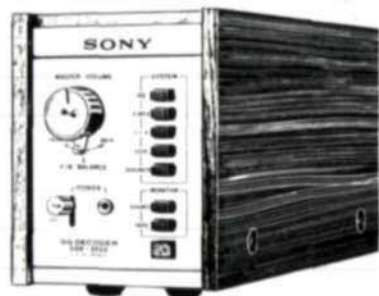


SONY®

SQ DECODER

**SQD-2050**



OWNER'S INSTRUCTION MANUAL

SONY invites you to a new world of listening to Stereo Quadraphonic Sound.

The original ambience of concert-hall music comes from the reflected sound that has hit the walls, ceiling and bounced back to the listener. With this ambience, the music is rich and brilliant with profound spatial feeling. By reproducing sound over four widely-separated speakers, four-channel stereo not only provides the direct sound, but also recreates the ambience pattern as it actually exists in a concert hall. Furthermore, four-channel stereo also gives composers and recording directors a tool to create new musical effect by enveloping the listener with 360° sound.

The fundamental four-channel system is "discrete" recording. But, the "discrete" approach has a big limitation: Putting discrete four-channel on a disc requires the user to install new, costly, high-precision playback equipment. Moreover, that type of signal could not be used as a program source for fm stereo broadcasts. It is practical only on magnetic tape and even there it *reduces by half the amount of music that can be put on a given amount of tape.*

CBS laboratories developed a coded matrix system "SQ", and SONY has developed the hardware which can get the utmost from the SQ system. In this system, the reproduced sound maintains sufficient channel separation to "localize" the musicians where they belong. You will hear music indistinguishable from the original master tape and feel that you are actually in a hall. Another benefit of this system is that SQ allows four-channel sounds to be reproduced from any SQ records or to be broadcast through any fm-multiplex radio system, and even makes conventional stereophonic programs sound better. Also, this

system has true interchangeability with conventional two-channel stereo; add the SQD-2050, a back amplifier and two more speakers to change your existing two-channel system to a four-channel setup.

Your tiny SQD-2050 packs a lot of performances; the excellent separation provided by the front-back logic circuitry makes you feel as if you are at a live concert. The SQD-2050 provides splendid reproduction of any kind of four-channel sounds; SQ, ordinary matrix, and discrete four-channel programs. It has a convenient front-back balancer. Output level is enough to directly drive a power amplifier.

Please take the time to read through this manual completely so that you can become familiar with the SQD-2050's features and capabilities, then you can experience the pleasure of four-channel sound. Keep this manual for future reference.

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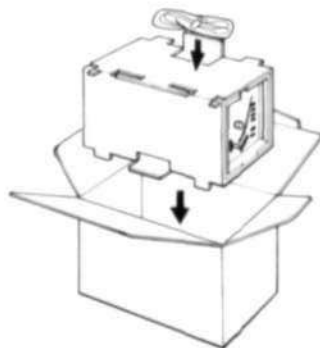
## PREPARING FOR USE

### UNPACKING

All SONY equipment comes to you carefully packed in cartons designed to withstand the rigors of shipment. Do not throw the carton or associated packing material away; they will come in handy if you ever have to transport or ship the SQD-2050.

Inspect your SQD-2050 immediately for signs of damage incurred in transit. If damage has occurred, consult your local SONY dealer for further instructions. Once again, save all packing material; it will substantiate your damage claim.

When shipping the unit for repair work or simply to another location, the unit must be repacked in the original carton and the packing material precisely as before.



## DO'S AND DON'T'S

No doubt you have already decided on a location for your SQD-2050. However, before going ahead with the installation, make sure that your choice of location agrees with the following list of DO's and DON'T's.

- DO** allow sufficient room behind the SQD-2050 so you can make connections to the rear panel without disrupting your entire setup.
- DON'T** place the SQD-2050 in direct sunlight, or near radiators, hot-air ducts, or any other source of heat. Similarly, don't place it in any area subject to freezing temperatures or excessive moisture.
- DON'T** connect the SQD-2050 to a power source other than that for which it is designed (120 V, 60 Hz ac)
- DON'T** make connections with the power turned on.

After you have found a suitable location for your SQD-2050, you can begin making the basic connections described in the following paragraphs. Refer to the overall-system connection diagram while making these connections. However, **before connect the decoder and discrete four-channel tape recorder, perform "ADJUSTMENT OF FOUR-CHANNEL SOUND" on page 12.**

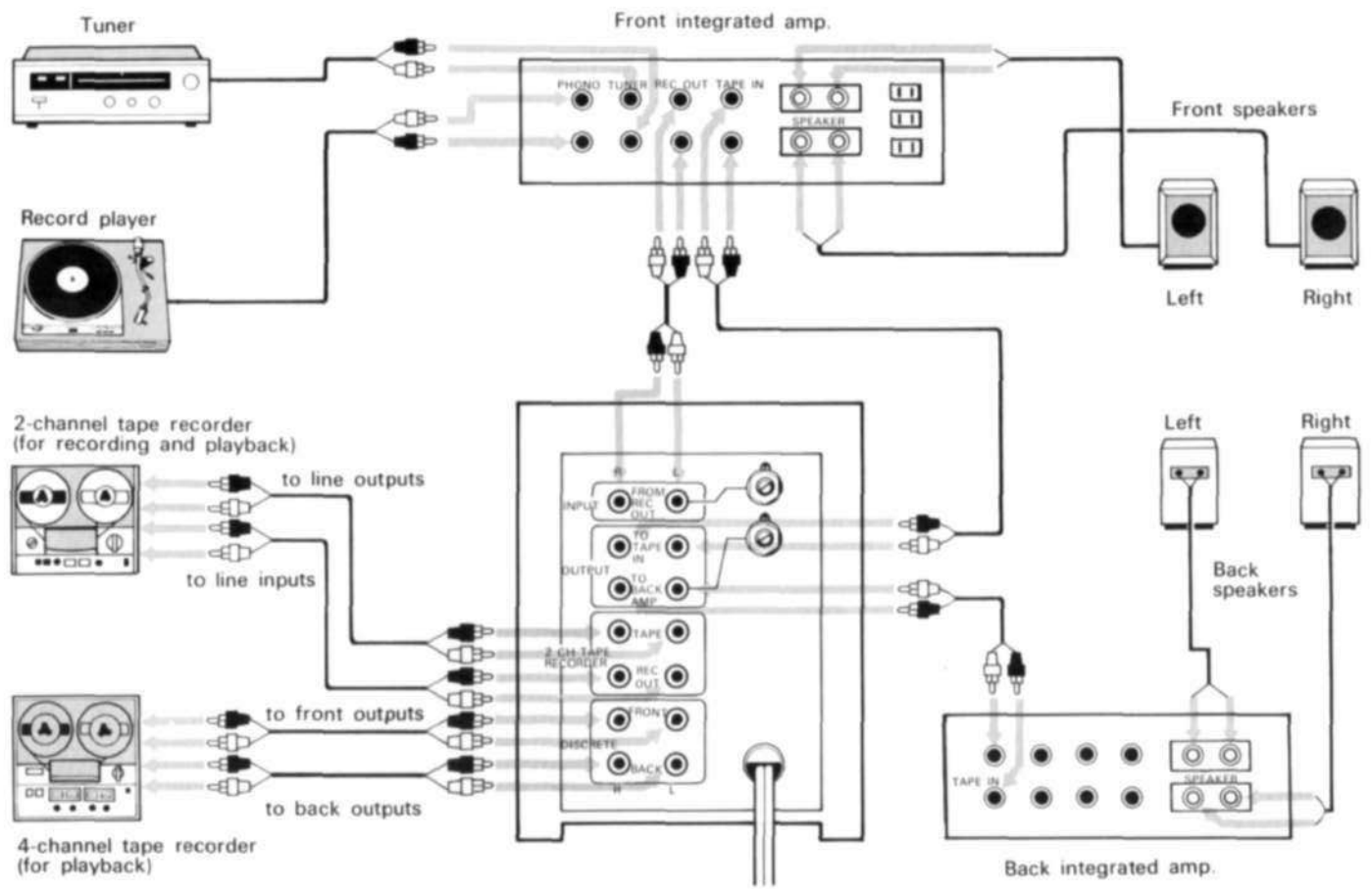
## SYSTEM CONNECTIONS

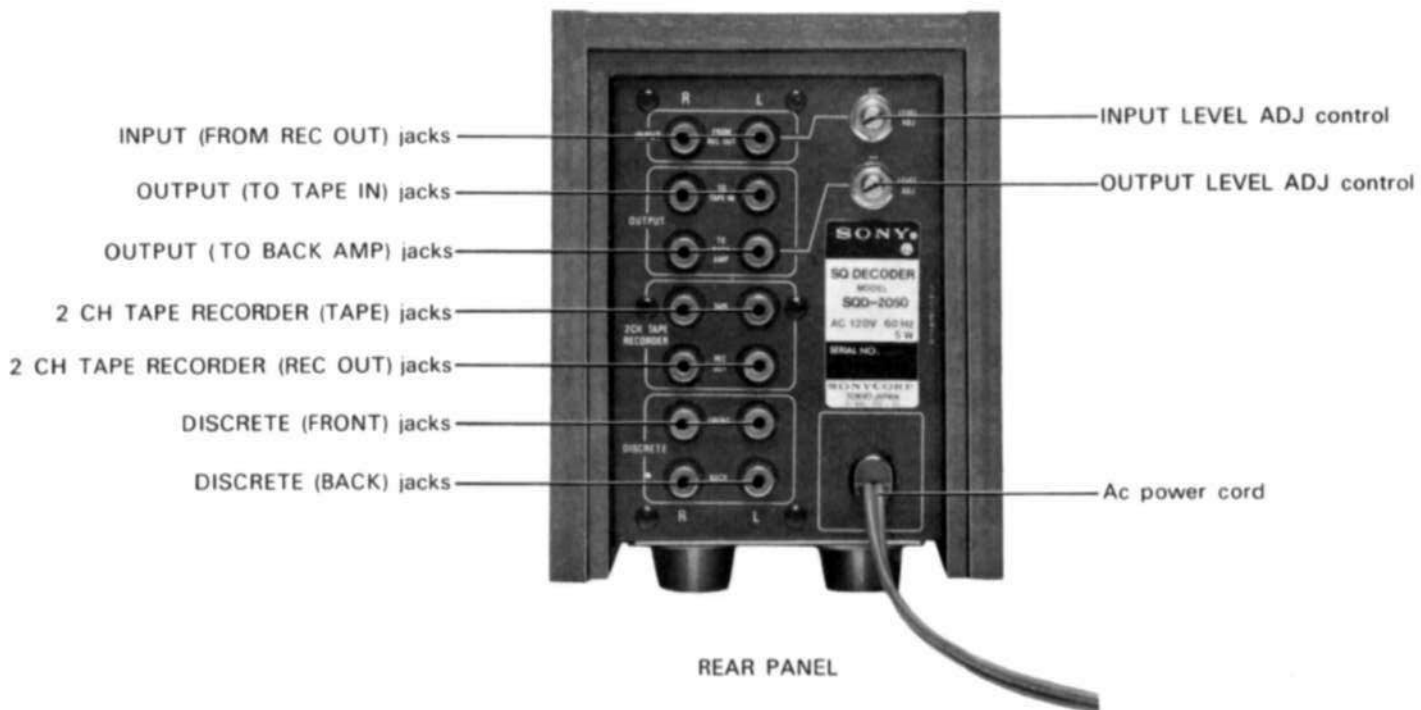
### SQ System

The owner of a good quality stereo system\* can convert his existing system to an SQ system by adding the SONY SQD-2050, a back amplifier and two more loudspeakers, keeping the existing system connections as they are.

\* Stereo system must have a tape/source monitor selector.

We recommend that all amplifiers have the same power output for maximum realism. For speakers, it is desirable to use four identical speakers for most realistic quadraphonic reproduction. However, even if front and back speakers are different, you will get good results.





### Input Connection Notes

To assure correct matching at the input and output terminals of your sound system, refer to the table of "SPECIFICATIONS" for the SQD-2050 (on page 21), and the specifications given in the instruction manuals provided with the components you want to connect to the SQD-2050. Generally the output level of a signal source (recording outputs of a front amplifier and line outputs of a tape recorder) should be between slightly higher than, to several times higher than, the sensitivity of the corresponding input. If the output level of the front amplifier's recording output is so high to cause distortion, reduce it with the INPUT LEVEL ADJ control. Also, the output impedance of a signal source should be considerably lower (several times or more) than the impedance of the input it connects to.

For input and output connections, use a low-capacitance shielded cable. Keep the cables as short as possible.

Be sure the cable connectors are fully inserted in the jacks. A loose connection may cause hum and noise.

### Speakers

**Location:** In many home-entertainment stereo systems, the choice of speaker location is often limited by the existing furniture arrangement. However, if rearrangement is possible, or you wish to furnish the area specifically for stereo listening, here are a few suggestions for optimizing your listening pleasure.

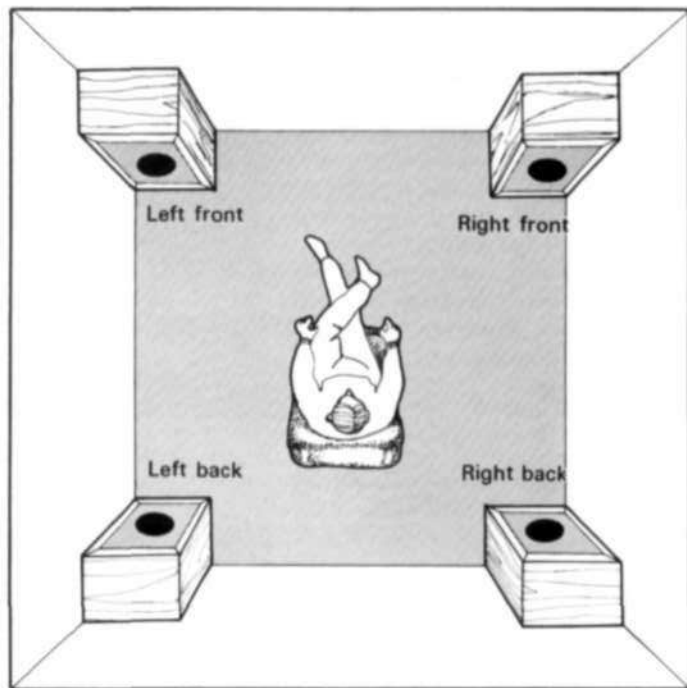
Set up your speakers in a large room having a rug on the floor. If the room has heavy drapery, so much the better. Rugs, draperies, and upholstered furniture minimize the multiple reflections of high-frequency sound that occur in a bare room and which degrade the stereo effect.

If you must position the speakers off the floor, do not put them higher than eye-level. Because of psychological conditioning, sound coming from the vicinity of the ceiling gives an unnatural feeling. Corner locations, however, are ideal for emphasizing the bass notes.

Position the left and right speakers in similar acoustic environments. If you set up the left and right speakers in an unbalanced acoustic condition, i.e. positioning the left speaker in a corner and the right speaker in the middle of a wall, the left channel sound will be emphasized.

Four-channel speaker placement requires no special demands. But for optimum acoustical effect we recommend you place the four speakers in a square or rectangular area having a maximum short-side to long-side ratio of approximately 1:1.5. When arranging the speakers in a rectangle, use the short side for right and left channels, and the long side for front and back channels.

**Connection:** Correctly connect the four speakers to the respective SPEAKER terminals of front and back amplifiers; left front, right front, left back, and right back, + to +, - to -. For the convenience of speaker phasing, most speaker cord has different colored leads. Connect the + terminals of a speaker and an amplifier with one color lead, and connect the - terminals with the remaining lead. When you use an ordinary dual-conductor lamp cord look for the colored thread molded in with one lead.





### **Decoder Connections**

Before the decoder connection, make the "ADJUSTMENT OF FOUR-CHANNEL SOUND" (on page 12).

For the connection between the front amplifier and the SQD-2050, connect the recording outputs of the front amplifier to the INPUT (FROM REC OUT) jacks, and the OUTPUT (TO TAPE IN) jacks to the tape inputs of the front amplifier.

For the back amplifier connection, connect the OUTPUT (TO BACK AMP) jacks to the tape inputs of the back integrated amplifier or to the inputs of the power amplifier\*.

\* Maximum output level of 2 volts can be provided with the OUTPUT LEVEL ADJ control in fully clockwise position to directly drive a power amplifier.

### **Record Player, Tuner and Auxiliary Sound Sources**

Connect these program sources to the front amplifier as usual. SQ records, conventional two-channel records, off-the-air programs and auxiliary sound sources can be played with these connections.

### **Two-channel Tape Recorder**

For tape recording, connect the line inputs of the tape recorder to the 2 CH TAPE RECORDER (REC OUT) jacks of the SQD-2050. For tape playback, connect the line outputs of the tape recorder to the 2 CH TAPE RECORDER (TAPE) jacks.

### **Discrete Four-channel Tape Recorder (for playback)**

Before connecting discrete four-channel tape recorder, make the "ADJUSTMENT OF FOUR-CHANNEL SOUND" on page 12.

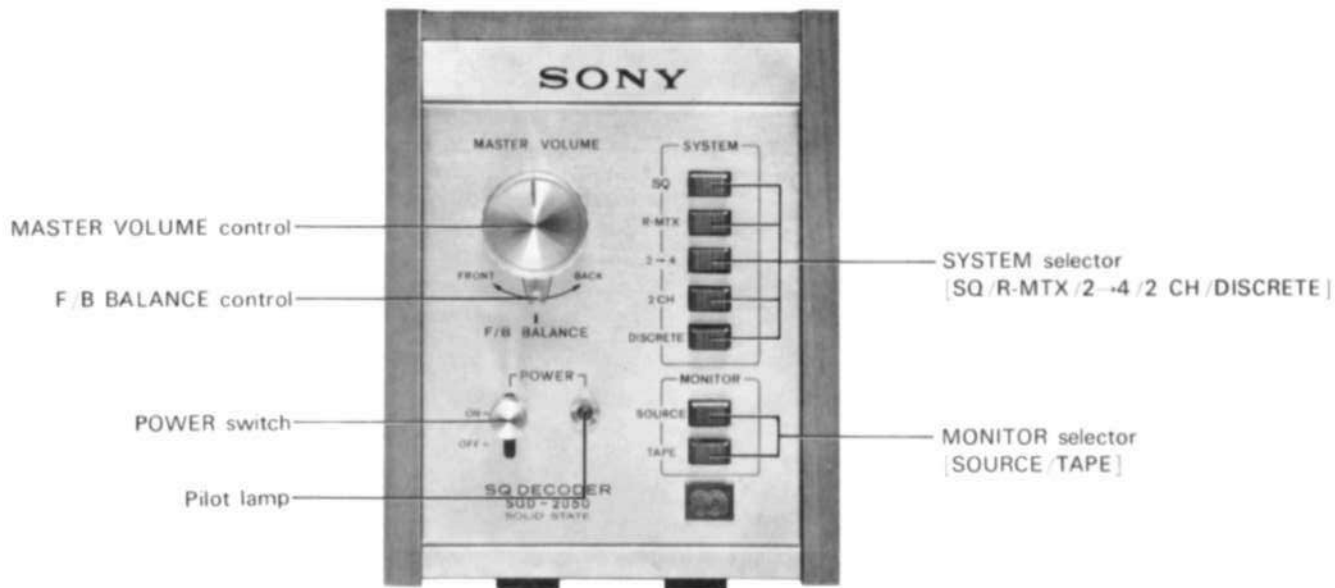
Connect the front line outputs of the tape recorder to the DISCRETE (FRONT) jacks and the back line outputs of the recorder to the DISCRETE (BACK) jacks. Check the connections of the left and right channels—the left outputs to left inputs and right outputs to right inputs.

### **Power Connection**

Before making any form of power connection, make sure the POWER switch is set to OFF. Then plug the SQD-2050 line cord in a convenient electrical outlet.

# OPERATING INSTRUCTIONS

## LOCATION OF CONTROLS



FRONT PANEL

## FUNCTION OF CONTROLS

Before attempting to operate your SQD-2050, take a few minutes to learn the function of the controls and other parts mentioned in the operating instructions.

### MASTER VOLUME control

This knob regulates the overall sound volume level of front and back channels simultaneously.

### F/B BALANCE control

This lever regulates the balance between front and back channels. To decrease the back-channel sound, slide it toward FRONT (to the left). To decrease the front-channel sound, slide it toward BACK (to the right). After accomplishing "ADJUSTMENT OF FOUR-CHANNEL SOUND" on next page, balance the front- and back-channel sounds according to your listening preference.

### SYSTEM selector

- SQ .....To listen to SQ sounds.
- R-MTX .....To listen to ordinary matrix type four-channel sounds.
- 2-4 .....For making ambient effects with conventional two-channel programs. For some kind of records, this ambient effect adds live depth.
- 2 CH .....To listen to conventional two-channel sounds as usual two-channel stereo.
- DISCRETE...To listen to discrete four-channel programs connected to the DISCRETE jacks.

When playing on a conventional two-channel programs, use either the SQ, R-MTX or 2-4 position for four-channel listening ac-

ording to your listening preference and the program material.  
**NOTE: Do not simultaneously push in more than two SYSTEM buttons.** Otherwise, the desired listening system may not be selected.

### MONITOR selector

- SOURCE ...To listen to program sources connected to the front amplifier.
  - TAPE .....To play back two-channel recorded tapes connected to the 2 CH TAPE RECORDER (TAPE) jacks.
- These buttons have no effect upon discrete four-channel program source.

### INPUT LEVEL ADJ control (on the rear panel)

This semifixed control adjusts the level of the input signals fed to the decoder to prevent the overload distortion at the decoder. If the distortion is audible when listening to your highest-output record, turn the INPUT LEVEL ADJ control counterclockwise until the distortion disappears.  
This control has no effect upon the 2 CH TAPE RECORDER and the DISCRETE programs.

### OUTPUT LEVEL ADJ control (on the rear panel)

This control adjusts the signal level at the OUTPUT (TO BACK AMP) jacks to match the inputs sensitivity of the back amplifier. A maximum output level of 2 volts can be provided with this control turned fully clockwise.

When connecting to the tape inputs of the back preamplifier, decrease the level by turning the OUTPUT LEVEL ADJ control counterclockwise.

When connecting to the inputs of the back power amplifier, turn this control counterclockwise until the proper sound level is obtained.

When power output of the front amplifier is much lower than that of the back amplifier, decrease the output with this control.

### ADJUSTMENT OF FOUR-CHANNEL SOUND

Good-quality SQ reproduction depends on four signals adjusted to the same level and the speakers properly phased.

#### Preparation

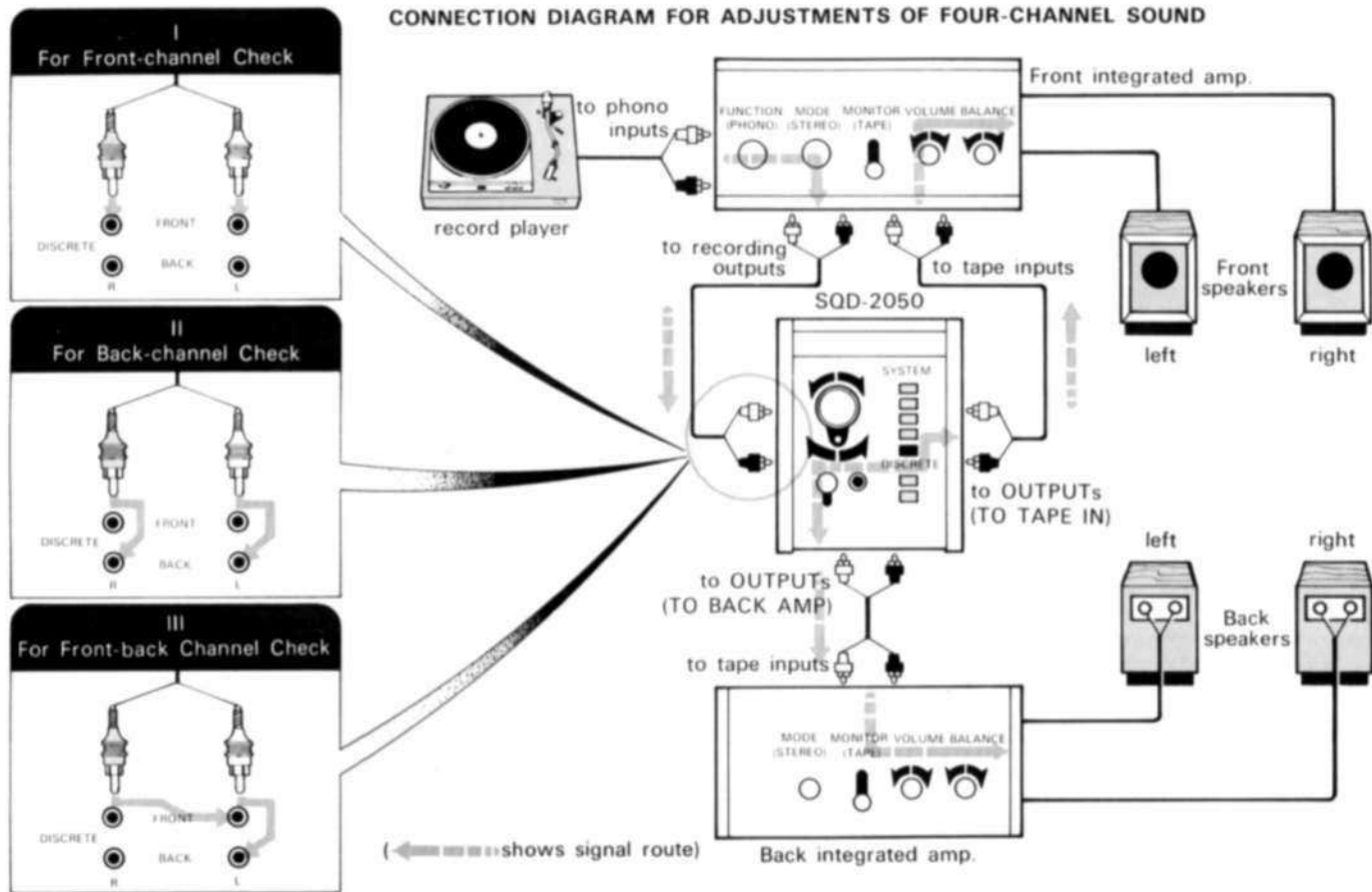
1. Make the connections according to the diagram at the right. When making the checks directed in the following adjustment procedures, connect the recording outputs of the front amplifier to the the SQD-2050 as directed in the first steps of these procedures.
2. Play a monaural record or a record which contains prominent bass notes with a soloist playing in the center.
3. Turn the MASTER VOLUME control\* and the OUTPUT LEVEL ADJ control fully counterclockwise.
4. Position the selectors of the SQD-2050, and the front and back amplifiers as follows :

	Front amplifier	Back amplifier**	SQD-2050
Mode selector	STEREO	STEREO	—
Monitor selector	TAPE	TAPE	—
Function selector	PHONO	—	—
SYSTEM selector	—	—	DISCRETE

\* When reconnecting, be sure to turn the MASTER VOLUME control fully counterclockwise.

\*\* If a power amplifier is used for the back channels, you do not need to set the selectors as directed in the above table.

# CONNECTION DIAGRAM FOR ADJUSTMENTS OF FOUR-CHANNEL SOUND



## I. Front-channel Checks

If the front speaker phasing in an existing system has previously been checked, omit Step 5 A in the following procedures. If stereo balance for the front channels has been also obtained, omit this "Front-channel Checks".

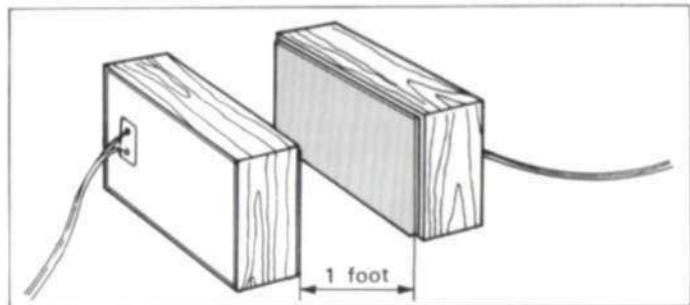
1. Connect the front amplifier as directed in diagram "I" on previous page: Plug the front amplifier recording outputs into the DISCRETE (FRONT) jacks of the SQD-2050.
2. Turn on the SQD-2050 and the front amplifier.
3. Slide the F/B BALANCE control of the SQD-2050 to the left (FRONT).
4. Adjust the sound volume of the front amplifier to your normal listening (or somewhat higher) level\*. Set the sound level to the normal listening level by turning the MASTER VOLUME control clockwise.

\* The highest level available from the MASTER VOLUME control (fully clockwise position) is determined by the level set at the front and back amplifiers. Therefore, set the level controls of the front and back amplifiers for normal listening. If this is not done, speaker damage may result when you set the monitor selector of the front amplifier to its source position and the program source is reproduced at a high volume level.

### 5. A. Speaker phasing check

Move the front speakers so that they are one foot apart and facing each other. Listen to a recorded passage containing prominent bass notes. Then, reverse the connection

to one of the front speakers and listen to the same bass passage again. If it now sounds like there is less bass, the speakers were correctly phased and the original connection should be restored. However, if the bass appears to have increased, the speakers were originally phased incorrectly and the new connection should be used.



### B. Balance adjustment

Locate the front speakers as directed in "Speaker location" on page 7. Then adjust the balance control of the front amplifier until the sound seems to come from a central point between the right- and left-front speakers.

## II. Back-channel Checks

1. Reconnect the front amplifier as directed in diagram "II" on page 13: Disconnect the front amplifier from the DISCRETE (FRONT) jacks and connect it to the DISCRETE (BACK) jacks.
2. Turn on the SQD-2050, and front and back amplifiers.
3. Slide the F/B BALANCE control to the right (BACK).
4. Set the level controls\* of the back amplifier to the normal listening (or somewhat higher) position. Turn the MASTER VOLUME control fully clockwise. Then turn the OUTPUT LEVEL ADJ control so that a normal listening level is obtained.  
\* If the back amplifier does not have level controls, adjust the sound level with the OUTPUT LEVEL ADJ control and omit Step 5 B—"Balance adjustment".
5. A. Speaker phasing check  
To check for correct phasing: Move the back speakers so that they are about one foot apart and facing each other. Do likewise as directed in Step I-5 A.  
B. Balance adjustment  
Locate the back speakers as directed in "Speaker location" on page 7. Do likewise as directed in Step I-5 B.

## III. Front-back Channel Checks

1. Reconnect the front amplifier as directed in diagram "III" on page 13: Disconnect the right output of the front amplifier from the R DISCRETE (BACK) jack and connect it to the L DISCRETE (FRONT) jack.
2. Turn on SQD-2050, and front and back amplifiers.
3. Set the F/B BALANCE control to its central position.
4. Turn the MASTER VOLUME control clockwise to a comfortable level. Adjust the sound level of the back amplifier to that of the front amplifier with the OUTPUT LEVEL ADJ control.  
◦ If you have omitted "I. Front-channel Checks", adjust the sound level of the front amplifier according to Step I-4.
5. A. Speaker phasing check  
Move the left-front and -back speakers so that they are one foot apart and facing each other. Do likewise as directed in Step I-5 A\*.  
\* If phasing is wrong, be sure to reverse the connections of both right- and left-back speakers.  
B. Balance adjustment  
Locate the left-front and -back speakers to their original position. Then adjust the OUTPUT LEVEL ADJ control until the sound seems to come from a central point between the left-front and -back speakers.
6. Make the proper decoder connection as directed in "Decoder connections" on page 9: Connect the recording outputs of the front amplifier to the INPUT (FROM REC OUT) jacks.

## USING THE SQD-2050

After you have connected all of the components in your system and adjusted four-channel sound, your SQ system is ready for operation.

### Reproduction

1. Turn the MASTER VOLUME control counterclockwise, then turn on the SQD-2050, and the front and back amplifiers.
2. Set the selectors of the amplifiers as follows:

Amplifier		Front amplifier	Back amplifier*
Selector			
Mode selector		STEREO	STEREO
Function selector		PHONO, TUNER or AUX	—
Monitor selector		TAPE	TAPE

\* If a power amplifier is used for the back-channels, you do not need to set the selectors as directed in the above table.

3. Push the selectors of the SQD-2050 according to the program source, while referring to the following table.

Program		Selector	SYSTEM selector	MONITOR selector
SQ	record, fm		SQ	SOURCE
	tape			TAPE
Ordinary matrix	record, fm		R-MTX	SOURCE
	tape			TAPE
Conventional two-channel	record, fm		SQ, R-MTX 2-4 or 2 CH	SOURCE
	tape			TAPE
Discrete four-channel	record*		DISCRETE	—
	tape			

4. Adjust the MASTER VOLUME control and the F/B BALANCE control to your listening preference. Adjust the tone quality to your preference. For the front channel, use the front amplifier tone control; for the back channel, use the back amplifier tone control. If distortion is audible while listening to your highest-output record, turn the INPUT LEVEL ADJ control\*\* counterclockwise until the distortion disappears.

\* Adaptor is needed for discrete four-channel disc programs.

\*\* For the details of the INPUT LEVEL ADJ control, refer to the "Input Connection Notes" on page 7 and "INPUT LEVEL ADJ control" on page 11.



## CLEANING

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### Tape Recording

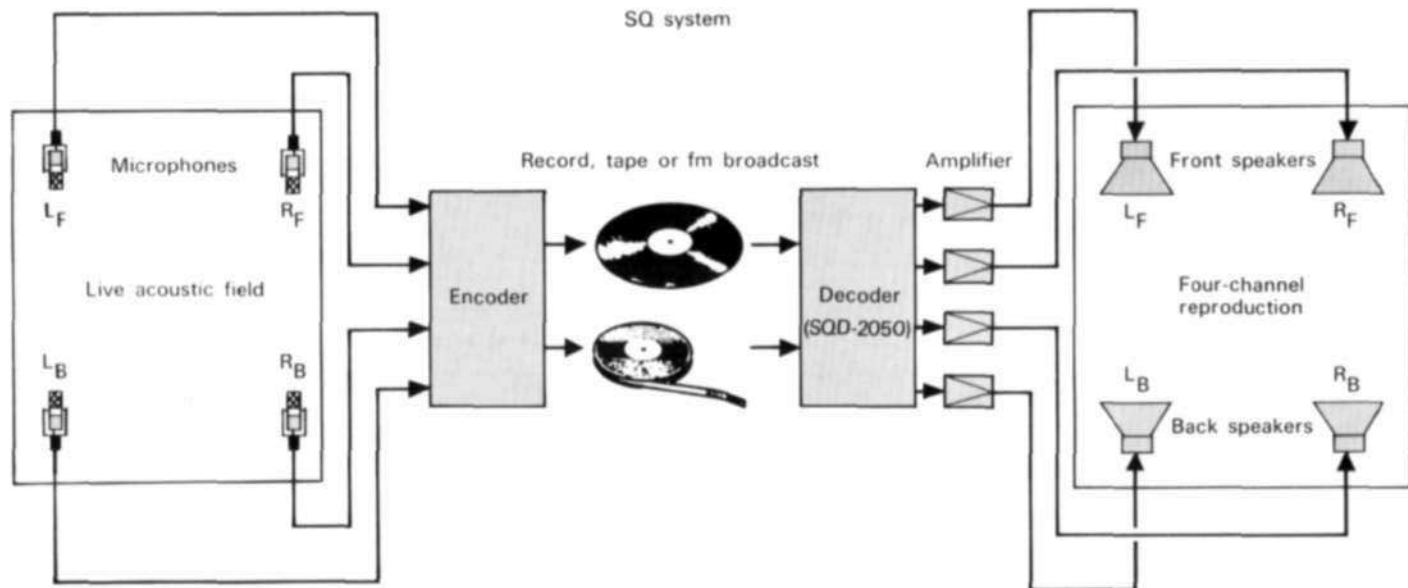
**Two-channel tape recording:** The signal applied to the INPUT (FROM REC OUT) jacks are always by-passed to the 2 CH TAPE RECORDER (REC OUT) jacks without being decoded. Therefore, any SQ program can be recorded as an SQ tape. When playing back an SQ tape, push SQ button of the SYSTEM selector. When you record the ordinary matrix record programs, play them back with R-MTX button pushed.

Finger prints, the kid's chocolate candy, and similar house-hold annoyances can mar the beauty of your SQD-2050. These can be cleaned up by wiping the panel or knobs with a soft clean cloth moistened with water. Do not use any type of scouring powder, abrasive pads, or solvents.

## TECHNICAL DATA

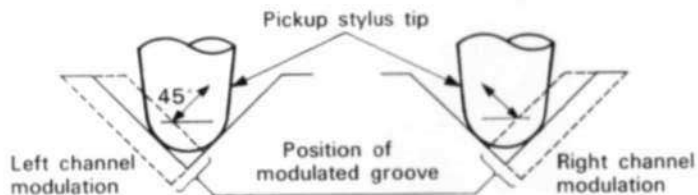
### WHAT IS THE SQ SYSTEM ?

In the SQ system, a quadraphonic program is converted into a two-track program by an encoder prior to cutting the SQ record. During playback, the encoded program on the SQ record produces four-channel signals after being processed by a decoder.

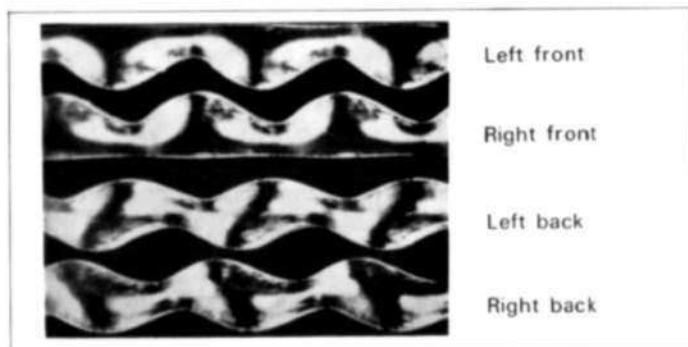
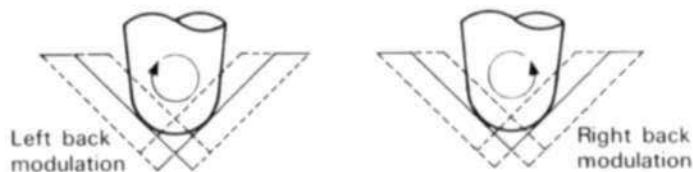


The SQ encoder takes in four channels of information from a four-channel master tape or from a "live" pickup, and combines them into two channels which have the following characteristics: The left encoded, or "total" channel contains the left front signal unaltered, plus reduced amounts of the two back channel signals, with phases altered.

The right "total" channel has the right front signal unaltered, plus reduced amounts of the two back channel signals, but phase shifted with relation to the back signals in the left total channel. When the two total channels are applied to the stereo cutter, the left front and right front signals are recorded on the two side walls of the groove by cutting-stylus motion along the 45-degree lines exactly as in two-channel recording.



Each back signal, however, (since it appears in both total channels but with a 90-degree phase difference between the two versions) produces a circular motion of the stylus, with the stylus motion for one back signal circling in the clockwise direction and the motion for the other back signal in a counterclockwise direction. As the record moves under the cutting stylus, the circular motions leave two oppositely directed helical groove cuts.



This unique stereo modulation system allows the decoder to sense clearly the phases, as well as the amplitudes, of the different components of the total signal. The record is played with a standard stereo pickup, and the two total signals go to the decoder.

The final result of the encoding and decoding is that each speaker gets a signal in which the channel for that speaker position is dominant. Each speaker also gets "side-effect" signals, inevitable in any matrix system. The crux of good matrix design is to so dispose of the side-effect signals that they do not prevent the establishment of firm directionality. The results are clear in only a few moments of listening. The music is in front, to the right, in back, or wherever else the composer intended it to be, and it stays in its assigned position. The listener gets the four-channel experience to the fullest extent.

Moreover, the SQ system is a winner, not only in four-channel performance, but also in preserving the value of existing two-channel equipment and records. It is completely compatible:

(1) SQ records are playable on two-channel system, bringing the listener all the music contained in the original four channels. When played on a two-channel system, the music is spread between the two speakers in a satisfying way—the SQ records are, in fact, splendid as two-channel records. The listener not yet ready to change over can buy the records now and enjoy them fully in the interim.

(2) Monophonic and two-channel records are also splendidly reproduced on the SQ playback system. Thus, when the consumer goes to SQ four-channel playback, his record collection does not suddenly become valueless; on the contrary, its value is enhanced because many two-channel recordings gain in "depth" when played on the SQ system.

(3) The consumer with a good quality two-channel system does not lose any of his investment in equipment either; he goes to SQ four-channel by making a moderate addition to this system, without discarding any of his costly units.

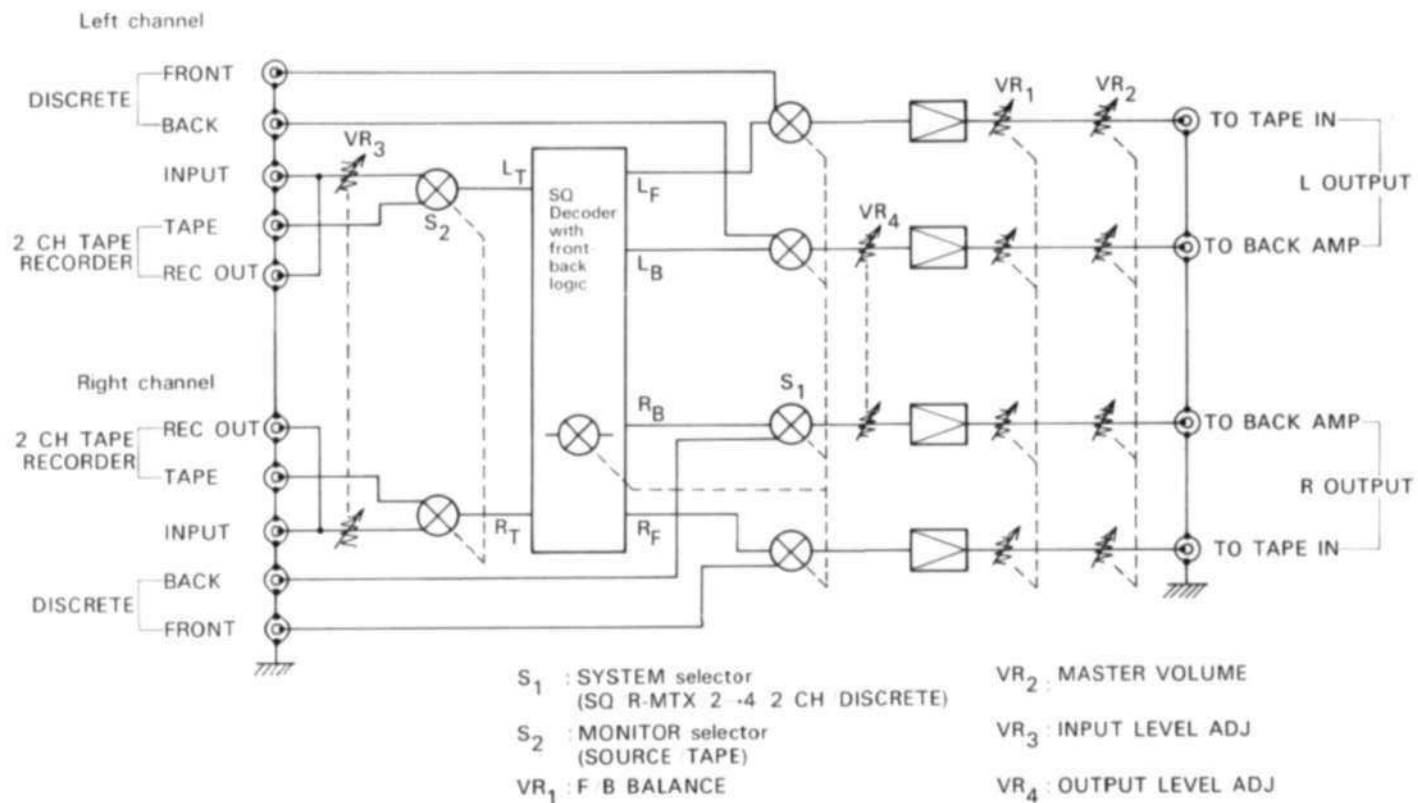
## SPECIFICATIONS

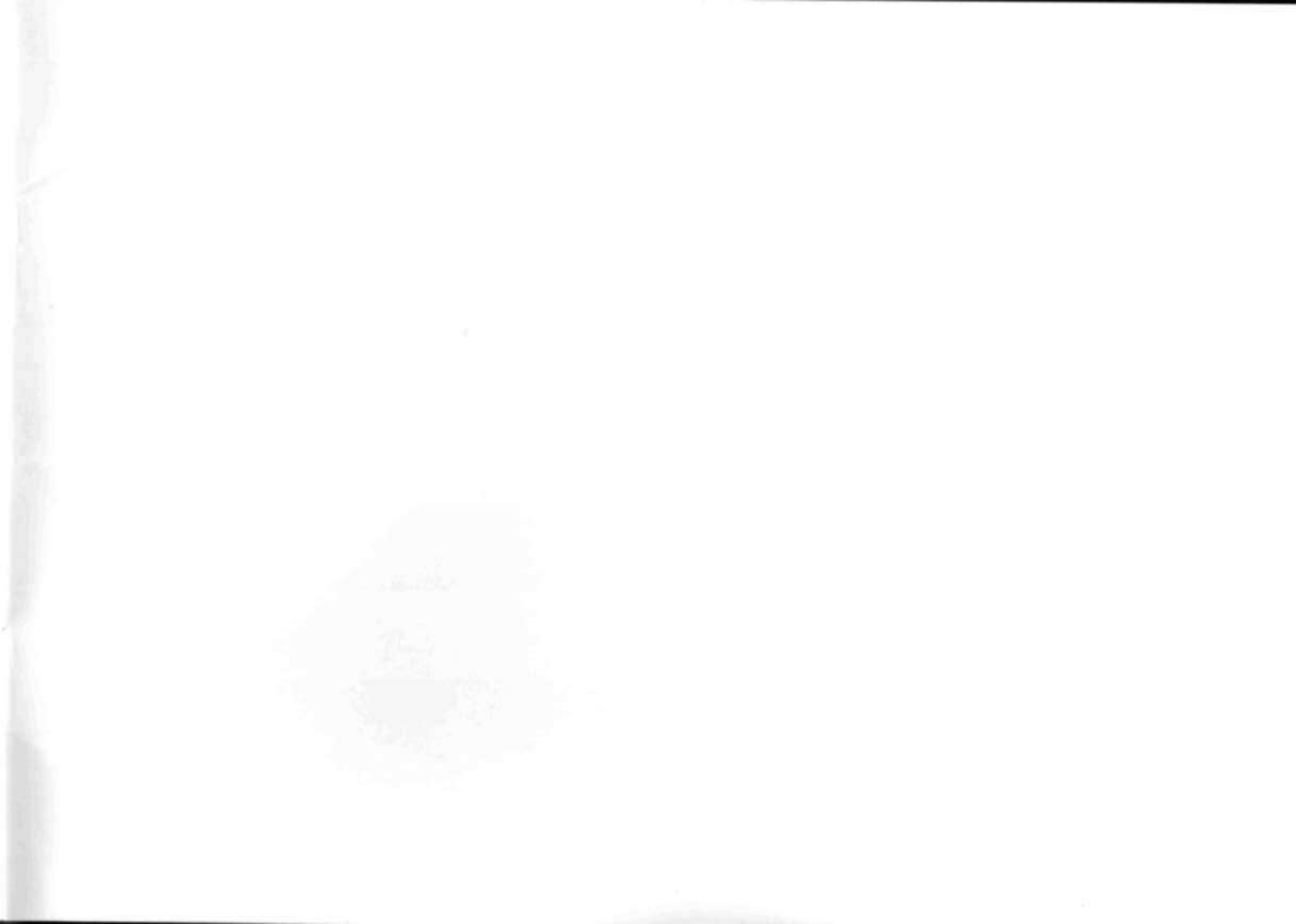
Harmonic distortion :	Front	less than 0.2%	
	Back	less than 0.2%	
	(input signal ; 250 mV at 2 kHz)		
Frequency response :	SQ	} 20 Hz—20 kHz	
	R-MTX 2+4		
	DISCRETE	} 10 Hz—50 kHz	
	2 CH		
Inputs :		Sensitivity	Impedance
	INPUT (FROM REC OUT)	250 mV	50 k $\Omega$
	2 CH TAPE RECORDER (TAPE)	750 mV	100 k $\Omega$
	DISCRETE	750 mV	100 k $\Omega$
Outputs :		Output voltage	Impedance
	OUTPUT (TO TAPE IN)	750 mV (max.)*	10 k $\Omega$
	OUTPUT (TO BACK AMP)	2 V (max.)*	10 k $\Omega$
	2 CH TAPE RECORDER (REC OUT)	250 mV	—
	* The output voltages are adjustable.		
S/N :	80 dB (input level 250 mV, weighting network A)		
SQ separation :	Lf - Rf	20 dB	
	Lb - Rb	14 dB	
	Cf - Cb	10 dB	
	(input signal ; 250 mV at 2 kHz)		

## General

Circuit system :	SQ decoder (with front-back logic) R-MTX circuit 2+4 circuit
Semiconductors :	2 IC's 22 transistors 16 diodes
Power requirement :	Ac 120 V, 60 Hz
Power consumption :	5 W
Dimensions :	4 $\frac{3}{4}$ (W) $\times$ 6 $\frac{1}{4}$ (H) $\times$ 12 $\frac{1}{4}$ (D) inches
Weight :	Approx. 6 lb 13 oz (net) Approx. 9 lb 4 oz (in shipping carton)
Supplied accessories :	Connecting Cord RK-74 (3)
Design and specifications subject to change without notice.	

## BLOCK DIAGRAM

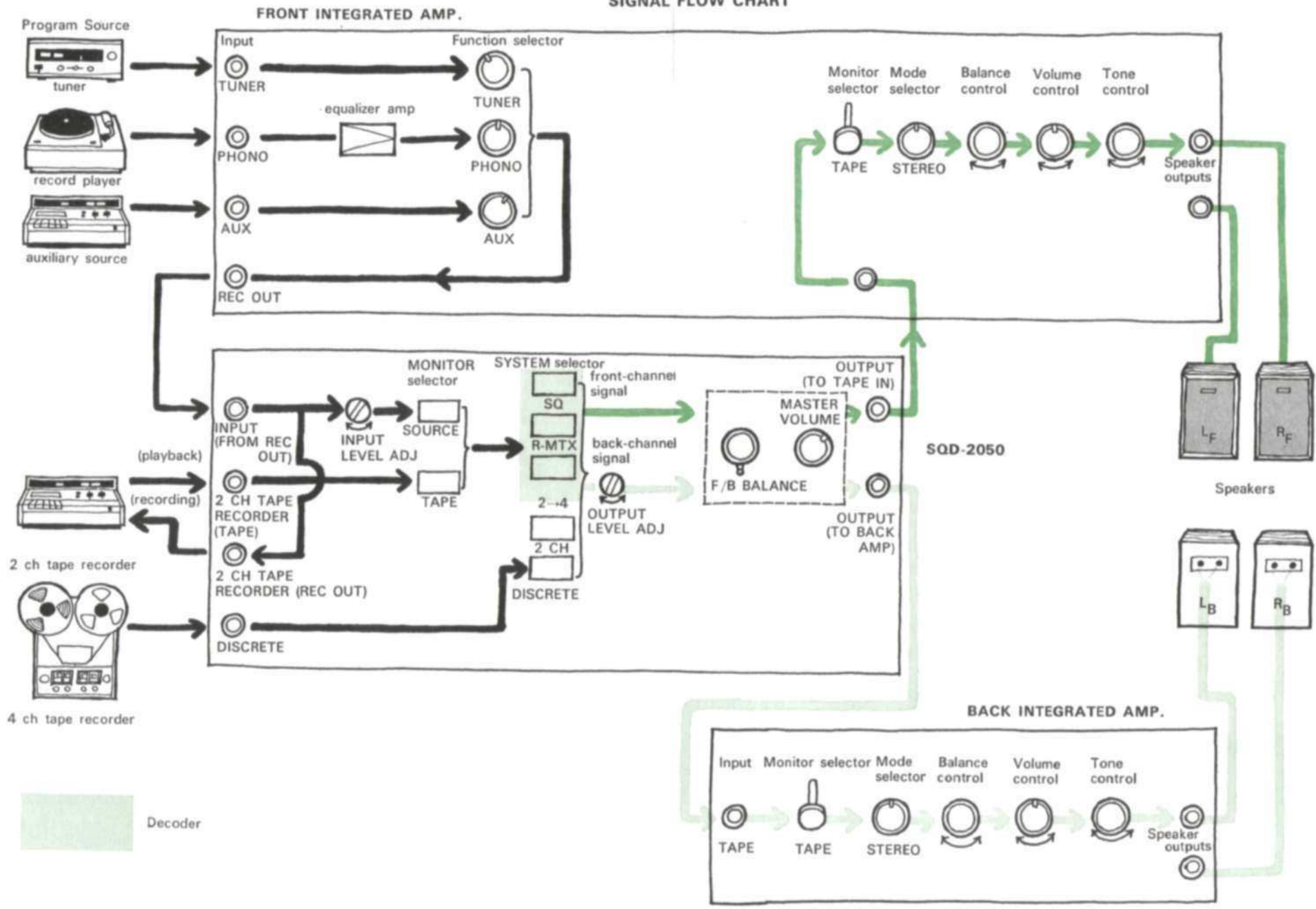








# SIGNAL FLOW CHART



Decoder

## SQD-2050 QUICK REFERENCE CARD

Before proceeding, make connections and four-channel sound adjustments as directed in the manual on pages 4 and 12.

## USING THE SQD-2050

1. Turn the MASTER VOLUME control counterclockwise, then turn on the SQD-2050, and the front and back amplifiers.
2. Set the selectors of the amplifiers as follows:

Amplifiers Selectors	Front amplifier	Back amplifier*
Mode selector	STEREO	STEREO
Function selector	PHONO, TUNER or AUX	—
Monitor selector	TAPE	TAPE

\*If a power amplifier is used for the back-channels, you do not need to set the selectors as directed in the above table.

3. Push the selectors of the SQD-2050 according to the program source, while referring to the following table.

Program	Selectors		SYSTEM selector	MONITOR selector
	record, fm	tape		
SQ	record, fm	SQ	SOURCE	TAPE
	tape			
Ordinary matrix	record, fm	R-MTX	SOURCE	TAPE
	tape			
Conventional two-channel	record, fm	SQ, R-MTX 2-4 or 2 CH	SOURCE	TAPE
	tape			
Discrete four-channel	record	DISCRETE	—	—
	tape			

○Adaptor is needed for discrete four-channel disc programs.

4. Adjust the MASTER VOLUME control and the F/B BALANCE control to your listening preference. Adjust the tone quality to your preference. For the front channel, use the front amplifier tone control; for the back channel, use the back amplifier tone control.