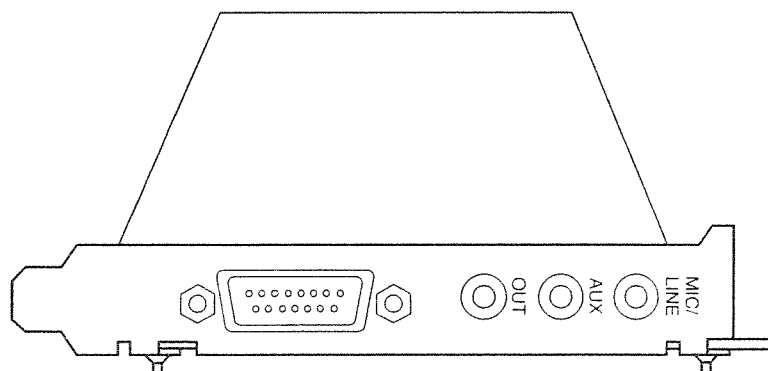


ROLAND AUDIO PRODUCTION CARD

RAP-10/AT

OWNER'S MANUAL



ROLAND AUDIO PRODUCTION CARD

RAP-10/AT

OWNER'S MANUAL

We'd like to take a moment to thank you for purchasing the RAP-10/AT Roland Audio Production Card. The RAP-10 is a multimedia sound card that features a synthesizer sound source containing high-quality sounds compatible with the GM (General MIDI) system. It also features a stereo sampling (16-bit, 44.1 kHz) function. The RAP-10 is compatible with Microsoft Windows 3.1, making it ideal for multimedia applications that handle music and sounds.

To ensure proper installation and usage in the environment that's best for you, we hope you'll take the time to read this owner's manual carefully.

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FEATURES

Compatible with Microsoft Windows 3.1

The RAP-10 is compatible with Windows 3.1, which means that you can use MPC-compatible application software for use under Windows 3.1.

Compatible with GM (General MIDI) System Level 1

The synthesizer sound source of the RAP-10 is compatible with General MIDI system level 1, which was designed to transcend variations among different manufacturers and models to standardize sound source operation. This means you can play music data for General MIDI sound sources without any additional modification.

16-part Multi-Timbral Sound Source

The synthesizer sound source of the RAP-10 is 16-part multi-timbral (including the drum part). It can play up to 26 sounds simultaneously, making possible ensembles of up to 16 parts.

Reverb and Chorus Effects

Reverb capable of adding expressive depth and width is built in, and so is chorus that adds fullness to the sound for majestic ensembles. These digital effects let you create music with virtually the same fidelity and acoustics as a concert hall.

Sampling Sound Source

By connecting the RAP-10 with a microphone, CD player, or tape recorder you can record sounds for stereo playback (or mono playback on two channels). You can even add reverb or chorus effects to what you've recorded.

** A driver and application software for the RAP-10 are needed to perform sampling and its playback.*

Easy Installation

All you need to do is slip the RAP-10 into an expansion slot in your computer and connect it to an audio playback device, and you're ready to go.

Built-in Joystick Interface and MIDI Interface Connector

The RAP-10 has a joystick connector, which means you can use it with joysticks like those for game use. And if you hook up the MCB-10 MIDI connector box (sold separately), you can send and receive MIDI data from external MIDI equipment.



General MIDI System

The General MIDI System is a set of recommendations which seek to provide a way for going beyond the limitations of proprietary designs, and standardize the MIDI capabilities provided by sound generating devices.

If you use a sound generating unit which carries the General MIDI logo, you will be able to faithfully reproduce any song data which also carries the General MIDI logo.

** IBM is a registered trademark of International Business Machines Corporation.*

** Microsoft is a registered trademark of Microsoft Corporation.*

** Windows is a trademark of Microsoft Corporation.*

SYSTEM REQUIREMENTS

The basic requirements to install and run the RAP-10 are :

- An 80386SX16MHz computer or higher with VGA monitor.
- 640K conventional memory (2048K extended memory required for Windows).
- A free 16-bit expansion slot.
- Microsoft Windows, version 3.1 (or later) for application software.

IMPORTANT NOTES

[Power Supply]

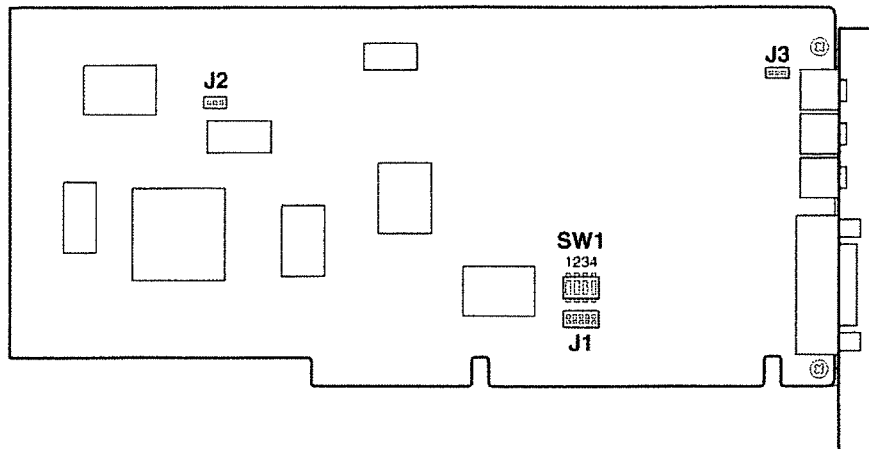
- When making any connections with other devices, always turn off the power to all equipment first; this will help prevent damage or malfunction.

[Additional Precautions]

- Protect the unit from strong impact.
- Should a malfunction occur (or if you suspect there is a problem) discontinue use immediately. Contact qualified service personnel as soon as possible.

1. PART NAMES

RAP-10 Board



SW1-1

Enables or disables the joystick function.

SW1-2, -3, and -4

These select the I/O address.

J1

This sets the interrupt level.

J2

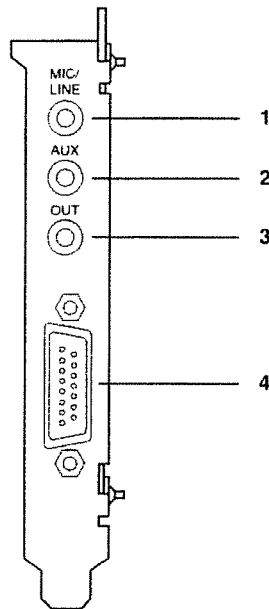
Use this with the factory default setting.
Changing this setting will result in a loss of sound output.

J3

This sets the MIC/LINE input jack to stereo or mono.

** For a detailed explanation of DIP switch and jumper settings, see page 6
" 2. INSTALLING RAP-10 "*

Panel



1. MIC/LINE (Stereo miniature phone jack)

This is an input jack for sampling use.
Connect it to a stereo microphone, or to the output jack on a CD player, tape recorder, or other device. If you want to use a monaural microphone and record on both the left and right channels, switch jumper J3 on the board to the monaural setting.

2. AUX (Stereo miniature phone jack)

This is an input jack for sampling use.
Connect it to the output jack on a CD player, tape recorder, or other device.

3. OUT (Stereo miniature phone jack)

This is the output jack for the RAP-10's sound source.
Use the audio cable included with the RAP-10 to connect this to the AUX IN or LINE IN jack on the audio playback device. Headphones can also be connected to this jack.

4. JOYSTICK/MIDI Connector (DB-15)

This is for an IBM-standard analog joystick and the MCB-10 (sold separately). If you want to hook up an external MIDI device, first connect the MCB-10 to this connector. Then use a MIDI cable to connect the MIDI device to the MIDI IN/OUT jack on the MCB-10. A joystick may be connected to this MCB-10.

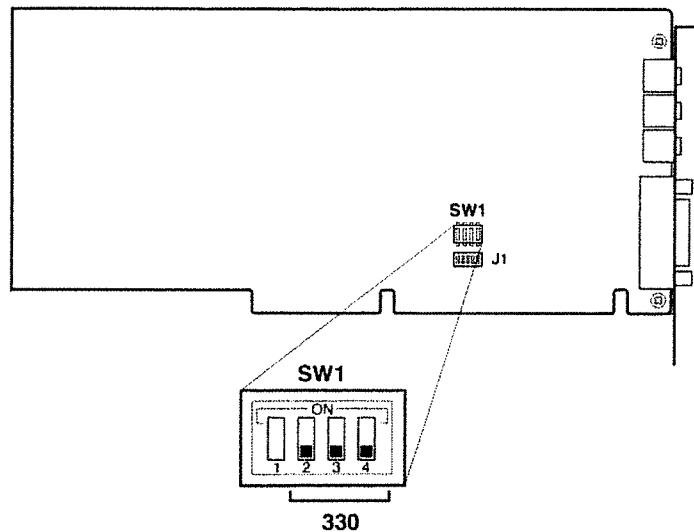
* The sampled signals are a mixture of the signals input through both the MIC/LINE and the AUX jacks. Use your software to control the levels for each of these.

2. INSTALLING THE RAP-10

Before you install the RAP-10 board in your computer, you must check the board configuration. You can change the input/output (I/O) address and the interrupt level (IRQ) for the board.

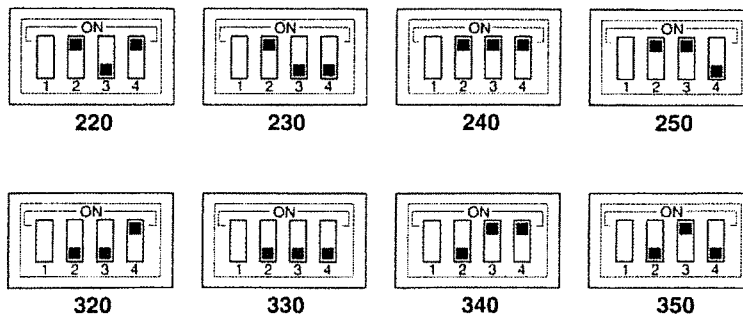
Setting the I/O Address

The following diagram shows the switch positions for the default I/O address (330). Check your board to make sure that the settings match those in this diagram.



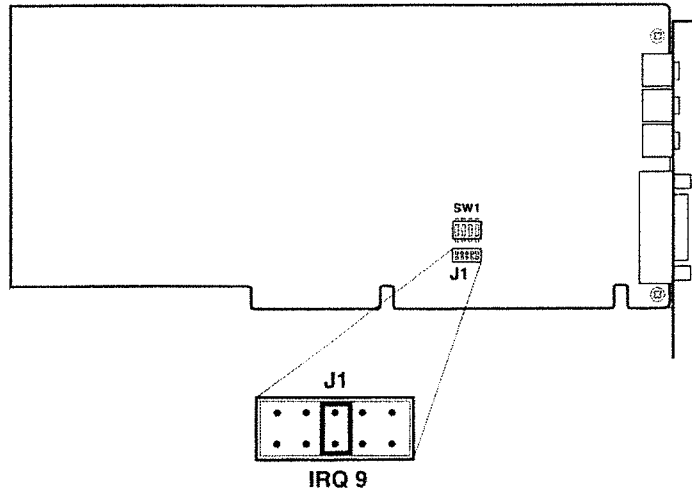
Additional I/O Address Settings

If the default I/O address is already used by another board, you may select one of the alternate I/O addresses. The following diagrams show how to set the switches if you need to use an I/O address other than 330.



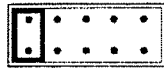
Setting the IRQ Level

The following diagram shows the jumper position for the default IRQ level (9). Check your board to make sure that the position matches the one in this diagram.



Additional IRQ Level Settings

If the default IRQ level is already used, you may select one of the alternate IRQ levels. IRQ conflicts could be caused by other cards in your computer such as network, bus mouse, CD ROM, tape drive, SCSI disk, other audio cards, etc. The following diagrams show how to position the jumper if you need to use an IRQ level other than 9.



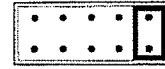
IRQ 5



IRQ 7



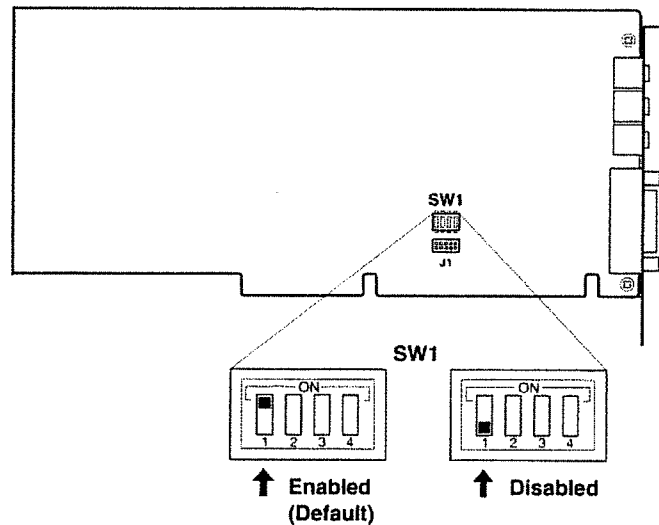
IRQ 10



IRQ 11

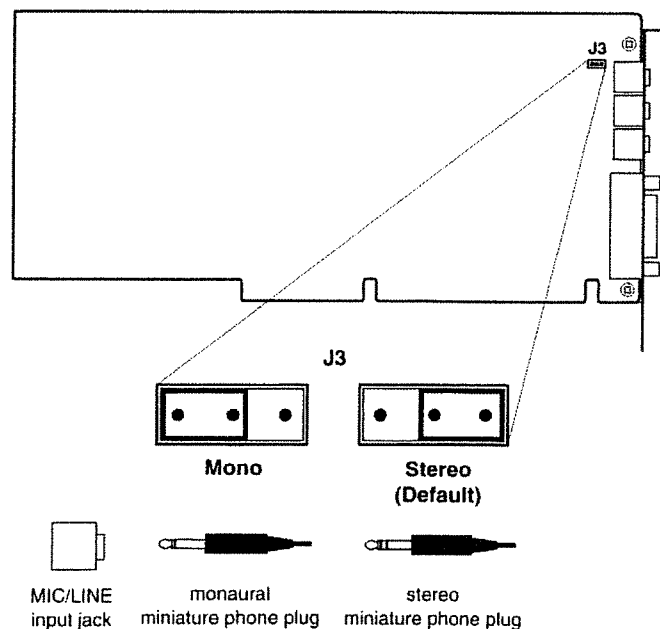
Disabling the Joystick Port

The following diagram shows the switch positions to enable and disable the joystick port. The joystick port should be enabled, unless another joystick port is already being used. Check your board to make sure that the switch position is set correctly.



Setting the MIC/LINE Input Jack

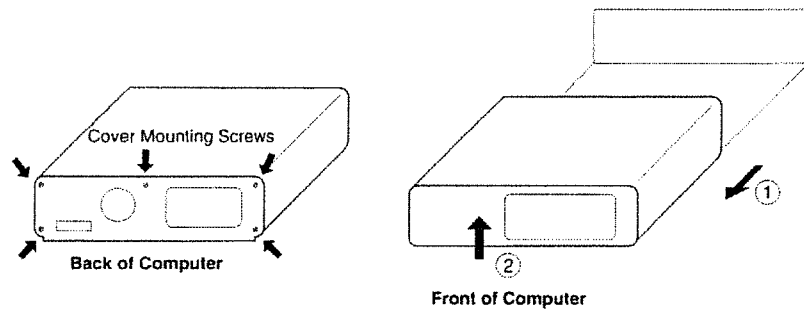
The following diagram shows the jumper position for the MIC/LINE input jack. If you are using the RAP-10 with a CD player, tape recorder, stereo microphone or something similar, set this to STEREO. If you're using a monaural microphone, set it to MONAURAL. The factory setting is STEREO.



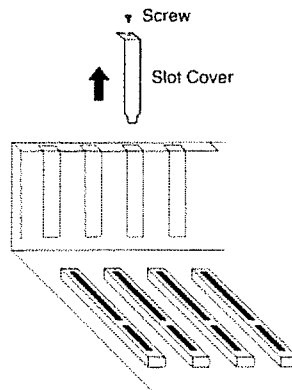
Installing the Board

The next step is to install the sound board in your computer. If you have never done this before, refer to the documentation that came with your computer.

1. Turn off your computer and all peripheral devices (such as printers and monitors connected to it) and unplug the power cable.
2. Remove the system unit cover. For more information, see the owner's manual for your computer.

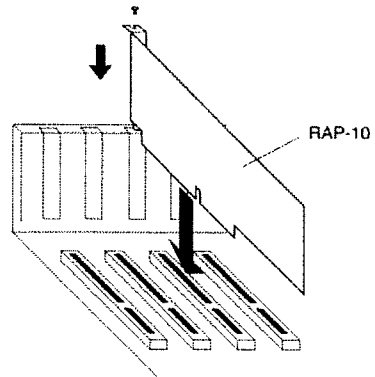


3. Find an unused 16-bit expansion slot in your system unit. Remove the screw that secures the slot cover and lift out the slot cover. For best results, choose a slot that is not immediately adjacent to another board. Some boards may emit signals that can interfere with a sound board.



4. Line up the back bracket of the RAP-10 board with the expansion slot and align the board's connector with the expansion slot socket.

-
5. Lower the board into this slot. You may need to use some pressure to snap the board into the slot, but do not force it or you could damage the board.



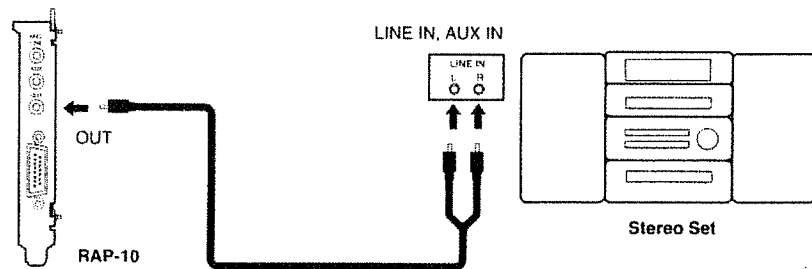
6. Replace the screw you removed from the expansion slot cover.
7. Replace the system unit cover.
8. Plug in the power cable.

3. MAKING CONNECTIONS

Connecting the Audio Cable

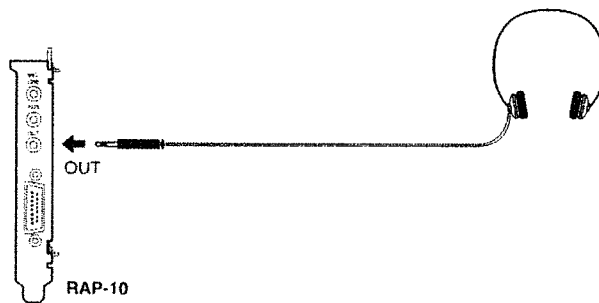
Because the RAP-10 has a built-in sound source, all you have to do is connect the audio cable to an external audio device.

Use the audio cable included with the RAP-10 to connect the OUT jack on the RAP-10 to the external input jack (labeled LINE IN or AUX IN) on the audio playback device.



Using Headphones

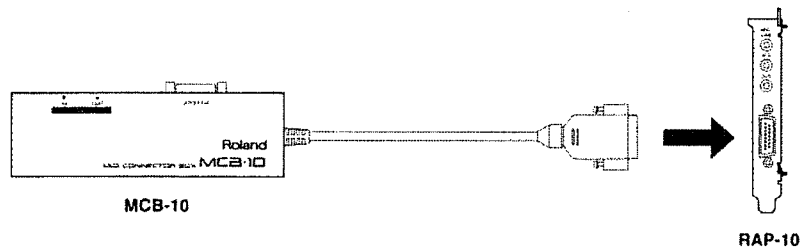
If you want to listen with headphones, connect the headphone plug to the OUT jack on the RAP-10. Be sure to use stereo headphones with a miniature phone plug. Use the software to adjust the volume.



Connecting an External MIDI Device

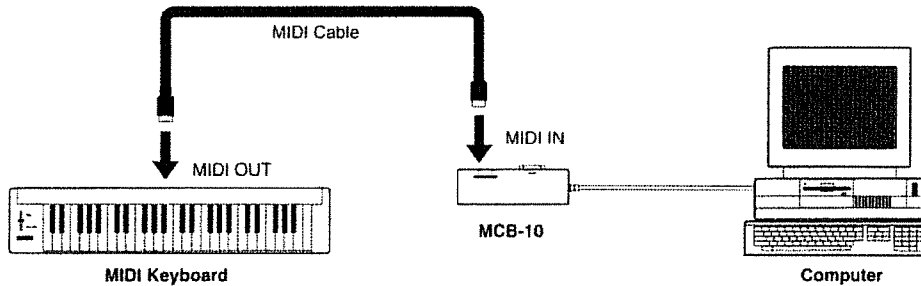
If you want to use a MIDI keyboard or some other external sound source, you'll need the MCB-10 (sold separately).

- **Connecting the MCB-10**



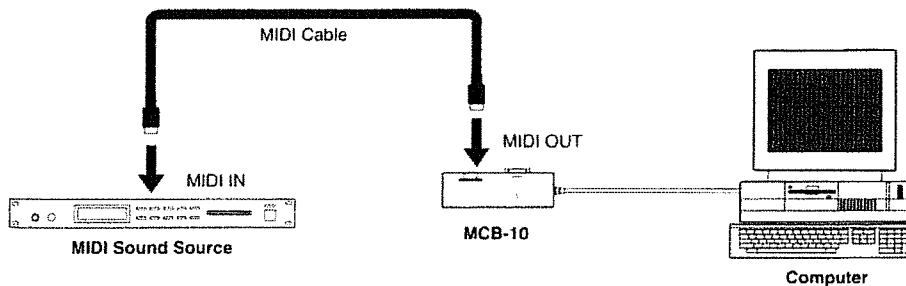
- **Connecting a MIDI Keyboard**

Use a MIDI cable to connect the MIDI OUT jack on the MIDI keyboard to the MIDI IN jack on the MCB-10.



- **Connecting an External Sound Source**

Use a MIDI cable to connect the MIDI IN jack on the external sound source to the MIDI OUT jack on the MCB-10.



4. THE SYNTHESIZER SOUND SOURCE

The synthesizer sound source of the RAP-10 is controlled by the computer software and can also be played by MIDI data from a MIDI keyboard or MIDI sequencer connected through the MCB-10.

MIDI stands for "Musical Instrument Digital Interface," a worldwide standard for communicating performance data between digital musical instruments and computers. A MIDI-compatible device can read and understand performance data sent from another MIDI device, even if they are made by different manufacturers. In the MIDI standard, "performance data" means not the sounds themselves, but digital data describing what is to be done. This performance data is referred to as MIDI "messages."



The RAP-10's synthesizer sound source is compatible with GM (General MIDI) System Level 1. GM is a set of recommended guidelines for standardizing and overcoming the differences between the MIDI function specifications of sound modules made by different manufacturers. GM sets down the relationship between MIDI channels and parts, between program numbers and the sounds that are actually played, and, for rhythm performances, the relationship between note numbers and rhythm sounds. This means the RAP-10 can play any GM-format MIDI data.

The synthesizer sound source has 16 Parts. Up to 15 different musical parts and one rhythm part can be played at the same time. The synthesizer sound source can play up to 26 sounds simultaneously. Some Tones use two sounds, so the actual number of sounds may be less.

To check the number of Voices used by each Tone, refer to the Tone Table on page 16 or the Drum Set Table on page 18.

The MIDI Implementation Chart

MIDI (Musical Instrument Digital Interface) allows musical instruments, synthesizers, sequencers, computers, sound modules, etc. to be interconnected through a standard interface. Instruments equipped with a MIDI interface exchange information via a standardized set of MIDI messages. An instrument transmits MIDI messages through its MIDI-OUT connector and receives MIDI messages through its MIDI-IN connector.

The MIDI specification defines a large set of MIDI messages. However instruments are not required to support the complete MIDI specification and may transmit or respond to a subset of the MIDI messages. MIDI instrument owner's manuals include a standardized "MIDI Implementation Chart" which shows the types of MIDI messages it will transmit (MIDI-OUT) and recognize (MIDI-IN). Fold the MIDI Implementation Chart vertically between the "Transmitted" and "Recognized" columns. Now, compare the "Transmitted" column of the MIDI-OUT instrument to the "Recognized" column of the MIDI-IN instrument. Messages that are transmitted or responded to are marked with an "O". If the "Transmitted" and "Recognized" rows are both marked with an "O", the receiving instrument will respond to that MIDI message.

* The MIDI Implementation Chart for this device is shown on page 33. Also, a description of the details of MIDI implementation for the RAP-10 starts on page 19.

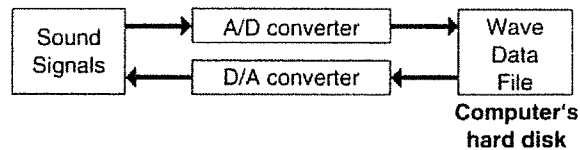
5. THE SAMPLING SOUND SOURCE

The RAP-10 has two channels that can be used for recording and playback. This sampling sound source is controlled by the software, but it is set up in the following way.

Recording and Playback

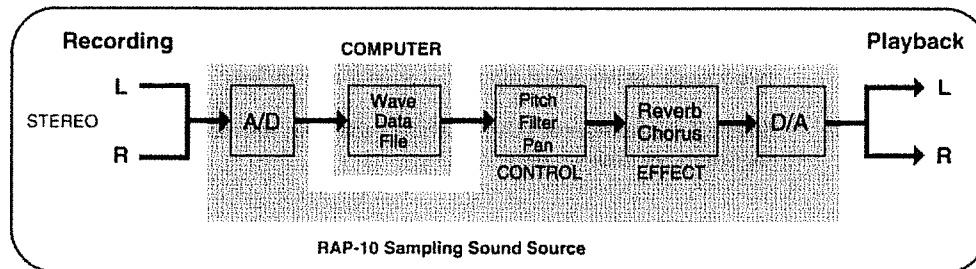
When you're recording, sounds that are input from the microphone, CD player, or tape recorder are converted to digital data, which are stored as a wave data file on your computer's hard disk.

During playback, wave data is read from the computer's hard disk, converted to analog signals, and output as sound.



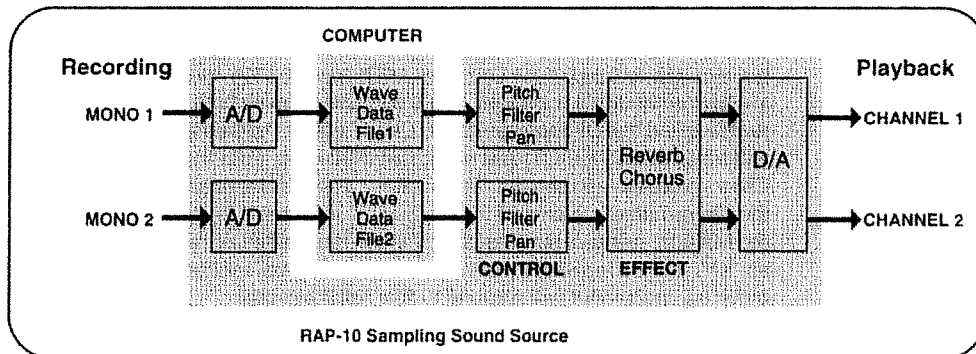
About Stereo and Mono

• Stereo Recording and Playback



• Mono Recording and Playback

Two sets of wave data recorded in monaural format can be processed simultaneously during playback.



With the RAP-10, you can vary parameters and effects -- such as pan, pitch, and filter -- for wave data in real time.

TROUBLESHOOTING

If you aren't getting any sound, or things aren't working the way you expect, we suggest running through this little checklist first. If none of these suggestions fix the problem, then contact the dealer where you purchased your RAP-10.

The application doesn't start or doesn't run correctly.

- Is the RAP-10 correctly inserted into the expansion slot? Check to make sure.
- If you are using more than one expansion board, are any of the interrupt levels or I/O addresses duplicated?
Check the interrupt level and I/O address settings.
- Do the interrupt level and I/O address settings for the expansion board match the settings for the driver?
If you alter the settings for the board, be sure to change the settings for the software so that they are identical.
- Is your application connected to the RAP-10?
Check the application's Setup or Settings menu to verify the selection of the RAP-10 driver.

No sound

- Is the amplifier turned on?
- Is the input for the audio device selected correctly?
- Is the volume for the audio device turned down too low?
- Is the software volume control turned down too low?
If the performance data has a volume setting, be sure to check it and adjust it if necessary.
- If you are using more than one expansion board, are any of the interrupt levels or I/O addresses duplicated?
Check the interrupt level and I/O address settings.
- Do the interrupt level and I/O address settings for the expansion board match the settings for the driver?
If you alter the settings for the board, be sure to change the settings for the software so that they are identical.
- Is your application connected to the RAP-10?
Check the application's Setup or Settings menu to verify the selection of the RAP-10 driver.

MIDI Sounds drop out.

- The RAP-10 can play up to 26 sounds simultaneously. When the sum of the sounds exceeds 26, the RAP-10 gives priority to the new sounds and "steals" sound generators from lower priority parts.
To reduce sound drop out :
 - * Select tones that use only one voice. (See Tone Table, p.16)
 - * Reduce the number of sounds being played.
 - * Give important parts a higher priority. (See MIDI Implementation, p.23)
 - * Increase the voice reserve for the priority part to guarantee the minimum number of voices for the part. (See MIDI Implementation, p.23)

TONE TABLE

	PC#	Tone Name	V	TVF
Piano	1 00h	Piano 1	1	
	2 01h	Piano 2	1	
	3 02h	Piano 3	1	
	4 03h	Honky-tonk	2	
	5 04h	E.Piano 1	1	
	6 05h	E.Piano 2	1	
	7 06h	Harpsichord	1	
	8 07h	Clav.	1	
Chromatic Percussion	9 08h	Celesta	1	
	10 09h	Glockenspiel	1	
	11 0Ah	Music Box	1	
	12 0Bh	Vibraphone	1	
	13 0Ch	Marimba	1	
	14 0Dh	Xylophone	1	
	15 0Eh	Tubular-bell	1	
	16 0Fh	Dulcimer	1	
Organ	17 10h	Organ 1	1	
	18 11h	Organ 2	1	
	19 12h	Organ 3	2	
	20 13h	Church Org.1	1	
	21 14h	Reed Organ	1	
	22 15h	Accordion Fr	2	
	23 16h	Harmonica	1	
	24 17h	Tango Accordion	2	
Guitar	25 18h	Nylon-str.Gt	1	
	26 19h	Steel-str.Gt	1	
	27 1Ah	Jazz Gt.	1	
	28 1Bh	Clean Gt.	1	
	29 1Ch	Muted Gt.	1	
	30 1Dh	Overdrive Gt	1	
	31 1Eh	Distortion Gt	1	
	32 1Fh	Gt.Harmonics	1	
Bass	33 20h	Acoustic Bs.	1	
	34 21h	Fingered Bs.	1	
	35 22h	Picked Bs.	1	
	36 23h	Fretless Bs.	1	
	37 24h	Slap Bass 1	1	
	38 25h	Slap Bass 2	1	
	39 26h	Synth Bass 1	1	
	40 27h	Synth Bass 2	2	
Strings & Orchestra	41 28h	Violin	1	
	42 29h	Viola	1	
	43 2Ah	Cello	1	
	44 2Bh	Contrabass	1	
	45 2Ch	Tremolo Str	1	
	46 2Dh	Pizzicato Str	1	
	47 2Eh	Harp	1	
	48 2Fh	Timpani	1	
Ensemble	49 30h	Strings	1	
	50 31h	Slow Strings	1	
	51 32h	Syn.Strings1	1	
	52 33h	Syn.Strings2	2	
	53 34h	Choir Aahs	1	
	54 35h	Voice Oohs	1	
	55 36h	SynVox	1	
	56 37h	Orchestra Hit	2	OFF
Brass	57 38h	Trumpet	1	
	58 39h	Trombone	1	
	59 3Ah	Tuba	1	
	60 3Bh	Muted Trumpet	1	
	61 3Ch	French Horn	2	
	62 3Dh	Brass 1	1	
	63 3Eh	Synth Brass1	2	
	64 3Fh	Synth Brass2	2	

PC#: Program Change Number

V: Number of voices used

TVF: Instruments marked "OFF" cannot have their TVF's (Time Variant Filter) modified by Channel aftertouch.

* Reception of channel aftertouch on the RAP-10 is disabled as a default setting. When you wish to use this function, enable it from your application software. See the MIDI Implementation for more details.

	PC#	Tone Name	V	TVF
Reed	65	40h Soprano Sax	1	
	66	41h Alto Sax	1	
	67	42h Tenor Sax	1	
	68	43h Baritone Sax	1	
	69	44h Oboe	1	
	70	45h English Horn	1	
	71	46h Bassoon	1	
	72	47h Clarinet	1	
Pipe	73	48h Piccolo	1	
	74	49h Flute	1	
	75	4Ah Recorder	1	
	76	4Bh Pan Flute	1	
	77	4Ch Bottle Blow	2	
	78	4Dh Shakuhachi	2	
	79	4Eh Whistle	1	OFF
	80	4Fh Ocarina	1	
Synth Lead	81	50h Square Wave	2	
	82	51h Saw Wave	2	
	83	52h Syn.Calliope	2	
	84	53h Chiffer Lead	2	
	85	54h Charang	2	
	86	55h Solo Vox	2	
	87	56h 5th Saw Wave	2	
	88	57h Bass & Lead	2	
Synth Pad	89	58h Fantasia	2	
	90	59h Warm Pad	1	
	91	5Ah Polysynth	2	
	92	5Bh Space Voice	1	
	93	5Ch Bowed Glass	2	
	94	5Dh Metal Pad	2	
	95	5Eh Halo Pad	2	
	96	5Fh Sweep Pad	1	

	PC#	Tone Name	V	TVF
Synth SFX	97	60h Ice Rain	2	
	98	61h Soundtrack	2	
	99	62h Crystal	2	
	100	63h Atmosphere	2	
	101	64h Brightness	2	OFF
	102	65h Goblin	2	
	103	66h Echo Drops	1	
	104	67h Star Theme	2	
Ethnic Misc	105	68h Sitar	1	
	106	69h Banjo	1	
	107	6Ah Shamisen	1	
	108	6Bh Koto	1	
	109	6Ch Kalimba	1	
	110	6Dh Bag Pipe	1	
	111	6Eh Fiddle	1	
	112	6Fh Shannai	1	
Percussive	113	70h Tinkle Bell	1	
	114	71h Agogo	1	
	115	72h Steel Drums	1	
	116	73h Woodblock	1	OFF
	117	74h Taiko	1	
	118	75h Melo. Tom 1	1	OFF
	119	76h Synth Drum	1	OFF
	120	77h Reverse Cym.	1	OFF
SFX	121	78h Gt.FretNoise	1	OFF
	122	79h Breath Noise	1	
	123	7Ah Seashore	1	
	124	7Bh Bird	2	OFF
	125	7Ch Telephone 1	1	OFF
	126	7Dh Helicopter	1	
	127	7Eh Applause	2	
	128	7Fh Gun Shot	1	OFF

PC#: Program Change Number

V: Number of voices used

TVF: Instruments marked "OFF" cannot have their TVF's (Time Variant Filter) modified by Channel aftertouch.

* Reception of channel aftertouch on the RAP-10 is disabled as a default setting. When you wish to use this function, enable it from your application software. See the MIDI Implementation for more details.

DRUM SET TABLE

PC#	1	17	25	26	41	49
Drum set	Standard set	Power set	Elec. set	TR-808 set	Brush set	Orchestra set
27	High Q					Closed HH [EXC1]
28	Slap					Pedal HH [EXC1]
29	Scratch Push					Open HH [EXC1]
30	Scratch Pull					Ride Cymbal
31	Sticks					
32	Square Click					
33	Metronome Click					
34	Metronome Bell					
35	Kick Drum 2					Concert BD 2
36	Kick Drum 1	MONDO Kick	Elec BD (*)	808 Bass Drum (*)		Concert BD 1 (*)
37	Side Stick			808 Rim Shot		
38	Snare Drum 1	Gated SD	Elec SD	808 Snare Drum	Brush Swish	Concert SD (*)
39	Hand Clap				Brush Slap	Castanets
40	Snare Drum 2		Gated SD		Brush Swirl (*)	Concert SD (*)
41	Low Tom 2		Elec LowTom 2	808 Low Tom 2		Timpani F (*)
42	Closed Hi-Hat [EXC1]			808 CHH (*) [EXC1]		Timpani F# (*)
43	Low Tom 1		Elec LowTom 1	808 Low Tom 1		Timpani G (*)
44	Pedal Hi-Hat [EXC1]			808 CHH (*) [EXC1]		Timpani G# (*)
45	Mid Tom 2		Elec MidTom 2	808 Mid Tom 2		Timpani A (*)
46	Open Hi-Hat [EXC1]			808 OHH (*) [EXC1]		Timpani A# (*)
47	Mid Tom 1		Elec MidTom 1	808 Mid Tom 1		Timpani B (*)
48	High Tom 2		Elec Hi Tom 2	808 Hi Tom 2		Timpani c (*)
49	Crash Cymbal 1 (*)		Reverse Cymbal	808 Cymbal (*)		Timpani c# (*)
50	High Tom 1		Elec Hi Tom 1	808 Hi Tom 1		Timpani d (*)
51	Ride Cymbal 1					Timpani d# (*)
52	Chinese Cymbal					Timpani e (*)
53	Ride Bell (*)					Timpani f (*)
54	Tambourine					
55	Splash Cymbal (*)					
56	Cowbell			808 Cowbell		
57	Crash Cymbal 2 (*)					Concert Cymbal2 (*)
58	Vibra-slap					
59	Ride Cymbal 2					Concert Cymbal1
60	High Bongo					
61	Low Bongo					
62	Mute High Conga			808 Hi Conga (*)		
63	Open High Conga			808 Mid Conga (*)		
64	Low Conga			808 Low Conga (*)		
65	High Timbale					
66	Low Timbale					
67	High Agogo					
68	Low Agogo					
69	Cabasa					
70	Maracas			808 Maracas		
71	Short Hi Whistle [EXC2]					
72	Long Low Whistle [EXC2]					
73	Short Guiro [EXC3]					
74	Long Guiro [EXC3]					
75	Claves			808 Claves		
76	High Wood Block					
77	Low Wood Block					
78	Mute Cuica [EXC4]					
79	Open Cuica [EXC4]					
80	Mute Triangle (*) [EXC5]					
81	Open Triangle [EXC5]					
82	Shaker					
83	Jingle Bell					
84	----					
85	Castanets					
86	Mute Surdo (*) [EXC6]					
87	Open Surdo (*) [EXC6]					
88	----	----	----	----	----	Applause

- The blank positions have the same instruments as the "Standard set." "----" means "empty."
- Instruments with the same [EXC#] (Exclusive group number) will mute each other when played in combination.
- Instruments marked with "(*)" can have their TVF's (Time Variant Filter) modified by Channel aftertouch.

MIDI IMPLEMENTATION

1. RECEIVED DATA

[Channel Voice Message]

<1> NOTE OFF

Status	Second	Third
BnH	kkH	vvH
9nH	kkH	00H

n = MIDI channel : 0H...FH (ch1...ch16)
 kk = Note number : 00H...7FH (0...127)
 vv = Velocity : 00H...7FH (0...127)

- * Velocity is ignored
- * Drum Instruments (except 'Applause' of Drum Part) ignore both messages.

<2> NOTE ON

Status	Second	Third
9nH	kkH	vvH

n = MIDI channel : 0H...FH (ch1...ch16)
 kk = Note number : 00H...7FH (0...127)
 vv = Velocity : 00H...7FH (0...127)

<3> CONTROL CHANGE

Control value is not affected when receiving Program Change messages. However, that of Drum Part by NRPN are reset when receiving Program Change messages. (Refer to //NRPN//)

(1) Modulation

Status	Second	Third
BnH	01H	vvH

n = MIDI channel : 0H...FH (ch1...ch16)
 vv = Modulation depth : 00H...7FH (0...127)

- * Affects pitch modulation or rate control (Refer to P.23 'PATCH PARAMETERS')

(2) Data entry

Status	Second	Third
BnH	06H	mmH
BnH	26H	llH

n = MIDI channel : 0H...FH (ch1...ch16)
 mm = MSB value of the parameter specified by RPN or NRPN
 ll = LSB value of the parameter specified by RPN or NRPN

(3) Volume

Status	Second	Third
BnH	07H	vvH

n = MIDI channel : 0H...FH (ch1...ch16)
 vv = Volume : 00H...7FH (0...127)

- * Real volume is determined by (Volume value) x (Expression value) x (Master Volume value)

(4) Panpot

Status	Second	Third
BnH	0AH	vvH

n = MIDI channel : 0H...FH (ch1...ch16)
 vv = Panpot : 00H...40H...7FH (0...64...127) [Left..Center..Right]

- * 0 and 1 mean Left, 64 means Center, 127 means Right
 Total 127 steps from Left to Right

(5) Expression

Status	Second	Third
BnH	0BH	vvH

n = MIDI channel : 0H...FH (ch1...ch16)
 vv = Expression : 00H...7FH (0...127)

- * Affects volume
- * Real volume is determined by (Volume value) x (Expression value) x (Master Volume value)

(6) Hold1

Status	Second	Third
BnH	40H	vvH

n = MIDI channel : 0H...FH (ch1...ch16)
 vv = Control Value : 0H...3FH (0...63) : Hold OFF
 40H...7FH (64...127) : Hold ON

(7) Effect1 depth (Reverb depth)

Status	Second	Third
BnH	5BH	vvH

n = MIDI channel : 0H...FH (ch1...ch16)
 vv = Reverb send level : 00H...7FH (0...127)

- * Real sending level is determined by Volume value, Expression value, Master Volume value and this value. (Refer to block diagram on page 24)

(8) Effect3 depth (Chorus depth)

Status	Second	Third
BnH	5DH	vvH

n = MIDI channel : 0H...FH (ch1...ch16)
 vv = Chorus send level : 00H...7FH (0...127)

- * Real sending level is determined by Volume value, Expression value, Master Volume value and this value. (Refer to block diagram on page 24)

(9) NRPN MSB/LSB

Status	Second	Third
BnH	62H	llH
BnH	63H	mmH

n = MIDI channel : 0H...FH (ch1...ch16)
 ll = LSB value of the parameter specified by NRPN
 mm = MSB value of the parameter specified by NRPN

- * At power up or receiving a "Turn General MIDI System On (F0 7E 7F 09 01 F7)" message, NRPN is not recognized (Rx.NRPN = OFF). System Exclusive message can enable NRPN. (Refer to P.23 'PATCH PARAMETERS')

//NRPN//

NRPN (Non Registered Parameter Number) is the expanded Control Change message to control native functions of each MIDI instrument. NRPN is used to modify tone parameters that are relative values from preset or absolute values.

NRPN MSB/LSB should be set before sending data entry.

NRPN is available for only the Drum Part in the RAP-10.

NRPN	Data Entry	Description
MSB LSB 1BH nH	MSB LSB mmH	Pitch coarse of Drum Instruments (relative change) mm : 00H...7FH (-64...0...+63 semitones)
TAH rH	mmH	TVA level of Drum Instruments (absolute change) mm : 00H...7FH
1CH rH	mmH	Panpot of Drum Instrument (absolute change) mm : 01H...40H...7FH (Left-Center-Right)
1DH rH	mmH	Reverb send depth of Drum Instruments (absolute change) mm : 00H...7FH
1EH rH	mmH	Chorus send depth of Drum Instruments (absolute change) mm : 00H...7FH

rr : key number of Drum and Percussion

- * LSB of data entry is ignored.
- * Relative parameter specifies relative value regarding preset value as 40H.
- * Absolute parameter specifies absolute value regardless of current value.

<< How to use NRPN >>

Recognizing NRPN is always off at power up or when receiving 'Turn GM System On', because parameters specified by NRPN can be assigned native functions of each MIDI instrument and may cause problems.

NRPN is available for only the Drum Part in the RAP-10.

(1) Enable to receive NRPN by System Exclusive message

```
'F0 41 10 56 12 01 00 01 01 sum(7D) F7'
Part10 = Drum Part
```

(2) Specify the parameter to NRPN

```
B9 63 mm (B9) 62 ll mm: parameter
ll: key number of Drum Instrument
```

(3) Set parameter value using data entry

```
(B9) 06 vv vv: parameter value (use only MSB in RAP-10)
```

(4) Reset NRPN (no parameter specified by NRPN)

```
(B9) 65 7F (B9) 64 7F
```

Once the parameter is specified by NRPN (Step 2), all values sent by data entry are valid (Step 3). It is recommended to reset NRPN after sending the value so as to avoid any problems (Step 4).

(10) RPN MSB/LSB

Status	Second	Third
BnH	64H	llH
BnH	65H	mmH

n = MIDI channel : 0H...FH (ch1...ch16)
ll = LSB of parameter specified by RPN
mm = MSB of parameter specified by RPN

There is no change in parameter values via RPN by Program Change messages.

//RPN//

RPN (Registered Parameter Number) is the expanded Control Change message defined by the MIDI standard. Each RPN function is described in "MIDI 1.0 DETAILED SPECIFICATION DOCUMENT". RPN MSB/LSB should be set before sending data entry.

RPN	Data Entry	Description
MSB LSB 00H 00H	MSB LSB mmH	Pitch bend sensitivity mm : 00H...1BH (0...24 semitones) * Up to 2 octaves; default setting is 2 semitones
00H 01H	mmH llH	Master fine tuning mm,ll : 00H,00H...40H,00H...7FH,7FH (-100...0...+100 cent)
00H 02H	mmH	Master coarse tuning mm : 2BH...40H...5BH (-24...0...+24 semitones)
7FH 7FH	---	RPN reset * No specified parameter is assigned to RPN and NRPN. Current value is not affected.

<< How to use RPN >>

(1) Specify the parameter to RPN

```
Bn 65 mm (Bn) 64 ll mm: MSB of parameter name
ll: LSB of parameter name
```

(2) Set parameter value using data entry

```
(Bn) 06 vm (Bn) 26 vl vm: MSB of parameter value
vl: LSB of parameter value
```

Sending only the MSB value is possible, if the required resolution of the value is 128 steps. Omitting the MSB value is allowed, if the required range of the value is less than 128.

(3) Reset RPN (no parameter specified by RPN)

```
(Bn) 65 7F (Bn) 64 7F
```

Once the parameter is specified by RPN (Step 1), all values sent by data entry are valid (Step 2). It is recommended to reset RPN after sending the value so as to avoid any problems (Step 3).

<4> PROGRAM CHANGE

Status	Second
CnH	ppH

n = MIDI channel : 0H...FH (ch1...ch16)
pp = Program number : 00H...7FH (0...127)

* Current active voices are not affected when receiving PROGRAM CHANGE messages. New sounds will be played after receiving PROGRAM CHANGE messages.

<5> CHANNEL PRESSURE

Status	Second
DnH	vvH

n = MIDI channel : 0H...FH (ch1...ch16)
vv = Value : 00H...7FH (0...127)

* TVF cutoff, volume, LFO rate and LFO pitch depth can be controlled. Default has no effect. System Exclusive Messages can enable and change depth of each. (Refer to P.23 'PATCH PARAMETERS')

<6> PITCH BEND CHANGE

Status	Second	Third
EnH	llH	mmH

n = MIDI channel : 0H...FH (ch1...ch16)
mm,ll = Value : 00H,00H...40H,00H...7FH,7FH (-8192 ... 0 ... +8191)

* The default bend range is from +/-2 semitones. (Refer to //RPN//)

[Channel Mode Message]

<1> ALL SOUNDS OFF

Status	Second	Third
BnH	7BH	00H

n = MIDI channel : 0H...FH (ch1...ch16)

- * All current active voices in the specified channel will be shut off. However, current mode is not affected.

<2> RESET ALL CONTROLLERS

Status	Second	Third
BnH	79H	00H

n = MIDI channel : 0H...FH (ch1...ch16)

- * The following control values on the specified channel return to the default values:

Controller	Default Value
Pitch bend change	0 (center)
Channel pressure	0 (off)
Modulation	0 (min)
Expression	127 (max)
Hold1	0 (off)
RPN	No specified parameter
	No change in value
NRPN	No specified parameter
	No change in value

<3> ALL NOTES OFF

Status	Second	Third
BnH	7BH	00H

n = MIDI channel : 0H...FH (ch1...ch16)

- * All active voices on the specified channel are turned off. (Each voice responds as to a "NOTE OFF"). If HOLD1 is ON, this message does not become effective until HOLD1 is OFF.
- * Drum Instruments (except "Applause" of Drum Part) ignore this message.

<4> OMNI OFF

Status	Second	Third
BnH	7CH	00H

n = MIDI channel : 0H...FH (ch1...ch16)

- * OMNI OFF is only recognized as "ALL NOTES OFF". Current mode doesn't change. (always at Mode 3)

<5> OMNI ON

Status	Second	Third
BnH	7DH	00H

n = MIDI channel : 0H...FH (ch1...ch16)

- * OMNI ON is only recognized as "ALL NOTES OFF". Current mode doesn't change. (always at Mode 3)

<6> MONO

Status	Second	Third
BnH	7EH	mmH

mm = number of mono : 00H...10H (0...16)
n = MIDI channel : 0H...FH (ch1...ch16)

- * MONO is only recognized as "ALL NOTES OFF". Current mode doesn't change. (always at Mode 3)

<7> POLY

Status	Second	Third
BnH	7FH	00H

n = MIDI channel : 0H...FH (ch1...ch16)

- * POLY is only recognized as "ALL NOTES OFF". Current mode doesn't change. (always at Mode 3)

[System Realtime Message]

<1> ACTIVE SENSING

Status
F7H

- * Once received, these messages monitor the integrity of the MIDI connections. If the interval of reception is longer than 420 ms, "ALL SOUNDS OFF, ALL NOTES OFF and RESET ALL CONTROLLERS" are executed. Monitoring is then terminated.

[System Exclusive Message]

Status	Data	Status
F0H	iiH, ddH,....., eeH	F7H

F0H : Status for System Exclusive
ii = ID number : Manufacturer ID
This ID indicates that manufacturer's System Exclusive Messages.
(Ex.) 41H (56) = Roland Corporation
7EH (126) = Universal Non-Realtime Messages
7FH (127) = Universal Realtime Messages
dd.....ee : Data 00H...7FH (0...127)
F7H : EOX (End of Exclusive)

RAP-10 has nothing to transmit. RAP-10 recognizes the following System Exclusive messages.

- * General MIDI System Messages
- * Universal Realtime System Exclusive Messages
- * Data Set (DT)

<1> GENERAL MIDI SYSTEM MESSAGES

Turn General MIDI System On

Status	Data	Status
F0H	7EH, 7FH, 09H, 01H	F7H

F0H : Status for System Exclusive Message
7EH : ID number (Universal Non-Realtime Exclusive Messages)
7FH : Device ID (Broadcast)
09H : sub-ID #1 (General MIDI message)
01H : sub-ID #2 (General MIDI On)
F7H : EOX

- * Sets GM (General MIDI Performance—Level 1) and NRPN is disabled. The unit can reproduce GM scores (Level 1) correctly.
- * About 50ms is needed to complete this reset.

<2> UNIVERSAL REALTIME SYSTEM EXCLUSIVE MESSAGES

Status	Data	Status
F0H	7FH, 7FH, 04H, 01H, 0H, mmH	F7H

F0H : Status for System Exclusive Message
7FH : ID number (Universal Realtime Exclusive Messages)
7FH : Device ID (Broadcast)
04H : sub-ID #1 (Device Control Messages)
01H : sub-ID #2 (Master Volume)
0H : LSB of Master Volume
mmH : MSB of Master Volume
F7H : EOX

- * This message has the same effect as Master Volume addressed in 40 00 04H of System Exclusive Message. Whichever message is received, the latest message is valid as the Master Volume.

<3> DATA SET

Internal setting of RAP-10 can be controlled by System Exclusive Messages. When sending data to RAP-10, use Model ID = 56H (but some data uses 42H) and Device ID = 10H.

Data Set 1 DT1 (12H)

This message is used when sending actual parameter values to the unit.

Status	Data	Status
F0H	41H, 10H, 56(42)H, 12H, aaH, bbH, ccH, ddH, ..., eeH, sum	F7H

- 10H : Status for System Exclusive Messages
- 41H : Manufacturer ID number (Roland)
- 10H : Device ID
- 56H : Model ID (RAP-10) (* Some data uses 42H)
- 12H : Command ID (DT1)
- aaH : MSB of data address (Upper byte of the top of data address)
- bbH : Data address (Middle byte of the top of data address)
- ccH : LSB of data address (Lower byte of the top of data address)
- ddH : Data (Several bits of data should be sent in address order)
- :
- :
- eeH : Data
- sum : Check sum
- F7H : EOF

- * Some parameters are fixed in data size. These parameters should be transmitted as fixed-size data from the top of address described in section 2 "PARAMETER ADDRESS MAP".
- * Divide data of more than 256 bytes into two or more packets containing 256 bytes or less (if transmitting data size is over 256 bytes).
- * Allow more than 40ms between each packet.
- * Refer to "Checksums for Exclusive Messages" (P. 25).

2. PARAMETER ADDRESS MAP

This PARAMETER ADDRESS MAP shows details of parameters used when its value is changed by the "Data Set 1" method of System Exclusive messages.

PARAMETER ADDRESS MAP contains Address, Data size, Data range, Parameter name, Description, Default value of parameter.

<< Example >>

- Address : Top of parameter address
- Size : Data size (Ex. 01H means 1byte)
- Data : Available range of data value
- Parameter : Parameter name
- Description : Explanation of data value
- Default value : Initial data value

Address (H)	Size (H)	Data (H)	Parameter	Description	Default Value (H)
00 00 00	01	00...07	REVERB CHARACTER	00 : Room 1 01 : Room 2 02 : Room 3 03 : Hall 1 04 : Hall 2 05 : Plate 06 : Delay 07 : Panning Delay	04
00 00 01	01	00...7F	REVERB LEVEL	0...127	40
:	:	:	:	:	:

[ADDRESS BLOCK MAP]

Entire address map for Exclusive Messages is shown below.

Address	Block	sub Block	Notes
00 00 00	System parameters		use MODEL ID=56H
01 00 00	Patch parameters	Patch block 0 : : : Patch block f	use MODEL ID=56H
40 00 00	System parameters		use MODEL ID=42H

[PARAMETER ADDRESS MAP]

<1> SYSTEM PARAMETERS

System parameters affect system setup. Addresses marked "#" cannot be used as the top of an address.

(1) Effect Control (Recognized when MODEL ID = 56H)

Address (H)	Size (H)	Data (H)	Parameter	Description	Default Value (H)
00 00 00	01	00...07	REVERB CHARACTER	00 : Room 1 01 : Room 2 02 : Room 3 03 : Hall 1 04 : Hall 2 05 : Plate 06 : Delay 07 : Panning Delay	04
00 00 01	01	00...7F	REVERB LEVEL	0...127(*1)	58
00 00 02	01	00...7F	REVERB (DELAY) TIME	0...127	40
00 00 03	01	00...7F	DELAY TIME	0...127	40
00 00 04	01	00...7F	DELAY FEEDBACK	0...127(*1)	00
00 00 05	01	00...7F	CHORUS LEVEL	0...127	40
00 00 06	01	00...7F	CHORUS FEEDBACK	0...127(*1)	00
00 00 07	01	00...7F	CHORUS DELAY	0...127	50
00 00 08	01	00...7F	CHORUS RATE	0...127	03
00 00 09	01	00...7F	CHORUS DEPTH	0...127	13

(*1) If the value is close to maximum, noise may occur. Reduce the value until the noise is gone.

(2) System Common (Recognized when MODEL ID = 42H)

Address (H)	Size (H)	Data (H)	Parameter	Description	Default Value (H)
40 00 00	04	0010...07EB	MASTER TUNE	-100.0...+100.0[cent]	00040000
40 00 01#				Use nibblized data (*1)	
40 00 02#					
40 00 03#					
40 00 04	01	00...7F	MASTER VOLUME(*2)	0...127	7F
40 00 05	01	2B...5B	MASTER KEY-SHIFT	-24...+24 semitone	40

(*1) MASTER TUNE has different method of data transfer.

<< Example >>

- If MASTER TUNE= +100 cents, the value should be set as '07EBH'.
- 1) Separate '07EBH' into four nibbled (of 4 bits) chunks like '0H', '7H', 'EH', 'BH'.
- 2) Change each nibbled chunk into byte data as '00H', '07H', '0EH', '0BH' (Only fills upper 4 bits with '0')
- 3) Send these data as follows.
 * F0 41 10 42 12 40 00 00 00 07 0E 0B sum (23) F7 *
 (07EBH → 07/E/B → 00,07,0E,0B)

(*2) This message has the same effect as Master Volume of Universal Realtime System Exclusive Message. Whichever message is received, the latest message is valid as the Master Volume.

<< Example >>

- If Master Volume= 100(64H), send the following messages:
 * F0 41 10 42 12 40 00 04 64 sum (5B) F7 *

<2> PATCH PARAMETER

(1) Voice Reserve (Recognized when MODEL ID = 42H)

Address (H)	Size (H)	Data (H)	Parameter	Description	Default Value (H)
40 01 10	10	00...1A	VOICE RESERVE	PART 10 (DRUM) 02	06
40 01 11				PART 1	06
40 01 12				PART 2	02
40 01 13				PART 3	02
40 01 14				PART 4	02
40 01 15				PART 5	02
40 01 16				PART 6	02
40 01 17				PART 7	02
40 01 18				PART 8	02
40 01 19				PART 9	02
40 01 1A				PART 11	00
40 01 1B				PART 12	00
40 01 1C				PART 13	00
40 01 1D				PART 14	00
40 01 1E				PART 15	00
40 01 1F				PART 16	00

* The sum of voice reserves should be 26 voices or less. If its over 26, the Parts have the following priority. However, Part 10 always has the highest priority.

Before receiving data

part number 1101 11 21 31 41 51 61 71 81 91 111 211 311 411 511 611
 value 1 21 61 21 21 21 21 21 21 01 01 01 01 01 01

Example (A) Received data : * F0 41 10 42 12 40 01 10 08 08 08 08 08 08 08 08 08 08 08 08 sum(2F) F7 *
 (Set all value of voice reserve to 'B')

part number 1101 11 21 31 41 51 61 71 81 91 111 211 311 411 511 611
 value 1 81 81 81 21 01 01 01 01 01 01 01 01 01 01

* Part10, 1 and 2 become 'B', but Part3 is set to '2' (=26-(8+8+8)). The others are set to '0'.

Example (B) Received data : * F0 41 10 42 12 40 01 14 07 sum (24) F7 *
 (Set value of Part4 to '7')

part number 1101 11 21 31 41 51 61 71 81 91 111 211 311 411 511 611
 value 1 21 61 21 21 71 21 21 01 01 01 01 01 01 01

* The rest of the voices are assigned to lower part numbers.

Example (C) Received data : * F0 41 10 42 12 40 01 1F 0B sum (1B) F7 *
 (Set value of Part 16 to 'B')

part number 1101 11 21 31 41 51 61 71 81 91 111 211 311 411 511 611
 value 1 21 61 21 21 21 21 21 21 01 01 01 01 01 21

* Part 16 is set '2' (=26-(2+6+2+2+2+2+2+2+2))

(2) PATCH PARAMETERS (Recognized when MODEL ID = 56H)

part number = 10, 1, 9, 11..16
 n = 0, 1, 9, A..F

Address (H)	Size (H)	Data (H)	Parameter	Description	Default Value (H)
01 0n 00	01	00...10	RX_CHANNEL	00...DF : 1...16 ch 10 : OFF	Part10:09 Part 1:00 Part 2:01 Part 3:02 Part 4:03 Part 5:04 Part 6:05 Part 7:06 Part 8:07 Part 9:08 Part11:0A Part12:0B Part13:0C Part14:0D Part15:0E Part16:0F
01 0n 01	01	00...01	RX_NRPN	00 : OFF 01 : ON (*1)	00
01 0n 02	01	00...7F	MOD LFO RATE CONTROL	-10.0...+10.0 Hz 40 (*2)	40
01 0n 03	01	00...7F	MOD LFO PITCH DEPTH	0...600 cents (*2)	0A
01 0n 04	01	00...7F	CAF TVF CUT OFF CONTROL	-9600...+9600 (*3)(*4)	40
01 0n 05	01	00...7F	CAF AMPLITUDE CONTROL	-100.0...+100.0% (*3)	40
01 0n 06	01	00...7F	CAF LFO RATE CONTROL	-10.0...+10.0 Hz 40 (*3)	40
01 0n 07	01	00...7F	CAF LFO PITCH DEPTH	0...600 cents (*3)	00

CAF: Channel aftertouch

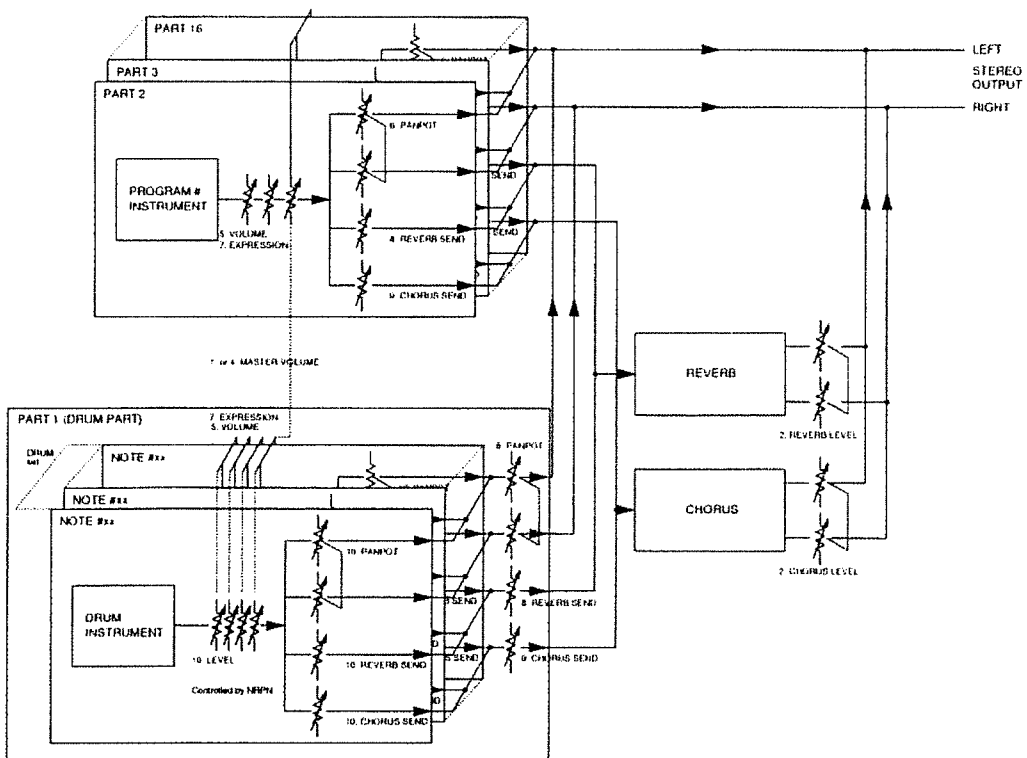
(*1) This value is available only for the Drum Part. The others ignore this value.

(*2) This value is valid by modulation control after the new value is set.

(*3) This value is valid by channel pressure after the new value is set.

(*4) Some of the sounds have no TVF parameter. This value then has no effect on those sounds. (Refer to P.16 'TONE TABLE')

Block Diagram of the Synthesizer Sound Source



Useful Information

• Decimal and Hexadecimal

It is common to use 7-bit Hexadecimal numbers in MIDI communication. The following is a conversion table between decimal numbers and 7-bit Hexadecimal numbers.

Decimal	Hexa-decimal	Decimal	Hexa-decimal	Decimal	Hexa-decimal	Decimal	Hexa-decimal
0	00H	32	20H	64	40H	96	60H
1	01H	33	21H	65	41H	97	61H
2	02H	34	22H	66	42H	98	62H
3	03H	35	23H	67	43H	99	63H
4	04H	36	24H	68	44H	100	64H
5	05H	37	25H	69	45H	101	65H
6	06H	38	26H	70	46H	102	66H
7	07H	39	27H	71	47H	103	67H
8	08H	40	28H	72	48H	104	68H
9	09H	41	29H	73	49H	105	69H
10	0AH	42	2AH	74	4AH	106	6AH
11	0BH	43	2BH	75	4BH	107	6BH
12	0CH	44	2CH	76	4CH	108	6CH
13	0DH	45	2DH	77	4DH	109	6DH
14	0EH	46	2EH	78	4EH	110	6EH
15	0FH	47	2FH	79	4FH	111	6FH
16	10H	48	30H	80	50H	112	70H
17	11H	49	31H	81	51H	113	71H
18	12H	50	32H	82	52H	114	72H
19	13H	51	33H	83	53H	115	73H
20	14H	52	34H	84	54H	116	74H
21	15H	53	35H	85	55H	117	75H
22	16H	54	36H	86	56H	118	76H
23	17H	55	37H	87	57H	119	77H
24	18H	56	38H	88	58H	120	78H
25	19H	57	39H	89	59H	121	79H
26	1AH	58	3AH	90	5AH	122	7AH
27	1BH	59	3BH	91	5BH	123	7BH
28	1CH	60	3CH	92	5CH	124	7CH
29	1DH	61	3DH	93	5DH	125	7DH
30	1EH	62	3EH	94	5EH	126	7EH
31	1FH	63	3FH	95	5FH	127	7FH

- * To indicate a decimal number for the MIDI channel and Program number, add one to the values in the table.
- * The resolution of 7-bit Hexadecimal numbers is 128. Use several bytes for values which require greater resolution.
i.e. The number "aa bbH" in 7-bit Hexadecimal is "aa x 128 + bb" in Decimal form.
- * A signed number is indicated as 00H = -64, 40H = 0, 7FH = +63.
So the signed number "aaH" in 7-bit Hexadecimal is "aa - 64".
A signed number using two bytes is indicated as 00 00H = -8192, 40 00H = 0, 7F 7FH = +8191.
So the signed number "aa bbH" in 7-bit Hexadecimal is "aa bbH - 40 00H = (aa x 128 + bb) - (64 x 128)".
- * The data indicated as "nibbled" is a 4-bit Hexadecimal number.
i.e. "0a 0bH" is "a x 16 + b".

<EXAMPLE 1> Convert "5AH" in Hexadecimal to a Decimal number.
By using the table: 5AH = 90.

<EXAMPLE 2> Convert "12 34H" in 7-bit Hexadecimal to a Decimal number.
By using the table: 12H = 18, 34H = 52.
So, 18 x 128 + 52 = 2356.

<EXAMPLE 3> Convert "0A 03 09 0DH" in nibbled form to a Decimal number (By using the table): 0AH = 10, 03H = 3, 09H = 9, 0DH = 13.
So, (10 x 16 + 3) x 16 + 9 x 16 + 13 = 4185.

• Example of actual MIDI messages

<EXAMPLE 1> 92 3E 5F

"92" is a status of a Note On message, and "n" is a MIDI channel number. The second byte is the Note number, and the third byte is Velocity.

2H = 2, 3EH = 62, 5FH = 95.
So, this is a Note On message of MIDI channel=3, Note number=62(D4) and Velocity=95.

<EXAMPLE 2> CE 49

"Cn" is a status of a Program change message, and "n" is a MIDI channel number.

The second byte is a Program number.

EH = 14, 49H = 73

So, this is a Program change message of MIDI channel=15, Program number=74 (Flute in GM).

<EXAMPLE 3> EA 00 2B

"EnH" is a status of a Pitch bend change message, and "n" is a MIDI channel number.

The second byte (00H) is an LSB and the third byte(2BH) is an MSB of a Pitch bend value (signed).

The Pitch bend value is

2B 00H - 40 00H = 40 x 128 + 0 - 64 x 128 + 0 = 5120 - 8192 = -3072
So, this is a Pitch bend change message of MIDI channel=11, Pitch bend value = -3072.

If the Pitch bend sensitivity is set to 2 semitones, and the Pitch bend value -8192 (00 00H)

is defined as -200 cents,

The actual pitch bend value of this message is :

$$-200 \times (-3072) / (-8192) = -75 \text{ cent}$$

Checksums for Exclusive Messages

Roland System Exclusive messages (RQ1 and DT1) have a Checksum at the end of the data (before EOX) to be able to check for communication errors. The Checksum results from address and data (or size) included in the message.

[How to calculate Checksums ("H" indicates Hexadecimal.)]

The error checking process uses a Checksum which provides a number where the least significant 7 bits are zero when values for an address, data (or size) and the Checksum are summed. Use the table shown above to convert number between decimal and hexadecimal.

If the address is "aa bb ccH" and the data (or the size) is "dd ee fH"
aa + bb + cc + dd + ee + f = sum
sum / 128 = quotient ... remainder
128 - remainder = checksum

<EXAMPLE 1> Set "REVERB CHARACTER" to "ROOM 3"

According to the Parameter Address Map, the Address of REVERB CHARACTER is 00 00 00H, and the Value corresponding to ROOM 3 is 02H. So, the message should be :

EO	41	10	56	12	00	00	00	02	??	E7
(1)	(2)	(3)	(4)	(5)	address	data	checksum	(6)		
					(1)Exclusive Status		(4)Model ID			
					(2)ID (Roland)		(5)Command ID (DT1)			
					(3)Device ID (16)		(6)End of Exclusive			

The Checksum is :

$$00H + 00H + 00H + 02H = 0 + 0 + 0 + 2 = 2(\text{sum})$$

$$2(\text{sum}) / 128 = 0(\text{quotient}) \dots 2(\text{remainder})$$

$$\text{checksum} = 128 - 2(\text{remainder}) = 126 = 7EH$$

Therefore, the message to send is : F0 41 10 56 12 00 00 00 02 7E F7

<EXAMPLE 2> Set "MASTER TUNE" to +23.4 cents by System Exclusive. The Address of "MASTER TUNE" is 40 00 00H.

The Value should be nibbled data whose resolution is 0.1 cents, and which is a signed value. (00 04 00 00H = 1024) = +/-0.1.

$$+23.4(\text{cents}) = 234 + 1024 = 1258 = 04 EAH = 00 04 0E 0AH (\text{nibbled})$$

So, the message should be :

EO	41	10	42	12	40	00	00	00	04	0E	0A	??	E7
(1)	(2)	(3)	(4)	(5)	address	data	checksum	(6)					
					(1)Exclusive Status		(4)Model ID						
					(2)ID (Roland)		(5)Command ID (DT1)						
					(3)Device ID (16)		(6)End of Exclusive						

The Checksum is :

$$40H + 00H + 00H + 00H + 04H + 0EH + 0AH = 64 + 0 + 0 + 0 + 4 + 14 + 10 = 92(\text{sum})$$

$$92(\text{sum}) / 128 = 0(\text{quotient}) \dots 92(\text{remainder})$$

$$\text{checksum} = 128 - 92(\text{remainder}) = 36 = 24H$$

Therefore, the message to send is :

F0 41 10 42 12 40 00 00 00 04 0E 0A 24 F7

PARAMETER LIST

Parameters Common to All Parts

System Exclusive Messages

[System Common] MODEL ID=42H(p. 22)

- MASTER TUNE
- MASTER VOLUME (1)
- MASTER KEY-SHIFT

[Effect Control] MODEL ID=56H(p. 22)

- REVERB CHARACTER
- REVERB LEVEL (2)
- REVERB TIME
- DELAY TIME
- DELAY FEEDBACK
- CHORUS LEVEL (3)
- CHORUS FEEDBACK
- CHORUS DELAY
- CHORUS RATE
- CHORUS DEPTH

[GENERAL MIDI SYSTEM MESSAGES](p. 21)

- Turn General MIDI System On

[UNIVERSAL REALTIME SYSTEM EXCLUSIVE MESSAGES](p. 21)

- Master Volume (4)

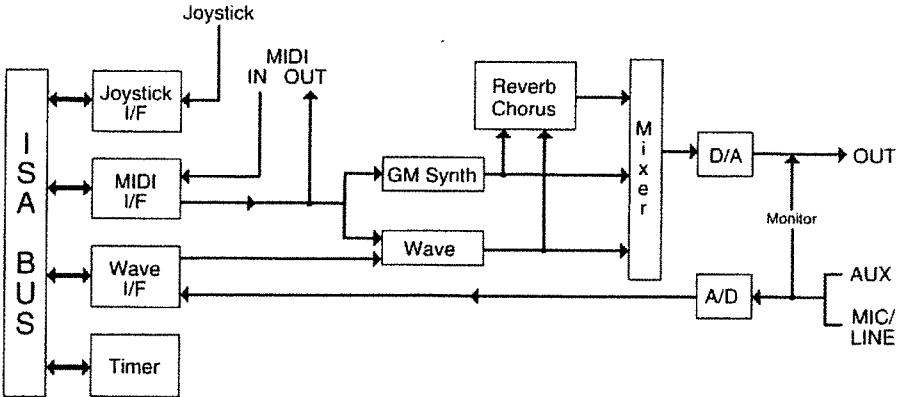
(?) : Refer to "Block Diagram of the Synthesizer Sound Source" (p. 24)

Parameters for Individual Parts

CONTROL CHANGE	(p. 19)
[Modulation]	(p. 19)
[Volume] (5)	(p. 19)
[Panpot] (6)	(p. 19)
[Expression] (7)	(p. 19)
[Effect1 depth (Reverb depth)] (8)	(p. 19)
[Effect3 depth (Chorus depth)] (9)	(p. 19)
[RPN]	(p. 20)
Pitch bend sensitivity	
Master fine tuning	
Master coarse tuning	
[NRPN (NRPN is available for only Drum Part.)] (10)	(p. 19)
Pitch coarse of Drum Instrument	
TVA level of Drum Instrument	
Panpot of Drum Instrument	
Reverb send depth of Drum Instrument	
Chorus send depth of Drum Instrument	
System Exclusive Message	
[PATCH PARAMETER] MODEL ID=42H	(p. 23)
Voice Reserve	
[PATCH PARAMETER] MODEL ID=56H	(p. 23)
RX. CHANNEL	
RX. NRPN (available for only Drum Part)	
MOD LFO RATE CONTROL	
MOD LFO PITCH DEPTH	
CAF TVF CUT OFF CONTROL	
(Some of sounds have no TVF parameter, then this value has no effect to those sounds.)	
CAF AMPLITUDE CONTROL	
CAF LFO RATE CONTROL	
CAF LFO PITCH DEPTH	

(?) : Refer to "Block Diagram of the Synthesizer Sound Source" (p. 24)

BLOCK DIAGRAM



SPECIFICATIONS

[Synthesizer Sound Source]

- Compatible with GM(General MIDI) System
- **Number of Parts**
16 parts
- **Maximum Polyphony**
26 voices
- **Number of Sounds**
Number of sounds : 128
Number of drum sets : 6

[Sampling Sound Source]

- **Number of PCM Record/Playback Channels**
2 (can be used for stereo or as 2 monaural channels)
- **A/D Sampling Rate**
44.1 kHz, 22.05 kHz, and 11.025 kHz
- **A/D Sampling Resolution**
16-bit linear or 8-bit linear
- **Sampling Input Jacks**
2 sets (MIC/LINE switchable stereo input and line level stereo input)

[Specifications Common to the Synthesizer Sound Source and the Sampling Sound Source]

- **Internal Effects**
Reverb and chorus

[Interface Functions]

- MIDI Interface
- Joystick Interface
- Supports IBM-standard analog joystick

[Other Specifications]

- **Interrupt Level Selector Switches**
IRQ 5 7 9 10 11
- **Input/Output Address Selector Switches**
220 230 240 250 320 330 340 350
- **Connector Jacks**
MIC/LINE input jack (stereo miniature phone)
AUX input jack (stereo miniature phone)
Audio output jack (stereo miniature phone)
JOYSTICK/MIDI connector (DB-15)
- **Power Supply**
Supplied by computer
- **Current Draw**
360 mA (DC +5 V), 100 mA (DC +12 V)
- **External Dimensions**
23 (W) x 246 (D) x 126 (H) mm
15/16 (W) x 9-11/16 (D) x 5 (H) inches
- **Weight**
170 g / 6 oz
- **Options**
MCB-10 (MIDI Connector Box)
MIDI jacks (MIDI IN and MIDI OUT)
Joystick connector (DB-15)

* In the interest of product improvement, the specifications of this unit are subject to change without prior notice.



For Germany

Bescheinigung des Herstellers / Importeurs

Hiermit wird bescheinigt, daß der/die/das
Roland RAP-10/AT

.....
(Gerät, Typ Bezeichnung)

in Übereinstimmung mit den Bestimmungen der
Amtsbl. Vfg 1046 / 1984

.....
(Amtsblattverfügung)

funk-entstört 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

FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Unauthorized changes or modification to this system can void the users authority to operate this equipment.
This equipment requires shielded interface cables in order to meet FCC class B Limit.

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 Règlement des signaux parasites par le ministère canadien des Communications.

Information

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

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Roland Corporation US
7200 Dominion Circle
Los Angeles, CA, 90040-
3696, U. S. A.
TEL: (213) 685 5141

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Roland Canada Music Ltd.
(Head Office)
5480 Parkwood Way
Richmond B. C., V6V 2M4
CANADA
TEL: (604) 270 6626

Roland Canada Music Ltd.

(Montreal Office)
9425 Transcanadienne
Service Rd. N., St Laurent,
Quebec H4S 1V3, CANADA
TEL: (514) 335 2009

Roland Canada Music Ltd.

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346 Watline Avenue,
Mississauga, Ontario L4Z
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TEL: (416) 890 6488

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Roland Corporation Australia Pty. Ltd.
38 Campbell Avenue
Dee Why West, NSW 2099
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TEL: (02) 982 8266

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97 Mt. Eden Road, Mt. Eden,
Auckland 3, NEW ZEALAND
TEL: (09) 3098 715

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Roland (U.K.) Ltd.
Rye Close Ancells Business
Park Fleet, Hampshire GU13
8UY, UNITED KINGDOM
TEL: (0252) 816181

**Roland (U.K.) Ltd.,
Swansea Office**

Atlantic Close, Swansea
Enterprise Park, Swansea,
West Glamorgan SA79FL,
UNITED KINGDOM
TEL: (0792) 700 139

IRELAND

The Dublin Service Centre Audio Maintenance Limited
11 Brunswick Place Dublin 2
Republic of Ireland
TEL: (01) 677322

ITALY

Roland Italy S. p. A.
Viale delle Industrie 8 20020
ARESE MILANO ITALY
TEL: (02) 93581311

SPAIN

Roland Electronics de España, S. A.
Calle Bolivia 239 08020
Barcelona, SPAIN
TEL: (93) 308 1000

GERMANY

Roland Elektronische Musikinstrumente Handelsgesellschaft mbH.
Oststrasse 96, 22844
Norderstedt, GERMANY
TEL: (040) 52 60090

FRANCE

Guillard Musiques
ZAC de Rosange Les Echets
01700
MIRIBEL FRANCE
TEL: (72) 26 5060

Guillard Musiques

Roland (Paris Office)
1923 rue Léon Geoffroy
94400 VITRY-SUR-SEINE
FRANCE
TEL: (1) 4680 86 62

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Houtstraat 1 B-2260 Oevel-
Westerlo BELGIUM
TEL: (014) 575811

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DK-1023 Copenhagen K,
DENMARK
TEL: 31 95 31 11

SWEDEN

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Danvik Center 2B A, 2 tr.
S-131 30 Nacka SWEDEN
TEL: (08) 702 0020

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Kontor Norge**
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Lilleaker N-0216 Oslo 2
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SF-02101 Espoo FINLAND
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(2) 466 423

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TEL: 360715

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TEL: (011) 403 4105

Paul Bothner (PTY) Ltd.

17 Weidmuller Centre
Claremont 7700
Republic of South Africa
TEL: (021) 64 4030

MIDI Implementation Chart

Function...		Transmitted	Recognized	Remarks
Basic Channel	Default	x	1-16	
	Changed	x	1-16	
Mode	Default	x	Mode 3	
	Messages	x	x	
	Altered	*****	x	
Note Number	True Voice	x	0-127	
		*****	0-127	
Velocity	Note ON	x	o	
	Note OFF	x	x	
After Touch	Key's	x	x	
	Ch's	x	o	
Pitch Bend		x	o	
Control Change	1	x	o	Modulation
	6, 38	x	o	Data entry
	7	x	o	Volume
	10	x	o	Panpot
	11	x	o	Expression
	64	x	o	Hold 1
	91	x	o (Reverb)	Effect 1 depth
	93	x	o (Chorus)	Effect 3 depth
	98, 99	x	x / o	NRPN LSB, MSB(*)
	100, 101	x	o	RPN LSB, MSB
	120	x	o	All sounds off
121	x	o	Reset all controllers	
Prog Change	True #	x	o	Program number 1-128
		*****	0-127	
System Exclusive		x	o	
System Common	Song Pos	x	x	
	Song Sel	x	x	
	True	x	x	
System Real Time	Clock	x	x	
	Commands	x	x	
AUX Messages	Local ON/OFF	x	x	
	All Notes OFF	x	o (123-127)	
	Active Sense	x	o	
	Reset	x	x	
Notes		* NRPN can be enabled or disabled by System Exclusive Message. Default is always disabled.		

Mode 1 : OMNI ON, POLY
 Mode 3 : OMNI OFF, POLY

Mode 2 : OMNI ON, MONO
 Mode 4 : OMNI OFF, MONO

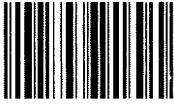
o : Yes
 x : No

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RAP-10/AT

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