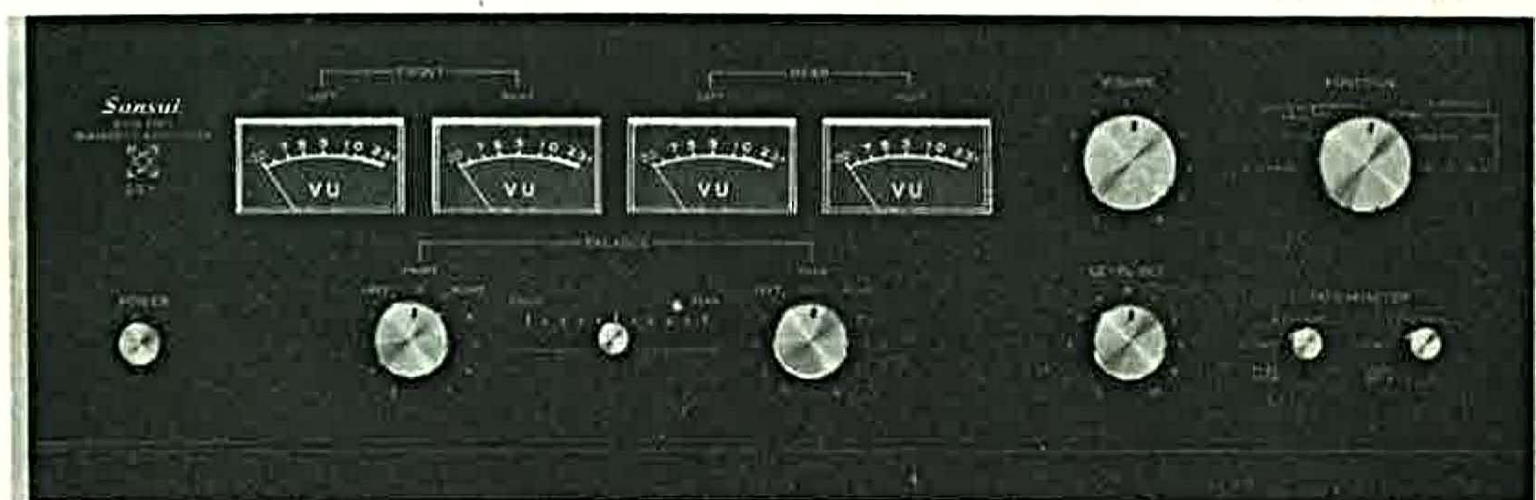




OPERATING INSTRUCTIONS

SOLID-STATE QUADPHONIC SYNTHESIZER

SANSUI QS-1



Sansui

SANSUI ELECTRIC COMPANY LIMITED

Congratulations on joining the thousands of proud, satisfied owners of quality stereo components from Sansui.

The Quadphonic Synthesizer QS-1 is a revolutionary new innovation that permits the reproduction of 4-channel stereo sound from regular 2-channel stereo records, tapes or FM broadcasts. Incorporating Sansui's unique 'sound field creating circuit' (patents pending), this new instrument produces 4-channel stereo sound quite comparable to that heard from regular 4-source 4-channel stereo tapes. The manufacturer feels it is destined to become an indispensable part of any stereo installation as more and more audiophiles the world over take to 4-channel stereo.

To enjoy dynamic life-like 4-channel stereo sound at its best, you should be well acquainted not only with the operation of the various controls of the QS-1, but with such matters as the proper positioning of speaker systems. Read carefully the instructions contained in this booklet, and you will be better prepared to take full advantage of the advanced performance capabilities of this new instrument for years to come.

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FEATURES/SPECIFICATIONS

FEATURES

The Quadphonic Synthesizer QS-1:

- 1) Converts any regular 2-channel stereo sources—such as a record, tape, cartridge or FM broadcast—into 4 channels. The use of phase modulation completely integrates the sounds from all four speaker systems, so that the overall effect is an enveloping sound field much like a live sound field.
- 2) Incorporates all-electronic circuitry to achieve the analysis and synthesis of 4-channel signals; there is nothing mechanical in it to impair the tone quality of reproduced sound or deteriorate the instrument's performance with the passage of time.
- 3) Provides the same sense of sound source positions as regular 4-source 4-channel stereo if fed with a 2-channel stereo program that is recorded with 4-channel reproduction in mind from the outset—such as the Sansui QS records, Dynaco records or whatever is recorded through the Sansui-developed new recording matrix.

- 4) Can be connected to any amplifier with a tape monitor switch, be it a control amplifier, receiver, ensemble stereo set or modular stereo.
- 5) Provides its output at two levels, so the amplifier for the rear channels may be either an independent power amplifier, control amplifier or receiver.
- 6) Is equipped with both 2-channel and 4-channel tape monitor circuits, so a 4-channel tape recording can be made from a 2-channel program simply by connecting a 4-channel tape deck.
- 7) Is equipped with an input level control to permit adjusting the level of input signals.
- 8) Is equipped with four VU meters to indicate the signal strengths in the four channels.
- 9) Is equipped with three balance controls for balancing the front left and right, the rear left and right, and the front and rear channels, respectively.
- 10) Is equipped with a 7-position Function Selector to permit selecting the sound effect best suited to the type of program in use.

SPECIFICATIONS

INPUT LEVEL

| | |
|----------------|---------------------------------|
| RATED INPUT: | 2-Channel 130mV (50k Ω) |
| MINIMUM INPUT: | 2-Channel 90mV |
| TAPE MONITOR: | 2-Channel 130mV (50k Ω) |
| | 4-Channel 775mV (50k Ω) |

OUTPUT LEVEL:

RATED OUTPUT (OVU):

| |
|-------------------------------|
| 4-Channel 130mV (LOW OUTPUT) |
| 4-Channel 430mV (HIGH OUTPUT) |

MAXIMUM OUTPUT:

| |
|------------------------------|
| 4-Channel 1V (LOW OUTPUT) |
| 4-Channel 3.5V (HIGH OUTPUT) |

RECORDING OUTPUT:

| |
|-----------------|
| 2-Channel 130mV |
| 4-Channel 775mV |

FREQUENCY RESPONSE

FRONT-CHANNEL: 20 to 20,000Hz \pm 1dB

REAR-CHANNEL

| | |
|------------------------|--------------------------------|
| SOLO: | -10dB at 10,000Hz |
| CONCERT HALL-1: | 20 to 20,000Hz \pm 1dB, -2dB |
| CONCERT HALL-2 (left): | +6dB at 10,000Hz |
| (right): | +6dB at 50Hz |
| SURROUND: | +6dB at 50Hz |

SYNTHESIS OF REAR-CHANNEL SIGNALS

1 SANSUI'S NEW MATRIX SYSTEM

2 PHASE MODULATION SYSTEM

REAR-CHANNEL PHASE MODULATION RANGE:

Max. 180 degrees at 10,000Hz

CONTROLS: VOLUME, LEVEL SET, FRONT BALANCE
REAR BALANCE, FRONT AND REAR BALANCE

SWITCHES:

| | |
|-----------|---|
| FUNCTION: | 2-CHANNEL, SOLO, CONCERT HALL-1, CONCERT HALL-2, SURROUND- NORMAL, SURROUND-QUARTER TURN, SURROUND-HALF TURN |
|-----------|---|

TAPE MONITOR:

| | |
|-----------|--------------------|
| 2-Channel | SOURCE, PLAY BACK |
| 4-Channel | SOURCE, . LAY BACK |

SEMICONDUCTORS:

Transistors: 22 IC: 8 Diodes: 12 Zener Diode: 2

POWER REQUIREMENTS:

| | |
|----------------|---------------------|
| POWER VOLTAGE: | 100, 117, 220, 240V |
| | 50/60Hz |

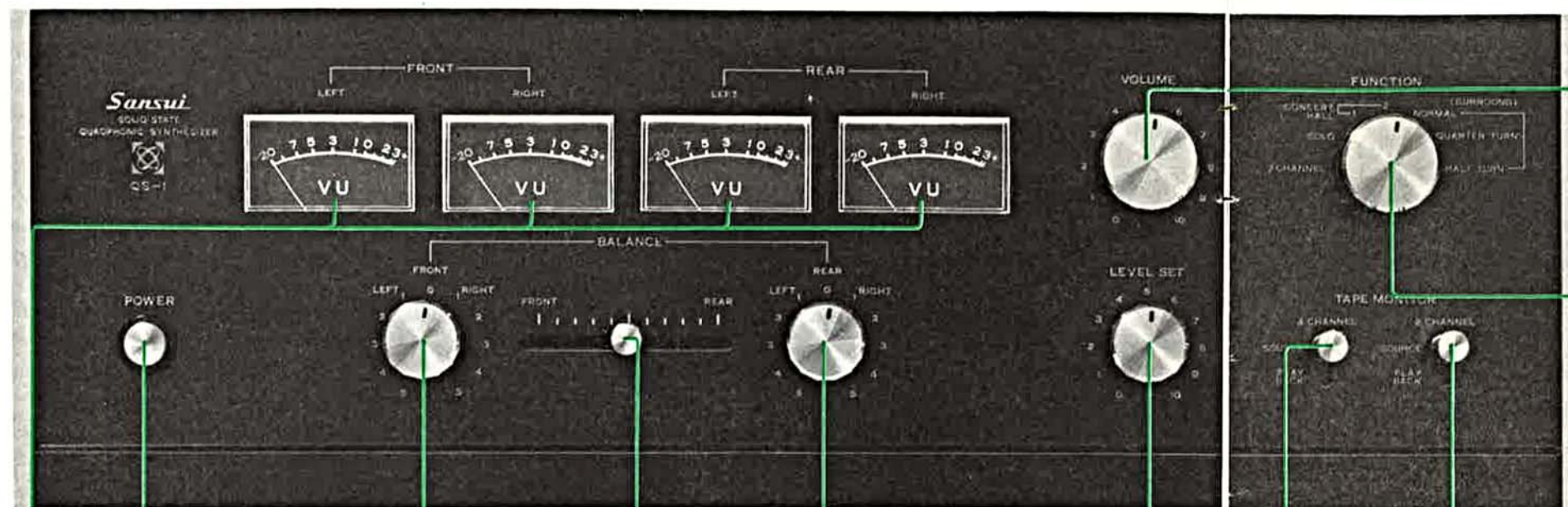
POWER CONSUMPTION: 12VA

DIMENSIONS:

395mm(15 $\frac{9}{16}$ ")W, 127mm(5")H, 278mm(10 $\frac{5}{16}$ ")D

WEIGHT: 5.5kg (12.1 lbs.)

SWITCHES AND CONTROLS



VU Meters

Indicate signal strengths in the four channels. From left: front left, front right, rear left, and rear right channels.

Power Switch

Turns on and off the power supply for the instrument. Push it once to turn on, and again to turn off. It also controls the AC outlet marked SWITCHED on the rear panel.

Front Balance Control

Controls the balance between the front left and right channels. Turning it clockwise accents the front right channel, while turning it counterclockwise accents the front left channel.

Main Balance Control

Use to balance the front and rear channels. Move it to the left to strengthen the front channels, to the right to strengthen the rear channels.

Rear Balance Control

Use in the same manner as the Front Balance Control to balance the rear left and right channels.

Level Set Control

Use to adjust the level of input signals. Set it where the front channel VU meters swing to the red 1 or 2 mark at the loudest passages of the selection to be played.

Volume Control

Controls the overall sound volume. Turn it clockwise to raise the volume, counterclockwise to lower it.

Function Selector

Set to the appropriate position to obtain the desired function.

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

SOLO: For solo performances or selections played by a small band. The high-frequency response in the rear channels is somewhat emphasized.

CONCERT HALL-1: For orchestras, big bands, etc. Suitable for most purposes. Both the front and rear channels are amplified flatly.

CONCERT HALL-2: For exaggerated concert hall effects. In this position, considerable 4-channel effect can be obtained even from monophonic programs.

SURROUND: Suitable for programs which sound most effective with the musical instruments scattered throughout the room, such as popular music, mood music, rock 'n roll, Moog sound, etc.

NORMAL: To obtain a normal surround stereo effect.

QUARTER TURN: To turn around sound by 90 degrees; i.e., the front left and right sound will now be heard from the front and rear left speaker systems, and the rear left and right sound from the front and rear right speaker systems. Use this position to obtain a normal 4-channel stereo effect when hearing vocal or other type of programs where sound is loud only on one side.

HALF TURN: To turn around sound by 180 degrees, so that the front sound will be heard from the rear speaker systems. Used with vocal or other type of programs, the position makes the listener feel like he is right in the middle of the stage.

Tape Monitor (2 Channel) Switch

Setting this to the PLAYBACK position energizes the 2-channel tape monitor circuit in the QS-1. If your tape deck is a 3-head type, you can make a recording and play it back almost simultaneously for monitoring. To play back a recorded tape, set the switch to PLAYBACK, also. Otherwise, leave it at SOURCE.

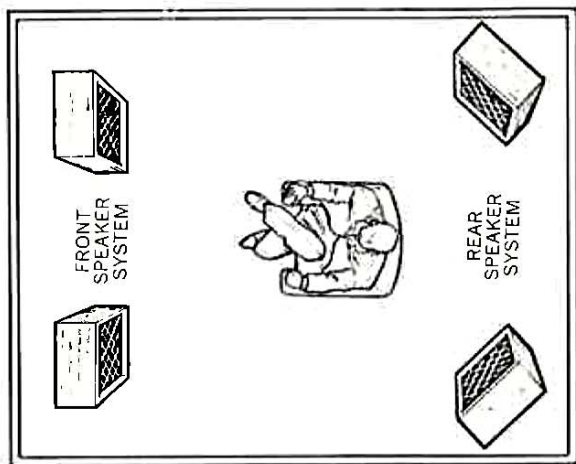
Tape Monitor (4 Channel) Switch

Use in the same manner as the above switch to control the 4-channel tape deck, if it is connected. To monitor the 4-channel tape recordings made from the 2-channel program or to play back a pre-recorded 4-channel tape through the QS-1, set the switch to PLAYBACK.

POSITIONING/SELECTING SPEAKER SYSTEMS

Basically there are two ways to position the speaker systems that permit the QS-1 to produce ideal 4-channel stereo sound.

1) 2-2 System



This is the 4-corner position that is being widely accepted as the standard speaker position for 4-channel stereo. This position permits the listener to enjoy music surrounded by four speaker systems. While it closely approximates the live sound field, it is particularly good for those who wish to enjoy the unique sound effect. It will be highly effective when used to hear these programs:

Mood music—The QS-1 turns the room into a very soft sound field where the speaker positions are hardly noticeable. Music could then be enjoyed as very pleasant background music.

Moog sound—The sound effect unique to 4-channel stereo—the 'ping-pong' effect of the four speaker systems—becomes particularly evident. Sound may run around from one speaker system to another, or echoes may run away to the rear speaker systems.

Rhythm & blues—The 2-2 system is also good for hearing the so-called 'go-go music'. Singer may be heard at the front center, the drums at the rear center, flanked by electric guitars, etc. Go-go fans who like feeling the music with their bodies would love the sound field effect.

Popular vocal numbers—The 2-2 system works very well for this kind of music, also. Singer will be heard on the front, and the echoes of his voice on the rear, with accompanying artists surrounding the singer.

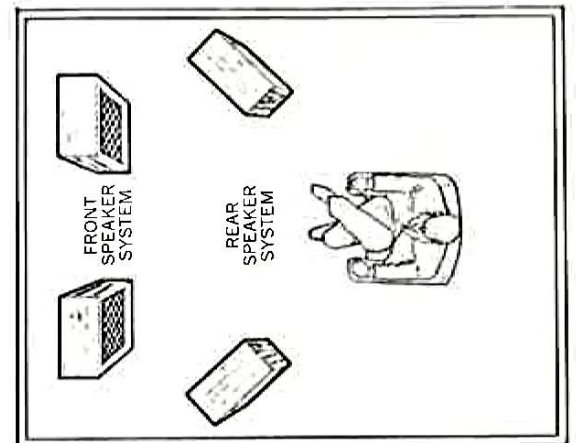
Musical numbers—The listener will feel like he is sitting in a cinerama movie theater. Dialogues will be heard from this speaker system or that, with the orchestra filling the entire room.

Modern music—The 2-2 system is also ideal for hearing concrete music and other types of modern music.

Classic music—Some types of classic music is best heard by the 2-2 system of speaker positioning.

Live recordings—In most "recorded-live" performances, the hand clapping by the audience is heard from the rear speakers, so the 2-2 system makes the listener feel like he is part of the audience.

2) Front 2-2 System



This system is designed to create a live sound field in the area covered with diagonal lines by moving the rear speaker systems of the 2-2 system up front, making them face the front speaker systems. The sound field is equivalent to the stage of a concert hall, and the listener is able to listen from outside that stage. This system makes the listener feel like he is part of the original audience.

Symphonies—The front 2-2 system is particularly suited for hearing orchestral performances of classic symphonies, and the QS-1 enables the four speaker systems to create a sound field very closely resembling a live performance.

Operas—The system is also highly effective in approximating the atmosphere of opera houses. The degree of the echo effect can be freely controlled by changing the output levels of the rear channels; this will create the same effect for the listener as changing his seat in the opera house.

Chamber music—The system is also good for hearing chamber music played by a small group of musicians. As the listener switches the QS-1 from 2-channel to 4-channel operation, the music will suddenly become three-dimensional. The change can be almost compared to a flat picture changing to a sculpture.

Modern jazz—The system is also good for hearing records or pre-recorded tapes made by modern jazz combos. The QS-1 will bring the impressive atmosphere of jazz clubs into your listening room.

Big-band jazz—The exciting atmosphere of big-band performances of jazz is best re-created by the front 2-2 system of speaker positioning in 4-channel stereo. Any other system is likely to fail to reproduce this kind of music with its wide dynamic range.

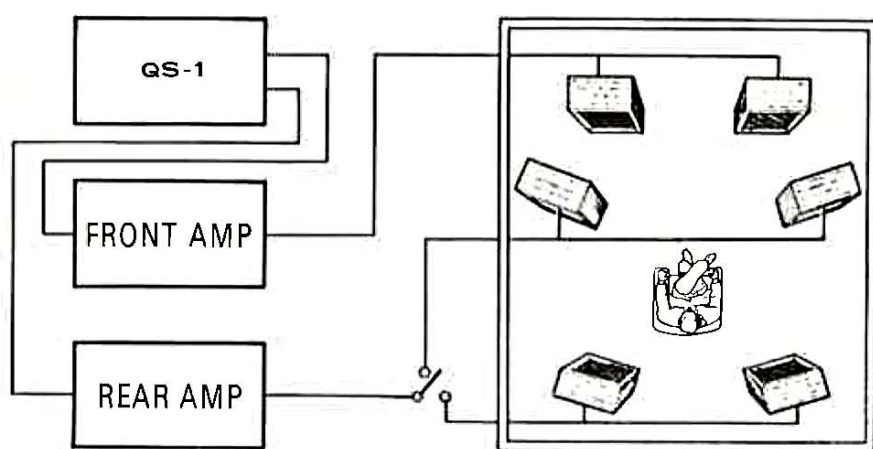
with satisfactory fidelity.

Other kinds of music—The front 2-2 system is not unfit for any other kinds of music, stereo or monophonic.

Actual Positioning Methods

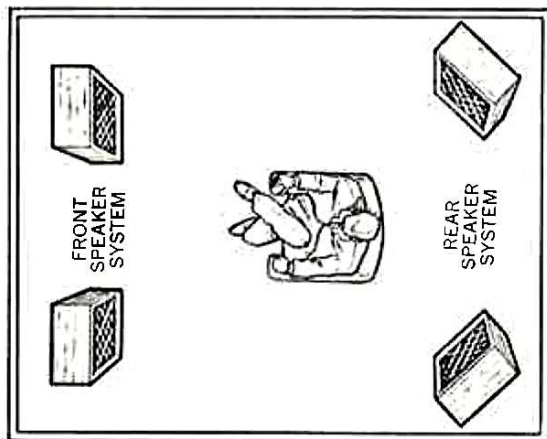
1) Ideal Positioning Method

This method involves the use of six speaker systems as shown below, and permits the listener to choose the regular 2-2 or front 2-2 system by the simple changeover of a switch according to his preference or the type of music to be played.



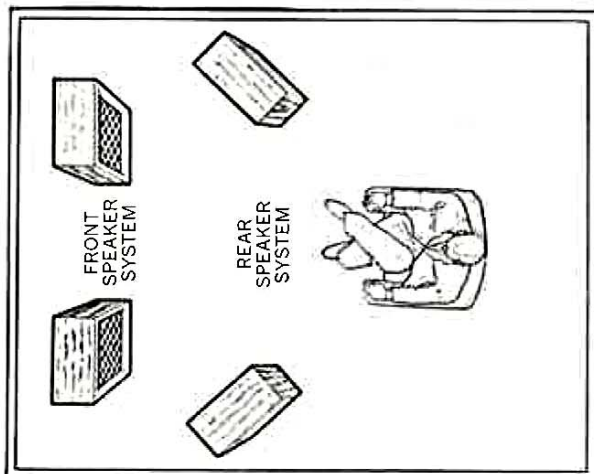
2) 2-2 System Only

Place the front left and right speaker systems as in conventional 2-channel stereo, and place the rear speaker systems toward the listener as shown below.



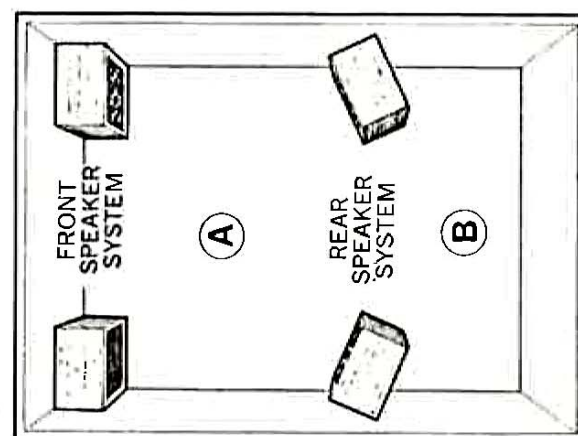
3) Front 2-2 System Only

Place the rear speaker systems so that they will form a stage with the front speaker systems in the area covering about $\frac{1}{2}$ to $\frac{1}{3}$ the area of the room, as shown below.



4) Regular 2-2/Front 2-2 Compatible Positioning Method

Place the rear speaker systems as shown below, and the listener will be able to enjoy both systems in the limited space available. To enjoy the regular 2-2 system, he should situate himself near point A, and to enjoy the front 2-2 system, near point B.



Selecting Speaker Systems

1) Front Speaker Systems

The speaker systems that you have used in regular 2-channel stereo are more than good enough for use as the front left and right speaker systems. In fact, the dynamic range of reproduced sound is considerably expanded in 4-channel stereo owing to the aerial synthesis of 4-channel sounds, so that even compact speaker systems are capable of producing a very good 4-channel stereo effect. But of course, the better the quality of these speaker systems, the better the 4-channel stereo effect. If desired, the front speaker systems may be driven by the sophisticated 'electronic crossover stereo system'—where separate power amplifiers drive the woofers, mid-ranges and tweeters—for unexcelled distortion and tonal quality characteristics.

2) Rear Speaker Systems

Needless to say, the best 4-channel stereo effect will be realized by using identical speaker systems for both the front and rear channels. But compact systems are quite good enough for the rear channels and permit the QS-1 to produce more than satisfactory 4-channel stereo sound. The speaker systems, however, should be able to reproduce sound with natural tone quality and not slanted in some way or another.

CONNECTIONS

Connecting the Amplifier for the Front Channels

Connect two of the shielded cables supplied with the QS-1 to the left and right recording output terminals of the amplifier. Then connect the other ends of these cables to the left and right 2-CHANNEL INPUT terminals of the QS-1. Next, connect two more of the shielded cables between the left and right LOW FRONT OUTPUT terminals of the QS-1 and the left and right tape playback (or tape monitor or play) terminals of the amplifier.

Note:

1) Be sure to use the shielded cables supplied with the QS-1. Use cables of different colors for the left and right channels to avoid mistaking one channel for the other.

2) Be sure to turn on the tape monitor switch of the amplifier once the above connections are completed.

3) Do not connect the QS-1 between the preamplifier and power amplifier sections of the amplifier even if those sections are separable. Use the amplifier's recording output and playback terminals instead, if possible at all. Otherwise, the use of the balance and tone controls in the preamplifier section will prevent obtaining an ideal 4-channel stereo effect.

Should you be forced to connect the QS-1 between the preamplifier and power amplifier sections of the amplifier for some reason, be sure to set its balance control at the center and the tone controls in their neutral positions.

Connecting the Amplifier for the Rear Channels

If Using an Independent Power Amplifier

Connect another pair of the shielded cables supplied with the QS-1 between the left and right HIGH REAR OUTPUT terminals of the QS-1 and the left and right input terminals of the amplifier.

Next connect the amplifier to the speaker systems for the rear channels. The speaker system on your rear left as you face the front speaker systems should be connected to the left channel output terminal of the amplifier, and the one on your rear right to the right channel output terminal of the same. Take

care not to mistake the plus and minus polarities of the speaker cables.

If Using a Control Amplifier or Receiver

Connect a pair of the shielded cables supplied with the QS-1 between the left and right LOW REAR OUTPUT terminals of the QS-1 and the left and right tape playback (or tape monitor or play) terminals of the amplifier. Then connect the speaker systems for the rear channels to the amplifier. The one on your rear left as you face the front speaker systems should be connected to the left channel output terminals of the amplifier, and the one on your rear right to the right channel output terminal of the same. Take care not to mistake the plus and minus polarities of the speaker cables.

Once the above connections are completed, do not forget to turn on the tape monitor switch of the amplifier.

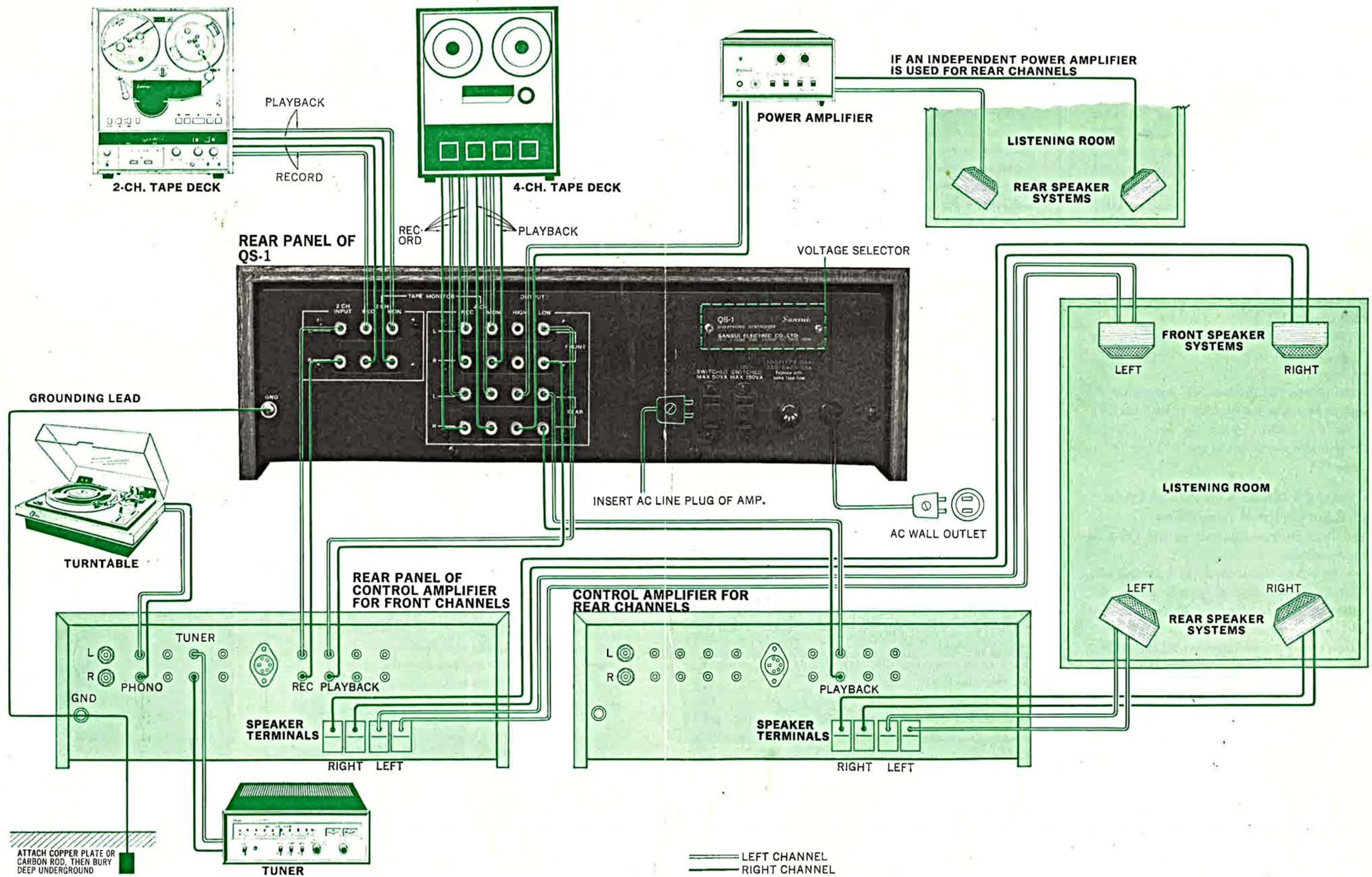
Connecting a Tape Deck

2-Channel Stereo Tape Deck

The QS-1 is equipped with separate recording and playback terminals for connecting a 2-channel stereo tape deck. To make a 2-channel stereo tape recording, connect the left and right recording terminals to the left and right input terminals of such a tape deck. To play back such a recording, connect the left and right playback terminals of the QS-1 to the left and right output terminals of the tape deck.

4-Channel Tape Deck

The QS-1 is also equipped with separate recording and playback terminals for connecting a 4-channel stereo tape deck. To record the 4-channel sound that the QS-1 supplies from 2-channel sources, connect shielded cables between the FRONT LEFT 4-channel recording terminal of the QS-1 and the front left (or as indicated on some tape decks, channel-1 or track-1) input terminal of the 4-channel tape deck; FRONT RIGHT 4-channel recording terminal of the QS-1 and the front right (or channel-3 or track-3) input terminal of the tape deck; REAR LEFT 4-channel recording terminal of the QS-1 and the rear left (or channel-2 or track-2) input terminal of the tape deck; REAR RIGHT 4-channel recording terminal of the QS-1 and the rear right (or channel-4 or track-4) input terminal of the tape deck.



ADJUSTMENTS/OPERATION

(1) Setting for Optimum Input Signal Levels

- 1) Turn up the volume controls of the front and rear channel amplifiers slightly—probable to the mark “2” or “3”. Then on their power switches.
- 2) Set the function selector control of the front channel amplifier to the PHONO position. Then turn on the tape monitor switches of the front and rear channel amplifiers (on many amplifiers, this means setting the switches to the PLAYBACK position). It does not matter where the function selector control of the rear channel amplifier is set.
- 3) Turn on the power switch of the QS-1.
- 4) Set the Function Selector of the QS-1 to the CONCERT HALL-1 position.
- 5) Set the three Balance Controls on the QS-1 to their center positions.
- 6) Turn up the Volume Control of the QS-1 to the mark “2” or “3”.
- 7) Play a record.
- 8) Note the pointers of the four VU meters on the QS-1 begin to swing as you turn up its LEVEL SET Control. Set the control where the front channel VU meter pointers swing to the mark “1” or “2” in the red zone.

(2) Adjusting Volume Controls of Front and Rear Channel Amplifiers

- 1) Set the three Balance Controls on the QS-1 to their center positions.
- 2) Adjust the volume controls of the front and rear channel amplifiers so that they will afford the loudest tolerable volume when the Volume Control of the QS-1 is fully turned up.
- 3) Now turn down the Volume Control of the QS-1 to the usual listening level, and then adjust the volume control of the rear channel amplifier again—this time to balance the volume of the rear speaker systems with that of the front speaker systems.
- 4) The above completes the adjustment of the volume controls of the front and rear channel amplifiers. Make any further adjustment in the overall sound volume by manipulating the Volume Control of the QS-1.

(3) Adjusting the Left/Right, Front/Rear Balance Controls

Of the three balance controls provided on the front panel of the QS-1, the one on the left is for balancing the sound volume from the front left and right speaker systems, and the one on the right for balancing the sound volume from the rear left and right speaker systems. Turning these controls clockwise increases the sound volume from the right speaker systems while decreasing that from the left speaker systems; turning them counterclockwise has a reverse effect. The sliding control at the center adjusts the balance between the front and rear speaker systems. Sliding it to the left raises the sound volume from the front left and right speaker systems simultaneously while lowering that from the rear left and right speaker systems simultaneously; sliding it to the right raises the sound volume from the rear left and right speaker systems simultaneously while lowering that from the front left and right speaker systems simultaneously.

Playing Records

- 1) Set the function selector control of the front channel amplifier to the PHONO position.
- 2) Set the mode switches of the front and rear channel amplifiers to STEREO.
- 3) Set the tape monitor switches of the front and rear channel amplifiers to ON or PLAYBACK.
- 4) Turn on the turntable, and adjust it for the right speed.
- 5) Start playing the record.
- 6) Adjust the QS-1 for optimum sound volume and sound balance between the front and rear, left and right channels.
- 7) Use the tone controls and various filter switches on the amplifiers according to your preference or the room acoustics.
- 8) Operate the Function Selector of the QS-1 to obtain the desired sound effect. Set it to the “2 CHANNEL” position, and the QS-1 will deliver ordinaly 2-channel stereo sound from the front left and right speaker systems only. The other positions of this control—SOLO, CONCERT HALL-1, CONCERT HALL-2, and SURROUND-NORMAL—permit the QS-1 to deliver sounds of varying tonal quality from the rear speaker systems. Switch the

OPERATION

control around and select the position right for the type of the program source in use, room acoustics or your personal preference. In making the choice, keep the following in mind as a rule of thumb:

SOLO—For solo vocal numbers, piano solos and other type of music which would sound unnatural if the sound source became too loud. The high-frequency response of the rear channel sound is slightly attenuated to make it mild.

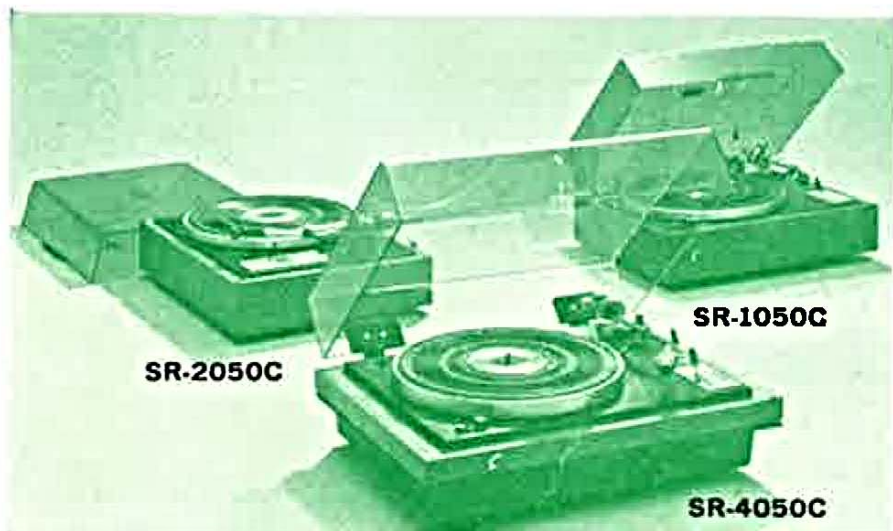
CONCERT HALL-1—To hear orchestras, big bands, etc. Suitable for most purposes. Both the front and rear channels are amplified flatly.

CONCERT HALL-2—To hear those orchestra performances and other programs which do not require wide stereo separation. Also for monophonic programs. The rear left and front channels are given different frequency responses, so that sound effects are exaggerated.

SURROUND-NORMAL—For popular music, mood music, Moog sound, rock 'n roll and other types of music which sound very attractive with the musical instruments scattered in the room. Gives very strong 4-channel stereo sound.

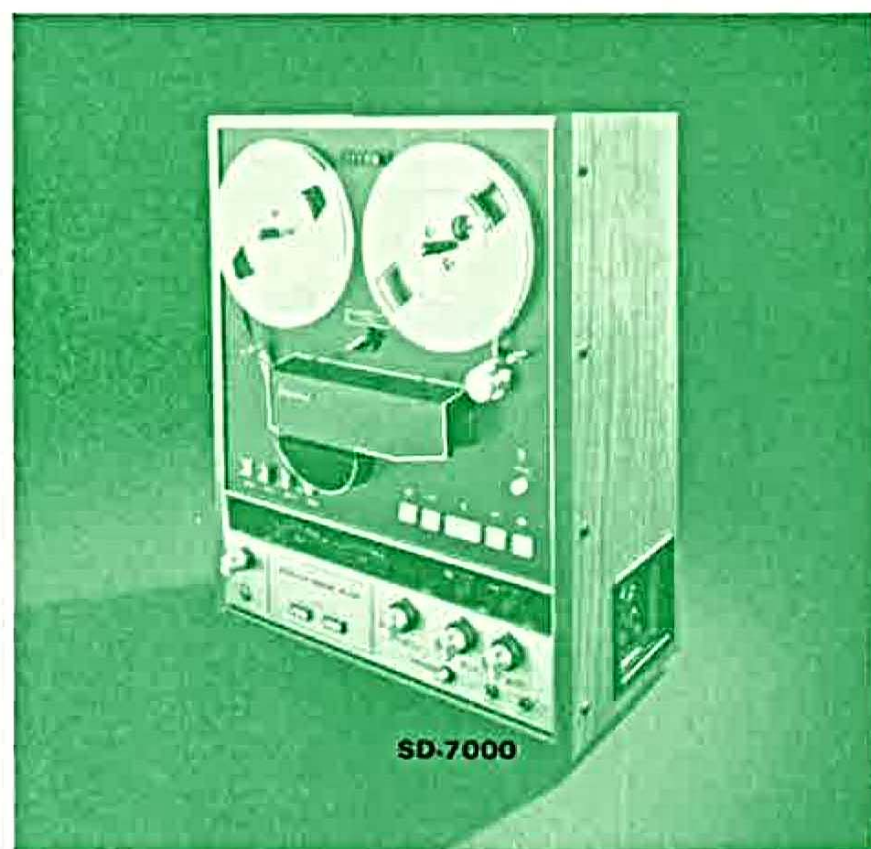
SURROUND-QUARTER TURN—To turn around sound by 90 degrees. For example, set the control to this position when hearing a vocal number where the singer is singing in the right channel only. The singer will move over to the front of the room.

SURROUND-HALF TURN—To turn around sound by 180 degrees. With the control set to this position when hearing a vocal number, you would feel like you are sitting in the middle of the stage. The voice of the singer(s) will be heard from the rear speaker systems, and the orchestra will be heard from the front speaker systems.



Recording and Playing a 2-Channel Stereo Tape

Two-channel stereo tape recordings can be made and reproduced by the use of a 2-channel stereo tape deck connected to the QS-1. If the tape deck is of a 3-head type (with separate record and playback heads), it is possible to record a tape and reproduce it almost simultaneously for the purpose of monitoring.



Recording

- 1) Set the function selector control of the front channel amplifier to the program source to be recorded—such as phono, tuner, microphone, auxiliary input, etc.
- 2) Start the tape deck in the recording mode.
- 3) Use the tone controls and other controls to suit your personal preference or room acoustics.

Playback

- 1) Set the 2-channel TAPE MONITOR Switch of the QS-1 to the PLAYBACK position.
- 2) Engage the tape deck in the playback mode.
- 3) Adjust the playback volume control of the tape deck or the LEVEL SET Control of the QS-1 so that the front channel VU meter pointers will swing to the mark "1" or "2" in the red zone for the loudest passages of the recording.
- 4) Use the tone controls and other controls to suit your personal preference or the room acoustics.

SIMPLE MAINTENANCE HINTS

About Speaker Polarities

If the polarities (plus and minus) of the front left and right speaker systems are not identical, sound from them will lack a sense of natural connection, and also be weak in the bass range. The same applies to the polarities of the rear left and right speaker systems. Further, if the polarities of the front left and right and the rear left and right speaker systems are not identical, sound from the four speaker systems will lack a sense of natural connection, and especially show a weakness in the bass range.

Should you be using amplifiers of different makes for the front and rear channels, matching the polarities between the rear channel amplifiers and speaker systems alone may sometimes fail to achieve correct matching with those of the front channel amplifiers and speaker systems. To prevent this, try reversing the amplifier-speaker connections once (i.e., connecting the plus side of the amplifier output terminal to the minus side of the speaker input terminal, and the minus side of the amplifier output terminal to the plus side of the speaker input terminal, without reversing the left and right channels) and see if better 4-channel stereo effect can be obtained.

If Hum Noise Is Heard When You Connect the Amplifiers

In the very unlikely even that hum (boomy) noise is heard when you connect the front and rear channel amplifiers to the QS-1, connect a PVC (poly-vinyl chloride) cable to the grounding terminal of the QS-1, and connect it to the grounding terminals of the amplifiers.

Avoid Installation Near Heat-Radiating Objects

While the QS-1 does not generate heat of itself, it could eventually break down if set in a warm place for a long period of time. Avoid installing it on top of a heat-radiating amplifier or in a place exposed to the direct sunlight; place it where the air circulation is very smooth.

Rear-Panel AC Outlets

Of the two AC outlets provided on the rear panel, the one marked SWITCHED is controlled by the front-panel Power Switch, and so is convenient for connecting the rear-channel amplifier. The other, marked UNSWITCHED, is always 'live' and independent of the Power Switch. Their power capacity is limited, and it is dangerous to connect equipment with a bigger power requirement. Before connecting any equipment, make certain its power requirement does not exceed the power capacity limit.

Should the Power Fuse Blow

Should the power fuse blow for some reason and the QS-1 become dead, remove the AC line cord and replace the blown fuse with a similar new 1-ampere glass-tubed fuse. If it seems the fuse has blown because of an internal defect in the QS-1, be sure to discover and remove the defect before replacing the fuse. Never use a piece of wire or a fuse of a different capacity, even as a stop-gap measure, or serious danger could result.

To Connect Amplifiers, etc.

Use the shielded cables supplied with the QS-1 to connect the front and rear channel amplifiers to the QS-1. These cables not only keep the distributed capacity to a minimum but are very stable against environmental changes. If you should need longer cables for some reason, be sure to use thick cables with a minimum of distributed capacity. Generally, the longer the connecting cables, the more the treble notes tend to be attenuated. It is therefore wise to keep their length below 15 feet or so wherever possible. Above all, never use the parallel PVC cable—the kind usually used for the household power supply—to connect such equipment, or chances are you will be troubled with disturbing hum noise.

If the Rear Channel Sound Is Shaky

You may sometimes notice the sound from the rear speaker systems is shaky when that from the front speaker systems is not. This usually happens because the indirect sound components that the QS-1 extracts are distorted to begin with, for one of the following reasons:

- 1) The record is damaged or worn out.
- 2) The cartridge stylus is damaged or has dust on it.
- 3) The tracking force of the cartridge is either too light or heavy.
- 4) The cartridge itself is faulty.
- 5) The level of the input signals fed to the QS-1 is too high, causing the VU meter pointers to swing to the right end.
- 6) The sound in the record or tape is already distorted.
- 7) The stereo separation of the FM tuner is poor, or the FM antenna input is insufficient and the broadcast signal contains much noise.

If the Separation of the Front and Rear, Left and Right Channels Is Poor

While the QS-1 is designed so that the sounds from the four speaker systems blend with one another to form an integrated sound field, the separation of the four channels may be noticeably poor sometimes, for one of the following reasons:

- 1) The separation by the cartridge is poor.
- 2) The left and right channels of the cartridge are not in phase.
- 3) The left and right output voltages of the cartridge are way out of proportion.
- 4) The left and right channels of the playback head of the tape deck are not in phase.
- 5) The left and right output voltages of the tape deck are way out of proportion.
- 6) The left and right output voltages of the FM tuner are way out of proportion.
- 7) The separation by the FM tuner is poor.
- 8) The program source itself is faulty.

Grounding

Any noise picked up by connecting cables is effectively grounded by connecting a piece of PVC (polyvinyl chloride) or enameled wire to the rear-panel grounding terminal (marked GND), attaching a small copper plate or carbon rod to the other end and burying it deep underground. Or else, the wire may be connected to the amplifiers already so grounded.

Program Sources/Basic Principles Behind QS-1

Since the QS-1 derives 4-channel information by reorganizing the information already present in the original 2-channel stereo program sources, the resultant 4-channel sound would not be half as effective if the original program sources did not contain information that can be re-organized. However, most stereo program sources are qualified for conversion into 4-channel sound, including FM stereo broadcasts, commercially available recorded tapes and phonograph records. By and large, the effectiveness of the conversion is determined by the method of original recording.

Voltage Adjustment

To reach the Voltage Selector, remove the two screws securing the name plate on the rear panel, then remove the name plate. The Voltage Selector makes it possible to operate the QS-1 at the correct voltage in any area. The voltage has been pre-adjusted at our factory, but can be easily readjusted as follows:

1. Set the arrow on the Voltage Selector plug to the required voltage: 100, 117, 220 or 240 volts.
2. The power fuse should also be changed whenever the AC line voltage changes. For 100-117 volt operation, a 0.5 ampere fuse is required. For 220-240 volt operation, use a 0.3 ampere fuse.

Note: Should the AC line voltage in your area fluctuate considerably, it is wise to set the Voltage Selector to the next higher voltage for safety.

PROGRAM SOURCES/TECHNICAL PRINCIPLES

Program Sources Suited for Conversion to 4-Channel Stereo

Recordings Containing Abundant Indirect Sound Waves

Classic music is often recorded to include the reverberation inside the recording studio or concert hall. Such reverberation can be reproduced fully from the rear speaker systems to create a wonderfully life-like sound field.

Recordings with Rich Echoes

Even if these echoes are artificial, they help create a beautiful sound field when fed through the QS-1 and converted into four channels.

Programs with Moving Sounds

Moog sound and other programs where sounds move back and forth or from one side to another are uniquely suited for conversion into 4-channel stereo. These would sound very 'alive' when reproduced through the four speaker systems.

Programs with Good Stereo Separation

While the sound field effect is a major advantage of the 4-channel sound reproduced by the QS-1, the sense of sound source positions is another important consideration, which can be fully enjoyed by reproducing those programs where the stereo separation is so good that the musical instruments are already very clearly located in the original recordings.

Mood Music with Emphasis on 'Presence'

The soft mood music, such as is played by the famous Mantovani Orchestra, is also well suited for reproduction through the QS-1. Reproduced by the four speaker systems, it would create a very soft sound field and fill the room with rich 'presence'.

Your Own Recordings, Too

Tape recordings that you make for yourself with a pair of microphones are also qualified for conversion into 4-channel stereo. Needless to say, these would be more effective if the reverberation and echoes are fully picked up.

Program Sources Not Suited for Conversion To 4-Channel Stereo

Solo performances, whether a piano, violin or whatever, are basically hard to convert to 4-channel

stereo sound. Even this is no problem, however, if only the front 2-2 speaker positioning system is used.

Basic Principles behind the QS-1

To help you acquire a basic understanding of the engineering principles behind the QS-1, let us now turn to a brief discussion of the difference between the conventional 2-channel stereo and the new 4-channel stereo, and the difference between the 4-channel stereo by the QS-1 and the ordinary 4-channel stereo employing 4-channel recorded tapes—or the 4-source 4-channel stereo as it is called by some audio specialists.

(1) Difference between Conventional 2-Channel Stereo and 4-Channel Stereo

In a live sound field such as a concert hall, an infinite number of direct and indirect sound waves combine to create a feeling of levelness called 'presence', as illustrated in Fig. 1. The human ear feels this sound field by sensing the relative phase differences, or time delays of these sound waves arriving from numerous directions.

If a single microphone is placed in such a sound field, it would simply convert all these sound waves with their individual phase differences into a single sum signal, as shown in Fig. 2. Such a signal, obviously, would not be able to reproduce the original sound field.

For the regular 2-channel stereo, a pair of microphones are employed to pick up the numerous sound waves, as illustrated in Fig. 3. Then the numerous sound waves present in the live sound field are converted into two sum signals, which transmit far more information than the single sum signal of a monophonic program source but still fail to reproduce the original sound field with sufficient fidelity. For the new 4-channel stereo that is fast emerging of late, as many as four microphones are employed to pick up the sound waves, which are amplified through four separate amplifiers and reproduced through four speaker systems placed in the listening room. While this systems is far superior to the conventional 2-channel stereo in the amount of information it transmits, it still falls short of the mark of receiving and reproducing the original sound field because four microphones are simply not up to the

job. Theoretically, as shown in Fig. 4, n number of channels (microphones) are necessary to reproduce the original sound field faithfully.

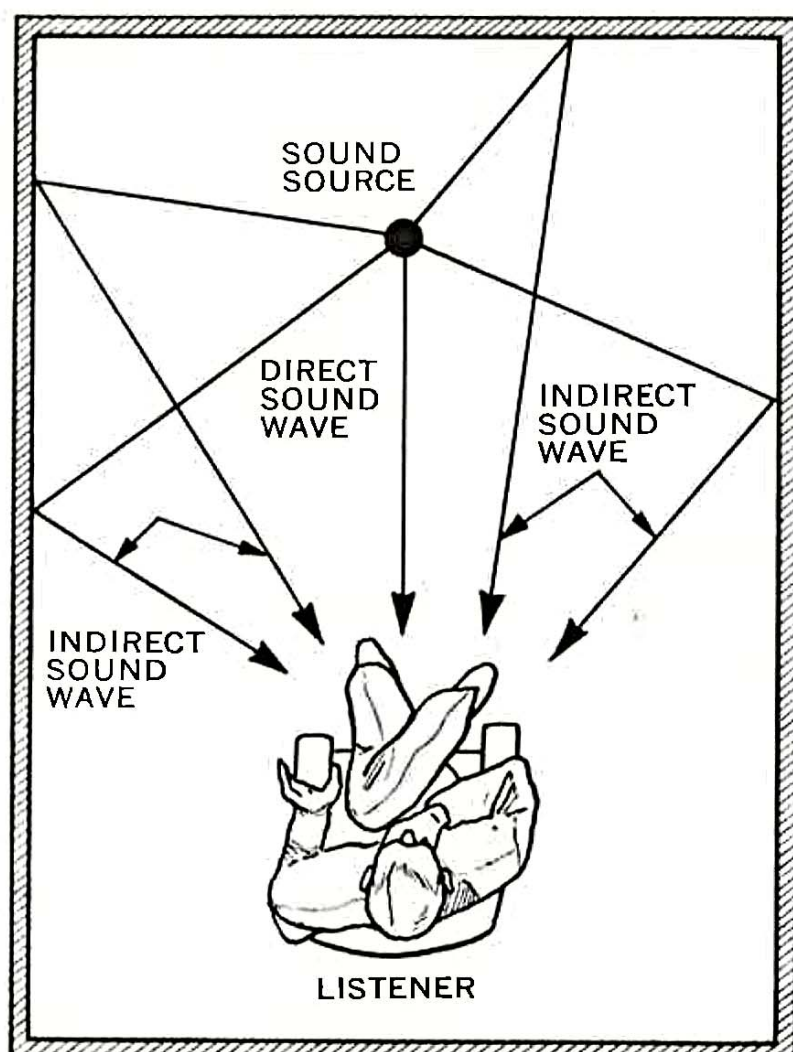


Fig. 1

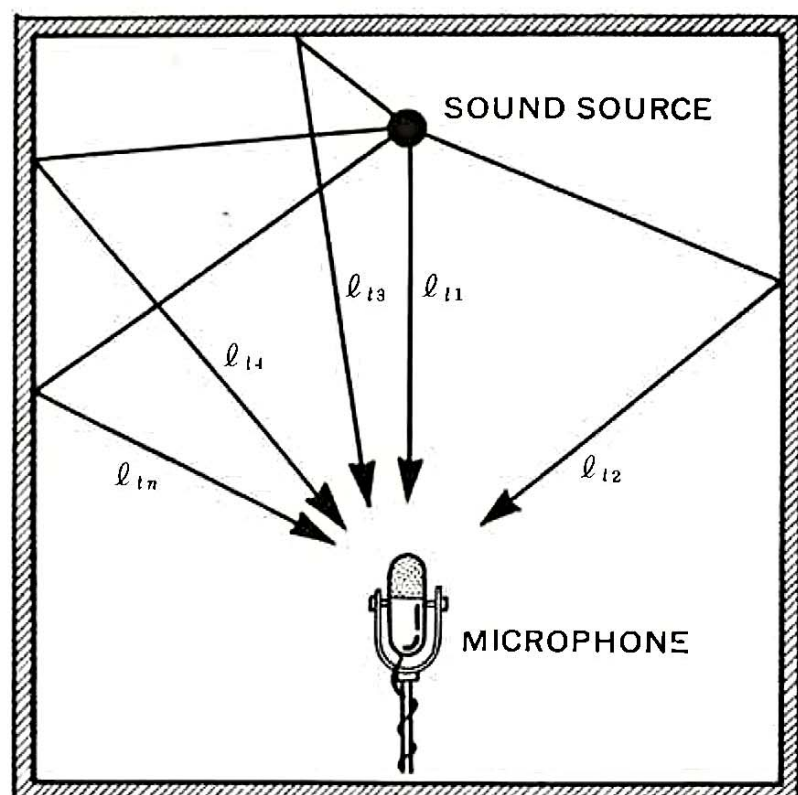


Fig. 2

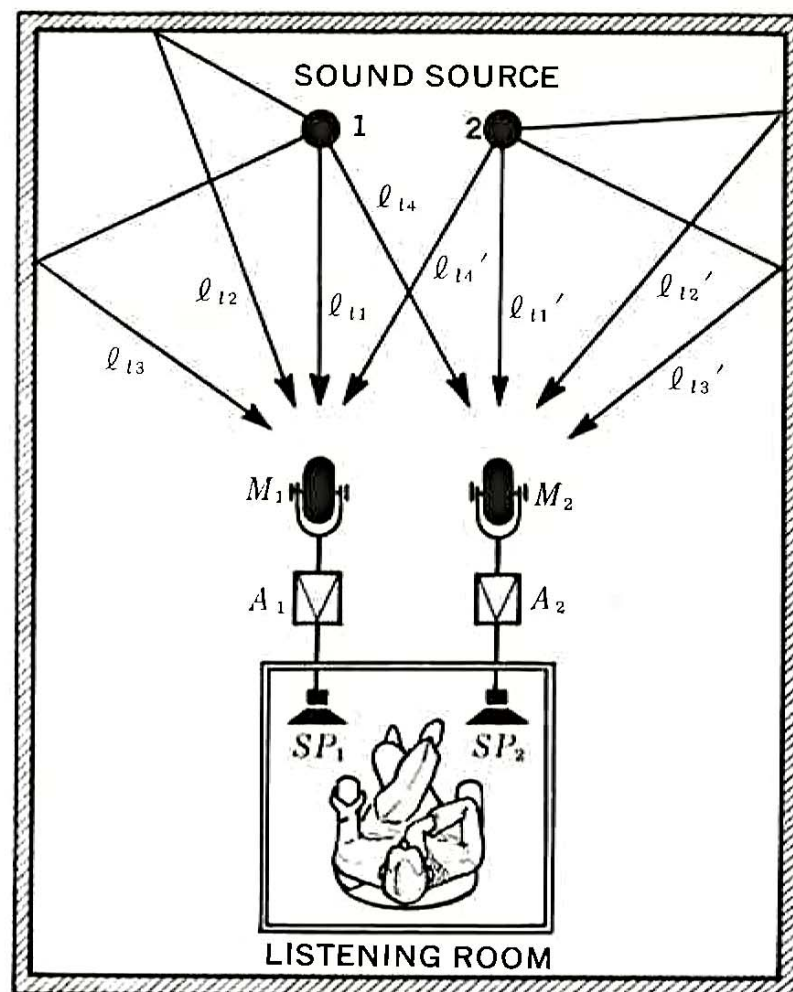


Fig. 3

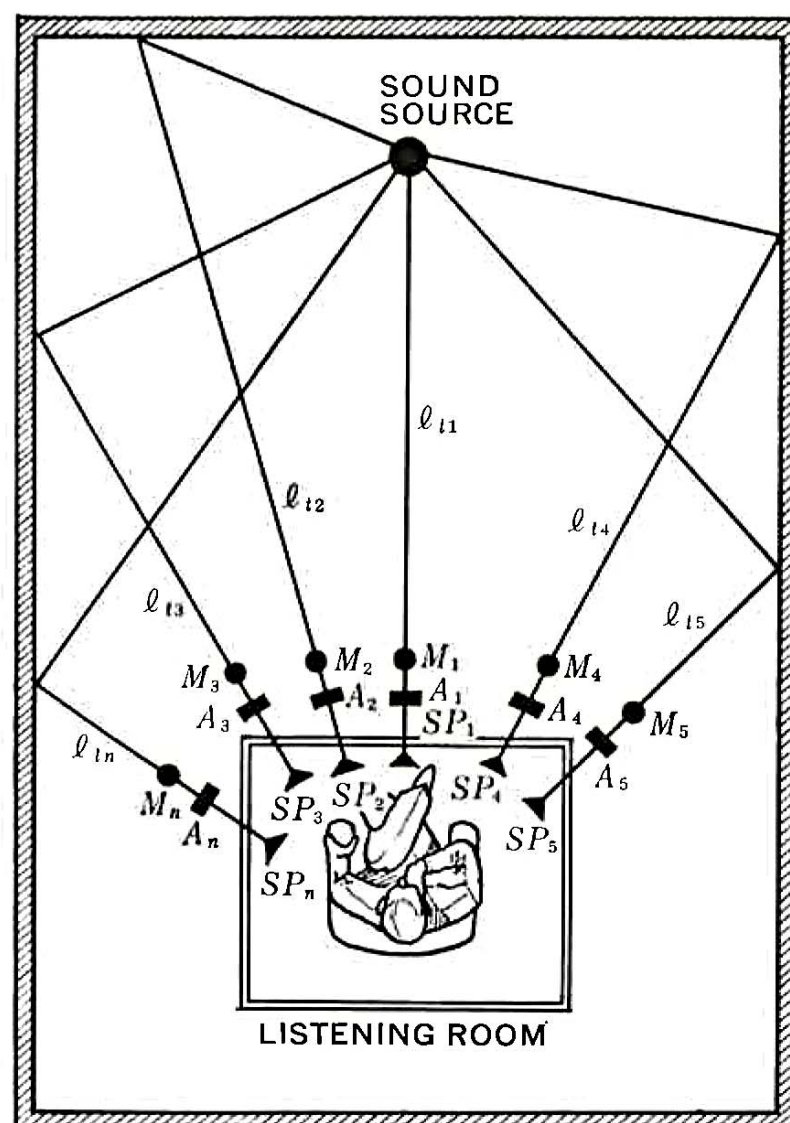


Fig. 4

TECHNICAL PRINCIPLES

(2) Four-Channel Stereo by the Sansui Quadphonic Synthesizer QS-1

It should be obvious from the foregoing discussion that 4-channel stereo is far superior to 2-channel stereo in approximating the original sound field. Then, let us now see how the new Sansui Quadphonic Synthesizer in your hand produces 4-channel stereo sound from regular 2-channel sources.

Unique Reproducing Matrix Is the Key

In their effort to obtain 4-channel stereo sound from 2-channel sources, Sansui engineers first concentrated on creating the sense of sound source positions so peculiar to 4-channel stereo. This was eventually solved by the development of a unique reproducing matrix (patents pending) that analyzes and synthesizes the regular 2-channel stereo signals to obtain separate direct and indirect sound components. Through this process, the QS-1 re-organizes the left and right stereo channels of regular 2-channel stereo into a sound field comprising four sound sources—front left and right and rear left and right, as illustrated in Fig. 5. This sense of sound source positions would be even more pronounced if the original 2-channel recording were made with the subsequent conversion to 4-channel stereo in mind from the outset. This can be easily accomplished through the use of another important invention by Sansui—a unique recording matrix (patents pending). Fig. 6 shows how 4-channel information

is condensed into 2 channels through the use of the new recording matrix, delivered to the listening room in the form of a 2-channel stereo record, tape or FM stereo broadcast, fed through the QS-1 and expanded back into four channels for reproduction by four speaker systems.

If no such special recording matrix were available and a regular 2-channel stereo source were fed to the QS-1, the instrument would still create the sense of original sound source positions this way. Namely, as shown in Fig. 5, any musical instruments or voices located at the left end of the stage in regular 2-channel stereo would be heard near the rear left corner; any such sound sources located slightly to the right of those just mentioned would be heard near the front left corner; any such sound sources located in the center would remain there; any such sound sources located to the right of the center would be heard near the front right corner; and finally, any such sound sources located at the right end would be heard near the rear right corner.

The QS-1 does not include any mechanical echo or sound-delaying device. This is because most 2-channel stereo recordings already contain sufficient echo components that, when reproduced by the QS-1 through the four channels, fill the room with a natural 'live-performance' atmosphere. These echo components are usually stored in opposite channels—i.e., the echoes of the right channel sounds are recorded in the left channel, and vice versa.

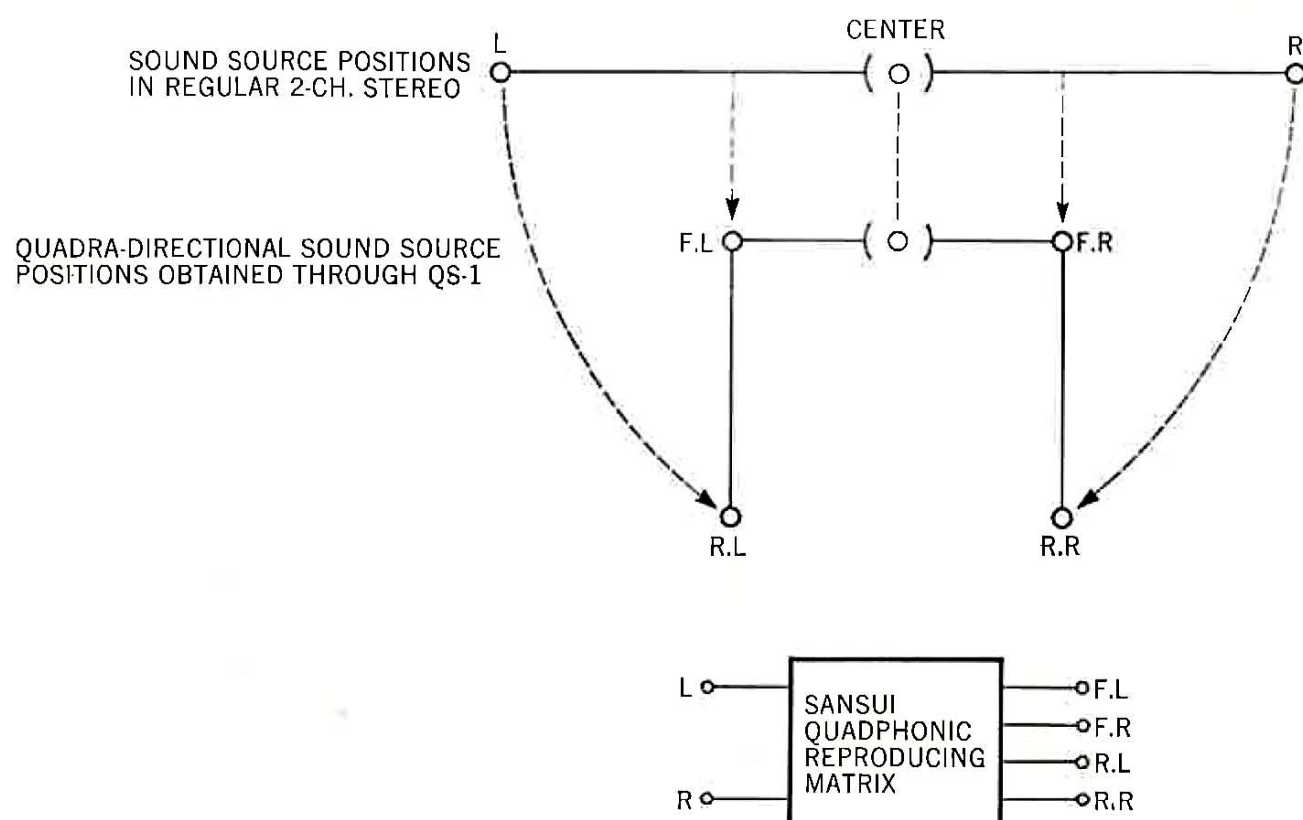
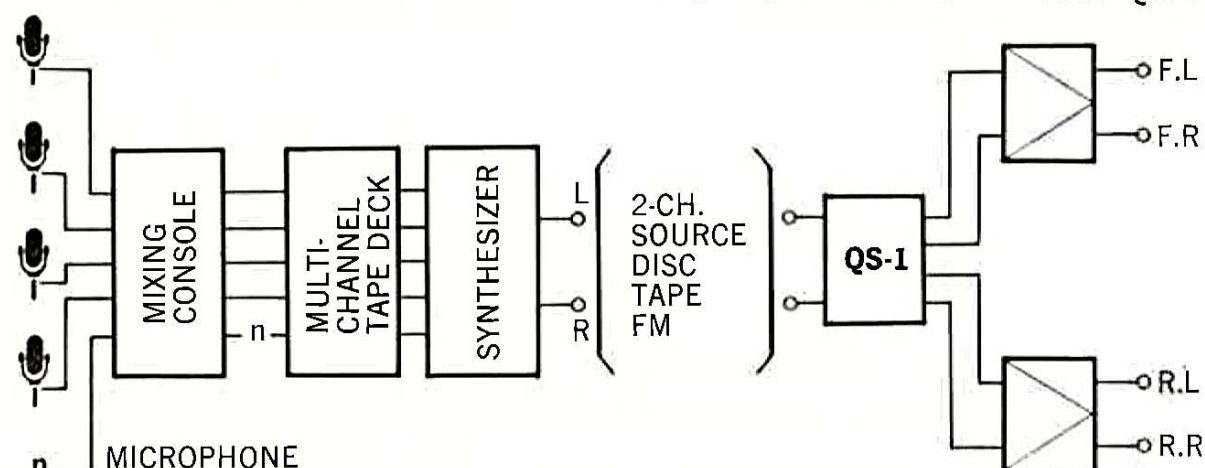


Fig. 5

HOW REGULAR 2-CHANNEL SOURCES ARE CONVERTED INTO 4-CHANNELS BY THE QS-1



* If Sansui's own recording matrix were used for the synthesizer, the sense of sound source positions in the reproduced sound would be even more pronounced.

ORDINARY 4-SOURCE 4-CHANNEL RECORDING AND PLAYBACK

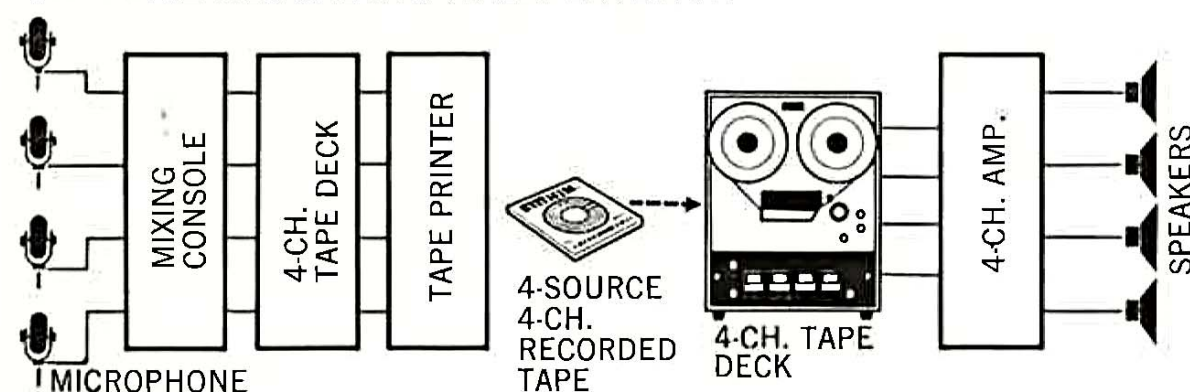


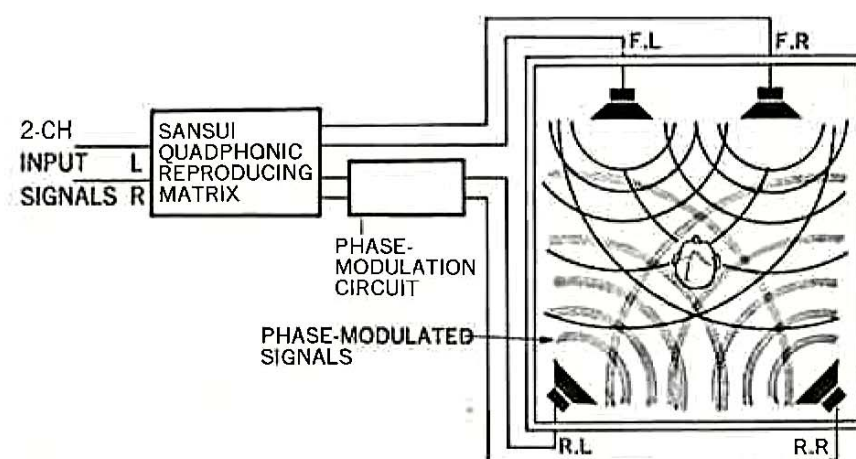
Fig. 6

Phase Modulation Utilized to Create Presence Unique to 4-Channel Stereo (Patents Pending)

As stated previously, a live sound field comprises almost an infinite number of sound waves with their individual phase differences. While the unique reproducing matrix in the QS-1 successfully creates the sense of sound source positions in converting 2-channel stereo signals into 4 channels, the total amount of information transmitted is admittedly much smaller than is present in a live sound field. To overcome this problem, Sansui engineers brought in another technique known as phase modulation. The indirect sound components separated by the reproducing matrix are phase-modulated by a unique Sansui-developed system before being emitted from the rear speaker systems. As a result, when they join the unaffected direct sound components released from the front speaker systems, they create a richer, livelier 'presence' than was ever before possible. The phase modulation is designed to take advantage of a well known phenomenon. As is generally known, two speaker systems in phase will permit

the reproduced sound to be located at a point midway between them. Connected out of phase with each other, however, the same two speaker systems will fail to form any clear sound image. Phase modulating the signals of either speaker system under this condition produces the same effect as if numerous speaker systems were placed between them, creating a very rich sound field.

At any rate, the tonal quality of the 4-channel stereo sound reproduced by the QS-1, as your ears will attest very soon, is at least equal to and often better than that of the sound obtained from 4-source 4-channel stereo tapes.



RECOMMENDED SANSUI COMPONENT COMBINATIONS FOR 4-CHANNEL STEREO

You only need add the QS-1, a control amplifier and another set of speaker systems to your present 2-channel stereo set-up to enjoy the exciting 4-channel stereo sound. While the best 4-channel stereo effect is realized by employing identical amplifiers and speaker systems for both front and rear channels, it is by no means an absolute requirement. Make your choices of these additional components freely, using the chart below for reference.

| QUADPHONIC SYNTHESIZER | FRONT AMPLIFIER | REAR AMPLIFIER | FRONT SPEAKERS | REAR SPEAKERS | TAPE DECK | TURNTABLE |
|---------------------------|-----------------|----------------|-------------------|---------------|-----------|----------------------|
| QS-1 | 5000A | AU-666 | SP-3000 | SP-150 | SD-7000 | SR-2050C SR-1050C |
| QS-1 | 4000/3500 | AU-666 | SP-2000 | SP-150 | SD-7000 | SR-2050C SR-1050C |
| QS-1 | 2000A | AU-555A | SP-2000 | SP-70 | SD-7000 | SR-2050C SR-1050C |
| QS-1 | 1000X | AU-555A | SP-1500 | SP-50 | SD-7000 | SR-2050C SR-1050C |
| QS-1 | 800 | AU-222 | SP-150 | SP-50 | SD-7000 | SR-2050C SR-1050C |
| QS-1 | 350 | AU-222 | SP-70 | SP-30 | SD-7000 | SR-2050C SR-1050C |
| QS-1 | 300L/300E/300 | AU-222 | SP-50 | SP-30 | SD-7000 | SR-2050C SR-1050C |
| QS-1 | 200 | AU-222 | SP-30 | SP-10 | SD-7000 | SR-2050C SR-1050C |
| QS-1 | AU-999 | AU-666 | SP-3000 | SP-1500 | SD-7000 | SR-2050C SR-1050C |
| QS-1 | AU-666 | AU-555A | SP-2000 | SP-150 | SD-7000 | SR-2050C SR-1050C |
| QS-1 | AU-555A | AU-222 | SP-150 | SP-70 | SD-7000 | SR-2050C SR-1050C |
| QS-1 | AU-222 | AU-222 | SP-50 | SP-30 | SD-7000 | SR-2050C SR-1050C |