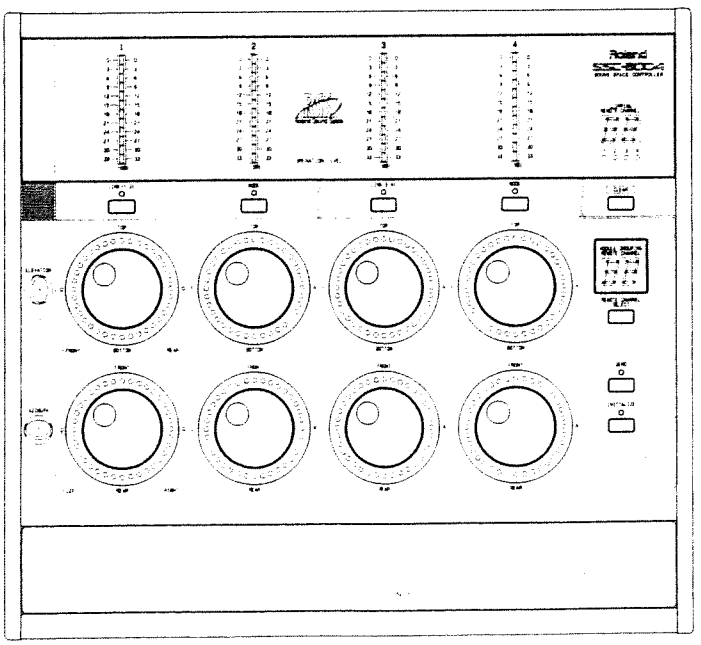
Roland

Roland Sound Space

SOUND SPACE CONTROLLER

SSC-8004

OWNER'S MANUAL



26045596 '91-2-AF2-11S(G)

For West Germany

Bescheiningung des Herstellers/Importeurs

Hiermit wird bescheinigt, daß der/die/das

SOUND SPACE CONTROLLER SSC-8004

(Gerät. Typ. Bezeichnung)

in Übereinstimmung mit den Bestimmungen der

Amtsbl. Vfg 1046/1984

(Amtsblattverfugung)

funk-enstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.

Roland Corporation Osaka/Japan

Name des Herstellers Importeurs

For the USA

RADIO AND TELEVISION INTERFERENCE

WARNING — This equipment has been verified to comply with the limits for a Class B computing device, pursuant to Subpart J, of Part 15, of FCC rules. Operation with non-certified or non-verified equipment is likely to result in interference to radio and TV reception.

The equipment described in this manual generates and uses radio frequency energy. If it is not installed and used properly, that is, in strict accordance with our instructions, it may cause interference with radio and television reception. This equipment has been tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J, of Part 15, of FCC Rules. These rules are designed to provide reasonable protection against such a interference in a rasidential installation. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by the following measure.

- Disconnect other devices and their input/output cables one at a time. If the interference stops, it is caused by either the other device or its I/O cable. These devices usually require Roland designated shielded I/O cables. For Roland devices, you can obtain the proper shielded cable from your dealer. For non-Roland devices, contact the manufacturer or dealer for assistance.

If your equipment does cause interference to radio or television reception, you can try to correct the interference by using one or more of the following measures:

- Turn the TV or radio antenna until the interference stops.
- Move the equipment to one side or the other of the TV or radio.
- Move the equipment farther away from the TV or radio.
- Plug the equipment into an outlet that is on a different circuit than the TV or radio. (That is, make certain the equipment and the radio or television set are on circuits controlled by different circuit breakers or fuses.)
- Consider installing a rooftop television antenna with coaxial cable lead-in between the antenna and TV. If necessary, you should consult your dealer or an experienced radio/television technician for additional suggestions. You may find helpful the following booklet prepared by the Federal Communications Commission.

"How to Identify and Resolve Radio — TV Interference Problems"

This booklet is available from the U.S. Government Printing Office, Washington, D.C., 20402, Stock No. 004-000-00345-4.

For Canada

CLASS B **NOTICE**

This digital apparatus does not exceed the Class B limits for radio noise emissions set out in the Radio Interference Regulations of the Canadian Department of Communications.

CLASSE B **AVIS**

Cet appareil numérique ne dépasse pas les limites de la classe B au niveau des émissions de bruits radioélectriques fixés dans le Réglement des signaux parasites par le ministère canadien des Communications.

SOUND SPACE CONTROLLER

SSC-8004

OWNER'S MANUAL

Thank you and congratulations on your choice of the Roland Sound Space Processing System.
To become familiar with all the functions and features of this system, and to ensure your satisfaction for years to come, please take the time to read this manual in its entirety before starting out.

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■ Important Notes

[Placement]

- Do not subject the unit to temperature extremes (eg. direct sunlight in an enclosed vehicle). Avoid using or storing the unit in dusty or humid areas or areas that are subject to high vibration levels.
- This unit may interfere with radio and television reception. Do not use this unit in the vicinity of such receivers.

[Maintenance]

- For everyday cleaning wipe the unit with a soft, dry cloth or one that has been slightly dampened with water. To remove stubborn dirt, use a mild, neutral, non-abrasive detergent. Afterwards, be sure to wipe the unit thoroughly with a soft, dry cloth.
- Never use benzine, thinners, alcohol or solvents of any kind, to avoid the risk of discoloration and/or deformation.

[Additional Precautions]

- Protect the unit from strong impact.
- Do not allow objects or liquids of any kind to penetrate the unit. In the event of such an occurrence, discontinue use immediately. Contact qualified service personnel as soon as possible.
- Never strike or apply strong pressure to the display.
- Should a malfunction occur, or if you suspect there is a problem, discontinue use immediately. Contact qualified service personnel as soon as possible.
- To prevent the risk of electric shock, do not open the unit.

■ Important Concepts Behind the RSS Processing System

●Conventional Two-channel Stereo

Most human beings are fortunate enough to be equipped with two functioning ears which provide the ability to sense the direction from which sound originates (front or back, left or right, above or below).

With conventional two-channel stereo, localization (providing a sense of having a certain position on the sound stage) is achieved as a result of the slight differences that occur when sound is output from the two speakers placed in front of the listener. The main drawback of this arrangement, however, is that sounds can only be localized between the two speakers.

In creating such two-channel stereo source material, two major recording techniques are used. With one, known as multi-microphone stereo recording, microphones are placed in front of each instrument, and the sound picked up from each instrument is adjusted so everything is balanced. A dimensional sound stage is created as a result of the difference in the volume between left and right channels produced when the sound is output through speakers.

The other technique, referred to as one-point stereo recording, obtains left and right channel information directly from two adjacent microphones that are positioned near the sound source, at what would be an ideal listening position.

It might seem that the one-point method would be superior in terms of providing the most presence and dimension, but it has its weaknesses. For example, some sound sources can seem farther away than they actually are.

As a result, a great number of contemporary recording situations call for a combination of both the multi-microphone and one-point stereo recording techniques.

In any case, with stereo reproduction sound is localized only within the space defined by the left and right speakers.

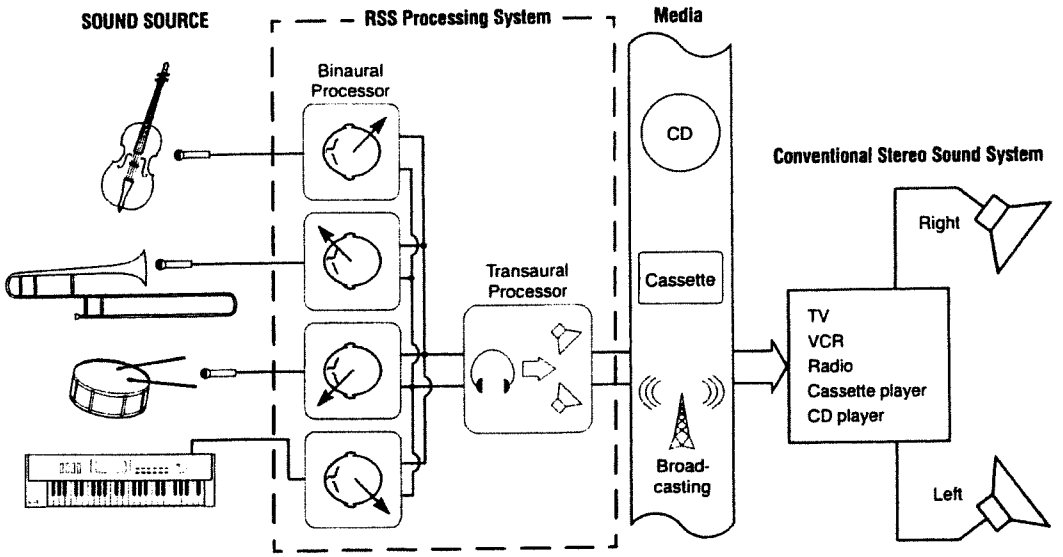
Numerous attempts have been made to go beyond these limitations and discover a way to localize sound "outside" of the speaker's normally narrow field. One such attempt is known as "binaural" recording, and is essentially an extension of the one-point method. First, a life-size model of a human being, covering the upper chest, shoulder and head regions, is made.

Next, exact replicas of the ears, including lobes and the external auditory canal, are created. Small microphones are then placed inside the head, precisely where the eardrums would be located. From the information captured by these two microphones, a stereo recording is made.

Using the binaural method of recording, the subtle alterations caused by the shape of the ears and their passages are captured. However, an excessive amount of recording equipment is required in order to record using this method. In addition, when such binaurally recorded material is played back using speakers, the perceived effect is not as pronounced as what can be heard through headphones.

As a solution to these limitations, Roland, through development of its proprietary RSS Method, has now made possible three-dimensional sound images that are equally striking - when listening with speakers or headphones, and its three-dimensional sound field that is obtained by easy operation.

●RSS Processor



The RSS system involves the use of two processors.
One is the Binaural Processor which converts the input signals in a manner that creates left and right channel signals that are virtually identical to those obtained through binaural recording. This processor greatly facilitates localization of sound sources to any desired position.

When sound recorded by Binaural Processor is played-back using a two-speaker system, sounds intended only for the right ear will also be heard by the left ear, and vice-versa. (This is referred to as L/R aural crosstalk.) For this reason, it is generally best to use headphones when listening to the sounds recorded by Binaural Processor.

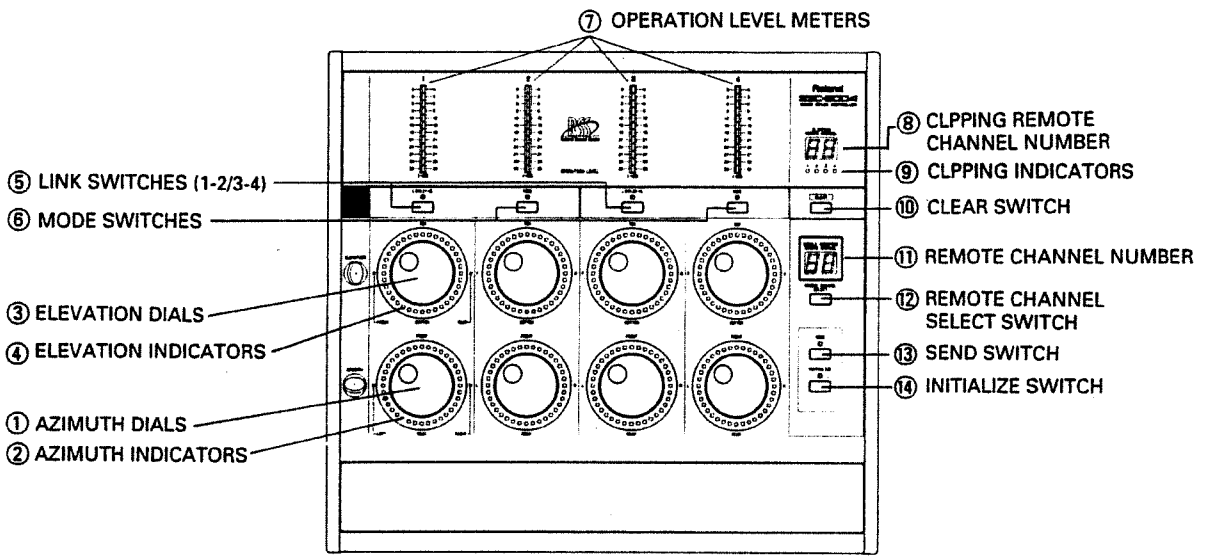
Thus, when employing two speakers, and using only the techniques introduced above, it would be impossible to obtain the degree of effect that headphones can provide.

That's where the Transaural Processor comes in. Thanks to this second processor, which eliminates the L/R aural crosstalk, two-speaker systems can also be used for optimum sound reproduction.

Through the combined use of these two processors, sound images can now be localized directly in front or back, to the left or right, or above or below — easily going well beyond the limited space defined by two speakers.

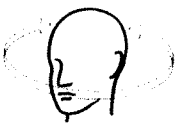
■PANEL DESCRIPTIONS

<< Front Panel >>



① AZIMUTH DIALS

Control orientation on the horizontal plane.



When a dial is rotated, the perceived location of the sound source moves along the horizontal plane within an imaginary sphere that encompasses the listener at its center.
The position of the dial's concavity indicates the orientation.

* **The orientation of the sound can be altered only after the concavity on the dial has been moved to match the position indicated by the LED indicator (in the ring of LEDs surrounding the dial).**
* **If the dial is turned too rapidly, the unit may not be able to accurately reflect the change in position.**

② AZIMUTH INDICATORS

These LEDs indicate the location of the sound source on the horizontal plane. During normal operation, they light to correspond with positions selected by rotating the Azimuth Dials.

③ ELEVATION DIALS

Control orientation on the vertical plane.

When a dial is rotated, the perceived location of the sound source moves along the vertical plane within an imaginary sphere that encompasses the listener at its center.
The position of the dial's concavity indicates the orientation.

* **The orientation of the sound can be altered only after the concavity on the dial has been moved to match the position indicated by the LED indicator (in the ring of LEDs surrounding the dial).**
* **If the dial is turned too rapidly, the unit may not be able to accurately reflect the change in position.**

④ ELEVATION INDICATORS

Indicate the location of the sound source on the vertical plane. During normal operation, they light to correspond with positions selected by turning the Elevation Dials.

* **The three-dimensional sound field is located on a sphere which has the listener at its center. On this sphere, the Azimuth could be thought of as the longitude, while Elevation corresponds to the latitude. Thus, regardless of where the Azimuth may be set, the sound image will travel directly above, then directly below the listener along with a complete revolution of the Elevation dial.**

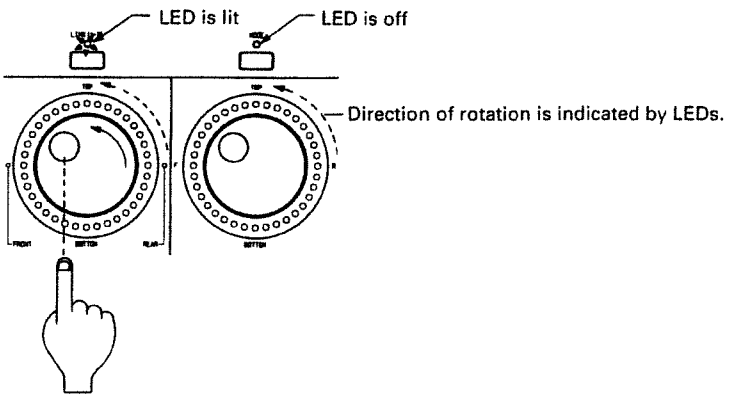
Of the 360° of movement possible for both the Azimuth and Elevation, settings for the position of the sound image can be made in 3° steps. The indicators provide display of changes in steps of 10°.

* **If you notice that a dial's position and the LED in the indicator ring do not match, rotate the dial until its concavity aligns with the lit LED. After that, the indicators will track the movement of the dial.**

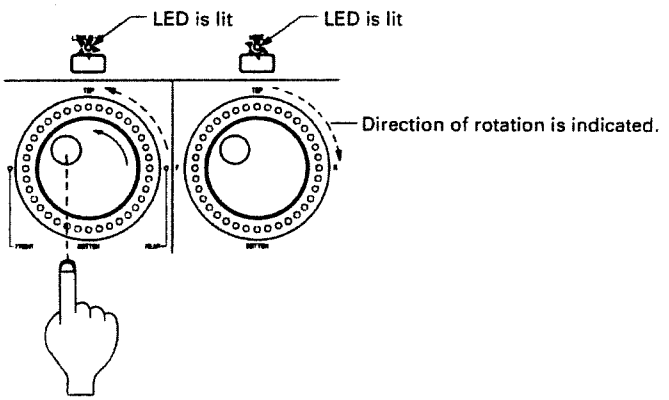
⑤ LINK SWITCHES (1-2 / 3-4) These switches allow you to turn the dial for channel 1 (3), and at the same time gain automatic, identical control over channel 2 (4).
Press the desired switch ON, and its indicator will light. Press it again to turn it OFF.
When ON, the channel 2 (or 4) dials cannot be used manually.

⑥ MODE SWITCHES

Select the Mode (two available) that you wish to use while making use of the LINK feature.
When the button has not been pressed (its indicator is dark), the change in the localization for both channels 1 and 2 (or 3 and 4) occurs in the same direction.



When pressed, and its indicator is lit, the changes in the localization for channels 1 and 2 (or 3 and 4) will occur in opposite directions.



⑦ OPERATION LEVEL METERS

These are peak meters, equipped with a "peak hold" function. They indicate the level of input signals for each channel.
When using a setup in which several RSS-8048s are linked (☞p.12), you can also use the meters to monitor the input levels of each RSS-8048 using the Remote Channel Select switch.

*** Once a peak value is indicated, it will continue to be shown until the Clear button is pressed.**

⑧ CLIPPING REMOTE CHANNEL NUMBER

This display indicates the Remote Channel Number of the RSS-8048 which has received an excessively high input signal. If more than one unit clips, the first unit to clip will be displayed.

⑨ CLIPPING INDICATORS

Should the signal clip, the indicators show which of the four audio channels in the RSS-8048 received the excessive signal.

* **Lower the Input Level of the analog signal fed to the ADA-8024 whenever a Clipping Indicator lights.**
* **When using several RSS-8048s, you will need to view both the Clipping Remote Channel Number and the Clipping Indicators to determine which channel on which RSS-8048 is clipping.**

⑩ CLEAR SWITCH

Press this switch whenever you wish to turn off any indicator or displayed item. These include peak hold indications, or a Clipping Remote Channel Number.

⑪ REMOTE CHANNEL NUMBER

Displays the Remote Channel Numbers of the RSS-8048s which can be controlled.

* **Should two or more RSS-8048s be set to the same Remote Channel, "0" will be displayed. In such a case, set the different Remote Channels for all RSS-8048s.**

⑫ REMOTE CHANNEL SELECT SWITCH

This switch is used to select the remote channel number of the RSS-8048 that you wish to control (when using a setup in which several RSS-8048s are connected). With each press of this switch, you select the next channel number.

⑬ SEND SWITCH

Provides for transmission of the localization data of the currently selected RSS-8048; from Remote Out or MIDI OUT.
When the switch is pressed, its indicator will light while the localization data is being transmitted.

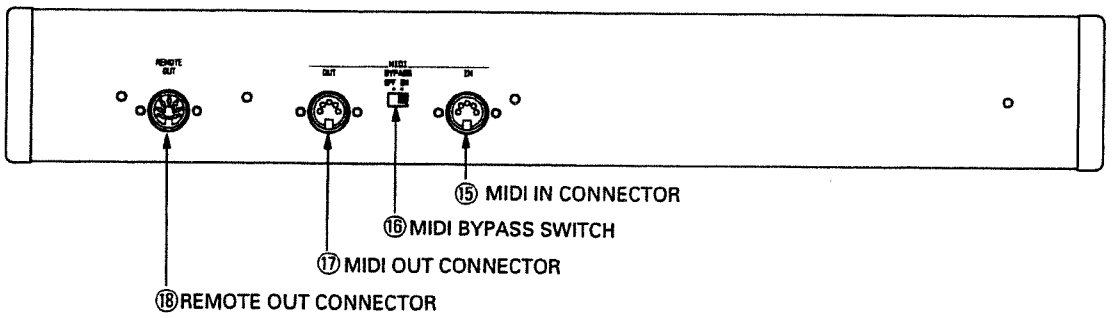
Should you wish to store a currently active localization setup (in a sequencer, for example), press the SEND switch after the localization has been determined. The localization data of all four channels will be sent out in bulk. If transmitted immediately after beginning real-time recording, you can later have the appropriate localization settings made when playback is started.

⑭ INITIALIZE SWITCH

Press this switch to initialize the unit (reset all settings to those shown below). The indicator will light during the process.

Azimuth/Elevation → Positioned at Front
Link Switch → Off
Operation Level Meter → Whatever appears is cleared
Clipping Remote Channel Number → Cleared
Clipping Indicator → Cleared

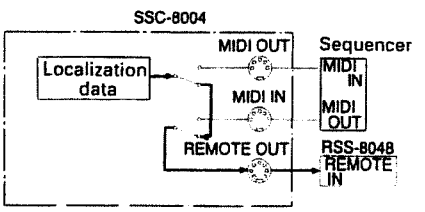
<< Rear Panel >>



⑮ MIDI IN CONNECTOR Accepts input of MIDI signals (previously recorded localization data) that arrive from the sequencer you have used for storing such localization data.

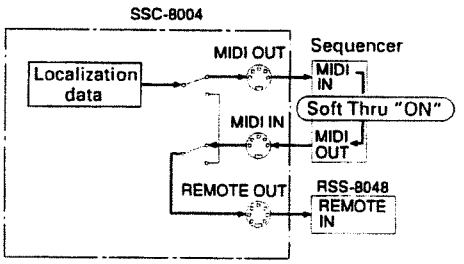
⑯ MIDI BYPASS SWITCH Allows you to select the method that is to be used when sending localization data.

When ON : The MIDI connector is bypassed, and the localization data is output directly from REMOTE OUT.



*** Be sure to turn the MIDI Bypass Switch "ON" when not using the external MIDI device.**

When OFF : The localization data passes through the external MIDI device and is then output from REMOTE OUT.



*** Be sure to set the Soft Thru function of the external device "ON".**

⑰ MIDI OUT CONNECTOR Sends out the MIDI signals to the sequencer you are using for recording localization data.

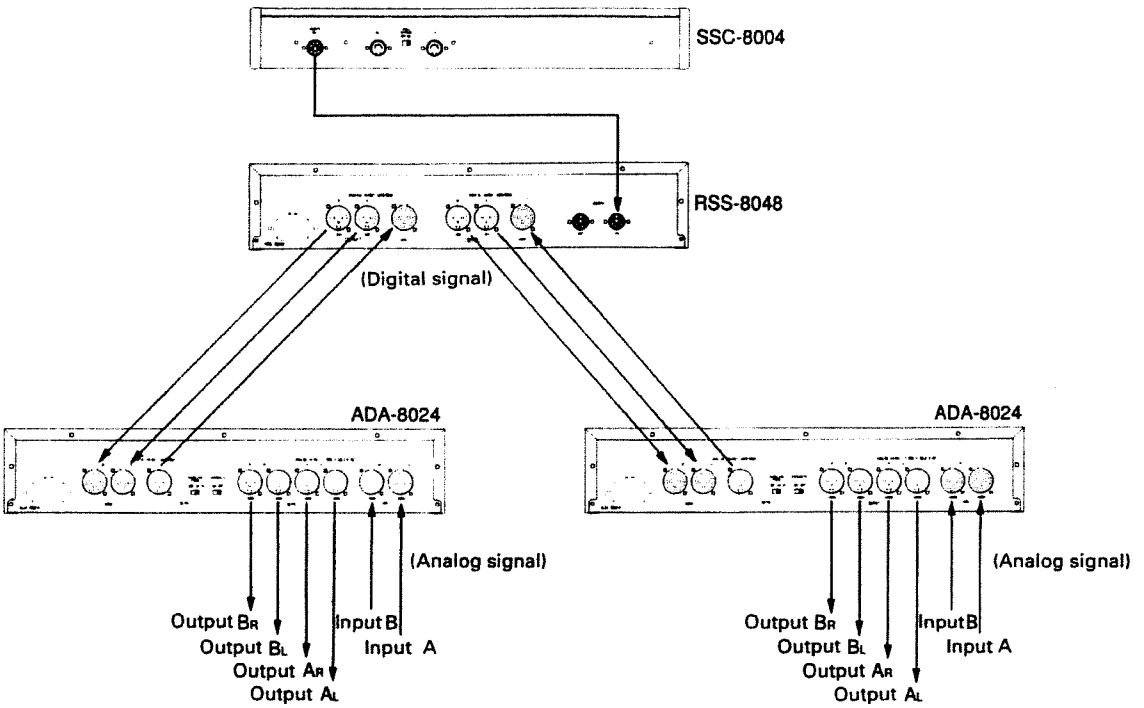
⑱ REMOTE OUT CONNECTOR

Used to make connections with the RSS-8048. A specialized Remote Cable (DIN 7P) should be connected so it runs from here to the REMOTE IN connector on the RSS-8048.

*** The power to the SSC-8004 is supplied by the RSS-8048 by way of the Remote Cable (accessory for RSS-8048).**

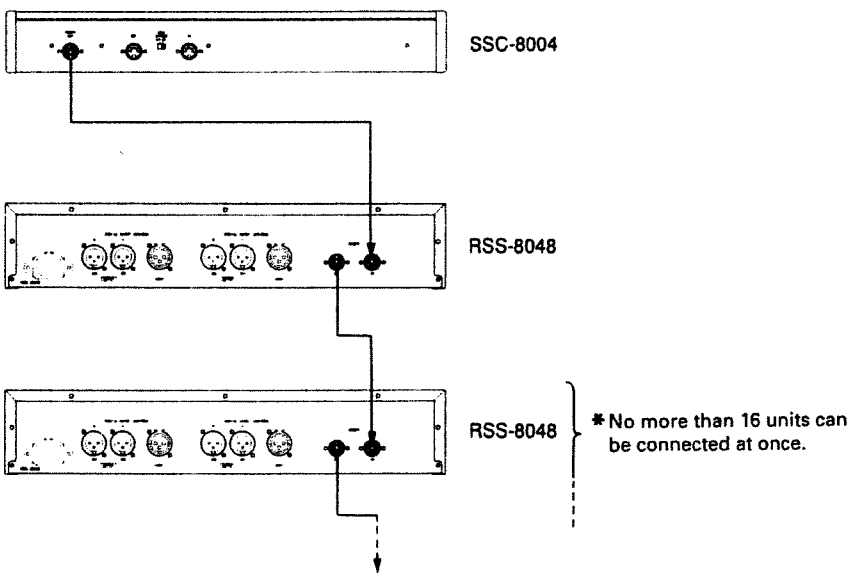
■Making the Connections

Make connections as described in the following:



*** DIGITAL OUT channels 1-4 on the RSS-8048 correspond with channels 1-4 on the SSC-8004.**

When using several RSS-8048s, connect them as described in the following:



*** Due to the complexity of internal signal processing, a delay of a few msec will occur before localization data is output from the RSS-8048.**
If several RSS-8048s are used, the delay is cumulative as the signal move down the chain.

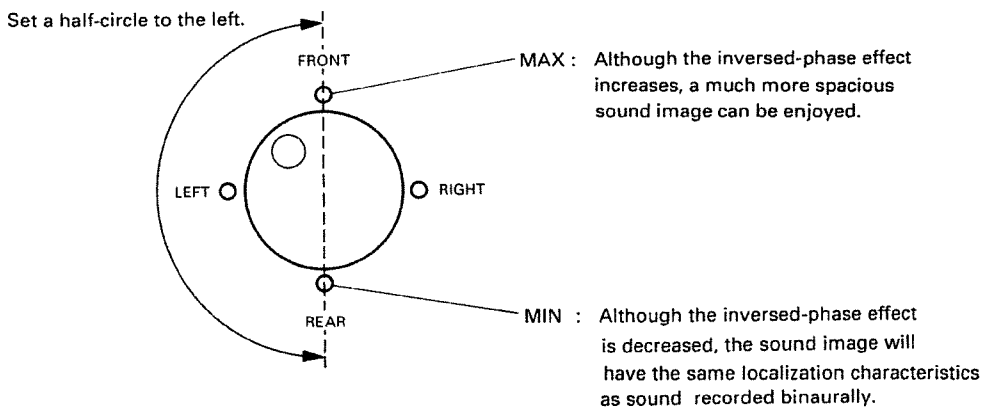
◇**The Special Mode**

Remote Channels 13-15 provide Binaural processing, whereas Remote Channel 16 provides Transaural processing.

Binaural Processor produce sound having a three-dimensional effect suitable for headphone listening. (You can get the same effect as Binaural recording.)
Each dial should be used in the same manner as in ordinary operation.

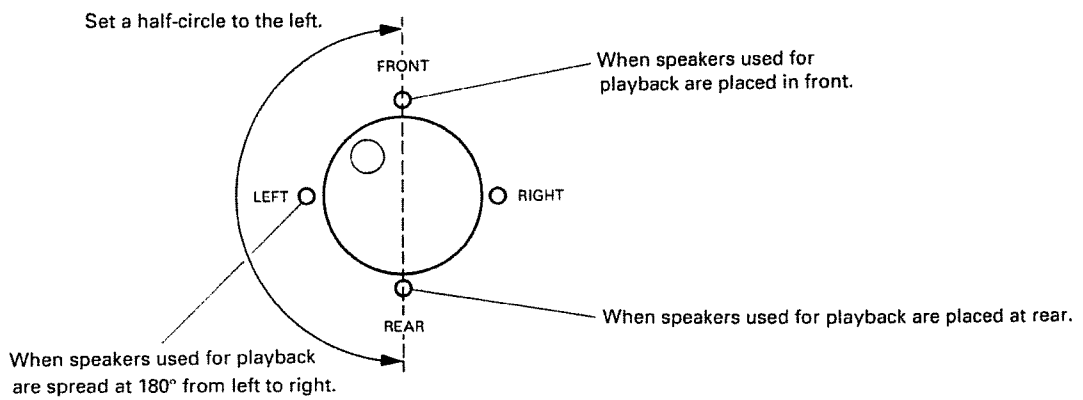
Transaural Processor take the binaurally recorded source, then convert it using the RSS process. The resulting three-dimensional sound is most effective when reproduced using speakers.
The Azimuth dial for the Transaural Processor's Channel 1(3) is used to adjust the amount of cancellation in the crosstalk that affects the opposite channels. (This affects the manner in which the sound image broadens.)

CH1(3) Azimuth Dial
(Adjusting the amount of cancellation applied to the crosstalk.)



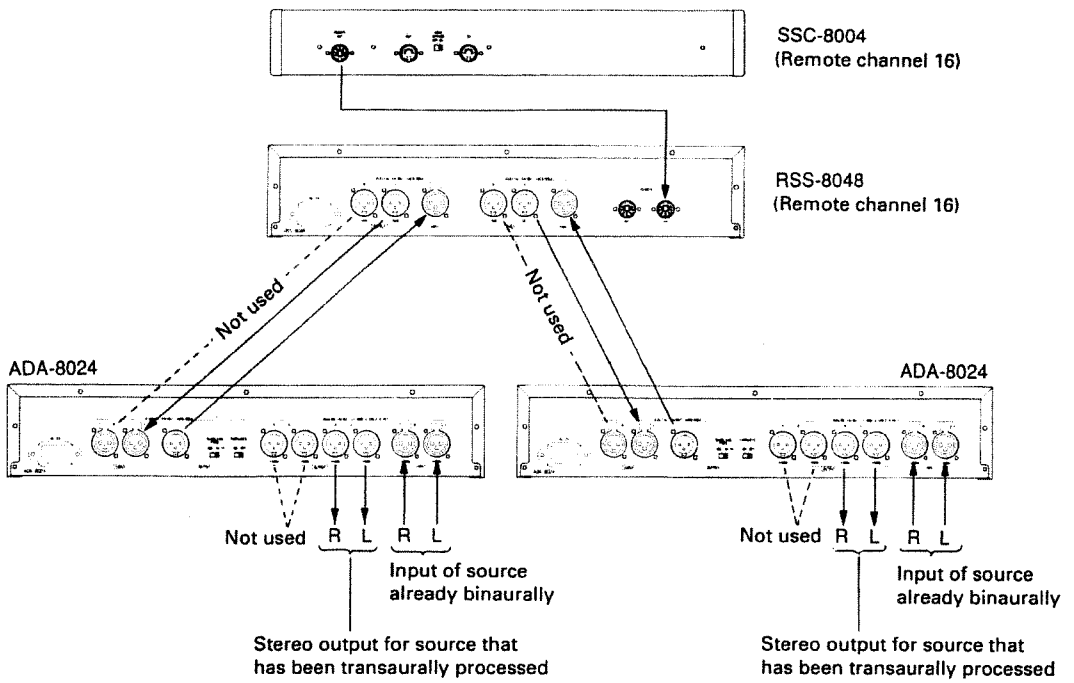
The Azimuth dial for the Transaural Processor's Channel 2(4) is used to adjust the angle between the left and right speakers. (Set it to match the angle at which the left and right speakers in the installation are spread.)

CH2(4) Azimuth Dial
(Adjusting to match the angle of separation in the speakers)



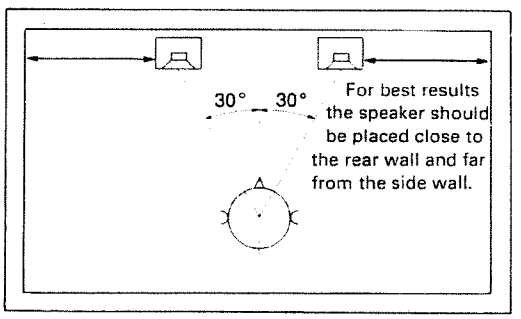
In this mode, the Elevation dials for each channel are inactive.

Connections are made as follows for the Transaural Processor.



◇Speaker Setup Used for Reproduction

In order to enjoy optimal quality when listening to sources created using the RSS Processing System, please setup your speakers as shown below:



*** Do not place the speakers too far apart. Excessive room reverberation will also have an adverse affect upon the sonic result.**

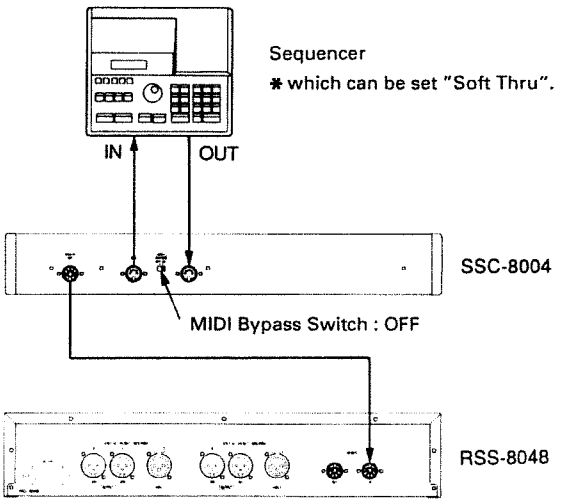
■Setups That Combine Other Units

Since the SSC-8004 is equipped with MIDI, a broad range of applications are possible. The following outlines a few examples.

●Setup Employing a Sequencer

If using a sequencer, you can record (store) the localization data.

○How the connections should be made:



*** Use only a sequencer capable of handling Polyphonic Aftertouch and System Exclusive.**

○To use the SSC-8004, and record into a sequencer:

① Turn the Bypass switch on the rear panel of the SSC-8004 to the OFF position.

② Turn the sequencer's Soft Thru function ON.

③ Set localization data using Azimuth/Elevation dials before you start to record.

④ Have the sequencer begin Real-time recording.

⑤ Press the SEND switch to transmit the localization data after recording begins.

⑥ Whenever an Azimuth or Elevation dial is rotated, localization data is transmitted.

*** If you have the MIDI Bypass switch ON, no localization data will be sent to the sequencer.**
*** You should not use the transpose feature on the sequencer, since it corrupt the localization data.**

<< Reference >>

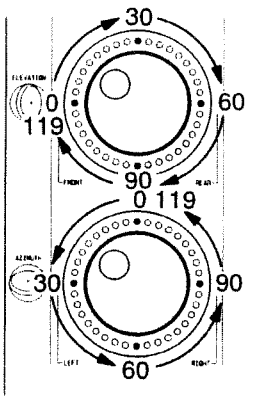
Localization data of the SSC-8004 corresponds to MIDI messages in the following way:

○Polyphonic Aftertouch

Status	Note Number	Value
AnH	kkH	vvH

n : MIDI Channel
kk : Azimuth (Note Number)
vv : Elevation (Value)

*** The Azimuth dial corresponds to the Note Numbers (0-119) of Polyphonic Aftertouch, whereas the Elevation dial corresponds to the Values (0-119) of Polyphonic Aftertouch.**



*** The various channels on the SSC-8004 correspond to MIDI channels as follows:**

RSS-8048's Remote Channel Number	MIDI channel			
	Channel of the SSC-8004			
	ch1	ch2	ch3	ch4
1	1	2	3	4
2	5	6	7	8
3	9	10	11	12
4	13	14	15	16
5 - 16	Corresponding to a System Exclusive. Refer to MIDI Implementation (☞ p. 19) and MIDI Implementation Chart (☞ p. 21).			

Roland Exclusive Messages

1. Data Format for Exclusive Messages

Roland's MIDI implementation uses the following data format for all exclusive messages (type IV):

Byte	Description
F0H	Exclusive status
41H	Manufacturer ID (Roland)
DEV	Device ID
MDL	Model ID
CMD	Command ID
[BODY]	Main data
F7H	End of exclusive

= MIDI status : F0H, F7H

An exclusive message must be flanked by a pair of status codes, starting with a Manufacturer-ID immediately after F0H (MIDI version1.0).

= Manufacturer ID : 41H

The Manufacturer-ID identifies the manufacturer of a MIDI instrument that triggers an exclusive message. Value 41H represents Roland's Manufacturer ID.

= Device-ID : DEV

The Device-ID contains a unique value that identifies the individual device in the multiple implementation of MIDI instruments. It is usually set to 00H - 0FH, a value smaller by one than that of a basic channel, but value 00H - 1FH may be used for a device with multiple basic channels.

= Model ID : MDL

The Model-ID contains a value that uniquely identifies one model from another. Different models, however, may share an identical Model-ID if they handle similar data.

The Model-ID format may contain 00H in one or more places to provide an extended data field. The following are examples of valid Model-IDs, each representing a unique model:

01H
02H
03H
00H, 01H
00H, 02H
00H, 00H, 01H

= Command ID : CMD

The Command-ID indicates the function of an exclusive message. The Command-ID format may contain 00H in one or more places to provide an extended data field. The following are examples of valid Command-IDs, each representing a unique function:

01H
02H
03H
00H, 01H
00H, 02H
00H, 00H, 01H

= Main data : BODY

This field contains a message to be exchanged across an interface. The exact data size and contents will vary with the Model-ID and Command-ID.

2. Address-mapped Data Transfer

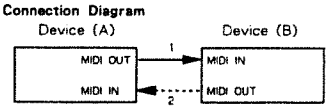
Address mapping is a technique for transferring messages conforming to the data format given in Section 1. It assigns a series of memory-resident records--waveform and tone data, switch status, and parameters, for example--to specific locations in a machine-dependent address space, thereby allowing access to data residing at the address a message specifies.

Address-mapped data transfer is therefore independent of models and data categories. This technique allows use of two different transfer procedures: one-way transfer and handshake transfer.

= One-way transfer procedure (See Section 3 for details.)

This procedure is suited for the transfer of a small amount of data. It sends out an exclusive message completely independent of a receiving device status.

Connection Diagram

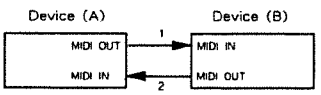


Connection at point 2 is essential for "Request data" procedures. (See Section 3.)

= Handshake-transfer procedure (This device does not cover this procedure)

This procedure initiates a predetermined transfer sequence (handshaking) across the interface before data transfer takes place. Handshaking ensures that reliability and transfer speed are high enough to handle a large amount of data.

Connection Diagram



Connection at points 1 and 2 is essential.

Notes on the above two procedures

* There are separate Command-IDs for different transfer procedures.
* Devices A and B cannot exchange data unless they use the same transfer procedure, share identical Device-ID and Model ID, and are ready for communication.

3. One-way Transfer Procedure

This procedure sends out data all the way until it stops and is used when the messages are so short that answerbacks need not be checked. For long messages, however, the receiving device must acquire each message in time with the transfer sequence, which inserts intervals of at least 20 milliseconds in between.

Types of Messages

Message	Command ID
Request data 1	RQ1 (11H)
Data set 1	DT1 (12H)

= Request data = 1 : RQ1 (11H)

This message is sent out when there is a need to acquire data from a device at the other end of the interface. It contains data for the address and size that specify designation and length, respectively, of data required.

On receiving an RQ1 message, the remote device checks its memory for the data address and size that satisfy the request.
If it finds them and is ready for communication, the device will transmit a "Data set 1 (DT1)" message, which contains the requested data. Otherwise, the device will send out nothing.

Byte	Description
F0H	Exclusive status
41H	Manufacturer ID (Roland)
DEV	Device ID
MDL	Model ID
11H	Command ID
aaH ⋮	Address MSB ⋮ LSB
ssH ⋮	Size MSB ⋮ LSB
sum	Check sum
F7H	End of exclusive

* The size of the requested data does not indicate the number of bytes that will make up a DT1 message, but represents the address fields where the requested data resides.
* Some models are subject to limitations in data format used for a single transaction. Requested data, for example, may have a limit in length or must be divided into predetermined address fields before it is exchanged across the interface.
* The same number of bytes comprises address and size data, which, however, vary with the Model-ID.
* The error checking process uses a checksum that provides a bit pattern where the least significant 7 bits are zero when values for an address, size, and that checksum are summed.

= Data set 1 : DT1 (12H)

This message corresponds to the actual data transfer process. Because every byte in the data is assigned a unique address, a DT1 message can convey the starting address of one or more data as well as a series of data formatted in an address-dependent order.

The MIDI standards inhibit non-real time messages from interrupting an exclusive one. This fact is inconvenient for the devices that support a "soft-through" mechanism. To maintain compatibility with such devices, Roland has limited the DT1 to 256 bytes so that an excessively long message is sent out in separate segments.

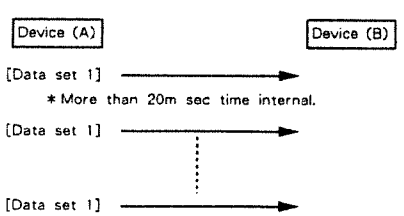
Byte	Description
F0H	Exclusive
41H	Manufacturer ID (Roland)
DEV	Device ID
MDL	Model ID
12H	Command ID
aaH	Address MSB
⋮	⋮
	LSB
ddH	Data
⋮	⋮
sum	Check sum
F7H	End of exclusive

* A DT1 message is capable of providing only the valid data among those specified by an RQ1 message.
* Some models are subject to limitations in data format used for a single transaction. Requested data, for example, may have a limit in length or must be divided into predetermined address fields before it is exchanged across the interface.
* The number of bytes comprising address data varies from one Model ID to another.
* The error checking process uses a checksum that provides a bit pattern where the least significant 7 bits are zero when values for an address, size, and that checksum are summed.

= Example of Message Transactions

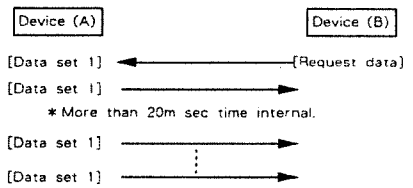
● Device A sending data to Device B

Transfer of a DT1 message is all that takes place.



● Device B requesting data from Device A

Device B sends an RQ1 message to Device A. Checking the message, Device A sends a DT1 message back to Device B.



Sound Space Controller

Model SSC-8004

MIDI Implementation

Date : Feb. 1 1991

Version : 1.00

1. Transmitted Data

■ Channel Voice Messages

● Polyphonic Key Pressure

Status	2nd	3rd
AnH	kkH	vvH

n = MIDI Channel Number : 0H - FH (0 - 15) 0 = ch.1 15 = ch.16
kk = note number : 00H - 77H (0 - 119)
The note number is used for Azimuth value. For every increment of the Azimuth value, the location of the sound image changes by 3 degrees (counter-clockwise).
FRONT(AZIMUTH = 0:0°)->LEFT(30:90°)->REAR(60:180°)->RIGHT(90:270°)
vv = value : 00H - 77H (0 - 119)
The value is used for Elevation value. For every increment of the Elevation value, the location of the sound image changes by 3 degrees as follows:
FRONT(ELEVATION = 0:0°)->TOP(30:90°)->REAR(60:180°)->BOTTOM(90:270°)

* MIDI Channel Numbers are assigned as follows:
RSS REMOTE CH : 1
Channel 1 - MIDI Channel Number 1
Channel 2 - MIDI Channel Number 2
Channel 3 - MIDI Channel Number 3
Channel 4 - MIDI Channel Number 4
RSS REMOTE CH : 2
Channel 1 - MIDI Channel Number 5
Channel 2 - MIDI Channel Number 6
Channel 3 - MIDI Channel Number 7
Channel 4 - MIDI Channel Number 8
RSS REMOTE CH : 3
Channel 1 - MIDI Channel Number 9
Channel 2 - MIDI Channel Number 10
Channel 3 - MIDI Channel Number 11
Channel 4 - MIDI Channel Number 12
RSS REMOTE CH : 4
Channel 1 - MIDI Channel Number 13
Channel 2 - MIDI Channel Number 14
Channel 3 - MIDI Channel Number 15
Channel 4 MIDI Channel Number 16

Remote Chs 5 through 16 don't have MIDI Channel Numbers. The Azimuth and the Elevation of these channels transmit the system exclusive messages.

■ System Exclusive Messages

Status	
F0H	: System Exclusive Message
F7H	: EOX (End of Exclusive)

* See also after section 3 and "Roland Exclusive Messages".

2. Recognized Data

■ Channel Voice Messages

● Polyphonic Key Pressure

Status	2nd	3rd
AnH	kkH	vvH

n = MIDI Channel Number : 0H - FH (0 - 15) 0 = ch.1 15 = ch.16
kk = note number : 00H - 77H (0 - 119)
The note number is used for Azimuth value. For every increment of the Azimuth value, the location of the sound image changes by 3 degrees (counter - clockwise).
FRONT(AZIMUTH=0:0°)->LEFT(30:90°)->REAR(60:180°)->RIGHT(90:270°)
vv = value : 00H - 77H (0 - 119)
The value is used for Elevation value. For every increment of the Elevation value,the location of the sound image changes by 3 degrees as follows:
FRONT(ELEVATION=0:0°)->TOP(30:90°)->REAR(60:180°)->BOTTOM(90:270°)

* MIDI Channel Numbers are assigned as follows:
RSS REMOTE CH : 1
Channel 1 - MIDI Channel Number 1
Channel 2 - MIDI Channel Number 2
Channel 3 - MIDI Channel Number 3
Channel 4 - MIDI Channel Number 4
RSS REMOTE CH : 2
Channel 1 - MIDI Channel Number 5
Channel 2 - MIDI Channel Number 6
Channel 3 - MIDI Channel Number 7
Channel 4 - MIDI Channel Number 8
RSS REMOTE CH : 3
Channel 1 - MIDI Channel Number 9
Channel 2 - MIDI Channel Number 10
Channel 3 - MIDI Channel Number 11
Channel 4 - MIDI Channel Number 12
RSS REMOTE CH : 4
Channel 1 - MIDI Channel Number 13
Channel 2 - MIDI Channel Number 14
Channel 3 - MIDI Channel Number 15
Channel 4 - MIDI Channel Number 16

Remote Chs 5 through 16 don't have MIDI Channel Numbers. Use System Exclusive Messages for controlling the Azimuth and the Elevation of those RSS REMOTE CHANNELS from external devices by MIDI. RSS REMOTE CHANNELS 1 to 4 can receive System Exclusive Massages.

■ System Exclusive Messages

Status	
F0H	: System Exclusive Message
F7H	: EOX (End of Exclusive)

* See also after section 3 and "Roland Exclusive Messages".

3. Exclusive Communications

■ Device ID

The Device ID number : 00H - 0FH (0 - 15)
RSS REMOTE CHANNEL 0 - CH 1 15 = CH 16

Receiver : It takes a value between 00H - 0FH
(RSS REMOTE CHANNEL : 1 - 16)
Transmitter : It takes a value between 05H - 0FH
(RSS REMOTE CHANNEL : 5 - 16)

■ Model ID

The Model ID for the RSS is 43H.

3.1 System Exclusive Messages

■ Data Set DT1 (12H)

Byte	Description
F0H	Exclusive Status
41H	Manufacturer ID (Roland)
DEV	Device ID
43H	Model ID (RSS)
12H	Command ID (DT1)
aaH	Address MSB
aaH	Address LSB
ddH	Data
:	:
sum	Check Sum
F7H	EOX (End of Exclusive)

*Check Sum is a 7 - bit number that makes zero by accumulating itself and the data between the Command ID and the EOX, excluding the Command ID and the EOX.

4. Parameter Address Map

Address	Description		
10 00 :	Channel 1	Azimuth	: 00H - 77H (0 - 119)
10 01 :		Elevation	: 00H - 77H (0 - 119)
10 02 :	Channel 2	Azimuth	: 00H - 77H (0 - 119)
10 03 :		Elevation	: 00H - 77H (0 - 119)
10 04 :	Channel 3	Azimuth	: 00H - 77H (0 - 119)
10 05 :		Elevation	: 00H - 77H (0 - 119)
10 06 :	Channel 4	Azimuth	: 00H - 77H (0 - 119)
10 07 :		Elevation	: 00H - 77H (0 - 119)

*A pair of Azimuth and Elevation values from each channel must be transmitted continually, otherwise they are ignored.

12 00 : Amount of crosstalk cancelation: 00H - 3FH (0 - 63)

13 00 : Angle between the loudspeakers: 01H - 3BH (1 - 59)

*The angle increases by 3 degrees for every increment of the angle between the loudspeakers.
the direct front(1:3°)->the both sides(30:90°)->just behind(59:177°)

14 00 : Amount of the crosstalk cancelation : 00H - 3FH (0 - 63)
[RSS REMOTE CHANNEL 16, channel 1 - 2 : Transaural Processor A]

14 01 : Amount of the crosstalk cancelation : 00H - 3FH (0 - 63)
[RSS REMOTE CHANNEL 16, channel 3 - 4 : Transaural Processor B]

15 00 : Angle between the loudspeakers : 01H - 3BH (1 - 59)
[RSS REMOTE CHANNEL 16, channel 1 - 2 : Transaural Processor A]

*The angle increases by 3 degrees for every increment of the angle between the loudspeakers.
the direct front(1:3°)->the both sides(30:90°)->just behind(59:177°)

15 01 : Angle between the loudspeakers : 01H - 3BH (1 - 59)
[RSS REMOTE CHANNEL 16, channel 3 - 4 : Transaural Processor B]

*The angle increases by 3 degrees for every increment of the angle between the loudspeakers.
the direct front(1:3°)->the both sides(30:90°)->just behind(59:177°)

*When controlling from the panel, only channel 1 - 2 and channel 3 - 4 of the RSS REMOTE CHANNEL 16 can control the amount of the crosstalk cancellation and the angle between the loudspeakers.

Example :
By transmitting the following message, the location of the Channel 1 of the RSS - 8048 (with the RSS REMOTE CHANNEL 10) will be set to the Azimuth = 90 degrees and the Elevation = 0 degrees.

F0 41 09 43 12 10 00 1E 00 52 F7

Sound Space Controller

Model SSC-8004

MIDI Implementation Chart

Date : Feb. 1 1991

Version : 1.00

Function ...		Transmitted	Recognized	Remarks
Basic Channel	Default Changed	1 - 16 1 - 16	1 - 16 1 - 16	Not memorized
Mode	Default Messages Altered	Mode 3 × *********	Mode 3 ×	
Note Number	True Voice	× *********	×	
Velocity	Note ON Note OFF	× ×	× ×	
After Touch	Key's Ch's	○ ×	○ ×	
Pitch Bender		×	×	
Control Change		×	×	
Prog Change	True #	× *********	×	
System Exclusive		○	○	
System Common	Song Pos Song Sel Tune	× × ×	× × ×	
System Real Time	Clock Commands	× ×	× ×	
Aux Messages	Local ON/OFF All Notes OFF Active Sense Reset	× × × ×	× × × ×	
Notes				

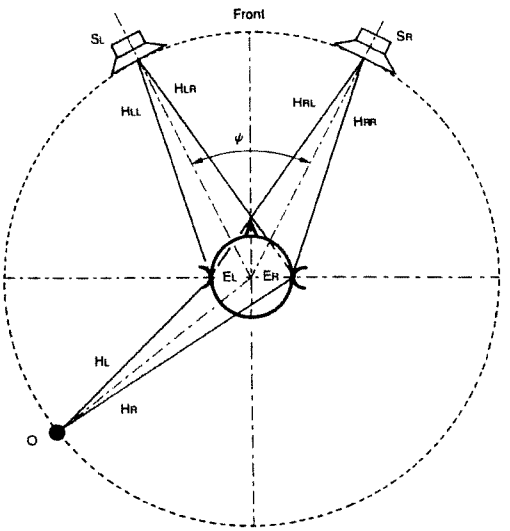
Mode 1 : OMNI ON, POLY Mode 2 : OMNI ON, MONO ○ : Yes

Mode 3 : OMNI OFF, POLY Mode 4 : OMNI OFF, MONO × : No

◇ **RSS Processing Principles**

The following provides a brief introduction to the principles behind RSS Processing.

First we'll present a model for the event whereby sound travels towards the ear, and is perceived as coming from a specific direction.



O	:	Sound source
H_L, H_R	:	Head-region acoustical transmission function for the path from the sound source to right and left ears.
H_{LL}, H_{LR}, H_{RL}, H_{RR}	:	Head-region acoustical transmission function for the path from the right and left speakers to both ears.
E_L, E_R	:	Signal at the entrance to the external auditory canal.

State where sound is received by both ears.

The diagram shows a situation where sound source "O" is being listened to, and sounds S_L and S_R are listened to through speakers.

Let's assume first that sound source "O" alone is generating sound. Sound source "O" is at rear-left. The sounds arriving at the left and right ears are represented respectively as E_L and E_R.

Expressed as a formula, we then arrive at the equation (1) below:

$$\begin{pmatrix} E_L \\ E_R \end{pmatrix} = \begin{pmatrix} H_L & 0 \\ 0 & H_R \end{pmatrix} \begin{pmatrix} O \\ O \end{pmatrix} \quad (1)$$

Next, with production of sound from sound source "O" halted, sound is output from the left and right speakers, S_L and S_R. This situation is shown by equation (2):

$$\begin{pmatrix} E_L \\ E_R \end{pmatrix} = \begin{pmatrix} H_{LL} & H_{LR} \\ H_{RL} & H_{RR} \end{pmatrix} \begin{pmatrix} S_L \\ S_R \end{pmatrix} \quad (2)$$

If the sounds from speakers S_L and S_R result in the values for E_L and E_R in equation (1) being equivalent to the values for E_L and E_R in equation (2), the sound source should in fact be perceived as originating from the rear-left direction (the position of "O").
H_L, H_R, H_{LL}, H_{LR}, and H_{RL} can be termed as the "head-region acoustical transmission functions."
The head-region acoustical transmission functions mathematically express what happens to sound as it is reflected off a person's head, ears, or shoulders, along with whatever other changes that occur in the course of it reaching the listener's ears. What is actually heard by the ears is always sound that has gone through such alterations. In calculating such changes we also include the time lag that occurs between ears, since one of them is likely to perceive the sound earlier than the other. (For example, if the sound source is at rear-left, sound will reach the left ear first, and then reach the right ear.)
Listeners determine the direction from which sound originates by evaluating (automatically) all such variances in the sound.
Continuing on, we next seek to determine the ideal manner in which sound should be produced by speakers S_L and S_R.
This can be found in the same way that a simultaneous equation is solved using a matrix.
First, given that E_L and E_R in equations (1) and (2) are equal, we obtain:

$$\begin{pmatrix} H_{LL} & H_{LR} \\ H_{RL} & H_{RR} \end{pmatrix} \begin{pmatrix} S_L \\ S_R \end{pmatrix} = \begin{pmatrix} H_L & 0 \\ 0 & H_R \end{pmatrix} \begin{pmatrix} O \\ O \end{pmatrix} \quad (3)$$

After solving the first term on the left side by applying an inverse matrix we obtain:

$$\begin{pmatrix} S_L \\ S_R \end{pmatrix} = \frac{1}{H_{LL} \cdot H_{RR} - H_{LR} \cdot H_{RL}} \begin{pmatrix} H_{RR} & -H_{RL} \\ -H_{LR} & H_{LL} \end{pmatrix} \begin{pmatrix} H_L & 0 \\ 0 & H_R \end{pmatrix} \begin{pmatrix} O \\ O \end{pmatrix} \quad (4)$$

Here, when the sound is listened to precisely at the center (between the left and right speakers), everyone would perceive that left and right are symmetrical, and we can assume:

$$H_{LL} = H_{RR} = H_E \quad (5\text{-}1)$$
$$H_{LR} = H_{RL} = H_X \quad (5\text{-}2)$$

Then as a result of equations

(4), (5-1), and (5-2), S_L and S_R become:

$$S_L = \frac{1}{1 - (H_X/H_E)^2} \left| O \cdot (H_L/H_E) - O \cdot (H_R/H_E)(H_X/H_E) \right| \quad (6\text{-}1)$$

$$S_R = \frac{1}{1 - (H_X/H_E)^2} \left| O \cdot (H_R/H_E) - O \cdot (H_L/H_E)(H_X/H_E) \right| \quad (6\text{-}2)$$

Since H_X/H_E represents the ratio of sound from the left speaker that reaches the right ear respective to that reaching the left, it obviously results in $H_X/H_E < 1$. Additionally, if we look at the observed value pertaining to the common positions in which speakers are placed (5/ > approx. 20K), there should be no problem if $(H_X/H_E)^2 \ll 1$ is inserted into equations (6-1) and (6-2), and we then obtain:

$$S_L = O \cdot (H_L/H_E) - O \cdot (H_R/H_E)(H_X/H_E) \quad (7\text{-}1)$$
$$S_R = O \cdot (H_R/H_E) - O \cdot (H_L/H_E)(H_X/H_E) \quad (7\text{-}2)$$

In conclusion, signals as prescribed by equations (7-1) and (7-2) should be output to obtain the desired results.
The first term on the right side in equations (7-1) and (7-2) correspond to the above-mentioned Binaural Processor, and the second term corresponds to the Transaural Processor.

Now, let's assume that sound source "O" is on a track of a Multitrack recorder. If, using the calculations in equations (7-1) and (7-2), and such processing is applied instantaneously, we are then able to localize the sound in real-time.

The RSS Processor in fact performs the calculations in equations (7-1) and (7-2) in real-time.

■ Specifications

<< SSC-8004 >>

● **Controls/Switches**
Azimuth Dials × 4
Elevation Dials × 4
Link Switches × 2
Mode Switches × 2
Remote Channel Select Switch × 1
Clear Switch × 1
Initialize Switch × 1
Send Switch × 1
MIDI Bypass Switch × 1

● **Displays/Indicators**
Azimuth Indicators × 4
Elevation Indicators × 4
Operation Level Meters × 4
Clipping Remote Channel Number × 1
Clipping Indicators × 4
Remote Channel Number × 1

● **Connectors**
Remote Out Connector × 1
MIDI OUT × 1
MIDI IN × 1

● **Power Supply**
DC12 V (Supplied through the Remote Cable from the connected RSS-8048.)

● **Current Draw**
500 mA

● **Dimensions**
430 (W) x 392 (D) x 64.5 (H) mm
16-15/16" (W) x 15-7/16" (D) x 2-9/16" (H) inches

● **Weight**
6.5 kg
14.3 lbs.

● **Accessories**
Owner's Manual

*** In the interest of product development, the specifications and/or appearance of this unit are subject to change without prior notice.**

Information

●When you need repair service, call your local Roland Service Station or the authorized Roland distributor in your country as shown below.

U. S. A.
Roland Corp US
7200 Dominion Circle
Los Angeles, CA. 90040 - 3647
U. S. A.
☎ (213)685 - 5141

CANADA
Roland Canada Music Ltd.
(Head Office)
13880 Mayfield Place
Richmond B. C., V6V 2E4
CANADA
☎ (604)270 - 6626

Roland Canada Music Ltd.
9425 Transcanadienne
Service Rd. N.,
St Laurent, Quebec H4S 1V3
CANADA
☎ (514)335 - 2009

Roland Canada Music Ltd.
346 Watline Avenue,
Mississauga, Ontario L4Z 1X2
CANADA
☎ (416)890 - 6488

AUSTRALIA
Roland Corporation
(Australia)Pty. Ltd.
(Head Office)
38 Campbell Avenue
Dee Why West. NSW 2099
AUSTRALIA
☎ (02)982 - 8266

Roland Corporation
(Australia)Pty. Ltd.
(Melbourne Office)
50 Garden Street
South Yarra, Victoria 3141
AUSTRALIA
☎ (03)241 - 1254

NEW ZEALAND
Roland Corporation (NZ)Ltd.
97 Mt. Eden Road, Mt. Eden,
Auckland 3
NEW ZEALAND
☎ (09)398 - 715

UNITED KINGDOM
Roland(UK)Ltd.
Amalgamated Drive
West Cross Centre, Brentford,
Middlesex TW8 9EZ,
UNITED KINGDOM
☎ (81)568 - 4578

GERMANY
Roland Elektronische
Musikinstrumente
Handelsgesellschaft mbH.
Oststrasse 96,
2000 Norderstedt
GERMANY
☎ 040/52 60 090

BELGIUM/HOLLAND/ LUXEMBOURG
Roland Benelux N. V.
Houtstraat 1
B - 2431 Oevel - Westerlo
BELGIUM
☎ (0032)14 - 575811

DENMARK
Roland Scandinavia as
Langebrogade 6
Box 1937
DK - 1023 Copenhagen K.
DENMARK
☎ 31 - 95 31 11

SWEDEN
Roland Scandinavia as
DanvikCenter 28 A, 2 tr.
S - 131 30 Nacka,
SWEDEN
☎ 08 - 702 00 20

NORWAY
Roland Scandinavia
Avd. Norge
Lilleakerveien 2
Postboks 95 Lilleaker
N - 0216 Oslo 2
NORWAY
☎ 02 - 73 00 74

FINLAND
Fazer Musik Inc.
Länsituulentie
POB 169
SF - 02101 Espoo
FINLAND
☎ 0 - 43 50 11

ITALY
Roland Italy S. p. A.
Viale delle Industrie 8
20020 ARESE MILANO
ITALY
☎ 02 - 93581311

SPAIN
Roland Electronics
de España, S. A.
Bolivia 239
08020 Barcelona
SPAIN
☎ 93 - 308 - 1000

SWITZERLAND
Musitronic AG
Gerberstrasse 5, CH - 4410
Liestal
SWITZERLAND
☎ 061/921 16 15

Roland CK (Switzerland) AG
Hauptstrasse 21/Postfach
CH - 4456 Tenniken
SWITZERLAND
☎ 061/98 60 55
Repair Service by Musitronic AG

FRANCE
Musikengro
102 Avenue Jean - Jaures
69007 Lyon Cedex 07
FRANCE
☎ (7)858 - 54 60

Musikengro
(Paris Office)
Centre Region Parisienne
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94400 Vitry s/Seine
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☎ (1)4680 86 62

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A - 6021 Innsbruck Box 591
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☎ 1 - 3620130

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Musicais Lda.
Rua de Santa Catarina 131
Porto
PORTUGAL
☎ 02 - 38 44 56

HUNGARY
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Warehouse Area 'DEPO'
Budapest. P.O. Box 3,
2045 Torokbalint
HUNGARY
☎ (1)1868905

BRAZIL
Foresight Corporation
Rua Coronel Octaviano
da Silveira
136 05522 Sao Paulo, SP
BRAZIL
☎ (011)843 - 9377

Roland

Roland Sound Space

RSS SYSTEM UPDATE: USING THE SYSTEM EFFECTIVELY

《Table of Contents》

26045598 '91-3-AF2-11S

About the additional functions

■ Adjust Mode

This mode allows you to make adjustment to resolve the difference between the sound position set on the controller and that which is actually heard. In practice, it adjusts the relative position between the speakers and the listener.

□ Operation

To make this adjustment;

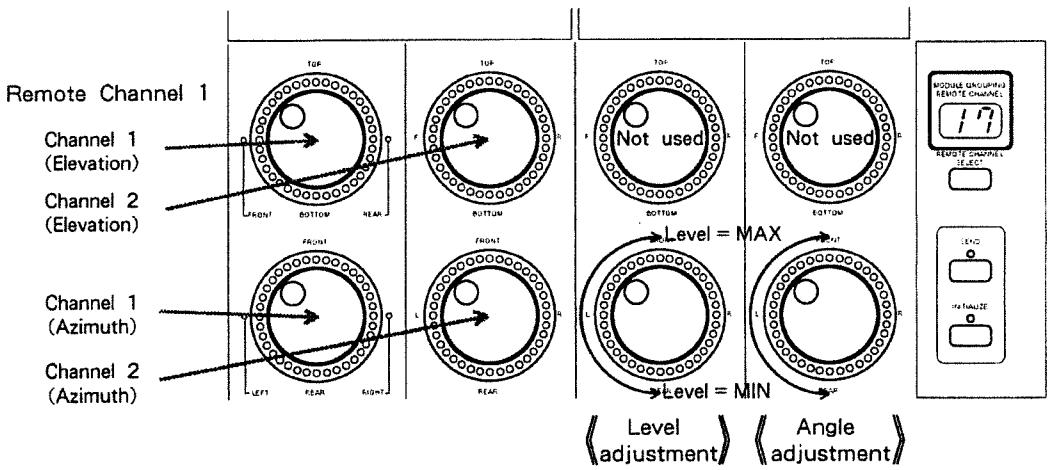
① Set the Remote Channel on one RSS - 8048 to 1.

② Press "Remote Channel Select" on the SSC - 8004 and set the remote channel to 17.
Now you can adjust the relative position between the speakers and listener.

③ Set the sound position on the controller using channels 1 and 2.

④ Using the Azimuth dials of channels 3 and 4, adjust the position of the sound actually heard.

The following shows how each dial on the SSC - 8004 works with the remote channel set to 17.



ⓐ Channels 1 and 2 set the position of the input sound.

ⓑ The Azimuth dial of channel 3 adjusts the volume ratio between the sound that reaches the listener's ears directly from a speaker and the component that cancels the crosstalk from the opposite speaker. (Level Adjustment)

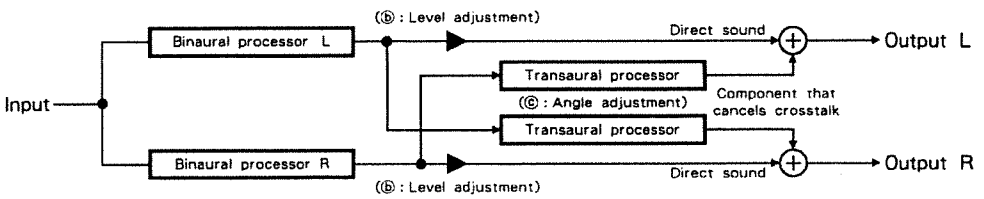
ⓒ The Azimuth dial of channel 4 adjusts the component itself that cancels crosstalk. (Angle Adjustment)

* Step b may cause some noise, but this should be considered normal.

By repeating steps b and c, adjust the gap between the angle set on the unit and the actual angle between the speaker and the listener.
Set the Elevation dials of channels 1 and 2 to the FRONT positions and the Azimuth dials to the LEFT or RIGHT. Then adjust the Azimuth dials of channels 3 and 4 so that the actual sound will be positioned to coincide with the position indicated by the panel controls.

Signal processing:

binaural and transaural processors;



Step b on the previous page adjusts the level of the direct sound from the binaural processor and step c adjusts the internal processing of the transaural processor.

☐ Writing the new setting

Once the edited setting is written into memory, it will work on all remote channels 1 – 12.

① With remote channel 17 selected, press [SEND].

* If you press [REMOTE CHANNEL SELECT] instead of pressing [SEND], and select a different remote channel, only remote channel 1's channels will have the new settings while all the other channels retain the previous settings.
If you change the RSS - 8048 to another remote channel (other than 1) or turn the unit off, the edited setting will be erased.

☐ How to return to the preprogrammed setting

You can return the edited value (which is set by using the Azimuth Dials of channel 3/4) to the initial value preprogrammed by the manufacturer.

① With remote channel 17 selected, press [INITIALIZE].
All the channels on remote channel 1 will be returned to the preprogrammed settings.

② Press [SEND].
All remote channels 1 – 12 will be returned to the preprogrammed settings.

* If you press [REMOTE CHANNEL SELECT] instead of pressing [SEND], and select a different remote channel, only the remote channel 1's channels will be returned to the preprogrammed settings while all the other channels retain the previous settings.
If you change the RSS - 8048 to another remote channel, or turn the unit off, the preprogrammed setting will be restored.

INFORMATION	On SSC - 8004s (from serial No. ZC40150), the function of the INITIALIZE Switch is as follows : (refer to the Owner's Manual for SSC - 8004, Page. 10, ⑭) Press [INITIALIZE] to initialize the unit (reset all settings to those shown below). The indicator will light during the process. Azimuth/Elevation → Positioned at Front Link Switch → Off Internal digital volume of the RSS - 8048 → – 0dB

MIDI Implementation and MIDI Implementation Chart Update

➡MIDI Implementation addition

→ Page 19, 26th line, right column — just before "System Exclusive Message"

● Control Change

○ Volume

Status	2nd Byte	3rd byte
BnH	07H	vvH

n = MIDI channel number : 0H - 0FH (0 - 15) 0 = ch.1 15 = ch.16

RSS REMOTE CHANNEL : No MIDI channel can be assigned to channels 5 - 16. To edit the volume of those channels, use System Exclusive messages. RSS REMOTE CHANNELS 1 - 4 can receive System Exclusive message.

→Add to the parameter address map, page 20, line 30 :

16 00 : CHANNEL 1 VOLUME : 00H - 7FH (0 - 127)
(RSS REMOTE CHANNELS 1 - 15)
16 01 : CHANNEL 2 VOLUME : 00H - 7FH (0 - 127)
(RSS REMOTE CHANNELS 1 - 15)
16 02 : CHANNEL 3 VOLUME : 00H - 7FH (0 - 127)
(RSS REMOTE CHANNELS 1 - 15)
16 03 : CHANNEL 4 VOLUME : 00H - 7FH (0 - 127)
(RSS REMOTE CHANNEL 1 - 15)
17 00 : Transaural Processor A volume : 00H - 7FH (0 - 127)
(RSS REMOTE CHANNEL : 16, Channels 1 and 2)
17 01 : Transaural Processor B volume : 00H - 7FH (0 - 127)
(RSS REMOTE CHANNELS : 16 Channels 3 and 4)

→Addition to the last part of the MIDI Implementation

NOTE :To transmit localization data to the RSS-8048 using a sequencer, be sure to set a 5 msec interval.

➡MIDI Implementation chart addition

Control change table :

Function...	Transmitted	Recognized	Remarks
Control Change 7	×	○	Volume

Effective use of the RSS System

Introduction

The RSS System is a sound processing system developed with the aid of research in the area of psychoacoustics. To make the best use of the RSS System, it is necessary to grasp the concepts in this research. This chapter briefly refers to the "Perception of sound direction", and how to best use the RSS System.

■ Perception of sound direction

The perception of sound direction can be divided into two categories; what can be recognized using only one ear and, what cannot be recognized unless using both ears.

Sound perception with one ear:

①Difference of ear's frequency response (amplitude, phase) according to the direction of sound.

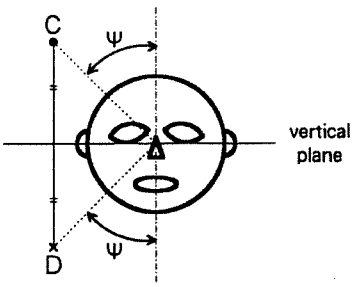
Sound perception with both ears:

②Time difference between receiving sounds (one ear usually receives sound before the other).

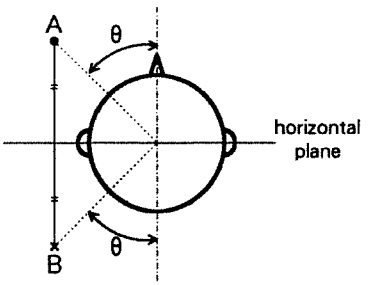
③The differences in frequency response (amplitude, phase).

Generally speaking, to perceive sound direction, all conditions (①−③) are important. However, with regard to perception of a front, central source (where reverberation is not a factor), perception is based mostly on the condition ① factor.

In the situations illustrated in the diagrams below (again where reverberation is not a factor), condition number two is not a factor.



《Sound generated between two points equidistant on a vertical plane (top/bottom)》



《Sound generated between two points equidistant on a horizontal plane (front/back)》

The human ability for perceiving the direction of soundis fairly limited and is diminished in an acoustically dead (non reverberant) environment. Taking this into consideration, the following condition may be counted as a supplementary element:

④Difference in reverberation characteristics depending on the position of the sound source.

■How to make the best use of the RSS System

The RSS System can easily reproduce three - dimensional sound fields which were not possible in the past. However, to achieve the best results, please pay attention to the following sections: "Monitoring", "Sense of sound positioning" and "How to use an effects device, etc.". This chapter refers attaining the best result from the RSS system.

【Note on monitoring】

The 'sound positioning' created by the RSS System will give different results depending on the system used for monitoring or the position of the listener, etc. Please take the following into consideration when using the RSS System.

〈When using loud speakers〉

- A non - reverberant control room is suitable for use with the RSS system.
- Speaker systems of a coaxial or virtual coaxial design are suitable for use with the RSS system.

* Monitor the sound at the sweet spot of the RSS System. (Refer to page 14 in the SSC - 8004's owner's manual.)

* Confirming sound position may be difficult if the volume is too low (or too high).

〈When using headphones〉

* Sounds localized to the front, central position cannot be heard clearly (perception will also differ depending on the listener and/or the headphones).

* Compared with loud speakers, the distance and space may be perceived differently when using headphones.

【Sound positioning】

The RSS System simulates how people perceive the positioning of the sound field, using a signal processing system. The perceived location of the sound differs depending on the tone color of the sound, sound image direction, etc. Also, perception will vary widely depending on the listener (this is most critical).

〈Difference of the sound position impression depending on the tone of the sound〉

- The perception of sound location of different tones is dependent not only on the nature of the RSS System, but also on the nature of human beings. For instance, it is more difficult to perceive the location of lower - frequency sounds when they are positioned above the listener's head. Also, locating the source of sine waves (or sounds with little harmonic content) is more difficult. Experimentation should confirm these findings.

〈Sound Position impression from the rear〉

- Sounds located in the front or back can be recognized because of the difference of the frequency responses. Sounds located behind the listener will be perceived differently depending on the listener.
- It may be effective to create the sensation of diagonal motion when working with sounds to be located behind the listener.
- It may be effective to use delay or decay type sounds (e.g. percussion instrument, piano, guitar). You might also add delay to sounds positioned slightly off - center.

〈Sound Positioning : Above and Below〉

●The perception of sounds located above and below the listener is highly subjective (as is all perception). This appears to be especially true of sounds located in front of the listener.

●Reverberation characteristics of the control room also affect the perception of sounds located above the listener. Using headphones eliminates any room considerations.

●To accurately hear the location of sounds positioned above or below, it may be effective to use sustain - type sounds (such as strings) and move the sound occasionally.

●The perceived location of sounds positioned above or below is again affected by the tone. Some tones are inclined to remain above or below the listener. Careful experimentation should help you decide where to position which sounds.

〈Time required for sound localization〉

●The time required for a person to locate any given sound in space is dependent on numerous factors. Depending on the individual, it may require some time before he/she can accurately locate the sound.

●Moving the sound position quickly will create an effect that is quite different from that intended.

* When you operate the RSS System using a sequencer, take the above into consideration.

〈Multiple sound sources〉

●Perceived sound localization will also be affected by the number of sound sources. For instance, even if you cannot hear the position of one sound clearly, you may hear it when several sounds are mixed together. This may be especially helpful when positioning sounds above or below the listener.

〈Sound and Space〉

Spacious sounds cannot be successfully produced by placing the same sound in different positions.

●Use a chorus or reverb device to create simulated stereophonic sound, and then place the right and left signals in different positions. In this way, spaciousness can be created. A trade - off for using this technique, however, is a sound which is more difficult to locate (perceive) in space.

●Spaciousness can also can be created by placing similar sounds (e.g. Synth strings and real strings) in different positions. Again, however, locating sounds in space will be more difficult.

〈Note on localizing a stereo sound source〉

* The RSS System essentially controls sound positioning of monophonic sources. When the right and left signals of a stereophonic sound source are placed in two different positions, a spacious sound will result. The sound position impression will be less distinct, however. Experimentation with symmetrical and asymmetrical placement of stereo sources may produce some interesting effects.

[When using effects devices]

When effects devices are used with the RSS System, the sound position created by the system may change. Please note the following:

⟨How to connect effects devices⟩

- Use an effects device that affects the original sound (such as distortion, limiter, compressor or pitch shifter), prior to entering the RSS System.
- When an effects device is connected after RSS System processing, set the effect parameters in both left and right channels to the same settings.
- A reverb device will create different effects depending on how it is connected. (See the following instructions.)

⟨Using a Reverb⟩

- When a reverb unit is connected prior to the RSS System, the reverberated sound will remain at the same position as the source sound. Therefore, the sound position will be stable although the reverb effect may be diminished.
- When a reverb unit is connected after the RSS System, you must be careful about the volume balance between the direct and reverb sounds. The sound image is determined by the localization of the direct sound, but it will be unstable if the volume of the reverberated sound is higher.
- When the direct and reverb sounds are placed in different positions, the depth of sound will change.

⟨Using a Sampler⟩

- Even if the sound output from the RSS System is recorded into a stereo sampler, the effect of the RSS System can be reproduced. If, however, you edit the recorded sound or use the key transpose function, the effect will be lost.
- Some types of samplers feature a phase data controlling function that controls phase during sampling. If you are using a sampler of this kind, do not use this function.

⟨Recording using a Dummy Head⟩

- An appropriate dummy head for recording is one that features a flat frequency response for sounds coming from the front. If you use a different type, create a flat frequency response using an equalizer.
- When you mix sound recorded using a dummy head with the sound processed by a binaural processor, you may add reverb to the binaurally - processed sound to minimize the sound - field differences.

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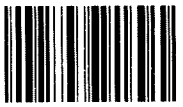

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