designed stand for B&W Matrix 1 which fulfils these requirements. If you have not already been shown this by your dealer, we suggest you

contact him for details.

The B&W loudspeaker stand is fitted with spikes in order to further increase stability. We recommend its use wherever possible.

Cables

The subject of cables between power amplifier and the loudspeaker has been dealt with in Section 3 under Installation.

There remains the question of interconnecting cables between the various pieces of equipment and the power amplifier. A number of excellent interconnect cables are available on the market and audible differences certainly exist between them. We suggest, therefore, that you choose one of the better cables for this purpose after consideration of the published reports.

8 Listening and record suggestions

Your B&W Matrix 1 loudspeakers take you a stage nearer listening to the music rather than to the loudspeakers. You will hear much more of the desirable ambience and detail in good recordings. Unfortunately, the faults in poor recordings will also be revealed. We list a small selection of recordings which we ourselves have enjoyed listening to – both for their music and excellence of recording.

Label	No.	Title
B&W	BW001	The Academy of Ancient Music, 'B&W Present'*
L'Oiseau-Lyre	400 080-2	JS Bach, Violin Concertos 1 & 2
	414 615-2	Josef Hadyn, Cello Concertos
	410 553-2	Pachelbel, Canon
	411 832-2	Mozart, Exsultate Jubilate
	400 086-2	Händel, Messiah Highlights
Decca	411 858-2	Händel, Messiah (complete work)
	411 929-2	Hurford, Toccata and Fugue
	400 048-2	Beethoven, Violin Concerto
London	414 273-2	Copland, Detroit SO
	410 201-2	Saint-Saëns, Organ Symphony
Philips	410 004-2	Kiri Te Kanawa, Chants d'Auvergne
	411 449-2	Haydn, Symphonies 100 & 104 (Davis)
Chandos	Chan 8313	Saint-Saëns, Piano Concerto No. 2
L'Oiseau-Lyre	DSL 09	Walton, Symphony No. 1 (Gibson)
ECM 1288	823 844-2	Shostakovich, String Quartets †
CBS/Sony	32DP 230	Eberhard Weber, Chorus
Geffen	35DP51	Miles Davis, 'You're Under Arrest' / Joni Mitchell, 'Wild Things Run Fast'
GRP Records	GRP D 9528	Billy Cobham, 'Warning'
Blue Note	CDP7 46092	Stanley Jordan, 'Magic Touch'
Windham Hill Records	WD1036	Live at Montreux

The numbers listed are all for compact discs, with the exception of the item marked †. Almost all these CDs are available on 'black disc' if required.

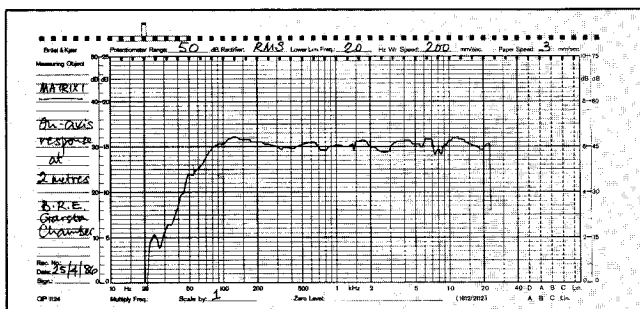
*From your B&W dealer.

Specifications

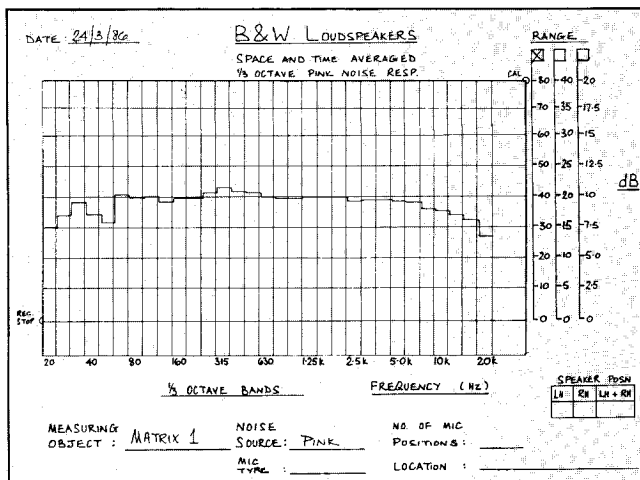
Frequency range	(-6dB points) 55Hz to 35kHz
System resonance	60Hz. System 'Q' 0.7
Free field response	listening axis \pm 2dB, 80Hz to 25kHz \pm 30° horizontal \pm 2dB to 10kHz \pm 5° vertical \pm 2dB to 20kHz
Averaged room response	See plot and caption
Sensitivity	85dB (1W 8 Ω)
Drive unit complement	Two: one 150mm (5 $\frac{7}{8}$ in) bass/midrange driver with homopolymer polypropylene cone, 31mm (1 $\frac{1}{4}$ in) voice coil on Kapton former, phenolic bonded and heat cured; one 25mm (1in) Ferrofluid-cooled tweeter with laser-optimised polyamide dome
Distortion	for 90dB SPL at 1m 2nd harmonic: < 3.0% (20Hz to 500Hz) < 1.0% (500Hz to 20kHz) 3rd harmonic: < 3.0% (20Hz to 500Hz) < 1.0% (500Hz to 20kHz)
Impedance	Modulus 4.5 Ω \pm 0.5 Ω Phase \pm 5° (essentially resistive)
Amplifier limits	50W-120W at 4 Ω (recommended)
Dimensions	Height 41cm (16in) Width 23cm (9in) Depth 32.2cm (12 $\frac{5}{8}$ in)
Weight	10kg (22lb)
Cabinet finishes	Real wood veneers of walnut, black ash, natural oak, rosewood. To special order: high gloss lacquered finish within a choice of colours

B&W Loudspeakers Ltd reserve the right to amend details of their specifications in line with technical developments.

B&W Matrix bass and bass/midrange drive units, which have a propylene homopolymer cone assembly, are manufactured under licence from CBS Inc. Patent numbers available from CBS Inc. upon request. B&W Matrix is a trademark of B&W Loudspeakers Ltd.



On axis free-field frequency response at 2m.



Third octave pink noise. Space and time averaged room response in typical domestic environment.



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