

4-Channel Receiver

SANSUI QR4500



The Symbol of Sansui 4-Channel Sound



SANSUI QR-4500 4-CHANNEL STEREO RECEIVER Sansui, Japan's most respected maker of quality audio products for nearly 25 years, now takes great pride in presenting its most significant achievement ever—the all-new 240 watt QR-4500 4-Channel Stereo Receiver. A component of truly conspicuous merit, the QR-4500 will recreate—right in your own living room—the extraordinarily vibrant atmosphere of live 'on stage' performances with all of their delicate nuances. The highest expression of man's unceasing search for purer, higher fidelity sound reproduction, the QR-4500 takes you now beyond mere linear (2-channel stereo) reproduction and into the immensely more rewarding world of multi-dimensional 'sound field' reproduction. The receiver incorporates Sansui's exclusive 4-Channel Synthesizer Decoder, which many audio specialists the world over have said represents "a revolution in sound reproduction technology," a high-performance control amplifier and a

super-sensitive stereo tuner. It is uniquely able to convert today's 2-channel stereo records, tapes and FM stereo broadcasts into the enrapturing new 4-channel format. At the same time, in its capacity as a decoder, it can decode 2-channel stereo programs encoded from four channels by a 4-channel encoder back to their original 4-channel format. And of course, it also stands prepared to process discrete 4-channel tapes. The exclusive 4-Channel Synthesizer Decoder is equipped with advanced-design integrated circuits, and is otherwise completely electronic. No mechanical time delay or echo device impairs the tonal quality of original sound. But the most outstanding advantages of the device are its phase shifter and exclusive phase modulator circuits which uniquely process the rear channel sounds to reproduce the 'sound field' experienced in any live performance. The QR-4500 from Sansui. The foremost name in 4-channel stereo.

Sansui

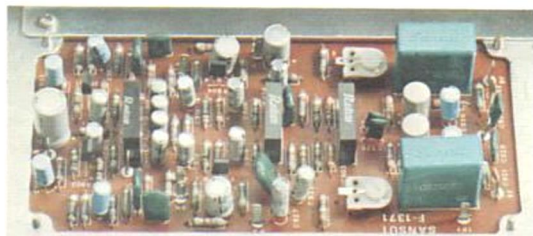
4-CHANNEL SYNTHESIZER DECODER SECTION

1 CONVERTS 2-CHANNEL SIGNALS INTO FOUR:

The IC-equipped QS decoder matrix in this section uniquely converts 2-channel signals into four without affecting the tonal quality of original sound whatsoever. This conversion is achieved without the use of any mechanical time delay or echo device, but completely electronically—by extracting 'indirect sound' components from the original sound and then shifting and modulating their phases. This has the effect of establishing an ideal phase relationship among the four speaker systems for the same natural sound field effect that you would normally experience in a live performance.

RESTORES ENCODED MATERIAL TO FOUR CHANNELS:

Not only does the 4-Channel Synthesizer Decoder convert your ordinary 2-channel stereo records and tapes—as well as FM multiplex stereo broadcasts—into four channels, but, working in the capacity of a 4-channel decoder, it restores any 2-channel program sources encoded from four channels by a 4-channel encoder back to their original 4-channel form.



2 UNIQUE PHASE SHIFTER CIRCUIT:

Right next to the QS decoder matrix is a unique phase shifter circuit that gives the two rear channels separated by the matrix a phase difference of 90 degrees each—plus 90 degrees to the rear left channel and minus 90 degrees to the rear right channel. This puts the rear channels in phase with each other, and establishes a correct phase relationship among all four channels, creating distinct sound images of original sound sources.



3 EXCLUSIVE PHASE MODULATOR CIRCUIT:

The live sound field existing in any concert hall or auditorium during an actual performance involves an infinite number of interactions between direct sounds and reflected, multi-dimensional indirect sounds with their infinitesimal phase differences. After the matrix re-organizes two-channel signals into four channels and the two rear channels are 'phase-shifted' by plus and minus 90 degrees, these two channels are fed through an exclusive phase modulator circuit (patents pending). Here, the signals are continuously phase-modulated and given the same minute phase differences as would be experienced in any live performance, and then are finally relayed on for reproduction through the rear left and right speaker systems. When these meet the direct, unaffected sounds emitted by the front left and right speaker systems, an astonishingly vibrant sound field is achieved, very closely approximating the original live performances.

4 VERSATILE SYNTHESIZER DECODER SELECTOR:

The QR-4500 renders optimum results with every kind of music—from piano solos to full orchestral performances to rock to jazz—by the simple turn of the 4-position Synthesizer decoder Selector.

CONCERT HALL-1: For orchestral performances of symphonies, for operas, for big-band jazz and combo jazz. Produces a sound field equivalent to that of a concert hall right in front of you. Use the 'Front 2-2 System' of speaker positioning for best results.

CONCERT HALL-2: Best for hearing music by small groups, such as chamber music, solo performances, and special recitals.

SURROUND/DECODER: Most appropriate for popular vocals, easy listening music, country and western, rhythm and blues, and other kinds of music which you 'feel', rather than judge. Puts you in the midst of the performers. Set to this position also when hearing 4-channel music encoded into a 2-channel form—be it a record, tape or FM multiplex stereo broadcast signal.

2-CH.: For regular 2-channel stereo sound from the front left and right speaker systems only.



5 CONVENIENT MODE SWITCH:

Set a NORMAL RIGHT QUARTER TURN, HALF TURN or LEFT QUARTER TURN, to bring the front channel sound in front of you, regardless of the direction in which you are facing. Each position turns the sound around by another 90 degrees.



6 2- AND 4-CHANNEL DIGITAL INDICATOR:

Controlled by the Mode Switch, this device shows at a glance whether you're hearing 2- or 4-channel sound.

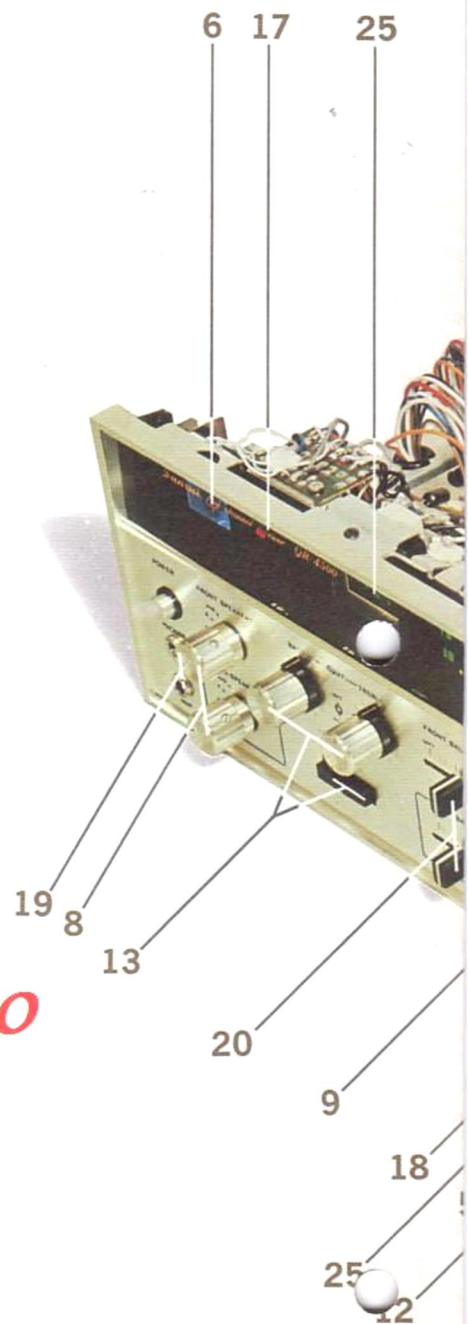


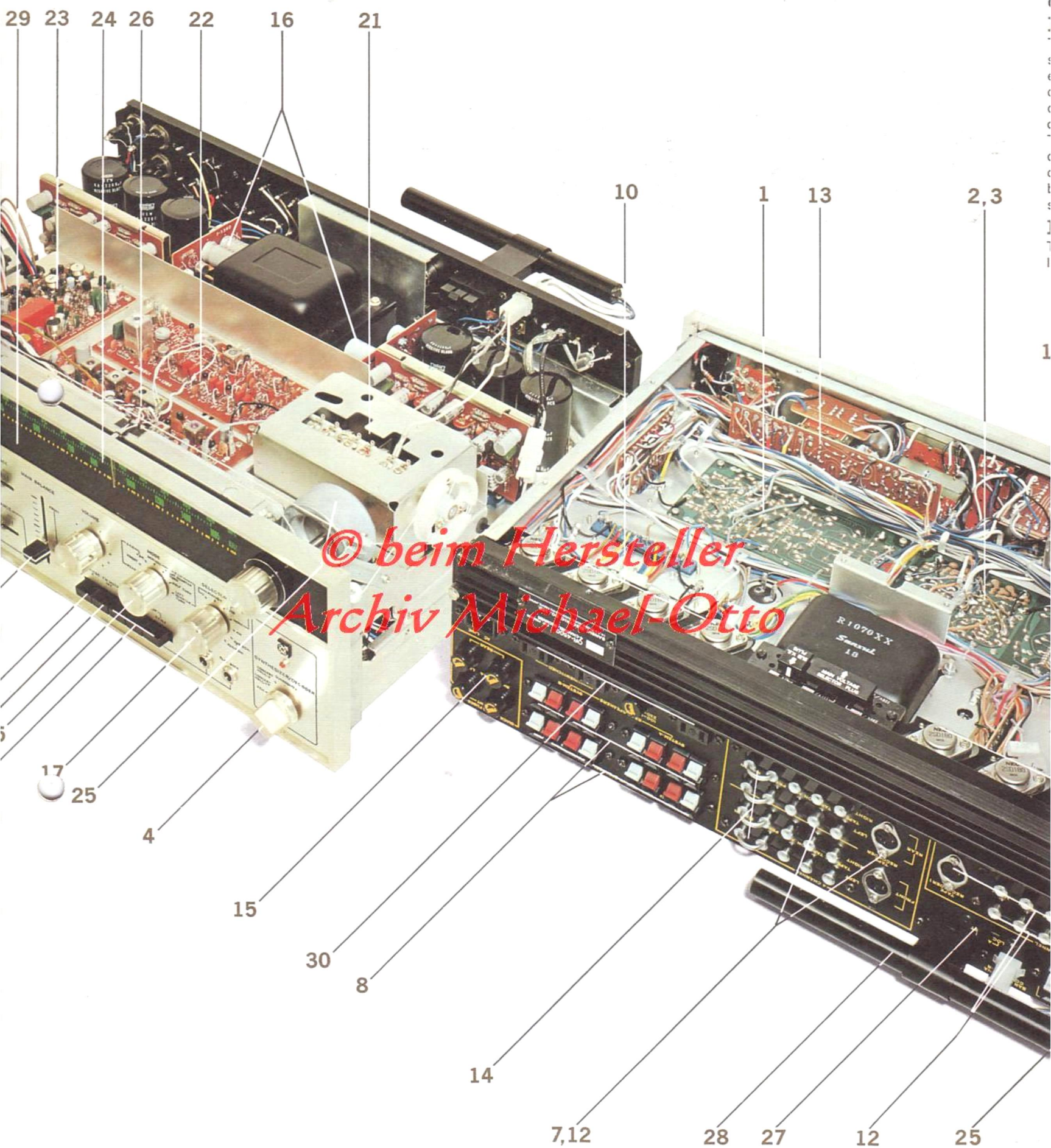
7 CONNECTS A 4-CHANNEL TAPE DECK:

The QR-4500 is equipped with recording and playback terminals for a 4-channel tape deck, plus 4-channel AUX terminals. So you're ready for the reproduction of any discrete 4-channel program sources in the future.

8 CONNECT FOUR PAIRS OF SPEAKER SYSTEMS:

The receiver is also equipped with terminals for connecting two pairs of speaker systems both for the front channels and the rear channels. This lets you switch over between the '2-2' and 'Front 2-2' System of speaker positioning, or install four speaker systems in each of two different rooms.





1 MAIN BALANCE CONTROL:

The over-all balance between the front and rear channels is easily adjusted by a sliding control. It is both easy to operate and to check visually.

CONTROL AMPLIFIER SECTION

10 SEPP-OTL POWER AMPLIFIER

This section incorporates a silicon power transistor-equipped power amplifier of a sophisticated semi-complementary SEPP-OTL design to deliver music power of 240 watts (into four ohms) and continuous power of 27 watts per channel (into eight ohms in 4-channel usage). The carefully selected transistors and advanced circuit design combine to keep total harmonic distortion below 0.5% and achieve a power bandwidth of from 20 to 30KHz. Exceptionally stable even when delivering a big output.

11 IDEAL EQUALIZER AMPLIFIER:

The equalizer amplifier is constructed exclusively of carefully chosen low-noise type silicon

transistors to keep noise and distortion to a bare minimum. This also improves the degree of the transparency of reproduced sound to a remarkable extent. Consequently, the receiver's dynamic range is very wide and reproduced sound is kept free of distortion even when excessively large input signals pour in.

12 2- AND 4-CHANNEL TAPE MONITOR CIRCUITS:

The QR-4500 provides two circuits for 2-channel tape monitoring and one for 4-channel tape monitoring. This means you can record or playback on two 2-channel tape decks or even copy a tape from one tape deck to the other. If you also have a 4-channel tape deck, you will not only be able to reproduce 4-channel tapes but convert 2-channel programs into four channels and record them into the tape deck. Pin jack and convenient DIN socket type terminals are offered for both 2- and 4-channel tape monitoring.

13 TONE CONTROLS AND FILTERS:

Bass and treble tone controls (with separate friction-coupled left and right channel knobs) and high and low filters are provided for the front-channel amplifiers to give you greater management over the sound you hear.

14 INDEPENDENT FRONT AND REAR PRE- AND POWER AMPLIFIERS:

Both the front and rear preamplifiers and power amplifiers can be separated for independent usage. This permits full exploitation of their superior basic functions and allows for further upgrading your 4-channel stereo system by setting up an electronic crossover system.

15 3-WAY POWER TRANSISTOR PROTECTION:

A safe steady protection circuit, large heat sinks and quick acting fuses combine to ensure perfect protection of the power transistors.

16 STABILIZED POWER SUPPLY CIRCUIT:

The control amplifier section includes a stabilized power supply circuit equipped with a giant power transformer and Zener diodes. Each circuit block operates with exceptional stability and keeps distortion to a negligible level.

17 PHONO, AUX INPUT CIRCUITS:

The QR-4500 is complete with two phono input circuits and 2- and 4-channel AUX input circuits. The program source selected on the Function Selector is indicated brightly on the front panel.

18 ONE-SWITCH LOUDNESS CONTROL:

A single convenient loudness control governs both the front and rear channels simultaneously to permit easily obtaining a uniform level.

19 FRONT AND REAR HEADPHONE JACKS:

The QR-4500 features separate headphone jacks for the front and rear channels.

20 SEPARATE LEFT-RIGHT BALANCE CONTROLS:

Both the front and rear channels are provided with their own left/right balance control for more precise adjustment.

FM TUNER SECTION

21 DUAL-GATED MOS FET-EQUIPPED FM FRONTEND:

Utilizing a dual-gated MOS FET (distortion-free even against an excessively large input) and a super precision 4-gang variable capacitor, the FM frontend of the QR-4500 offers a substantially lower intermodulation distortion figure and an improved image ratio. Above all, it offers exceptional 2.0 μ V (IHF) sensitivity, permitting the receiver to provide steady hi-fi stereo reception even in fringe signal areas.

22 SOPHISTICATED FM IF AMPLIFIER:

The FM IF amplifier combines a 6-resonator 3-stage amplifying ceramic filter and an IC 3-stage limiter that starts working with an antenna input as feeble as 1.5 μ V. It boasts ideal IF amplifier characteristics and assures quality FM reception, as evidenced by a selectivity figure of better than 70dB and capture ratio of 2dB. Other advantages of this expensive FM IF amplifier become particularly evident during FM stereo reception, when the tuner exhibits unexcelled separation and distortion characteristics in the treble range of reproduced sound. Also noteworthy are the greatly improved phase characteristics, which help make possible the faithful reproduction of encoded 2-channel FM stereo broadcast signals in their original 4-channel form.

23 ULTRA-DEPENDABLE MULTIPLEX CIRCUIT:

To preclude possible beat interference and intermodulation distortion, the multiplex circuit of the FM tuner combines a 2-stage SCA filter, sharp cutting LC type carrier leak filter and adjustment-free molded-coil block for unexcelled dependability in this area.

24 NEW WIDE DIAL, LINEAR FM SCALE:

The use of a frequency-linear 4-gang variable capacitor of extraordinary precision permits equipping the tuner with a lateral wide dial featuring an FM scale evenly graduated from 88 to 108MHz in steps of 250KHz. The dial adopts a distinctive blackout design, and is made of smoked acryl. The pointer, of course, is an easy-to-see self-lighting type.

25 OTHER FEATURES:

A large tuning meter for precision tuning; a noise-lock type FM muting circuit, for eliminating station noise during FM band tuning; 300-ohm balanced and 75-ohm unbalanced FM antenna terminals, automatic FM mono/stereo switching, an FM stereo indicator lamp, and a large flywheel-equipped smooth tuning dial mechanism.

AM TUNER SECTION

26 BOTH RF AND IF AMPLIFIERS:

This section is complete with both an RF amplifier and an IF amplifier to pull in numerous AM stations with unsurpassed sensitivity and distortion characteristics. The sensitive, highly selective IF amplifier is equipped with a two-resonator ceramic filter. And both amplifiers are governed by an AGC (Automatic Gain Control) circuit.

27 LOCAL/DISTANT SWITCH:

A rear panel switch marked LOC/DIS permits changing the input sensitivity to suit the signal strength, thus preventing excessively strong signals from entering the tuner in areas close to broadcast stations and distorting the sound.

28 POWERFUL FERRITE BAR ANTENNA:

A giant 'slide-out' type ferrite bar antenna pulls in AM broadcast signals with unsurpassed sensitivity.

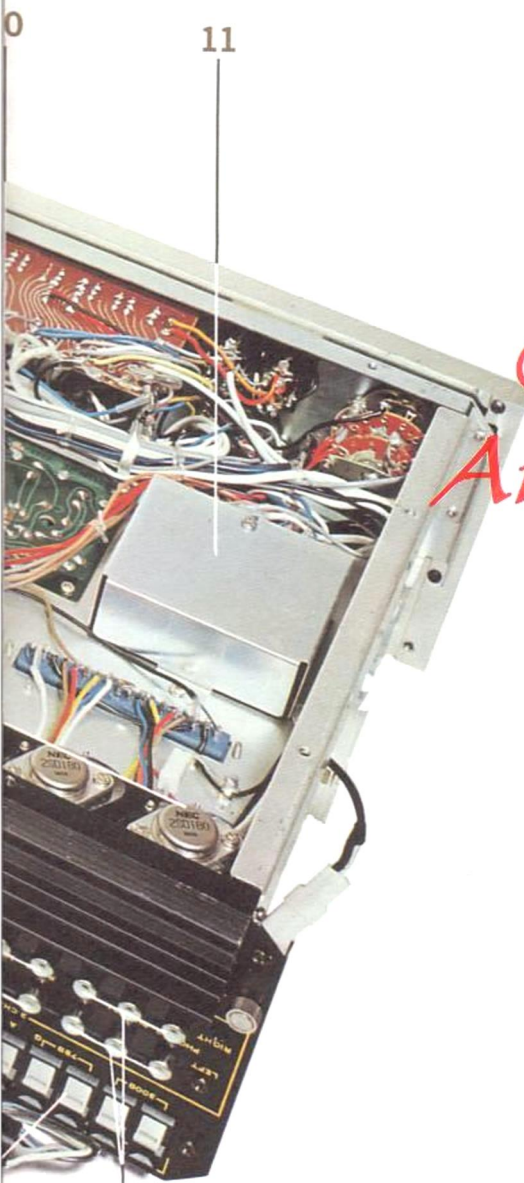
DRAMATIC STYLING

29 BLACKOUT WINDOW, WALNUT CABINETRY:

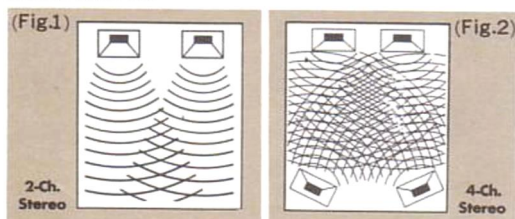
The sophisticated front-panel design of the QR-4500 combines a silver gold control panel and a blackout dial window. In addition, the receiver is encased in a walnut-finished solid wooden cabinet that radiates beauty any way you look at it.

30 ADDED ADVANTAGES:

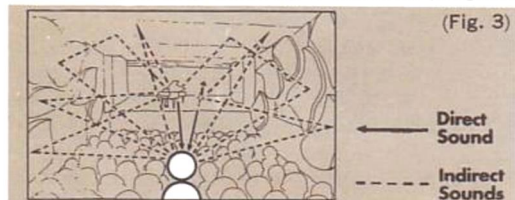
Three AC outlets on the rear panel, one of which is controlled by the front-panel power switch. Color-coded one-touch foolproof push-button terminals for connecting speaker systems and antennas.



THE SANSUI QR-4500 4-CHANNEL RECEIVER AND 4-CHANNEL STEREO: Four-channel stereo is the most advanced means yet devised of faithfully reproducing an original sound field. Two-channel stereo has reached the limit of its potential in this respect, restricted as it is to merely reproducing sound source points (Fig. 1). By moving up to 4-channel stereo with the Sansui QR-4500 4-Channel Receiver you are not merely doubling the stereo effect as you might suppose, but rather you are multiplying the effect many fold to approximate a sound field as it would be experienced in a concert hall (Fig. 2). In other words, you are moving from a sound source point method of reproduction to the reproduction of an entire sound field. This is made possible by the Sansui QR-4500's capability to handle reflected or indirect sound, in addition to direct sound, as an independent sound source.

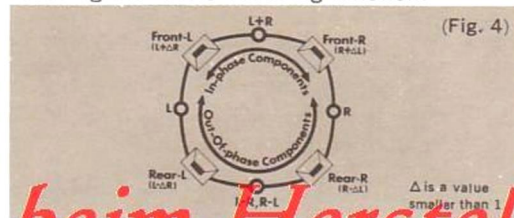


SOUND FIELD: By sound field we mean all of sounds that you are exposed to in a live performance—not only those coming directly from a stage—but those far more numerous indirect sounds which are reflected by the ceiling, walls, floor and furnishings as well (Fig. 3). The extra pair of speaker systems in the 4-channel stereo format gives the resources needed for reproducing a great deal more of such sounds and to approximate for the first time a sound field in the living room. Besides the second pair of speaker systems, you need only add the QR-4500 to achieve the new 4-channel stereo system. And while it may be a few more years before standardized 4-channel stereo records and FM broadcasts become available, the QR-4500 offers the immediate advantage of converting existing 2-channel program



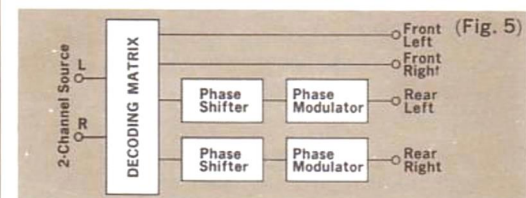
sources to the new 4-channel format. This is done by letting the second pair of speaker systems take over much of the sound burden formerly borne by one pair alone. The two pairs are then repositioned so that indirect sounds and extreme end sounds are processed through the QR-4500's QS decoding matrix before being emitted through the rear speaker systems, for a remarkable increase in liveliness and presence.

HOW THE QR-6500 WORKS: The QR-4500 more closely approximates such a sound field than any other system yet devised. It accomplishes this by singling out indirect sound components from 2-channel sources by the use of the Sansui-developed QS decoding matrix, shifting their phases to achieve complete 2- to 4-channel conversion, then finally modulating their phases anywhere from 0 to 180 degrees to create the apparent effect of emitting sound from numerous directions (Fig. 4). This results in a revolutionary increase in the sense of 'presence,' giving you the same feeling you'd experience at a live performance. Further, if you were to reproduce 2-channel discs recorded with a 4-channel encoding matrix, the decoding matrix would separate the two channels back into the original four channels, enabling each speaker system to establish distinct sound images of the particular sound sources assigned to it during the original 4-channel recording session. We call this restoration capability of the QS decoding matrix its decoding function.

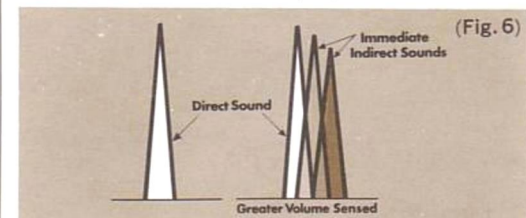


QS DECODING MATRIX: This is the first step on the way to converting 2-channel sound sources into the immensely richer sound of 4-channel stereo. To understand it fully, imagine an orchestra on stage. The two recording microphones in 2-channel stereo are normally spaced on either side of the center of the stage. Because of the limitations of this 2-point pickup arrangement, all the direct sounds (those which reach the microphones directly), indirect (those reflected by walls, ceiling, floor, etc., before reaching the microphone) and direct independent (those produced at the extreme ends of the stage) are randomly mixed and delivered as

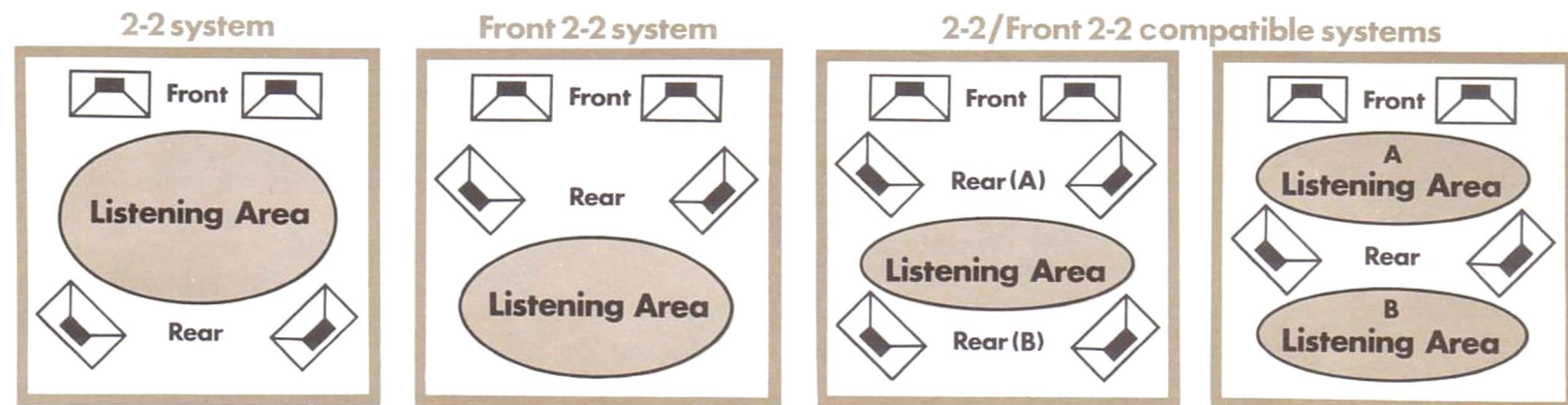
lump left and right channel signals. The QS decoding matrix in the QR-4500 takes these lump signals and reorganizes them. Now instead of having a mixture of direct, direct independent and indirect sounds, there is a separation of these components. The direct sounds are sent ahead for reproduction by the front channels, while the direct independent and indirect sounds are phase-shifted to render them identical in phase and establish clear sound images in the rear channels as well. These sounds are then phase-modulated and reproduced from the rear speaker systems (Fig. 5). This, we call the sound field synthesizing function of the QS decoding matrix.



PHASE MODULATION: As the illustration shows, the QR-4500 takes the rear channel sound components—shown as a regular pulse form—and through its unique process of phase modulation, gives it increased depth and richness without requiring an increase in power. The principle is easy enough to understand: As the rear channel sound components are phase-modulated from 0 to 180 degrees, sounds come out of the rear speaker systems with minute phase differences. This means, as Fig. 6 shows, the sense of sound volume dramatically increases, especially expanding the dynamic range of percussive sounds. Since the rear channel sounds now arrive at the listener's ear with fine time delays, the end effect very closely approximates the acoustic effect present in an actual concert hall where the original sounds are reflected by the walls, floor, ceiling etc. and converge upon the listener's ear with randomly varying time delays. This gives us a great increase in 'presence', and is the most important aspect of the 4-channel stereo effect made possible by the QR-4500.



This is a very important aspect of the entire new format. Speaker positioning can do much to determine just how you can exploit your new system to maximum advantage. Here are four different possibilities:



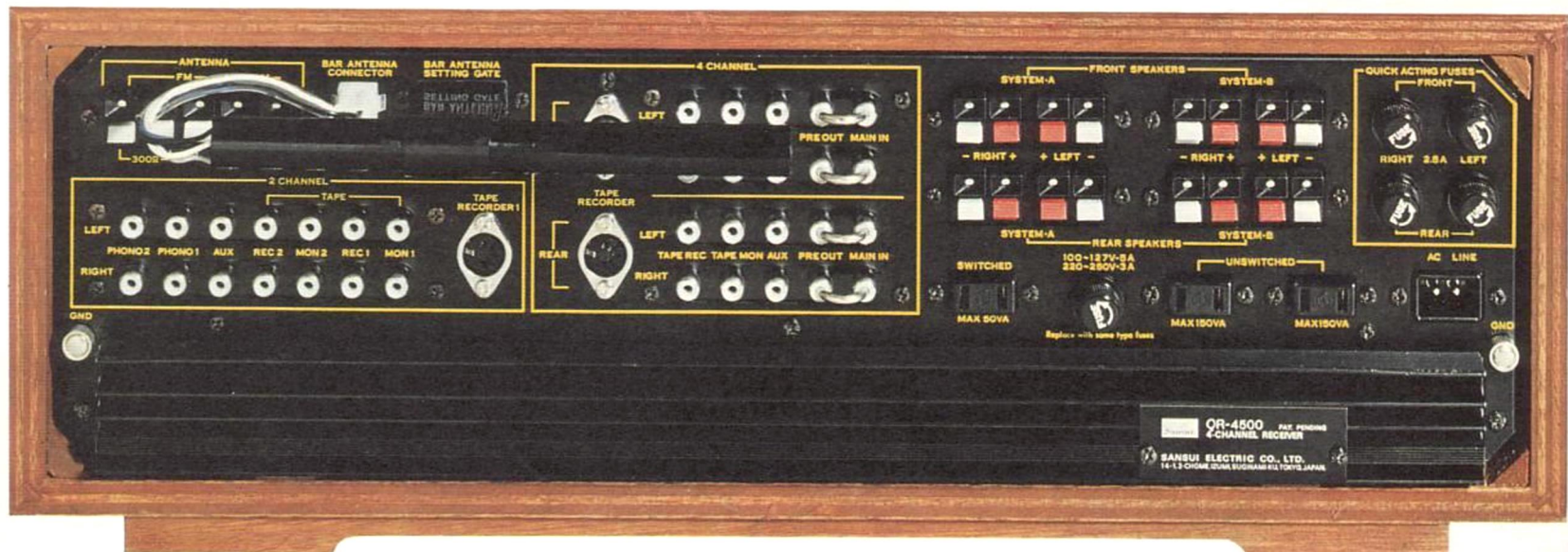
2-2 System: Regular 4-corner position widely accepted as "standard". Most effective for listening to mood music, rhythm and blues, vocal numbers and "recorded-live" records.

Front 2-2 system: Best for symphonies, operas, chamber music and big band jazz.

Ideal Positioning Method: Involves the use of six speaker systems and lets you choose the regular 2-2 or front 2-2 system by the simple changeover of the rear Speakers Switch.

2-2 / Front 2-2 Compatible Positioning Method: With the rear speakers placed as shown here, you're able to enjoy both the regular 2-2 system and the Front 2-2 system by moving from point A to point B.

Note: Whatever your preference, better effect can be obtained by placing the front two speaker systems on the floor slightly in from the extreme left and right corners of the room, and by elevating the rear systems about three feet off the floor.



SPECIFICATIONS

POWER AMPLIFIER SECTION

POWER OUTPUT

Music Power (IHF)	240W	at 4Ω load
	160W	at 8Ω load
Continuous Power	38W x 4	at 4Ω load
	27W x 4	at 8Ω load

TOTAL HARMONIC DISTORTION

less than 0.5% at rated output

INTERMODULATION DISTORTION

less than 0.5% at rated output (60Hz: 7,000Hz=4:1 SMPTE method)

POWER BANDWIDTH (IHF)

20 to 30,000Hz

FREQUENCY RESPONSE

(at normal listening level)

CHANNEL SEPARATION

20 to 30,000Hz ±1dB

HUM AND NOISE (IHF)

better than 50dB

INPUT SENSITIVITY

better than 70dB (for rated output, 1,000Hz)

INPUT IMPEDANCE

0.9V

LOAD IMPEDANCE

100kΩ

DAMPING FACTOR

4 to 16Ω load

PREAMPLIFIER SECTION

OUTPUT VOLTAGE

Maximum Output Voltage

3V

Rated Output Voltage

0.95V

TOTAL HARMONIC DISTORTION

less than 0.1% at rated output voltage

FREQUENCY RESPONSE (AUX)

20 to 30,000Hz ±1dB

CHANNEL SEPARATION

(at rated output, 1,000Hz)

PHONO

better than 50dB at closed circuit

AUX

better than 50dB at 10kΩ load

HUM AND NOISE (IHF)

better than 60dB

PHONO

better than 70dB

AUX

(at rated output, 1,000Hz)

INPUT SENSITIVITY

2mV (50kΩ)

PHONO-1

2mV (50kΩ)

PHONO-2

2mV (50kΩ)

AUX (2CH)

160mV (50kΩ)

AUX (4CH)

360mV (50kΩ)

TAPE MON (pin)

(2CH)

TAPE MON (pin)

160mV (50kΩ)

TAPE MON (pin)

(4CH)

360mV (50kΩ)

TAPE RECORDER

(DIN) (2CH)

160mV (50kΩ)

RECORDING OUTPUT

(at rated input, 1,000Hz)

TAPE REC (pin) (2CH)

160mV

TAPE REC (pin) (4CH)

360mV

TAPE RECORDER (DIN)

(2CH)

30mV

EQUALIZER

PHONO

RIAA NF type

TONE CONTROLS

Front and Rear

BASS

±15dB at 50Hz

TREBLE

±15dB at 20,000Hz

LOUDNESS CONTROL

+5dB at 50Hz +3dB at 10,000Hz

(Volume Control at -30dB)

SWITCHES

SELECTOR

PHONO-2, PHONO-1 FM

TAPE MONITOR (2CH)

AUTO, FM MONO

(1, 2)

AM AUX 2CH AUX (4CH)

TAPE MONITOR (4CH)

SOURCE, PLAY BACK

MODE

SOURCE, PLAY BACK

2-CHANNEL

REAR, FRONT FRONT and REAR

4-CHANNEL

NORMAL, RIGHT QUARTER TURN, HALF TURN, LEFT QUARTER TURN

LOW FILTER (Front)

-10dB at 50Hz

HIGH FILTER (Front)

-10dB at 10,000Hz

SPEAKER SELECTOR

(Front and Rear)

LOUDNESS

OFF, SYSTEM-A, SYSTEM-B, SYSTEM-A+B

OFF, ON

LOUDNESS

OFF, ON

LOUDNESS

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TUNER SECTION

FM:

TUNING RANGE

88 to 108MHz

SENSITIVITY

(20dB quieting)

1.6μV

(IHF)

2.0μV

TOTAL HARMONIC DISTORTION

less than 0.8%

SIGNAL TO NOISE

RATIO

better than 65dB

SELECTIVITY

better than 70dB

CAPTURE RATIO (IHF)

2.0dB

IMAGE FREQUENCY REJECTION

better than 80dB at 98MHz

IF REJECTION

better than 70dB at 98MHz

SPURIOUS RESPONSE

REJECTION

better than 70dB at 98MHz

FM STEREO

SEPARATION

better than 35dB at

SPURIOUS RADIATION

less than 34dB

ANTENNA INPUT

IMPEDANCE

300Ω balanced, 75Ω unbalanced

FREQUENCY RESPONSE

50Hz to 15,000Hz ±1dB

AMC

TUNING RANGE

535 to 1,605kHz

SENSITIVITY

200μV/mat 1,000kHz (bar antenna)

15μV at Distant position

(IHF)

IMAGE FREQUENCY

REJECTION

better than 90dB at 1,000kHz

IF REJECTION

better than 90dB at 1,000kHz

SELECTIVITY

better than 30dB at 1,000kHz

SWITCHES

FM MUTING

ON, OFF

AM SENSITIVITY

DISTANT, LOCAL (rear panel)

OTHER SPECIAL

FEATURES

Signal Strength Meter, Fly-wheel Tuning Knob, FM SCA Filter, FM Stereo Mono Automatic Switching, AM Ferrite Bar Antenna

SEMICONDUCTORS

Transistors: 85

FETs: 2 ICs: 5

Diodes: 32 Zener Diodes: 3 Modules: 5

POWER REQUIREMENTS

POWER VOLTAGE

100, 110, 117, 127, 220, 230, 240, 250V 50/60Hz

POWER CONSUMPTION

310 (max. signal)

DIMENSIONS

172mm (6 7/8") H x 528mm (20 7/8") W x 318mm (12 5/8") D

WEIGHT

18.6kg (41 lbs.)