CD-4 / Quadradisc

Panasonic Technics by Panasonic JVC RCA Warner Bros. Records Atlantic

Printed in Japan

THE CD-4 HANDBOOK

A discrete point of view about the quadraphonic evolution

It's time to choose again.

To the audio industry's great credit, critical choices made during the astonishing evolution of high fidelity sound have always been made using uncompromised accuracy of reproduction and greatest creative flexibility as the final standards of judgement. The first saleable home equipment, for instance, was big and bulky—a difficult marketing problem, to say the least. But that was the only way the industry knew how to provide uncompromised state-of-the-art accuracy and greatest creative flexibility—so big and bulky it was.

When it inevitably came time to choose a single industry method of producing a stereo disc, the system chosen represented the greatest possibility for utmost accuracy and flexibility through two totally separate channels with the lowest crosstalk of information between them. Once that decision was made, "stereo" soon became a household word everywhere.

Now quadraphonic sound has truly come of age. Hardware production and sales are riding a consistently increasing sales curve. Quadraphonic software releases and sales are paralleling that curve. New technological advances are occurring almost daily.

The time has come once more for the sound industry to make another evolutionary decision—to what quadraphonic disc system should its combined technological and marketing efforts be directed?

It is a decision that should be made as quickly as possible for the benefit of producer, retailer and consumer alike. A decision that will inevitably determine the future course of high fidelity sound reproduction.

That's basically why we've put this book together. We'd like you, the concerned individual who'll be directly affected by that decision, to fully understand what we believe that choice must be: the CD-4 Compatible Discrete 4-channel disc system—the "Quadradisc." Why? Because Quadradisc is the only genuine 4-channel disc system. Because no other system offers the pure accuracy of reproduction and vast creative flexibility of Quadradisc. And it's just as simple as that.

We invite you to step into the world of the CD-4 Quadradisc. Read about it, learn about it, listen to it. Then critically compare it to any of the other proposed systems.

If history means anything at all, Quadradisc will become the key that opens up the next great dimension in sound.

Where it's at.

Just for the record.

Not even the fertile and visionary mind of Thomas Alva Edison could have imagined the full scope of what he'd started when he first captured sound on a tiny tin foil cylinder. In less than a single century, that initial permanent "record" of sound reached the ears of the world and changed the life style of its people. It became the sound of an ever-expanding industry from which millions make their living. The sound of the rich gift of music and entertainment we find at our fingertips today.

Like any developing thing, Edison's amazing little cylinder was destined to go through a lot of changes. First it was flattened into a disc made of wax. This provided a much easier recording medium to work with, and eliminated much of the background noise inherent in the cylinder. Wax soon gave way to the durability of shellac, and the 78 RPM record Grandma used to play on her windup was born.

Then came microgroove. Now an entire symphony could be recorded on one disc with far better fidelity than ever before. Equipment manufacturers quickly created mechanical and electronic gear equal to the task. The "LP" ushered in the era of "high fidelity."

The 45 RPM single play "doughnut" made its entrance in the early fifties, and hundreds of musical performers rose to stardom or melted into obscurity on its revolutions.

But the next real milestone in the art of sound reproduction was the creation of a thing called "stereo". Up until then, everything was recorded on a single track and played back through a single channel—just as though you had only one ear. But with the development of multi-track tape equipment, sound was no longer limited by the unavoidable flatness of monaural reproduction. The ability to record and reproduce 2-channel source material raised the curtain on an immensely wider stage of musical realism and creativity.

Yet stereo sound didn't make its big impact until a stereo disc system was standardized. The "stereo LP", with a totally separate channel pressed into each wall of its tiny grooves, was a great new tool for creative technician and artist alike. Multi-channel recording techniques provided far greater accuracy and depth in the final 2-channel master. New disc raw materials and pressing techniques were developed that increased durability, expanded frequency response and assured the kind of complete channel separation necessary for each speaker to reproduce a proper sound field. FM stations rapidly adapted to stereo multiplex broadcasting—a system in which two separate channels are sent out on the carrier and sub-carrier of a radio wave. Equipment manufacturers once again rose to the occasion, and a whole range of home gear designed to take full fidelity advantage of the higher quality source material soon appeared on the shelves of the local hi-fi store.

After a few years of learning what this new tool could do, the technician and the artist formed a creative alliance that turned on the world to a two-eared era of electronic imagination. It was the birth of a musical dimension that only the alliance of artistry and technology could have fostered.

Today, another dimensional word has burst into the world of sound. "Quadraphonic." 4-channel sound. Sound that surrounds. Sound that lifts the listener up and drops him right in the middle of things. Sound with a whole new experience of involvement. Sound that many experts believe is a greater advancement over stereo than stereo was over monaural.

But there was an intrinsic problem with quadraphonic sound reproduction. With tape, everything was easy. Simply record four separate channels on the tape, and play it back through four separate channels—the discrete recording process now being used on quadraphonic tapes and cartridges. But what about the prime vehicle of sound for the home listener—the record? There were only two walls on the groove, and quadraphonic sound demanded four channels of information.

The first and simplest solution was to take four channels of recorded material, scramble it in a predictable pattern into two channels, then unscramble it into four channels again with special electronic circuitry in the playback equipment. This "matrix" method worked to a degree. The enhancement it provided to otherwise straight stereo source material was clearly audible, and as a stereo enhancer, matrix 4-channel reproduction should provide the home listener with a lot of musical pleasure in the future.
But even with the best electronic matrix unscramblers ever devised, something was always lost in the 4-2-4 translation. The result was loss of the defined separation necessary for accurate reproduction of the 4-channel master tape. The only real solution was to find a way to put four totally isolated, completely separate channels on an LP disc. Somehow.

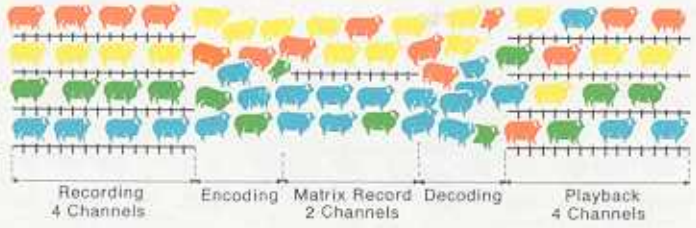
The idea captured the fancy of a team of Japanese engineers. Unable to resist the challenge, they put their full efforts behind the massive research and development program it takes to meet that kind of challenge. Using compatibility (ability to perform equally as well on stereo equipment with the equivalent durability of a stereo record) and discreteness (the maximum separation of information on each of the four channels)as their basic standards of performance evaluation, they developed the revolutionary CD-4 "Quadradisc." CD-4 means Compatibility and Discreteness on all 4 channels. The first and only quadraphonic system that combines uncompromised accuracy of reproduction and unlimited creative flexibility on a disc. Now it's inevitable.

The sound of the future will have four sides. CD-4 welcomes you to all of them.

The quadraphonic multiple choice game.

Whatever initials you christen them with, there are basically only two quadraphonic disc systems on the market—matrix and discrete. Matrix systems may be SQ, QS, or in some other form. The only discrete system is : CD-4.
Each has its own philosophy and approach to 4-channel sound reproduction. And each has certain advantages and disadvantages.
But before any valid comparison can be made, a firm understanding of the basic techniques of each system is an absolute must. We offer the following capsulized descriptions and detailed illustrations towards that end.

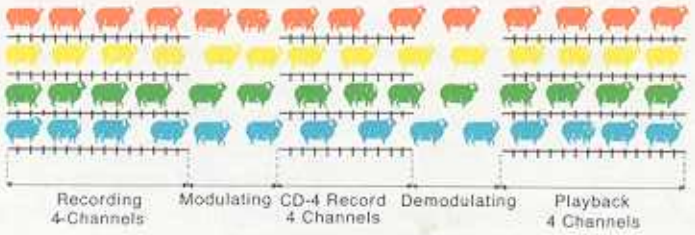
The 4-2-4 Matrix system



Mixed sound after interchange over each channel.

Four channels of discrete information are mixed (encoded) into two channels, then unmixed (decoded) into four-channels during playback. Note the "lane changing" of information that inevitably occurs during the 4-2-4 process.

The 4-4-4 Discrete System



Pure and unmixed sound from start to finish.

By recording the sum of front and rear channels in the audible region and the difference between front and rear channels as modulated FM signals in the 20 – 45 kHz region, four discrete channels can be maintained from master tape to loudspeakers—yet remain fully compatible with mono or stereo playback equipment.

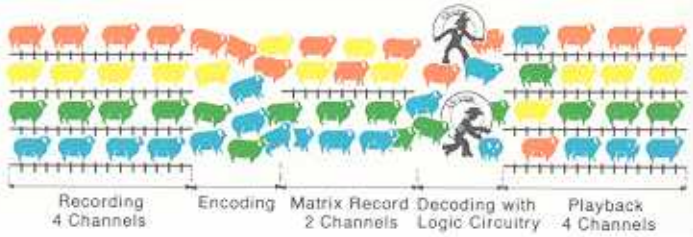
The Matrix System

In theory, the matrix system appears to be the simplest and most logical approach to the quadraphonic disc. Just take four separate channels of information, electronically scramble them together in a predetermined pattern or matrix, and put this 2-channel matrix on a standard stereo disc. Then all you had to do was develop a device that could decode that matrix during playback and restore the sound as closely as possible to the four discrete tracks of the original master tape.

Sounds easy enough. No major changes necessary in record material, cutting and pressing techniques, or FM broadcasting. Just some extra electronic circuitry, four speakers, and you were ready for the quadraphonic record.

But one problem—and apparently an unsolvable one—flaws the matrix theory. Once those four original discrete channels are mixed together, there is no known way to recover them exactly as they were. What happens during the "4-2-4" process is a blending of information between channels, sometimes to the point where some channels become nearly indistinguishable from others. This mingling of information is called "crosstalk", and the result is varying degrees of separation loss.

Unfortunately, even the best matrix decoders with sophisticated phase shift and logic circuitry can't prevent crosstalk, nor can they provide the kind of channel separation we've come to expect from stereo. A decent stereo system has channel separation of around 20-25 dB. But unless your matrix quadraphonic home equipment has full logic circuitry (and less than 20% of the products made today do), channel separation can drop to as low as 3 dB during the matrix decoding process.



That's very close to being monaural sound, and far less than necessary for acceptable reproduction of the quadraphonic sound fields portrayed on 4-channel masters.

Where the matrix system really shines, however, is in its ability to enhance standard stereo records. Anyone who's heard their favorite stereo LP played through a good matrix system will testify to that. For that reason alone, it's an advantage to have matrix circuitry in your quadraphonic playback equipment.

The Discrete System

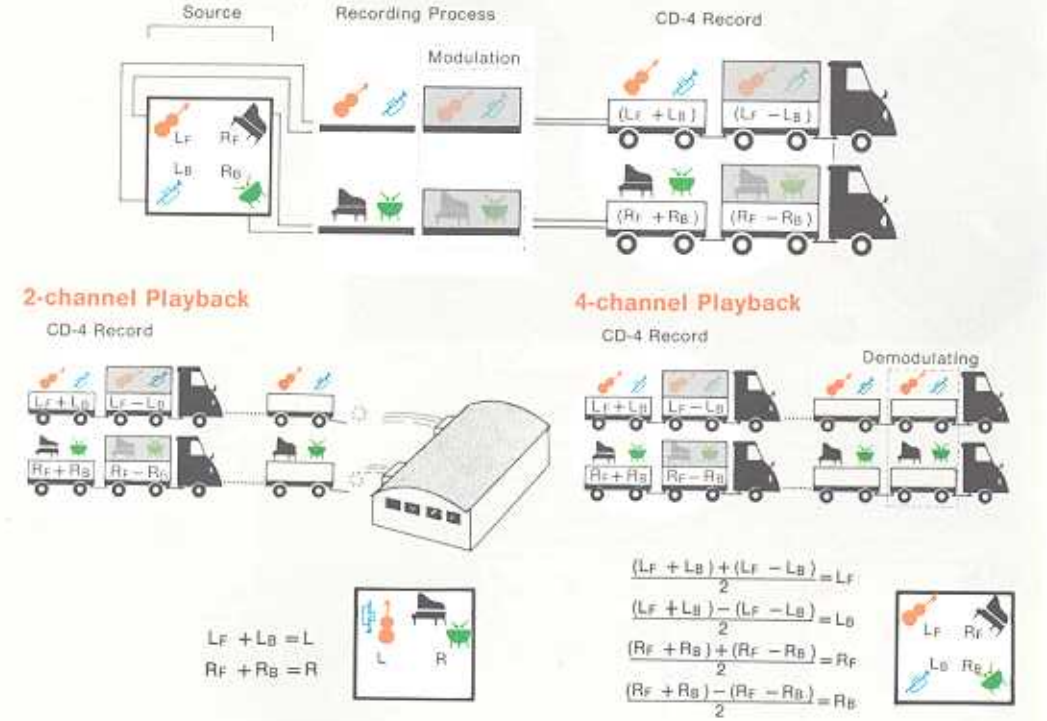
The discrete approach to the quadraphonic disc represented an entirely different point of view right from the beginning. Unwilling to accept the limitations of existing technology, discrete-devoted engineers recognized the pure necessity of four completely separate channels on a disc—and then set out to produce one.

First, they looked at the signal being put on the standard 45-45 stereo record groove—up to 18,000 Hertz on better records. But why, they reasoned, must that be the upper limit? Available techniques permitted pressing up to 45,000 Hertz on the groove wall. Cartridge technology was such that a cartridge could be produced that would accurately track at such frequencies and higher.

Then why not record the sum of front and rear channels in the normal audible region and the difference between front and rear channels as ultrasonic modulated FM signals up in the 20-45,000 Hz region? That way, the resulting disc would be fully compatible with existing stereo equipment, yet provide four totally discrete channels of information with the proper playback equipment. Since the two signals are so far apart in the frequency spectrum, the possibility of interference would be eliminated.

Then all that was needed was some good FM demodulation circuitry in the playback equipment—the kind that's

CD-4 Recording and Playback Processes



been used in FM stereo multiplexing for years—and a stylus capable of delivering the ultrasonic frequency response required.

Utilizing this new concept, the artist, engineer and record producer would for the first time be able to use the unlimited creative freedom afforded through the discrete channel medium—and the listener would be able to hear everything that creative freedom had to offer with absolute accuracy—all in an amazing new disc.

The result was Quadradisc.

Will the real 4-channel disc please stand up?

A lot of new developments had to take place before the CD-4 discrete Quadradisc process could become a viable concept in the quadraphonic marketplace. A tribute to today's audio technology, all of those necessary developments have been accomplished with the uncompromising concern for accuracy and artistic freedom that has been the very foundation of the discrete disc philosophy.

One of the basic requirements of the Quadradisc, for instance, was to provide the consumer with a product that had at least equivalent durability and performance life of its stereo counterpart. Record companies soon came up with new materials that were significantly harder with lower noise characteristics

The Quadraphonic Sound Field

A clear look at the type of sound fields created by discrete and matrix systems. Diagram A represents the exact sound field produced by the original 4-channel master tape. Diagram B shows the crosstalk inevitable in a matrix system.

A Discrete Quadraphonic Sound Field

(A)

A Matrix Quadraphonic Sound Field

(B)

Quadradisc Effects

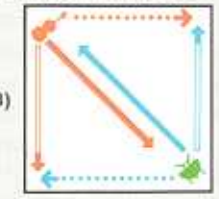
Some illustrations of the effect flexibility and accuracy possible only with Quadradisc.

(a) A direct sound may be assigned to a single channel, while the remaining three may be used for its natural ambience. Since crosstalk is absent in the discrete system, the effect is totally accurate.

(A)

(b) "Panning" (the ability to move the location of a sound within the sound field) is possible **in any direction**—even overhead. Absence of crosstalk makes these movements as clear and precise as the original 4-channel master tape.

(B)



(c) The "stage-hall" relationship—particularly important in classical music—remains pure and uncolored because of discreteness. The orchestra always remains up front, while rear speakers provide necessary natural ambience.

(C)

(d) A soloist can be placed in the center of the room, while four totally separate instruments or groups of instruments appear in each corner—a unique discrete listening experience.

(D)

than ever before possible. This new Quadradisc compound actually adds to performance longevity up to 50% and will soon be used for producing top quality stereo records.
Several cartridge manufacturers designed and now produce fine ultra-broadband cartridges fully capable of reaching the upper limits of the quadradisc—and beyond.
A whole new shape in styli—the Shibata type—was conceived and perfected.
This new super-stylus meant greatly increased frequency response and significantly decreased record wear.
Extra-precision cutting, mastering and pressing techniques were required and implemented—another quality advancement that will eventually spill over into stereo products. Demodulation systems were designed that deliver four discrete channels of sound equivalent in separation to some of the finest stereo recordings—without adding noise or coloration of its own to the signal.

A new shape in styli that means greater wall area contact and ultra-sonic frequency response—yet with less wear force on the record than an elliptical stylus. Other styli with the same Shibata stylus effect have been developed.

The effect of tracking force (2 grams) on a disc using a SHIBATA stylus.

The effect of tracking force (2 grams) on a disc using a conventional elliptical stylus.

Now the CD-4 Quadradisc is the potent force it deserves to be in the audio marketplace. Artists and producers who've used the system extol its virtues and proclaim it a creative tool destined to spawn new vistas of musical involvement. More and more record companies are producing their top talent on CD-4 Quadradiscs.
More and more hardware manufacturers are including CD-4 demodulation circuitry in their 4-channel products, less and less are providing the more costly full logic matrix circuits.

Will the real—and only—4-channel disc please stand up?

Thank you. Quadradisc.

Getting hooked on CD-4.

Getting hooked on CD-4 is a lot easier than it may sound.

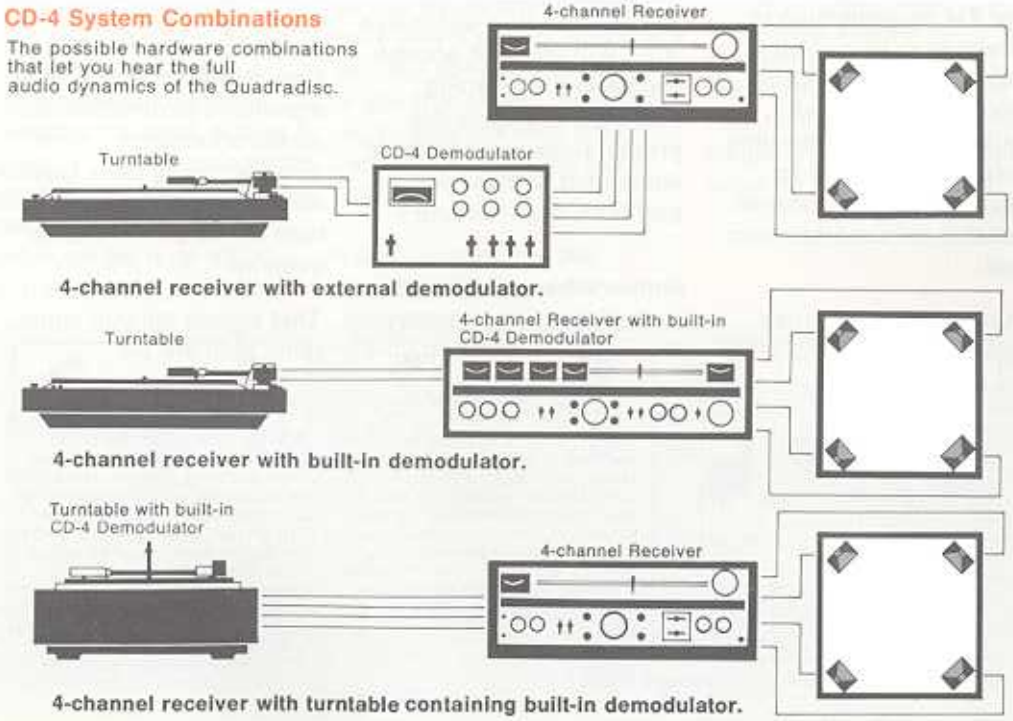
Begin with a basic 4-channel playback system—a good turntable, a 4-channel receiver (or amplifier), and four speakers closely matched in efficiency that please your listening preferences. Add to the turntable one of the many excellent cartridges designed for CD-4 disc reproduction, preferably with the Shibata or equivalent stylus. Now add a CD-4 demodulator, externally or built into the turntable or quadraphonic receiver.

Now pick out some of your favorite musical artists from the evergrowing Quadradisc list. Then take them home, listen to them, and as one Quadradisc reviewer so graphically stated, hear "a sonic diamond that really sparkles!"

If you haven't already experienced the indescribable surround of sound provided by the CD-4 Quadradisc, we can only suggest that you ask your favorite hi-fi dealer to demonstrate it to you. If his equipment is properly arranged, it won't take long to convince you that we're now living in the year of 19CD-4.

CD-4 System Combinations

The possible hardware combinations that let you hear the full audio dynamics of the Quadradisc.



CD-4 is in the air.

As it was during the initial development of stereo, the FM broadcasting medium is lagging behind the rest of industry in its commitment to 4-channel. This is not to fault the FM broadcasters, however. To the contrary, it is prudent policy on their part.

The reasons are simple when looked at through the perspective of the station owners and operators. Although some stations utilize tape source material, most FM programming is derived from disc. That means the purchase and installation of special quadraphonic broadcasting equipment designed to utilize the source material available on quadraphonic discs.

But before the FM broadcaster is willing to commit himself to the expenditure and format alterations required to make the changeover to 4-channel transmission, he must be totally satisfied with the answers to some very important questions. For instance, will there be enough quadraphonic source material to fill his huge appetite?
What will the standard quadraphonic disc process be? What kind of equipment will he need to assure good quality quadraphonic transmission and how expensive is it? Will there be enough people in his listening audience who have the proper 4-channel receiving equipment to make this a profitably wise venture?

Some of these questions have already been answered. The rapidly expanding library of quadraphonic software and the increasing sales of quadraphonic hardware will assure him of material to play and an adequately large audience to listen to it.

Other questions, however, still remain unanswered—but not for long. A long series of comparative tests using the discrete disc and all of the newly developed discrete 4-channel transmitting systems is in its final stages. It is felt by most broadcasters that once the results of this test are fully compiled, an FCC decision on the standard method of quadraphonic broadcasting would be less than a year away.

One final observation. It is significant to note that all systems being tested are discrete, using CD-4 Quadradiscs and discrete 4-channel tape as the prime source material.

That should tell you something is in the air.

Fig. (1)

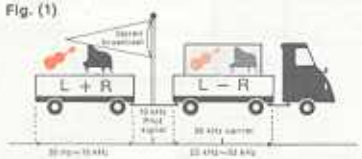
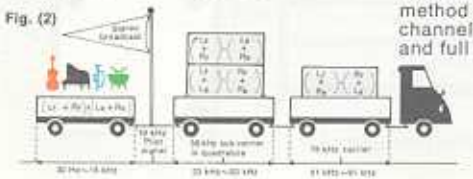


Fig. (2)



The Discrete Broadcasting System

Fig. (1) shows the stereo FM method of broadcasting used today, with the main base signal carrying the sum of left and right channels, and the subcarrier providing the difference between left and right channels. This method allows for two discrete channels of stereo information and full monaural signal as well.

Fig. (2) illustrates the proposed discrete quadraphonic broadcasting system. Here the main signal carries the sum of all channels (mono) while an "in phase" subcarrier provides standard stereo reproduction. A second subcarrier and a "quadrature" subcarrier deliver the remaining information needed to broadcast discrete 4-channel information and reproduce it exactly as it appears on the tape or Quadradisc source material at the station.

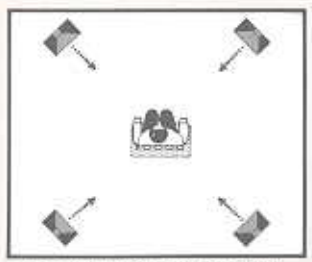
Suggested speaker placement for CD-4 listening.

Your room furnishings were probably arranged before you joined the ranks of quad high fidelity music listeners. Here are some tips and insight to get the most from your new listening experience. First remember that each set-up is as unique and personal as the individuals who listen to it. Don't be afraid to experiment. Moving a speaker toward a corner increases the bass, just as in stereo. If you hear too much bass for your taste move the speaker away from the corner, or get it up off the floor by placing it on the stand or mounting it on the wall.

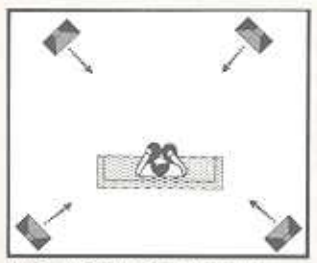
The first step is to decide where you will sit for your most serious listening—perhaps a favorite chair or sofa. Then locate the front speakers directly across from the listening sofa just as you would if the system were only a stereo. Now place the rear speakers in back of you if possible, remembering to keep the rear left on the same side as the front left.

It often occurs that the desired listening seats are on a sofa which is against a wall, making it impossible to move the speakers in back of you. In this case if you simply put the speakers against the wall on each side of the couch, you will be literally listening to the back of the speaker. This is hardly ideal. Hanging the speakers up high toward the ceiling or putting them at the extreme left and right with a slight angle will improve the depth of sound.

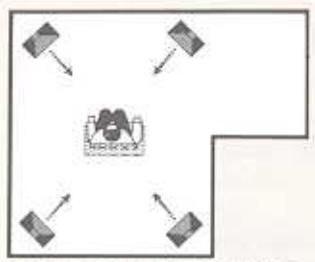
Although quad requires a little more attention to speaker placement than stereo, the end listening result will be a much larger listening area than you can hope for from stereo.



The ideal location of speakers and listeners. The serious listener may insist on being at the center, even if furniture must be rearranged.



In this configuration the rear speakers may be placed slightly above the listeners and mounted on the wall for excellent coverage of the listening area. If the speakers have narrow dispersion, angle them slightly to provide for adequate coverage.



For a typical living room/dining room combinations in contemporary homes, this arrangement may serve to illustrate an idea that will make an effective quad environment.

"I've already chosen."

Advocates of the CD-4 Compatible Discrete 4-Channel Disc are an unusually enthusiastic bunch. Because once anyone involved with the art of sound reproduction—be it artist, producer, engineer or industry leader—becomes involved with CD-4, avid enthusiasm for its uncompromised sonic accuracy and unlimited creative flexibility is a natural result.

Listen to what a few of this growing group of CD-4 devotees have to say about the discrete disc. Once you do, you won't find it difficult to understand why CD-4 has become the overwhelming choice of professionals who won't accept anything less than the very best in sound reproduction.

Hugo Montenegro

"CD-4 means freedom."

"The fact is that 4-channel sound has opened up a new world of creativity for the composer/arranger/producer. We now have the freedom to surround the listener with any sound environment our imaginations can conceive. The freedom to locate a sound anywhere within the environment. And the freedom to manipulate and move sound in any direction.

"But these new freedoms can only exist—and be utilized, if the final product can be faithfully reproduced on disc without any limitations. Of the several quadraphonic disc formats on the market, in my opinion, only the compatible discrete 4-channel record meets these criteria. That's why, to me, CD-4 means freedom."

Henry Mancini

Quadraphonic the new sound

"Quad shouldn't be compared to stereo," says Mancini. "It's a whole new listening experience, a real wrap around sound. Actually, it's an extension into the home of the new techniques that have been developed for wide-screen movies, mixed media shows and the new environments in which the listener is completely immersed in sound. It's amazing what it does for any kind of music, from Mozart to Sousa to Jazz. I have my own system in my billiard room in Malibu with four speakers mounted in corners. With Sousa in quad, the bold lines of the writing and the bright colors of the instruments come jumping out of the speakers. I get that 50-piece band marching right into the room."

Jac Holzman

"Our commitment to CD-4 was the result of almost two years of exhaustive research by the Warner/Elektra/Atlantic engineering team. Involved was a scrupulously detailed evaluation of all competing quad systems. Only then did we make our decision," says Jac Holzman, Senior Vice President, Warner Communications and Chairman Quadraphonic Planning Group of the Warner/Elektra/Atlantic Labels.

"Why CD-4? The WEA labels are blessed with an awesome roster of talent. Frank Sinatra. Carly Simon. Gordon Lightfoot. Aretha Franklin. The Doobie Brothers. Bread. Deep Purple. Alice Cooper. Mystic Moods. Seals and Crofts. Judy Collins. Artists of this magnitude demand the ultimate in state-of-the-art recording technology. They deserve the only 4-channel disc that encourages full creative freedom without limitation or compromise. "And, they'll settle for nothing less.

"Our software efforts, when added to comparably vigorous thrusts by RCA and other important CD-4 recording companies, provides continuing dramatic evidence of our far-reaching commitment to CD-4. Everyone, from hardware manufacturer to retailer to customer can be assured there will always be CD-4 product. "The public gets a fair deal, too. With CD-4, the record buyer—with his quality equipment—doesn't have to settle for a disc that is 'less discrete' than the quad tape he plays over his more modest car system.

"Today's CD-4 discs stand toe to toe with any stereo product. In frequency response, total playing time and in physical durability. And, they play true quad."

Richard Perry

a man who knows what he's talking about talks about CD-4:

Richard Perry is one of the main men in the music business today. Not only is he the brilliant independent producer for Ringo Starr, Carly Simon, Barbra Streisand, Harry Nilsson and Ella Fitzgerald, he's also a twice-named producer of the year with 10 gold albums and 5 gold singles to his name. In other words, when Richard Perry talks about CD-4, he knows what he's talking about.

"I think I can sefely say I've been involved with virtually every kind of music that's being produced today. The more we get into four-channel recording, four-channel mixing, and creating special effects, the more we want the most faithful reproduction of our efforts. I'm confident when I say that CD-4 is the truest reproduction there is.

"I'm concerned with the total musical environment I create. I want my music to be as exciting visually as it is musically. The only way to achieve this potential today is to do the disc in CD-4.

"One of the highest moments I've ever experienced in a studio was the first time I heard my work back in four-channel. What I heard really made me believe that CD-4 is the only way to go."

The CD-4 roster.

It doesn't make any difference how good the quadraphonic disc recording process is. If the audio hardware manufacturers don't produce the equipment you need to hear it in all its glory at home, it isn't worth a hoot. But again, that takes a major commitment on the part of the hardware manufacturer. It means new designs, new tooling, new models, new marketing direction. It means that he has to believe in the technical and sales viability of the product strongly enough to invest the many thousands of dollars required to make that kind of production and marketing conversion.

That's why we're exceptionally proud of the growing roster of hardware manufacturers who have joined the CD-4 ranks. Today, there are more than 25 CD-4 cartridges to choose from. And at latest count, more than 50 electronic equipment manufacturers include CD-4 demodulation capabilities in their quadraphonic products—over 5 as many as those who provide full logic matrix circuitry. An absolute must, by the way, for matrix performance that even begins to approach the separation quality of CD-4, and then only under certain performance conditions.

Look through the following list of hardware manufacturers who think enough about the potentional of CD-4 to make their equipment completely ready for the significant marketplace it represents.
You might come to the conclusion that most hardware manufacturers have already made their choice, too.

Equipment Manufacturers

AKAI
Audio World
B & O
B.G.W.
Brother
Clarion
Cybernet
Crown Radio
Denki Onkyo
Electrohome
Fisher
Foster
General
Gladding Claricon
Harman Kardon
Heath
Hitachi
JVC
Kenwood
Kokusai Musen
Magnavox
Marantz
Miida
Mitsubishi
Muntz
NEC
Nikko
Nippon Columbia
Noresco
Onkyo
Panasonic
Philips
Pilot
Pioneer
Plessey
Quadrasonics
RCA
Roland
Rotel
Sanyo
Sansui
Sharp
Sherwood
Shin Shirasuna Denki
Sonab
Standard
Superscope
Sylvania
Tanasawa
Technics by Panasonic
Terutron
Toshiba
Union
Wells Gardner
Yamaha

Cartridge Manufacturers

ADC
Audio Technica
B & O
Elac
Empire
Grace
Grado
JVC
Micro Acoustic
Ortofon
Panasonic
Pickering
Pioneer
Stanton
Toshiba

The sound on CD-4.

Many of the world's great musical artists have already made their CD-4 debut. We think it's an impressive list and present it here for your convenience.

ATLANTIC

The Modern Jazz Quartet Blues Are Back	QD-1652
Charles Mingus Mingus Moves	QD-1653
Billy Cobham Spectrum	QD-7268
Roberta Flack Killing me Softly	QD-7271
Herbie Mann Hold On I'm Comin'	QD-1632
Raunch'N' Roll Live Black Oak Arkansas	QD-7019
Donny Hathaway Extension of A Man	QD-7029
Bette Midler The Divine Miss M	QD-7238
The Spinners The Spinners	QD-7256
Aretha Franklin The Best of Aretha Franklin	QD-8305
Duke Ellington New Orleans Suite	QD-1580
Gil Evans Svengali	QD-1643
Aretha Franklin Live at Fillmore West	QD-7205
Mike Oldfield Tubular Bells	QD13-105
Eric Clapton 461 Ocean Blvd.	QD-4801
George Flynn John Cage	QD-9006
Bill Wyman Monkey Grip	QD-79100
Eric Salzman Wiretap	QD-9005
Herbie Mann Reggae	QD-1655
Average White Band	QD-7308
J. Geils Band Nightmares	QD-18107
Spinners New And Improved	QD-18118
Kahlil Gibran The Prophet	QD-18120
The Modern Jazz Quartet The Last Concert	QD2-909

RCA

POPULAR

Hugo Montenegro Love Theme from "The Godfather"	APD1-0001
Henry Mancini Mancini Salutes Sousa	APD1-0013
Hugo Montenegro Scenes & Themes	APD1-0025
Danny Davis and The Nashville Brass Travelin	APD1-0034
Nat Stuckey Take Time to Love Her/ I Used It All on You	APD1-0080
Carolyn Hester	APD1-0086
Henry Mancini, Doc Severinsen Brass, Ivory and Strings	APD1-0098
Perry Como And I Love You So	APD1-0100
The Jimmy Castor Bunch Dimension III	APD1-0103
The Guess Who - #10	APD1-0130
Hugo Montenegro Nail's Diamonds	APD1-0132
José Feliciano Compartments	APD1-0141
Dottie West If It's Alright with You/ Just What I've Been Looking For	APD1-0151
Floyd Cramer Super Country Hits	APD1-0155
David Clayton Thomas	APD1-0173
Charley Pride Sweet Country	APD1-0217
Danny Davis and The Nashville Brass Caribbean Cruise	APD1-0232
Jerry Reed Lord, Mr. Ford	APD1-0238
The Best of The Guess Who Vol. II	APD1-0269
Henry Mancini, His Piano, Orch. and Cho. Country Gentleman	APD1-0270
The Friends of Distinction Greatest Hits	APD1-0276
Dolly Parton Bubbling Over	APD1-0286
Floyd Cramer Class of '73	APD1-0299
Nilsson Schmilsson	APD1-0319
Jefferson Airplane Volunteers	APD1-0320
Chet Atkins Superpickers	APD1-0329
Charley Pride Amazing Love	APD1-0397
The Guess Who Road Food	APD1-0405
B.W. Stevenson Calabasas	APD1-0410
Hugo Montenegro Hugo in Wonder-Land	APD1-0413
Elvis Presley Elvis-Aloha from Hawaii Via Satellite	VPSX-6089
Hair (The American Tribal Love Rock Musical)	ABD1-0245
The New Birth It's Been a Long Time	APD1-0265
Danny Davis Nashville Brass in Bluegrass Country	APD1-0565
Floyd Cramer The Young and the Restless	APD1-0469
Ronnie Milsap Pure Love	APD1-0500
Harry Nilsson Pussy Cats	APD1-0570
Jim Ed Brown It's That Time of Night	APD1-0572
Perry Como Perry	APD1-0585
Stephen Michael Schwartz	APD1-0604
Elvis Recorded Live on Stage in Memphis	APD1-0606
Dottie West House of Love	APD1-0543

However, many new CD-4 albums featuring the most popular artists of today are scheduled for release after the printing of this publication. For the most current list of CD-4 Compatible Discrete 4-Channel Discs, check with your local record retailer.

Floyd Cramer In Concert	APD1-0661
The Gil Evans Orchestra Plays the Music of Jimi Hendrix	APD1-0667
Henry Mancini Hangin' Out With Henry Mancini	APD1-0672
The Jazz Piano Quartet Let It Happen	APD1-0680
Jefferson Starship Dragon Fly	APD1-0717
Charely Pride Pride of America	APD1-0757
Danny Davis and the Nashville Brass Latest and Greatest	APD1-0774
The Hues Corporation Rockin' Soul	APD1-0775
The Guess Who Flavours	APD1-0836
Hugo Montenegro Others by Brothers	APD1-0784
Harry Nilson Duit on Mon Dei	APD1-0817
Ronnie Milsap A Legend in My Time	APD1-0846
Elvis Presley Promised Land	APD1-0873
Floyd Cramer Piano Masterpieces 1900-1975	APD1-0893

RED SEAL

Ormandy/The Philadelphia Orch. The Fantastic Philadelphians Vol. 1	ARD1-0002
Ormandy/The Philadelphia Orch. Shostakovich: Symphony No. 15	ARD1-0014
Dr. Teleny's Incredible Plugged in Orchestra-Ken Howard and Alan Blaikley Present Stolen Goods Gems Lifted from the Masters	ARD1-0015
Ormandy/The Philadelphia Orch. The Fantastic Philadelphians Vol. 2	ARD1-0017
Ormandy/The Philadelphia Orch. Sibelius: Symphony No. 2	ARD1-0018
Ormandy/The Philadelphia Orch. Bach's Greatest Fugues	ARD1-0026
Ormandy/The Philadelphia Orch. Tchaikovsky: Suite from "The Nutcracker"	ARD1-0027
Ormandy/The Philadelphia Orch. Rimsky-Korsakov: Scheherazade	ARD1-0028
Ormandy/The Philadelphia Orch. Debussy: La Mer Ravel: Daphnis and Chloe: Suite No. 2	
Debussy: Prelude to the Afternoon of a Faun	ARD1-0029
Ormandy/The Philadelphia Orch. Tchaikovsky: Suite from "Swan Lake"	ARD1-0030
Rubinstein; Ormandy; The Philadelphia Orch. Rachmaninoff: Concerto No. 2	ARD1-0031
Al Stewart's Museum of Modern Brass	ARD1-0032
Fiedler/Boston Pops Greatest Hits of the '70s	ARD1-0035
Virgil Fox Heavy Organ at Carnegie Hall	ARD1-0081
Ormandy/The Philadelphia Orch. Tchaikovsky: Suite from "The Sleeping Beauty"	ARD1-0169

Ormandy/The Philadelphia Orch.
"The Yellow River" Concerto (Daniel Epstein, Pianist)
Folk Song: "San Pel" (Chinese Workers and Peasants March); Sousa: "The Stars and Stripes Forever"; Respighi: Pines of Rome ARD1-0415
Joseph Payne
Spaced-Out Bach ARD1-0439
Virgil Fox
Heavy Organ at Carnegie Hall Vol. 2 ..... ARD1-0477
Fox: Ormandy/The Philadelphia Orch.
Saint-Saens: Symphony No. 3 In C Minor, Op. 78 ("Organ") ARD1-0484
Isao Tomita
Snowflakes Are Dancing ARD1-0488
Fiedler/Boston Pops
Greatest Hits of the '70s, Vol. 2 ..... ARD1-0552
Stokowski/London Symph. Orch.
Tchaikovsky Symphony No. 6 in B Minor ("Pathetique") ARD1-0426
Ormandy/The Philadelphia Orch.
Spectacular Overtures ARD1-0453
Serebrier/London Philharmonic Orch.
The John Alldis Choir-Ives Symphony No. 4 ..... ARD1-0589
Ormandy/The Philadelphia Orch.
Ives: Symphony No. 2 ..... ARD1-0663
Ormandy/The Philadelphia Orch.
Tchaikovsky Symphony No. 5 in E Minor ARD1-0664
Ormandy/The Philadelphia Orch.
Tchaikovsky Symphony No. 4 in F Minor ARD1-0665
Virgil Fox
The Entertainer ARD1-0656
G. Solti/London Philharmonic Orch.
The John Alldis Choir-Puccini/ La Boheme ARD2-0371
Levine/New Philharmonic Orch.
Verdi: I Vespri Siciliani ARD1-0566
Mehta/New Philharmonic Orch.
Puccini: Tosca ARD1-0567
Gerhardt/National Philharmonic Orch.
Citizen Kane-The Classic Film Scores of Bernard Herrmann ARD1-0707
Gerhardt/National Philharmonic Orch.
Sunset Boulevard-The Classic Film Scores of Franz Waxman ARD1-0708
Fedor Leinsdorf/New Philharmonic Orch.
Tchaikovsky: Violin Concerto in D ARD1-0781
Gerhardt/National Philharmonic Orch.
Casablanca-Classic Film Scores for Humphrey Bogart ARD1-0422
Julius Rudel/New Philharmonic Orch.
The Ambrosian Opera Chorus, Anna Moffo-Jules Massenet/Thais ARD3-0842
Peter Maag/New Philharmonic Orch.
The Ambrosian Opera Chorus, Anna Moffo-Heroines from Great French Operas ARD1-0844
Tomita-Pictures at An Exhibition ARD1-0838
C. Gerhardt/National Philharmonic Orch.
Spellbound/The classic Film Scores of Miklos Rozsa ARD1-0911

ELEKTRA

Mickey Newbury
Frisco Mabel Joy EQ-4107
Carly Simon
Bread EQ-4082
Baby I'm-A Want You EQ-5015
Judy Collins
Colors Of The Day EQ-5033
The Best of the Doors EQ-5035
Carly Simon
No Secrets EQ-5049
The Best of the New Seekers EQ-5051
The Best of Bread EQ-5056
Stardrive
Intergalactic Trot EQ-5058
David Gates
First EQ-5068
Joni Mitchell
Court and Spark EQ-1001
Carly Simon
Hotcakes EQ-1002
Bob Dylan
Planet Waves EQ-1003

ASYLUM

The Eagles
On The Border EQ-1004
The Souther, Hillman Furay Band EQ-1006
Jackson Browne
Late For The Sky EQ-1017
Sergio Mendes EQ-1027
David Gates
Never Let Her Go EQ-1028
Judy Collins
Judith EQ-1032
Carly Simon
Playing Possum EQ-1033
Tony Orlando & Dawn
He Don't Love You EQ-1034

WARNER BROS.

Seals & Crofts
Summer Breeze BS4-2629
America
Holiday W4-2698
Randy Newman
Good Old Boys MS4-2193
Maria Muldaur
Waitress in the Donut Shop MS4-2194
Jethro Tull
Aqualung CH4-1044
Jethro Tull
War Child CH4-1067
Allman Brothers Band
At Fillmore East CX4-0131
Seals & Crofts
Unborn Child WS4-2761
The Doobie Brothers
What Were Once Vices WS4-2750
Alice Cooper
Muscle of Love BS4-2748
The San Sebastian Strings
Summer BS4-2707
Seals & Crofts
Diamond Girl BS4-2699
The Doobie Brothers
The Captain and Me BS4-2694
Alice Cooper
Billion Dollar Babies BS4-2685
James Taylor
One Man Dog BS4-2668
Deep Purple
Machine Head BS4-2607
Black Sabbath
Paranoid WS4-1887
Frank Sinatra
Some Nice Things I've Missed F4-2195
Gordon Lightfoot
Sundown MS4-2177
Frank Sinatra
Ol' Blue Eyes Is Back FS4-2156
Arlo Guthrie
Last of the Brooklyn Cowboys MS4-2142
Frank Sinatra
Frank Sinatra's Greatest Hits Vol. 2 ..... FS4-1034
Frank Sinatra
My Way FS4-1029
Frank Zappa
Apostrophe DS4-2175
The Mothers
Over-nite Sensation DS4-2149
Mystic Moods
Love the One You're With BS4-2577
Doobie Brothers
Toulouse Street BS4-2634
Mystic Moods
Highway One BS4-2648
Sounds in Motion BS4-2656
Mystic Moods
Awakening BS4-2690
Mystic Moods
Clear Light BS4-2743
Grn Brd. South
Sounds of Railway Steam Engines (Railroad Sounds) BS4-2751
Last Train to Waterloo BS4-2757
Mystic Moods
Erogenous BS4-2786
Storm and the Sea BS4-2788
Graham Central Station BS4-2763
Deep Purple
Stormbringer BS4-2632
The Doobie Brothers
Stampede BS4-2635

REPRISE

Dionne Warwicke
Then Came You BS4-2846
Seals & Crofts
I'll Play for You BS4-2848
America
Hearts BS4-2852
Gordon Lightfoot
Cold On The Shoulder BS4-2206
Frank Sinatra
The Main Event BS4-2207
The Allman Brothers Band
Eat a Peach 2D4-0102

NONESUCH

Varese
Offrandes, Integrales, Octandre, Equatorial HQ-1269
Early American Vocal Music
Kurt Weill
Music From The Threepenny Opera/DARIUS MILHAUD
La Creation Du Monde HQ-1281
George Rochberg
String Quartet #3 ..... HQ-1283
Piano Music by
George Gershwin HQ-1284
Vecchi
L'Amfiparnaso HQ-1286
PerCussion Music HQ-1291
Crumb
Makrokosmos, Volume 1 ..... HQ-1293
Cornet Favorites HQ-1298
Festival of Trumpets HQ-1301

JVC

Wonderful CD-4 Sound CD4B-5001
New Creative Sounds/The Dock of the Bay CD4B-5002
The Latest Film Themes/ The April Fool CD4B-5003
I Dream of Naomi/ The Sound Limited CD4B-5004
Love Story and Other Great Movie Themes CD4B-5005
4 Dimensions by 4 Saxes CD4B-5006
Toshiko Akiyoshi/ The Personal Aspects in Jazz CD4B-5007
Latin Rhythm Festival CD4B-5008
Rock & Drums/Eleanor Rigby CD4B-5009
Green Green Grass of Home/ Country Songs CD4B-5010
Rock & Drums/Free CD4B-5012
Harlem Nocturne Fascinating Tenor Sax CD4B-5014
Moog Sound/Black Magic Woman CD4B-5015
Your Favorite Russian Folk Songs CD4B-5021
Bridge Over Troubled Water CD4B-5023
Beyond The Reef/Hawaiians CD4B-5024
Uramachi Jinsei/Male Vocal CD4B-5025
Dazzling Trumpets/Flight of The Bumble Bee CD4B-5026
Frank Nagai/Male Vocal CD4B-5029
Godfather/Tenor Sax CD4B-5031
The Shadow of Your Smile/ Fantastic Sound CD4B-5032
Latin Drums/Spinning Wheel CD4B-5033
Exodus CD4B-5034
Golden Screen Themes/ The Graduate CD4B-5036
Victor CD-4 Sound Orchestra Excellent CD-4 Sound (II) CD4B-5037
The More I See You/Piano CD4B-5038
Mina Aoe Big Hit/Female Vocal CD4B-5039
Yuri Furi Suri/ New Dimensions Group CD4B-5040
Victor Orchestra and Latin Rhythm Boys Latin Festival CD4B-5042
Folk & Rock CD4B-5044
The Garmets
Moog Electric Sounds CD4B-5045
Eiji Kitamura and others
Eiji Kitamura on Stage: Swingin' Clarinet CD4B-5046
H. Matsumoto and other
Golden Jam Sessions at Junk CD4B-5049
Victor Orchestra
The Latest Screen Music Best 12 ..... CD4B-5050
CD-4 Sound Orchestra
CD-4 Sound Special/
Also Sprach Zarathurtra CD4B-5063

The Jewels of the Madonna/ Nini Rosso CD4W-7001
My Shawl CD4W-7002
The World of Francis Lai CD4W-7003
Days of Youth and Cherry Blossoms CD4W-7004
Marches of The World CD4W-7005
Art Blakey and The Jazz Messengers CD4W-7006
Mambo Jambo CD4W-7007
The World of Michel Legrand CD4W-7008
Godfather/Sound of Cine Action CD4W-7010
The Godfather/Nini Rosso CD4W-7013
Nini Rosso in Concert CD4W-7015
Mandolin Serenade CD4W-7016
One For Lady Live Jazz/ Kimiki Kasai, Mal Waldron CD4W-7017
Golden Screen Music CD4W-7019
Russian Folk Songs/Nini Rosso CD4W-7020
Cuarteto Roberto Pansera La Cumparsita CD4W-7021
Glenn Miller Orchestra A Strong of Pearls CD4W-7023
Glenn Miller Orchestra Moonlight Serenade CD4W-7024
Orquesta Frencini/Pontier Tanguera/Frencini with Pointer CD4W-7025
Lady Sings The Blues CD4W-7029
Nini Rosso Adoro CD4W-7030
Golden American Screen Themes CD4W-7031
Jack de Mello Hawaiian All Stars Hawaiian Sound In CD-4 ..... CD4W-7032
The Film Studio Orchestra The Poseidon Adventure CD4W-7033
Los Quilla Huasi El Condor Pasa CD4W-7034
Paul Yoder and His Brass Orchestra Marches of the World II CD4W-7035
Los Quilla Huasi La Cumparsita CD4W-7036
The Film Studio Orchestra Themes from "007" Series CD4W-7038
Perez Prado and His Orchestra Perez Prado in CD-4 ..... CD4W-7042
Francini y su Orquesta Symphonica Continental Tango in CD-4 ..... CD4W-7055
Nini Rosso Nini Rosso Plays Western Movie Themes CD4W-7056
Sonny Rollins Sonny Rollins In Japan CD4W-7059
Nini Rosso Nini Rosso Plays Francis Lai CD4W-7060
Blue Seas Grand Orchestra Poetry of the Sea CD4M-7001
Locomotive Sounds in CD-4 ..... CD4K-7001
Live In Nemu, Vol. 1/ Shoji Suzuki CD4K-7002
Live In Nemu, Vol. 2/ Shoji Suzuki CD4K-7003
Locomotive Sounds in CD-4, Vol. 2 ..... CD4K-7004
Bizet, Carmen Suite/Serge Baudo, Yomiuri Symphony CD4K-7501
Mroi, Piano Concerto/ H. Wakasugi, Symphony CD4K-7502
Bach, Brandenburg Concerto No. 5/ Deutsche Bach Solisten CD4K-7503
Khachaturian, Violin Concerto/ T. Tokunaga, The Tokyo Symphony CD4K-7504
Bach, Toccata & Fugue in D Minor/ A Webersinke CD4K-7507
Vivaldi, Flute Sonata No. 4/ S. Gazzeloni CD4K-7509
Beethoven, No. 3, Eroica/K. Masur, Gewandhaus Symphony CD4K-7510
Beethoven, No. 5, Coriolan/K. Masur, Gewandhaus Symphony CD4K-7511
Beethoven, No. 6, Pastorale/K. Masur, Gewandhaus Symphony CD4K-7512
Mahler, Symphony No. 8/T. Asahina, Osaka Philharmonic Orchestra CD4K-7513
Helmut Winschermann/Deutsche Bachsolisten J.S. Bach/"Musikalishes Opfer" CD4K-7515
K. Masur/Gewandhaus Orch. Leipzig Symphony No. 7 A Major Op. 92/ The Men of Prometheus, Overture Op. 43/Konig Stephen, Overture Op. 117 ..... CD4K-7517
K. Masur/Gewandhaus Orch. Leipzig Symphony No. 4B Major Op. 60/ The Consecration of the House, Overture Op. 124, Ruins of Athens Overture Op. 113 ..... CD4K-7520
K. Masur/Gewandhaus Orch. Leipzig Symphony No. 1 C Major Op. 21/ Symphony No. 8 F Major Op. 93 ..... CD4K-7521
Kurt Masur/Gewandhaus Orch. Leipzig Beethoven/Music from Fidelio CD4K-7524
Vaclav Hudecek/Josef Hala Beethoven/Sonata for Violin and Piano No. 5 "Spring" F Major Op. 24/ Sonata for Violin and Piano No. 9 G Major Op. 30 ..... CD4K-7526
Beethoven, Complete Set of Nine Symphonies/K. Masur, Gewandhaus Symphony CD4K-7530/7

PROJECT-3

Popular Science Quad Test Record PR-401CD
Enoch Light Spanish Strings PR-5006CD
Urbie Green Twenty-One Trombones PR-5024CD
Y. Lawson & B. Haggart World's Greatest Jazzband PR-5033CD
Enoch Light The Brass Menagerie PR-5036CD
Tony Mottola The Best of Tony Mottola PR-5041CD
Spaced Out Music of Bach, Bacharach & The Beatles PR-5043CD
Enoch Light Permissive Polyphonic PR-5048CD
Enoch Light The Big Band Hits of '30s PR-5049CD
Enoch Light The Big Band Hits of the '30s & '40s PR-5056CD
Enoch Light The Brass Menagerie '73 ..... PR-5060CD
Tony Mottola Superstar Guitar PR-5062CD
4 Channel Dynamite! PR-5068CD
Tony Mottola Tony & Strings PR-5069CD
Enoch Light Charge! PR-5073CD
Bit Band Hits of The '40s & '50s PR-5076CD
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Enoch Light and his Orchestra Beatles Classics PR-5084CD
Enoch Light and Brigades Great Hits From the Gatsby Era PR-5086CD
Big Band Hits of the '30s Vol. 2 ..... PR-5089CD
Tip Of The Iceberg PR-5091CD

SOUND BIRD

SHADYBROOK

Touch SB4-7507
Love the One You're With SB4-7508
Erogenous SB4-7509
Awakening SB4-7510
Sounds in Motion SB4-4501
Green Board South SB4-4502
Last Train to Waterloo SB4-4503
Storm & The Sea SB4-4551
Mystic Moods "Love the One You're With" BS4-2577
Mystic Moods "Highway One" BS4-2648
"Sound in Motion" BS4-2656
Mystic Moods "Awakening" BS4-2690
Mystic Moods "Clear Light" BS4-2743
"Sounds of Railway Steam Engines" BS4-2751
"Last Train to Waterloo (Railroad Sounds)" BS4-2757
Mystic Moods "Erogenous" BS4-2786
"Storm and the Sea" BS4-2788

A & M

Rick Wakeman
Journey to the Centre of the Earth QU-53621
Rick Wakeman
The Myths and Legends of king Arthur And The Knights of the Round Table QU-54515
Chuck Mangione
Chase the Clouds Away QU-54818

SINGCORD

Bob Krogstad Singers
Happiness ZLP-9125

DISCREET

Mothers-Over-nite Sensation S4-2149
Frank Zappa
Apostrophe' S4-2175

CHRYSALIS

Jethro Tull
Aqualung CH4-1044
Jethro Tull
War Child CH4-1067

CAPRICORN

Allman Brothers Band
At Fillmore East CX4-0131

ATCO

Black Oak Arkansas
Raunch 'N' Live QD-7019
Donny Hathaway
Extension of A Man QD-7029
Black Oak Arkansas
Street Party QD36-101
James Gang
Miami QD36-102

VIRGIN

Mike Oldfield
Tubular Bells QD13-105

RSO

Eric Clapton
461 Ocean Blvd. QD-4801
Eric Clapton
There's one in Every Crowd QD-4806

FINNADAR

George Flynn
John Cage QD-9006
Eric Salzman
Wiretap QD-9005

ROLLING STONES

Bill Wyman
Monkey Grip QD-79100

MIRROR-O

A lot of People Would like to See Armand Schaubroeck...Dead Armand Schaubroeck Steals

FANIA

Harlow
Live in Quad QXSLP-00472

Coming to terms with quadra-phonic.

Every new technological advancement brings with it its own unique language. Words that suddenly mean something different than they've ever meant before. Words that have been invented to describe the features and functions of a new invention.

Quadraphonic sound—an invented term in itself—is no different. To help you understand 4-channel sound reproduction on its own terms, we offer the following glossary of quadraphonic vernacular.

ambience:
A sound characteristic resulting from reverberance—such as the effect that occurs in a concert hall when the direct sound of an instrument reaches your ear a split second ahead of the same sound after it's been reflected off the walls and ceiling of the auditorium.

carrier:
The primary signal transmitted in radio broadcasting. Also used to describe the ultrasonic frequency signal that provides the two additional discrete channels on the CD-4 Quadradisc.

CD-4:
Stands for Compatible discrete 4-channel.
The only full range discrete 4-channel disc system on the market. Bears the trade name "Quadradisc."

channel:
A sound path. Monaural (mono) systems utilize a single channel. Stereo uses two channels—left (L) and right (R). Quadraphonic sound has four channels—left front (Lf), right front (Rf), left back (Lb) and right back (Rb).

compatibility:
The ability of source material to be used equally well on monaural, stereo or quadraphonic playback equipment.

crosstalk:
A blending of information between one channel and another which reduces separation and decreases the full dynamics of the original master recording. Particularly detrimental to quadraphonic sound accuracy.

decoder:
An electronic device that takes matrix encoded signals and translates them into 4-channel output.

demodulator:
Circuit used to extract the four discrete channels from the CD-4 Quadradisc.

discrete:
A constantly independent audio signal, such as those stored on each track of a master tape. Also used to describe the type of sound produced by the CD-4 Quadradisc system.

Dorren system:
A discrete 4-channel FM broadcasting system. Named for its inventor, Lou Dorren.

dynamic range:
The volume span between the softest and loudest sounds or electrical signals.

four (4)-channel sound:
See "quadraphonic sound."

integrated circuit:
The "IC" or "chip." A minature electronic circuit, sometimes as small as a pinhead, that performs the same equivalent functions of larger conventional circuits. Has provided the means to put complex electronic circuits into equipment with relatively compact dimensions.

joystick:
A panning-type audio control designed to facilitate 4-channel balancing. Usually on the panel of the 4-channel receiver. Performs the same function as separate left-right, front-rear controls.

logic:
A special circuit in an SQ matrix decoder that electronically reconstructs some of the quadraphonic effect lost during the SQ encoding-decoding process. Various degrees of logic are provided in playback equipment, but only a "full logic" circuit has the ability to reproduce quadraphonic recordings with separation approaching that of present stereo records—and then only under special conditions.

matrix:
Any system that reproduces quadraphonic sound by mixing 4 channels into two (encoding), and electronically returns them to four channels (decoding) during the playback process. Also referred to as the "4-2-4" system.

phase lock loop:
A feedback circuit that maximizes frequency accuracy and stability in FM tuners and multiplex decoders. Also used to assure utmost accuracy in CD-4 demodulators.

Quadradisc:
The trade name for the CD-4 discrete 4-channel record.

quadraphonic broadcasting:
4-channel transmission via FM signal. Although no standard system has yet been adopted, tests are currently being conducted in both the matrix and discrete formats. Since FM broadcasters consider matrix to be basically a stereo system, the greatest test interest has been in the discrete area. The selection of a standard 4-channel FM system is expected about a year after those tests are concluded and the results submitted to the FCC.

quadraphonic sound:
Also called "quadrasonic" and often shortened to "quad." All refer to the sound field created by information being recorded and reproduced from four different directions—a 360 degree circle of sound with the listener in the middle. This is accomplished by recording four separate channels on a master tape, then reproducing them through four separate amplifiers and four separate speakers in the listening room. Considered by many experts to be a greater advancement in sound reproduction than stereo was to mono.

QS:
See "RM."

Q-8:
8-track tape cartridges containing 4-channel programming.

RM:
Stands for "regular matrix." Also known as the QS system.

separation:
The degree of isolation maintained during the stereo or quadraphonic recording and reproduction process. The opposite of "crosstalk." A high degree of separation prevents dilution and distortion of the sound field present on the original master tape.

Shibata stylus:
An advanced stylus design created to reproduce the discrete 4-channel disc, yet provide perfect compatibility with existing stereo or monaural records. Permits retrieving of signals up to 60,000 Hertz. Also provides longer record life than elliptical stylus tracking at the same pressure.

SQ:
The matrixing method developed by CBS Records for encoding four channels of sound into two channels. Stands for "stereo-quadraphonic."

synthesizer:
Electronics that enhance 2-channel recordings when played through a 4-channel system.

Q&A×4.

Even though quadraphonic sound has been around for many years now, there are a number of disturbing questions that still cast their shadows on the efficacy of the 4-channel medium. Since one of the prime functions of this publication is to shed more light on the field of quadraphonic sound, we present the questions we most frequently encounter about 4-channel sound's present position and future potential, along with answers we hope will reduce some of the unnecessary apprehension that surrounds it.

Q

Where is 4-channel sound going in the U.S.? Is it, as many say, dying out as a market entity?

A

Quadraphonic sound is more alive than it ever has been, and it's getting healthier all the time. Today, however, the audio industry has a much more realistic view of its growth potential. It has not become, as some initially professed, a complete revolution in the marketplace, nor was it ever realistic to believe it would be. Quad is not a revolution, but instead an evolution. An orderly growth in the hardware marketplace geared to as fast a software growth as can be reasonably expected from record companies.
In addition, new technological achievements in quadraphonic integrated circuitry have recently made their appearance. Which now means better performance at a lower price— and an increase in the market potential. Add to it the fact that quadraphonic software releases continue to emerge, quadraphonic hardware sales continue to grow, and many touring rock groups and motion picture theatres have now converted to quadraphonic sound systems. It simply means that 4-channel sound is very much alive, and its growth rate may surprise us all very pleasantly.

Q

When will the battle of the systems be over, and who will be the winner?

A

In the tape format, there are no competing systems. With the disc, however, there is, on the surface at least, a battle between two matrix systems and one discrete disc system.
Our advice to the consumer is simply that he shouldn't worry about any battle. Just buy the program material he wants regardless of the format. Nearly all new 4-channel receivers provide circuitry to reproduce both matrix and discrete formats, so the consumer really won't have to make any choice at all.
From our point of view, the battle of the 4-channel disc is also over. There is only one real 4-channel disc—the CD-4 Compatible Discrete Disc. As we see the future of the quadraphonic disc, the discrete catalog will grow rapidly and eventually the matrix systems will be relegated to their primary role—enhancement of stereo product.

Q

Are retail dealers responding favorably to 4-channel in both hardware and software markets?

A

As dealers and salesmen on the retail level gain greater experience in the 4-channel medium, their response is becoming increasingly more enthusiastic. Software dealers are now asking for larger stocks of Quadradiscs. Audio hardware dealers are devoting more display and demonstration space to 4-channel equipment. In fact, those dealers who have made a full commitment to 4-channel are finding that it is representing a larger and larger portion of their overall business. The key to quadraphonic growth, however, is knowledge and the dissemination of accurate, understandable information about it. We hope this publication will help toward that end.

Q

Is 4-channel software getting easier to find?

A

The prime factor a record retailer has to consider is product movement. He has to give the most room to the product that moves through his store the quickest. There is no question that currently stereo records are that product. However, with more and better 4-channel records becoming available and a more positive attitude about the future of the 4-channel disc, sales of quadraphonic product are moving closer to those of stereo product, accounting for a more significant share of the retailer's profit. For that reason alone, the availability of 4-channel software has increased dramatically in the past year. Add to that the fact that record producers now see the potential of the 4-channel disc and are recording more and more of their artists in this medium. A bigger quadraphonic catalog means greater consumer interest and a correspondingly great availability of 4-channel software at the retail level.

Q

How fast is the 4-channel software catalog growing, and how fast will it grow in the future?

A

It is difficult to view the growth of the catalog apart from the world's economic developments. There is always a shortage of product during the initial introduction of any software medium, because it is simply impossible to "create" a catalog of 1500 or so items in as short a time as hardware manufacturers can bring out three or four models of electronics. Add to that the material shortage caused by such an unpredictable thing as a petroleum shortage.
As 1974 progressed, however, there was a significant relaxation of the compound shortage, and quadraphonic releases are back on schedule. Right now, the total availability of CD-4 product in the U.S. is about 200, and the hopes are to at least double that number by the end of 1975.

Q

Is a 4-channel sound system a lot more expensive than a stereo system?

A

Since additional circuitry and additional speakers are needed for 4-channel reproduction, a quadraphonic system is initially more expensive than an equivalent stereo system. However, with new developments in IC's and 4-channel technology, excellent quadraphonic systems can now be assembled for about the same outlay as a medium-priced stereo system. But whatever the additional cost, any truly involved music lover who has already made the 4-channel investment will tell you that the new experience in total sound it provides is well worth it—and more.

Q

What do 4-channel records cost?

A

CD-4 records cost only slightly more than stereo records—about 20% on the average—yet deliver twice as much information and an exciting new musical dimension to the listener.

Q

What is the playing time of a 4-channel disc?

A

Essentially the same as a stereo disc.

Q

Will a 4-channel disc system still play my stereo records?

A

Absolutely. Any system designed to play CD-4 records will also play any standard stereo record—but with a new degree of depth possible only with a 4-channel playback system.

Q

Are 4-channel records any more difficult to handle than a stereo record?

A

No. Simply clean them frequently as you would a standard stereo record, use the proper stylus pressure, and your CD-4 disc should deliver the same amount or even more performance life than the same stereo disc.

As a recording engineer, I have always felt that any quad disc system must offer the listener true concert hall realism and spatial integrity. To achieve this result it must have the same degree of separation which is inherent in a 4-channel master tape. In the long run, the consumer will be satisfied with nothing less. CD-4 has evolved rapidly over the last two and one half years and represents the only practical disc system embodying discrete performance.

John Eargle

It takes someone with a special kind of artistic appreciation to comprehend the aural magnitude of quadraphonic sound. Someone who wants to hear more than sound, listen to more than music. Someone who is totally involved in the music as well as the medium. If you've taken the time to read this entire booklet, you're that someone. And if you'd like someone who feels the same as you do to keep you informed about the latest developments in quadraphony, simply send your name and address to:

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A free copy of our informative newsletter, CD-4 Forum, will be sent to you each time it's published—our way of saying "thanks for being someone special."

John Eargle is one of America's foremost authorities in the field of sound recording. His present company, JME Associates, is a consultant to the CD-4 advocates Panasonic, JVC, RCA Records and the WEA Record group in areas related to four-channel technology. He holds the Degrees of Bachelor of Music, Bachelor of Science, Master of Music, and Master of Engineering. Mr. Eargle has written and lectured extensively in areas of recording technology. He is a member of the Acoustical Society of America, a senior member of the Institute of Electrical and Electronic Engineers, and currently president of the Audio Engineering Society.

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