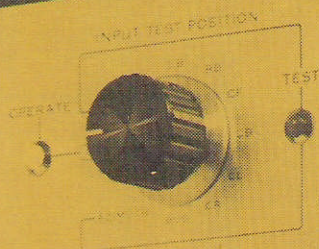


YOUR QUICK GUIDE TO QS REGULAR MATRIX

Sansui
QS

POWER

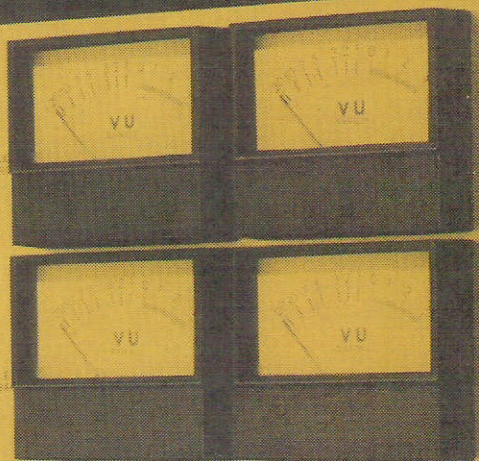
SCOPE



QS 4 CHANNEL ENCODER QSE-4

Sansui
QS

POWER



QS 4 CHANNEL DECODER QSD-4

INTRODUCTION

While a number of different systems have been introduced in the field of 4-channel sound reproduction, we are not concerned with a simple choice between the discrete or matrix system. We are, on the other hand, concerned with *the* system or 4-channel approach that guarantees the collecting, storing, transmitting and recovering of the total 360-degree directionality of each original sound source through a minimum number of transmission channels possible. We are also concerned with the system that guarantees non-degradation of tone quality and which is the most practical on both the recording and playback ends, as well as the system that best permits broadcast stations to transmit required information within the narrowest band possible.

We recall the days when RCA established firm theories of chromatics prior to the proposal of the NTSC color TV system, and feel likewise that we should benefit from an in-depth study of psycho-acoustics involved in recording and reproduction of sounds in 360-degree directional fields. This, of course, is what 4-channel stereo is all about.

CONSUMER INTEREST IN 4-CHANNEL STEREO: HOW DID IT BEGIN?

We begin with the consumer. He is the object of all our attention. We know that he wishes to reconstruct in his own music listening room the music which he experienced at a live music performance. To do this, he buys records, he invests in improved stereo equipment. He even goes as far as to adjust his room for better acoustics. All in an effort to recreate the impressive sound of the original musical performance.

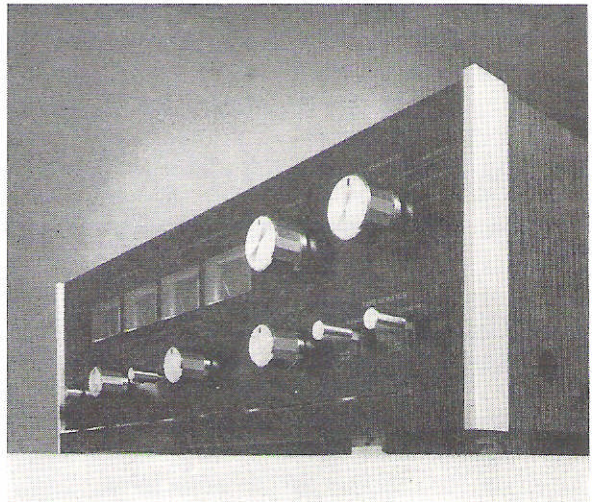
Eventually the consumer discovers that the best he can get from the 2-channel, 2-speaker system is a rather flat simulation of the original sound. He senses the need for additional channels, additional speakers.

Is there a way his needs can be satisfied without playing havoc with his stereo budget? In other words, can we satisfy his interest in sound without making all of his expensive equipment obsolete? Questions like these faced all stereo equipment manufacturers like Sansui when the 4-channel potential was in its early stages.

After considerable research and development work, Sansui in 1970 introduced matrix synthesizers that converted 2-channel material to 4-channel stereo. It was a good first step. Other manufacturers soon followed suit. From the standpoint of the history of sound reproduction, it was a natural step forward.

It is clear that the software industry had a lead on the utilization of more than two tracks for sound recording. But the use of the matrixing technique as a means of achieving 4-channel stereo reproduction had not

been seriously considered until Sansui announced a practical 4-channel matrix encoding technique for the first time in 1971. Until then everyone had regarded matrixing as a minor technique to be employed in the reproduction of 2-channel recordings for simulated 4-channel effects. The arrival of the Sansui QS encoding system signaled to the software industry that 4-channel stereo was as practical as it was inevitable.



The QS-1:
Sansui's first matrix synthesizer decoder for consumers.

APPROACH TO QUADRASONIC

Many recording engineers and producers agree today that the Sansui objectives in the development of a compatible 4-channel disc record system were, in fact, universal objectives. These included:

- * Protection of the non-quad consumer.
- * Non-obsolescence of non-quad systems.
- * Minimal additional cost to the consumer when he decides to quadralize his present stereo system.
- * Minimal additional cost to produce quad recordings.
- * Broadcastability with minimal modification or additions to present systems and regulations.
- * Non-degradation of the present standards of hi-fi.
- * Capabilities to record onto a magnetic tape recorder.

On the other hand, objections have been raised by various voices within the industry to the use of a carrier in *any* form in the disc record. These objections were mainly attributable to the fact that it is extremely difficult for a carrier disc system to fulfill most of the above-listed objectives. Some objectives simply can never be accomplished by a carrier disc system.

Besides, those are the problems that remain even if the classic problems of a carrier disc system such as record wear, broadcastability and loss of playing time, recording levels, dynamic range, signal to noise ratio and frequency response per channel have been overcome.

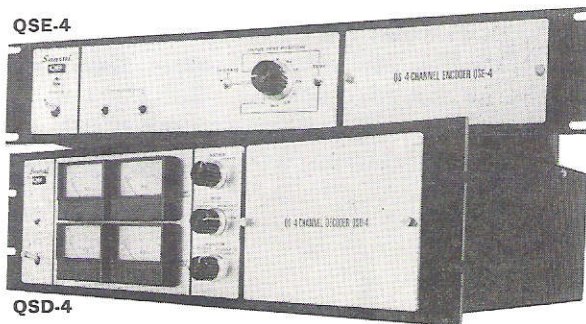
These objections were significant. They led us to conclude that a compatible carrier disc is not very practical, but that an ideally compatible matrix quadrasonic disc *can* be designed by taking advantage of a number

of factors, namely the redundancy of directional information in 2-channel media as well as a depth study of psycho-acoustic phenomenon in the sound field and the nature of human hearing.

We know, of course, that the science of matrixing signals of one kind to another for the simplicity of transmission or storage—and then dematrixing them back into the original form—goes back to a patent issued in the early '30s to the late A.D. Blumlein. Indeed, it had only been a few years ago that several companies conducted experiments in this science, attempting a practical application to quad and achieving only limited success due to the circular discontinuity and unpractical gain control logic concept.

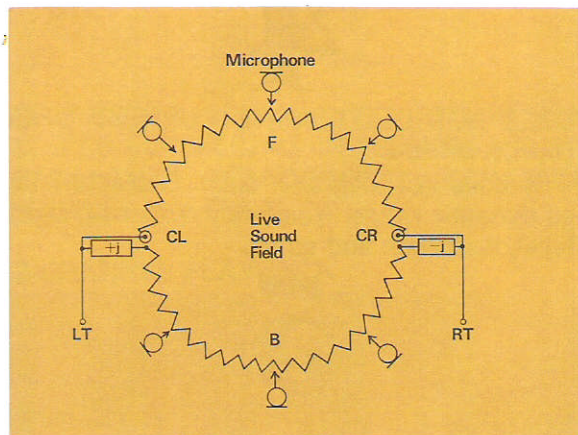
Sansui's 4-channel system was designed with consideration of the following concepts:

- * Combination of amplitude and phase matrixing techniques.
- * Rotationally symmetrical matrix.
- * Omnidirectional encoding capability within the total 360-degree sound field.
- * Square decoding matrix configuration.
- * Use of playback sound field enhancement technique by maintaining the total output power constant.
- * Capability of use by the recording industry as well as by the consumer worldwide.

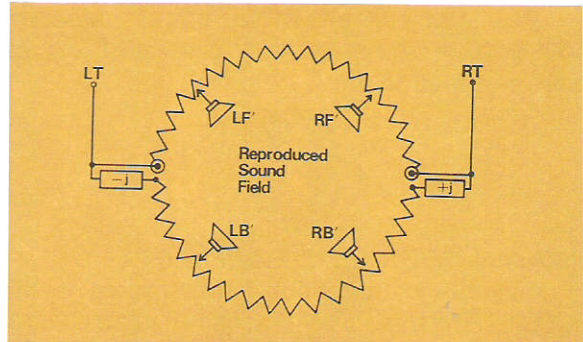


SANSUI'S QS SYSTEM ILLUSTRATED

QS Encoding Method



QS Decoding Method

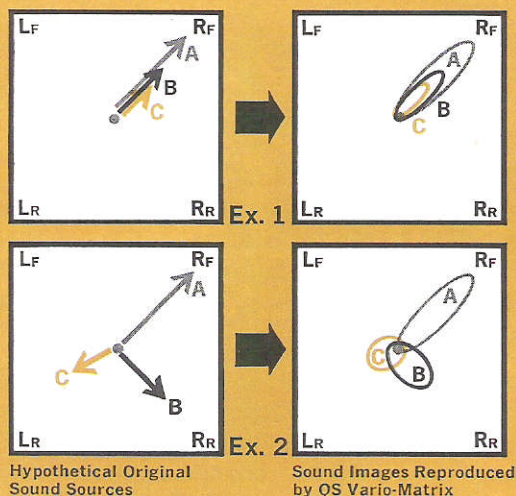


QS VARIO-MATRIX

Our latest 4-channel innovation adds a distinguished finishing touch to the QS Regular Matrix System. It is made possible by the various psycho-acoustic phenomena of the human hearing mechanism, especially the "directional masking." Our ears are such that when sounds of different loudness arrive simultaneously from different directions, the quieter sound is "masked" by the loudest

sound, and, naturally, the ears become insensitive to the direction from which it came. We know that this happens whenever there is a difference of 10dB or so in loudness among those sounds. The QS vario-matrix simply controls the decoder matrix parameter from moment to moment in proportion to the difference in loudness. This approach is entirely different from the complex "gain control" approach, and ensures that the quantity of the original sound field information is kept completely intact in reproduction. The QS vario-matrix decoder thus provides for infinite inter-channel separation in principle, and we have enhanced it by setting the value for optimum separation to the ears from the valid standpoint of music reproduction. The QS Encoder remains the same as it was originally designed in 1970.

Faithful Reproduction of Original Sound Sources by QS Vario-Matrix





THE QS REGULAR MATRIX: ITS MAJOR ADVANTAGES

1

STORES THE TOTAL 360-DEGREE SOUND FIELD INFORMATION IN 2-CHANNEL MEDIA.

Current stereo transmitters/receivers, disc-cutting equipment and other hardware can continue to be used. There are no infringements upon the government-prescribed FM radio regulations to broadcast quadrasonically.

2

EXCELLENT INTER-CHANNEL SEPARATION.

The QS vario-matrix decoder offers theoretically infinite 4-channel separation when the "QS" encoded materials are reproduced (see p. 3).

3

COMPLETE OMNIDIRECTIONAL FIDELITY.

A circumferentially uniform matrix configuration treats signals or sound sources anywhere within 360 degrees and enables the artists and producers to locate sounds at any desired position.

4

DOES NOT DETERIORATE CURRENT STANDARDS OF HI-FI.

It does not degrade such characteristics as dynamic range, frequency response, signal level, distortion and so on.

5

NO LOSS OR MISLOCALIZATION OF INPUT INFORMATION THROUGH THE ENCODE/DECODE PROCESS.

A unique phase-shift technique preserves the quality as well as the quantity of the input information.

6

MINIMAL ADDITIONAL EQUIPMENT.

Necessary equipment for recording is the QSE-4 Encoder. For playback, a popular 4-channel decoder like Sansui's QS Regular Matrix decoder. Nothing else.

7

QS-ENCODED SOURCES PROVIDE BETTER STEREO PERSPECTIVE IN 2-CHANNEL PLAYBACK THAN CONVENTIONAL 2-CHANNEL SOURCES (see Fig. 1).

2-CHANNEL PLAYBACK

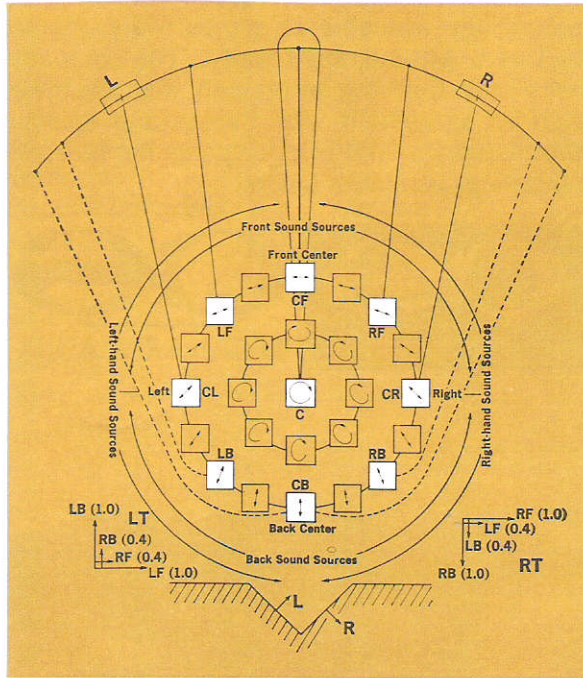


Fig. 1

8

EXCELLENT MONO COMPATIBILITY.

Mono compatibility of the system is virtually the same as that of the present 2-channel recording system. In addition, complete omnidirectional mono transmission is possible with a simple phase-shift device (see Fig. 2).

MONO PLAYBACK

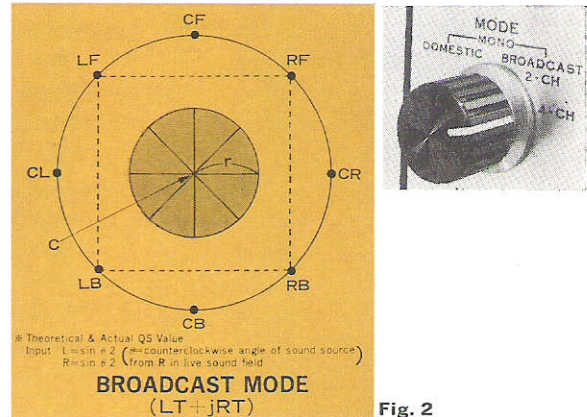


Fig. 2

9

NO SPECIAL CONDITIONS REQUIRED FOR RECORDING AND PLAYBACK.

Because of an independent Center-Left and Center-Right input circuit, the QS Encoder does not place any limitation on the kind of program source to be encoded or the mixing technique to be utilized. At the decoding end, the QS-encoded source is sufficiently compatible with all matrix decoders on the market.

QS LICENCE

HARDWARE

Sansui plans to make its QS decoder and vario-matrix technology available to all interested manufacturers.

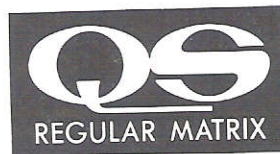
To accomplish this objective we are in the process of converting the vario-matrix decoder into IC's.

Such IC's will include Sansui's unique QS synthesizer that converts *all* conventional 2-channel sources to 4-channel sound quite similar to discrete reproduction. A working sample will be completed in the near future. While price is not yet determined, it is certain that it will be extremely low.

SOFTWARE

The Japan Phonograph Record Association has already standardized a 4-channel matrix encoding system. It is identical to the Sansui QS system and is called the Regular Matrix System. At present, RIAA and RIEE are considering the inclusion of the Sansui QS Regular Matrix System among their respective technical standards for 4-channel stereo.

Sansui is already making this portion of its technology available to all software manufacturers without any royalty. The company asks only that the interested manufacturer sign an agreement with Sansui and display the QS Regular Matrix logotype on the finished recordings as shown below.



THE GROWING WORLD OF QS REGULAR MATRIX 4-CHANNEL

GROWING LIST OF QS AND COMPATIBLE HOME DECODERS

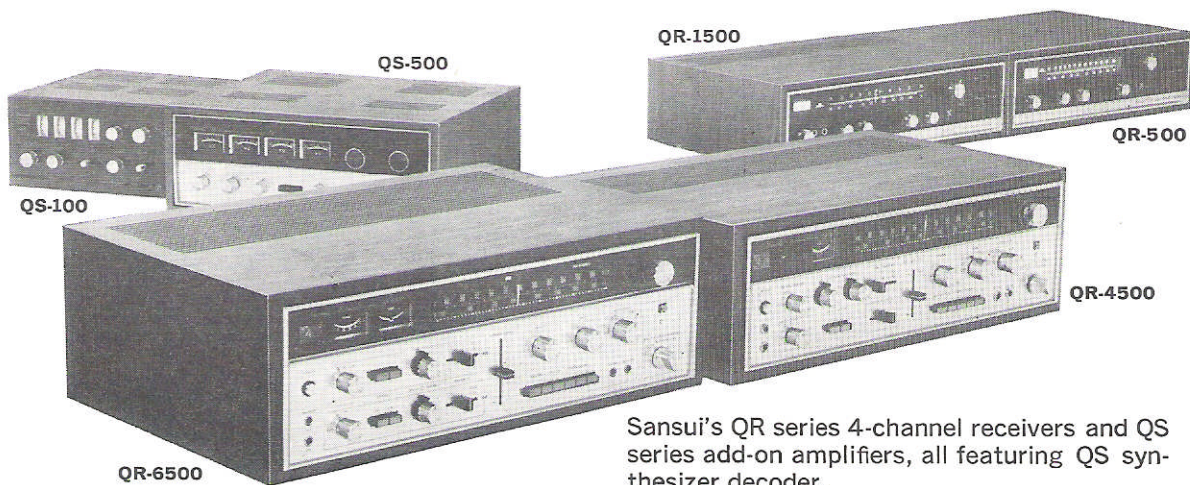
All in all, over 200 compatible Regular Matrix decoders to decode QS are widely available in many areas of the world, as of January, 1973.

Sansui alone has sold over 150,000 QS Regular Matrix decoders in 95 countries throughout the world. It is not too optimistic to predict that overall sales of these compati-

ble Regular Matrix decoders will increase to *more than two million*.

The QS and compatible Regular Matrix software also keeps growing in volume every day. Attached is an up-to-date list of record albums released by record companies world-wide.

In Japan		No. of models available			No. of models available		
Hitachi	(6)	Sansui	(8)	Clarion	(1)	Packard-Bell	(3)
JVC	(37)	Sanyo	(10)	Dokorder	(1)	Panasonic	(5)
Mitsubishi	(13)	Sharp	(7)	Dynaco	(1)	Pilot	(3)
National	(20)	Sony	(9)	Eico	(1)	Pioneer	(5)
Nippon Columbia	(16)	Toshiba	(8)	Electro-Voice	(4)	Radio Shack	(1)
Onkyo	(13)	Trio	(17)	Emerson	(1)	Robins	(1)
Pioneer	(16)	Yamaha	(4)	Fisher	(4)	Rotel	(1)
In U.S.A.				Harman-Kardon	(4)	Sansui	(9)
Admiral	(1)	Olson	(1)	Heath	(1)	Sanyo	(1)
Akai	(1)	Onkyo	(1)	JVC	(5)	Sony	(2)
				Kenwood	(3)	Scott	(1)
				Lafayette	(8)	Sylvania	(1)
				Motorola	(3)	Toshiba	(3)



Sansui's QR series 4-channel receivers and QS series add-on amplifiers, all featuring QS synthesizer decoder.

QS AIRPLAY IS SIGNIFICANT

SANSUI'S FUTURE POLICY

Already over 100 major FM stations in the U.S.A. and Japan are playing Quad in QS!

FMT, Tokyo has been broadcasting the world's top artists' live performance right from the concert hall for nearly two years now. Some of the artists who have appeared in this one hour program include:

James Taylor	Freddie Hubbard
Nancy Wilson	Gigliola Cinquetti
Duke Ellington	Milva
Arthur Fiedler	Alfred Hause
Jacques Loussier	Malando
Ravi Shankar	Claudio Villa
Frank Chacksfield	I Musici
Bill Evans	Jacqueline Francoir
Oscar Peterson	McCoy Tyner
	and many others

WFMT, Chicago aired probably the world's first 'live' Opera performance direct from Chicago's Civic Opera House using the QS encoding system, and they are doing more.

WCRB, Boston has for many months recorded exclusively the live performance of the Boston Symphony in QS.

WABC, New York aired a soul concert by B.B. King direct from A & R studios in NYC.

People are quickly becoming more aware of what quad is all about through a lot of QS airplay.

As is clear from this discussion, the Sansui QS Regular Matrix System with QS vario-matrix offers indisputable advantages. The system will certainly become increasingly popular world-wide. Sansui will continue to advocate its QS Regular Matrix System as long as the consumer's interest in multi-channel stereo continues. We believe that the use of a matrix and phase shifts will be a practical approach to multi-channel stereo for many years.



OSCAR PETERSON



NANCY WILSON



BILL EVANS



This is a Sansui QS Regular Matrix 4-channel record produced by Toshiba Records in Japan. Says Youichi Namekata, its recording engineer/mixer: "QS makes all my long-standing wishes possible. I just can't do without it anymore."

This record has been cut by the PTS-11 system invented by Toshiba Records. PTS stands for a Pinchless Tracing Simulator, which eliminates the tracing and pinching effect distortions traditionally encountered in the record cutting process.

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SANSUI AUDIO EUROPE S.A. DIACEM BUILDING, VESTINGSTRAAT 53-55, 2000 ANTWERP, BELGIUM/TELEX: ANTWERP 33538

The Sansui logo consists of the word "Sansui" in a white, italicized serif font, set against a solid teal rectangular background.

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