



RA-95

REALTIME ARRANGER

MIDI implementation

 **Roland**

RA-95 MIDI IMPLEMENTATION

MIDI IMPLEMENTATION

Version 1.00

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ARRANGER SECTION

1 Receive data (Arranger Section)

- Channel Voice Message -

■ Note off

Status	Second	Third
8nH	kkH	vvH
9nH	kkH	00H

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 kk=Note number: 00H - 7FH (0 - 127)
 vv=Velocity: 00H - 7FH (0 - 127)

*Ignored when "Midi Rx Channel = OFF".
 *Velocity is ignored.

■ Note on

Status	Second	Third
9nH	kkH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 kk=Note number: 00H - 7FH (0 - 127)
 vv=Velocity: 01H - 7FH (1 - 127)

*Ignored when "Midi Rx Channel = OFF".

■ Polyphonic key pressure

Status	Second	Third
AnH	kkH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 kk=Note number: 00H - 7FH (0 - 127)
 vv=Value: 00H - 7FH (0 - 127)

*Ignored when "Midi Rx Channel = OFF".
 *Effect to the parameter set on "PAF controller function".
 The default setting has no effect.

■ Control change

*Ignored when "Midi Rx Channel = OFF".
 *The values set by Control change messages won't reset by receiving new Program change messages.

Bank select

Status	Second	Third
BnH	00H	mmH
BnH	20H	llH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 mm,ll=Bank number: 00H,00H - 7FH,7FH (bank1 - bank16384)
 Default Value = 00 00H (bank.1)

"Rx.Bank Select" is set to ON by "GS RESET".(Power-on default value is ON.)
 * The LSB 7-bits are ignored (always regards as llH=00H). However, when sending Bank Select messages, you have to send both of the MSB(mm) and LSB(ll) together.
 * "Bank select" is suspended until receiving "Program change". To select a Tone of another bank, you have to send Bank select(mm,ll) before sending the Program change.
 * The "Variation number" of GS Format is defined as the decimal expression of the MSB value (Control change number 00H) of the Bank select.

Modulation

Status	Second	Third
BnH	01H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Modulation depth: 00H - 7FH (0 - 127)

* Ignored when "Modulation Midi Rx Filter = OFF".
 * Effect to the parameter set on "MOD controller function".
 The default setting is pitch modulation depth.

Portamento time

Status	Second	Third
BnH	05H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Portamento time: 00H - 7FH (0 - 127) Default Value = 00H (0)

* The Portamento time value changes the rate of pitch change when Portamento is ON or when using portamento control messages. Value 0 is the fastest.

Data entry

Status	Second	Third
BnH	06H	mmH
BnH	26H	llH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 mm,ll=Value of the parameter specified with RPN and/or NRPN

Volume

Status	Second	Third
BnH	07H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Volume: 00H - 7FH (0 - 127)

* Volume messages control the volume level of the specified channel (part).
 Use Volume messages to control volume balance of each part.
 * Ignored when "Volume Midi Rx Filter = OFF".

Panpot

Status	Second	Third
BnH	0AH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Panpot: 00H - 40H - 7FH (Left - Center - Right)

* 127 steps from Left to Center to Right.
 * Within the Drum Part, the panpot provides overall control of a stereophonic image.
 * Ignored when "Panpot Midi Rx Filter = OFF".

Expression

Status	Second	Third
BnH	0BH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Expression: 00H - 7FH (0 - 127)

* Expression and Volume messages are cumulative, and the result will control the overall volume.
 Use Expression messages for expression pedal, or creating expressive effects, such as crescendo, decrescendo, while playing.
 * Ignored when "Expression Midi Rx Filter = OFF".

Hold1

Status	Second	Third
BnH	40H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Control Value: 00H - 7FH (0 - 127) 0 - 63 = OFF, 64 - 127 = ON

* Ignored when "Sustain Midi Rx Filter = OFF".

Portamento

Status	Second	Third
BnH	41H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Control Value: 00H - 7FH (0 - 127) 0-63=OFF 64-127=ON

Sostenuto

Status	Second	Third
BnH	42H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Control Value: 00H - 7FH (0 - 127) 0-63=OFF 64-127=ON

Soft

Status	Second	Third
BnH	43H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Control Value: 00H - 7FH (0 - 127)

Portamento Control

Status	Second	Third
BnH	54H	kkH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 kk= source note number for pitch reference: 00H - 7FH (0 - 127)

* When a Note On message is received after a Portamento Control message, the voice's pitch will glide from the pitch specified by the source note number of the Portamento Control message at the rate set by the portamento time controller (regardless portamento on/off.) If there is a currently sounding voice whose note number is coincident with the source note number, the voice's pitch will glide to the new Note On's pitch according to the portamento time without re-triggering (played in legato). Then no new voice should be assigned.

Example 1.

On MIDI	Description	Result
90 3C 40	Note on C4	C4 on
B0 54 3C	Portamento Control from C4	no change (C4 voice still sounding)
90 40 40	Note on E4	glide from C4 to E4
80 3C 40	Note off C4	no change
80 40 40	Note off E4	E4 off

Example 2.

On MIDI	Description	Result
B0 54 3C	Portamento Control from C4	no change
90 40 40	Note on E4	E4 is played with glide from C4 to E4
80 40 40	Note off E4	E4 off

Effect1 depth (Reverb send level)

Status	Second	Third
BnH	5BH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Reverb send level: 00H - 7FH (0 - 127)

* Effect1 depth messages control the Send Level of the specified channel (part) to the internal Reverb unit.
 * Ignored when "Reverb Depth Midi Rx Filter = OFF".

Effect3 depth (Chorus send level)

Status	Second	Third
BnH	5DH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Chorus send level: 00H - 7FH (0 - 127)

* Effect3 depth messages control the Send Level of the specified channel (part) to the internal Chorus unit.
 * Ignored when "Chorus Depth Midi Rx Filter = OFF".

■ NRPN MSB/LSB

Status	Second	Third
BnH	63H	mmH
BnH	62H	llH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 mm=MSB of the NRPN
 ll=LSB of the NRPN

* Recognized when "Rx.NRPN = ON". "Rx.NRPN" is set ON by "GS RESET".
 * The values set by NRPN won't reset by receiving new Program Change messages or Reset All Controllers.

NRPN

An NRPN (Non Registered Parameter Number) is an expanded control change message. Each function of an NRPN is described by the individual manufacturer. To use NRPN, set NRPN number (MSB/LSB) before sending data. Then send data by Data entry message(Control Change # 6/38). And then, it is recommended to send RPN null (RPN number = 7FH/7FH) to prevent the data from being unexpectedly change. For more explanation, refer to Chapter 4. Useful Information, Example of actual MIDI messages <EXAMPLE 4>.

You can change the following parameters by using NRPN.

NRPN	Data entry	Description
MSB LSB	MSB	
01H 08H	mmH	Vibrato rate relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
01H 09H	mmH	Vibrato depth relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
01H 0AH	mmH	Vibrato delay relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
01H 20H	mmH	TVF cutoff frequency relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
01H 21H	mmH	TVF resonance relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
01H 63H	mmH	TVF&TVA Env. Attack time relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
01H 64H	mmH	TVF&TVA Env. Decay time relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
01H 66H	mmH	TVF&TVA Env. Release time relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
18H rrH	mmH	Pitch coarse of drum instrument relative change on specified drum instrument rr: key number of drum instrument mm: 00H - 40H - 7FH (-64 - 0 - +63 semitone)
1AH rrH	mmH	TVA level of drum instrument absolute change on specified drum instrument rr: key number of drum instrument mm: 00H - 7FH (zero - maximum)

1CH rrH	mmH	Panpot of drum instrument absolute change on specified drum instrument rr: key number of drum instrument - mm: 00H, 01H - 40H - 7FH (Random, Left- Center-Right)
1DH rrH	mmH	Reverb send level of drum instrument absolute change on specified drum instrument rr: key number of drum instrument mm: 00H - 7FH (zero - maximum)
1EH rrH	mmH	Chorus send level of drum instrument absolute change on specified drum instrument rr: key number of drum instrument mm: 00H - 7FH (zero - maximum)

- * Data entry LSB is ignored.
- * The relative change means that the parameter value(e.g.-50 - 0 - +50) will be added to the preset value.
- * The absolute change means that the parameter value will be replaced by the received value.
- * Ignored when "NRPN Midi Rx Filter = OFF".

■ RPN MSB/LSB

Status	Second	Third
BnH	65H	mmH
BnH	64H	llH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
mm=MSB of the RPN
ll=MSB of the RPN

- * The values set by an RPN won't be reset by receiving new Program Change messages or Reset All Controllers.

RPN

An RPN (Registered Parameter Number) is an expanded control change message.

Each function of an RPN is described by the MIDI Standard.

To use RPN, set RPN number (MSB/LSB) before sending data. Then send data by Data entry message(Control Change # 6/38). And then, it is recommended to send RPN null (RPN number = 7FH/7FH) to prevent the data from being unexpectedly change. For more explanation, refer to Chapter 4. Useful information, Example of actual MIDI messages <EXAMPLE 4>.

You can change the following parameters by using RPN.

RPN MSB LSB	Data entry MSB LSB	Description
00H 00H	mmH	Pitch bend sensitivity mm: 00H - 18H (0 - 24 semitone) Default value = 02H (two semitones) ll: ignored (value=00H) (Up to 2 octaves)
00H 01H	mmH llH	Master fine tuning mm,ll: 00 00H - 40 00H - 7F 7FH (-8192 x 100/8192 - 0 - +8191 x 100/8192 cents)
00H 02H	mmH	Master coarse tuning mm: 28H - 40H - 58H (-24 - 0 - +24 semitones) ll: ignored (value=00H)
7FH 7FH	---	RPN null Return to disable condition. The parameter already set retains its value. mm,ll: ignored

■ Program change

Status	Second
CnH	ppH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
pp=Program number: 00H - 7FH (prog.1 - prog.128)

- * The Tone of the voices already ON before receiving a program change message isn't affected.
The Tone will be changed by a new Note-on message after the program change is received.
- * Ignored when "Program Change Midi Rx Filter = OFF".
- * In the drum part, Program change messages are ignored when the Bank is set at 129 - 16384 (ie. the value of the control change number 0 is not 00H).

■ Channel pressure

Status	Second
DnH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
vv=Value:00H - 7FH (0 - 127)

- * Effect to the parameter set on "MOD controller function".
The default setting has no effect.

■ Pitch bend change

Status	Second	Third
EnH	llH	mmH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
mm,ll=Value:00 00H - 40 00H - 7F 7FH (-8192 - 0 - +8191)

- * Effect to the parameter set on "MOD controller function".
The default setting is pitch bend.
- * Ignored when "Pitch Bender Midi Rx Filter = OFF".

- Channel Mode Messages -

■ All sounds off

Status	Second	Third
BnH	78H	00H

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

- * When "All sounds off" is received, all sounds on a specified channel turn off immediately.
However, the state of channel messages does not change. You must not use "All sound off" message for "Note off".

■ Reset all controllers

Status	Second	Third
BnH	79H	00H

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

- * When "reset all controllers" is received, the controller value of a specified channel returns to the default values as follows.

Controller	Default Value
Pitch bend change	%0(Center)
Modulation	0(off)
Hold1	0(off)

■ All notes off

Status	Second	Third
BnH	7BH	00H

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

- * When "All notes off" is received, all notes are turned off in the specified channel.
However, sound continues while hold1 and/or sostenuto is on.

■ OMNI OFF

Status	Second	Third
BnH	7CH	00H

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

- * OMNI OFF is only recognized as "all notes off". Mode doesn't change.

■ OMNI ON

Status	Second	Third
BnH	7DH	00H

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

- * OMNI ON is only recognized as "all notes off". Mode doesn't change (OMNI OFF remains).

■ MONO

Status	Second	Third
BnH	7EH	mmH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
mm=number of mono:00H - 10H (0 - 16)

* MONO is recognized as "all sounds off". The specified channel turns to Mode4 (M=1), even if mm is not equal to 1 (mm is ignored).

■ POLY

Status	Second	Third
BnH	7FH	00H

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

* POLY is recognized as "all sounds off". The specified channel turns to Mode3.

- System Realtime Message -

■ Active sensing

Status
FEH

* Having received an "active sensing" message, RA-95 expects to receive additional active sensing messages at 300ms intervals. If the interval is greater than 420ms, RA-95 executes "All sounds off", "All notes off" and "Reset all controllers" and returns to normal operation. (Monitoring of active sensing messages will terminate.)

■ Sequencer start

Status
FAH

When "Sequencer start" is received the internal recorder and/or the internal arranger start according to the following table:

SYNC MODE	ARRANGER	MIDI FILE PLAYER Record Off	MIDI FILE PLAYER Record On
Internal			
Midi 1	Start		Start (Record)
Midi 2		Start (Play)	Start (Record)
Auto 1	Start		Start (Record)
Auto 2		Start (Play)	Start (Record)
Remote 1	Start		Start (Record)
Remote 2		Start (Play)	Start (Record)

■ Sequencer stop

Status
FCH

When "Sequencer stop" is received the internal recorder and/or the internal arranger stop

■ Timing clock

Status
F8H

When "Timing clock" is received the internal recorder or the internal arranger are synchronized with an external clock according to the above table.

- System Exclusive Message -

Status	Data	Status
F0H	iiH, ddH, eeH	F7H

F0H: System exclusive
ii=ID number: The ID number identifies the manufacturer of a MIDI device that triggers an exclusive message. Value 7EH and 7FH are reserved to use as universal messages which are used for extension of the MIDI Standard.

41H: Roland's Manufacturer-ID.
7EH: Universal Non-Realtime Message
7FH: Universal Realtime Message
dd,.....ee=data:00H-7FH (0-127)
F7H: EOX (End of Exclusive/System common)

■ System Exclusive Messages of Mode Change

System Exclusive Messages of Mode Change are the messages used to initialize the internal parameters of the device to General MIDI mode or GS default mode. "GS reset" and "Exit GS mode" use a form of Roland Exclusive Message. "Turn General MIDI System On" and "Turn General MIDI System Off" use a form of Universal Non-real Time Message.

■ GS reset

Status	Data Byte	Status
F0H	41H, 10H, 42H, 12H, 40H, 00H, 7FH, 00H, 41H	F7H
Byte	Description	
F0H	Exclusive status	
41H	ID number	(Roland)
10H	Device ID	(dev => 10H)
42H	Model ID	(GS)
12H	Command ID	(DT1)
40H	Address MSB	
00H	:	
7FH	Address LSB	
00H	Data	(GS reset)
41H	Checksum	
F7H	EOX	(End of exclusive)

* Upon receiving this message, all the internal parameters are set to the default settings of the GS Format. (Rx.NRPN SW will be turned ON by this message.)
* It takes about 100 ms to execute this message.

■ Exit GS mode

Status	Data Byte	Status
F0H	41H, 10H, 42H, 12H, 40H, 00H, 7FH, 7FH, 42H	F7H
Byte	Description	
F0H	Exclusive status	
41H	ID number	(Roland)
10H	Device ID	(dev => 10H)
42H	Model ID	(GS)
12H	Command ID	(DT1)
40H	Address MSB	
00H	:	
7FH	Address LSB	
7FH	Data	(Exit GS mode)
42H	Checksum	
F7H	EOX	(End of exclusive)

* Upon receiving this message, the unit changes from GS to RA-95 default mode.
* It takes about 100 ms to execute this message.

■ Turn General MIDI System On

Status	Data Byte	Status
F0H	7EH, 7FH, 09H, 01H	F7H
Byte	Description	
F0H	Exclusive status	
7EH	ID number	(Universal non-real time message)
7FH	ID of target device	(Broadcast)
09H	sub-ID#1	(General MIDI message)
01H	sub-ID#2	(General MIDI On)
F7H	EOX	(End of exclusive)

* Upon receiving this message, all the internal parameters are set to the default settings of General MIDI System Level 1.
* It takes about 100 ms to execute this message.

■ Turn General MIDI System Off

Status	Data Byte	Status
F0H	7EH, 7FH, 09H, 02H	F7H
Byte	Description	
F0H	Exclusive status	
7EH	ID number	(Universal non-real time message)
7FH	ID of target device	(Broadcast)

09H sub-ID#1 (General MIDI message)
 02H sub-ID#2 (General MIDI Off)
 F7H EOX (End of exclusive)
 * Upon receiving this message, the unit changes from General MIDI mode to RA-95 default mode.
 * It takes about 100 ms to execute this message.

■ **Data Transfer**

RA-95 can transmit and receive the various parameters using System Exclusive messages of the following data format.
 GS Common Exclusive messages use Model ID = 42H and Device ID = 17(10H).

■ **Request data 1 RQ1**

This message is sent out to request the remote device to send back the required data.

It contains data for the address and size that specify designation and length, respectively.

On receiving a proper RQ1 message for the device, the device will transmit a "Data set 1 (DT1)" message, which contains the requested data. Otherwise, the device will not send anything.

Status	Data Byte	Status
F0H	41H, 10H, 42H, 11H, aaH, bbH, ccH, ssH, ttH, uuH, sum	F7H
Byte	Description	
F0H	Exclusive status	
41H	Manufacturer's ID (Roland)	
10H	Device ID (dev => 10H)	
42H	Model ID (GS)	
11H	Command ID (RQ1)	
aaH	Address MSB	
bbH	:	
ccH	Address LSB	
ssH	Size MSB	
ttH	:	
uuH	Size LSB	
sum	Checksum	
F7H	EOX (End of exclusive)	

- * RA-95 only recognize the RQ1 messages whose address and size match the Parameter Address Map (Section 3).
- * The error checking process uses a Checksum. Refer to Section 4 to calculate a Checksum.

■ **Data set 1 DT1**

This message corresponds to the actual data transfer process.
 On receiving a DT1 message, the device writes the data to internal memory according to the address.

Status	Data Byte	Status
F0H	41H, 10H, 42H, 12H, aaH, bbH, ccH, ddH, ... eeH, sum	F7H
Byte	Description	
F0H	Exclusive status	
41H	Manufacturer's ID (Roland)	
10H	Device ID (dev => 10H)	
42H	Model ID (GS)	
12H	Command ID (DT1)	
aaH	Address MSB	
bbH	:	
ccH	Address LSB	
ddH	Data	
:	:	
eeH	Data	
sum	Checksum	
F7H	EOX (End of exclusive)	

- * RA-95 only recognize the DT1 messages whose address and size match the Parameter Address Map (Section 3).
- * To send large DT1 messages at a time, insert 40ms - intervals at least in between each packet.
- * The error checking process uses a Checksum. Refer to Section 4 to calculate a Checksum.

2 Transmit data (Arranger Section)

- Channel Voice Messages -

■ **Note off**

Status	Second	Third
9nH	kkH	00H

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 kk=Note number: 00H - 7FH (0 - 127)
 vv=Velocity: 00H (0)

- * The RA-95 does not send this message if "Midi Tx Channel" = Off

■ **Note on**

Status	Second	Third
9nH	kkH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 kk=Note number: 00H - 7FH (0 - 127)
 vv=Velocity: 01H - 7FH (1 - 127)

- * The RA-95 does not send this message if "Midi Tx Channel" = Off

■ **Control change**

- * The RA-95 does not send this message if "Midi Tx Channel" = Off

Bank select

Status	Second	Third
BnH	00H	mmH
BnH	20H	llH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 mm,ll=Bank number: 00H,00H - 7FH,7FH (bank1 - bank16384)

Modulation

Status	Second	Third
BnH	01H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Modulation depth: 00H - 7FH (0 - 127)

- * The RA-95 does not send this message if "Modulation Midi Tx Filter = OFF".

Volume

Status	Second	Third
BnH	07H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Volume: 00H - 7FH (0 - 127)

- * The RA-95 does not send this message if "Volume Midi Tx Filter = OFF".

Data entry

Status	Second	Third
BnH	06H	mmH
BnH	26H	iiH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 mm,ii=Value of the specified parameter with RPN and/or NRPN

Hold1

Status	Second	Third
BnH	40H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Control Value: 00H - 7FH (0 - 127)0 - 63 = OFF, 64 - 127 = ON

- * The RA-95 does not send this message if "Sustain Midi Tx Filter = OFF".

Effect1 depth (Reverb send level)

Status	Second	Third
BnH	5BH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Reverb send level: 00H - 7FH (0 - 127)

- * Effect1 depth messages control the Send Level of the specified channel (part) to the internal Reverb unit.
- * The RA-95 does not send this message if "Reverb Depth Midi Tx Filter = OFF".

Effect3 depth (Chorus send level)

Status	Second	Third
BnH	5DH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Chorus send level: 00H - 7FH (0 - 127)

- * Effect3 depth messages control the Send Level of the specified channel (part) to the internal Chorus unit.
- * The RA-95 does not send this message if "Chorus Depth Midi Tx Filter = OFF".

Program change

Status	Second
CnH	ppH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 pp=Program number: 00H - 7FH (prog.1 - prog.128)

- * The RA-95 does not send this message if "Program Change Midi Tx Filter = OFF".

Pitch bend change

Status	Second	Third
EnH	IIH	mmH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 mm,II=Value: 00 00H - 40 00H - 7F 7FH (-8192 - 0 - +8191)

- * The RA-95 does not send this message if "Pitch Bender Midi Tx Filter = OFF".

- System Realtime Message -

Active sensing

Status
FEH

- * Transmits at about 250ms intervals.

Sequencer start

Status
FAH

"Sequencer start" is transmitted if START/STOP button is pressed and the internal recorder/arranger is in STOP mode.(see note)

- * The RA-95 does not send this message if "Midi TX Str/Stp" = OFF".

Sequencer stop

Status
FCH

"Sequencer stop" is transmitted if START/STOP button is pressed and the internal recorder/arranger is in START mode. (see note)

- * The RA-95 does not send this message if "Midi TX Str/Stp" = OFF".

Timing clock

Status
F8H

"Timing clock" is always transmitted. (see note)

- * The RA-95 does not send this message if "Midi TX Clock" = OFF".

- System Exclusive Message -

Data Transfer

RA-95 transmits "Data set 1 (DT1)" message when receiving a proper "Request Data 1 (RQ1)" message. Refer to section1(System Exclusive Message)

Data set 1 DT1(12H)

Status	Data Byte	Status
F0H	41H, 10H, (42H), 12H, aaH, bbH, ccH, ddH, ... eeH, sum	F7H
Byte	Description	
F0H	Exclusive status	
41H	Manufacturer's ID (Roland)	
10H	Device ID (dev => 10H)	
42H	Model ID (GS)	
12H	Command ID (DT1)	
aaH	Address MSB	
bbH	Address	
ccH	Address LSB	
ddH	Data	
:	:	
eeH	Data	
sum	Checksum	
F7H	EOX (End of exclusive)	

- * RA-95 only send the DT1 messages whose address and size match the Parameter Address Map (Section 3).
- * If the data to send is a large data (more than 128 bytes), then the data will be sent out in separate packets.
- * Refer to Section 4 to calculate a Checksum.

3 Parameter address map (Model ID=42H)

This map indicates address, size, Data (range), Parameter, Description, and Default Value of parameters which can be transferred using "Request data 1 (RQ1)" and "Data set 1 (DT1)". All the numbers of address, size, Data, and Default Value are indicated in 7-bit Hexadecimal-form.

Individual parameter

You can use individual parameter communication to send or request an individual parameter value. One packet of System Exclusive messages "F0 F7" can only have one parameter (which may contain several bytes). You cannot use any address having "#" for the top address in a System Exclusive message.

System Parameters

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)
40 00 00	00 00 04	0018 - 07E8	MASTER TUNE	-100.0 - +100.0 [cent]	00 04 00 00
40 00 01#				Use nibblized data.	
40 00 02#					
40 00 03#					
40 00 7F	00 00 01	00, 7FMODE	SET 00 = GS Reset (Rx Only)	127 = Exit GS	

Refer to "System Exclusive Messages of Mode Change" Page ...)

Patch Parameters

RA-95 has 16 parts. The parameters of each part are called PATCH PARAMETERS.

To send or request a PATCH PARAMETER, use not the part number (which is usually same as the MIDI channel number) but the BLOCK NUMBER in the message.

- * x...BLOCK NUMBER (0 - F),
 - Part 1 (default MIDIch = 1) x=1 Acc 1
 - Part 2 (default MIDIch = 2) x=2 Acc Bass
 - Part 3 (default MIDIch = 3) x=3 Acc 2
 - Part 4 (default MIDIch = 4) x=4 Upper 1
 - Part 5 (default MIDIch = 5) x=5 Acc 3
 - Part 6 (default MIDIch = 6) x=6 Upper 2 (*)
 - Part 7 (default MIDIch = 7) x=7 Acc 4
 - Part 8 (default MIDIch = 8) x=8 Acc 5
 - Part 9 (default MIDIch = 9) x=9 Acc 6

Part10 (default MIDIch =10) x=0 Acc Drums
 Part11 (default MIDIch =11) x=A Lower
 Part12 (default MIDIch =12) x=B Man Bass
 Part13 (default MIDIch =13) x=C Rx only 1
 Part14 (default MIDIch =14) x=D Rx only 2
 Part15 (default MIDIch =15) x=E Rx only 3
 Part16 (default MIDIch =16) x=F Man Drums

TVF&TVA Env.attack (=Bn 63 01 62 63 06 vv)
 TONE MODIFY 6-50 - +5040
 TVF&TVA Env.decay (=Bn 63 01 62 64 06 vv)
 TONE MODIFY 7-50 - +5040 (*)
 TVF&TVA Env.release (=Bn 63 01 62 66 06 vv)
 TONE MODIFY 8-50 - +5040 (*)
 Vibrato delay (=Bn 63 01 62 0A 06 vv)

* n...MIDI channel number (0 - F) of the BLOCK.

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)
40 01 30	00 00 01	00 - 07	REVERB MACRO	00: Room 104 01: Room 2 02: Room 3 03: Hall 1 04: Hall 2 05: Plate 06: Delay 07: Panning Delay	(*) (*) (*) (*) (*) (*) (*) (*)
40 01 33	00 00 01	00 - 7F	REVERB LEVEL	40	
40 01 34	00 00 01	00 - 7F	REVERB TIME	40	(*)

REVERB MACRO is a parameter used to select the preset type of the effect.
 When set to another REVERB MACRO, all other reverb parameters will reset to the values set for each type of REVERB MACRO.

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)
40 01 38	00 00 01	00 - 07	CHORUS MACRO	00: Chorus 102 01: Chorus 2 02: Chorus 3 03: Chorus 4 04: Feedback Chorus 05: Flanger 06: Short Delay 07: Short Delay(FB)	(*) (*) (*) (*) (*) (*) (*) (*)
40 01 3A	00 00 01	00 - 7F	CHORUS LEVEL	40	(*)
40 01 3D	00 00 01	00 - 7F	CHORUS RATE	03	(*)

CHORUS MACRO is a parameter used to select the preset type of effect.
 When set to another CHORUS MACRO, then all other chorus parameters will reset to the values set for each type of CHORUS MACRO.

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)
40 1x 00	00 00 02	00 - 7F	TONE NUMBER	CC#00 VALUE	00
40 1x 01#	00 00 01	00 - 7F	P.C. VALUE	P.C. VALUE	00
40 1x 02	00 00 01	00 - 10	Rx. CHANNE	L1 - 16,OFF	same as the Part#
40 1x 03	00 00 01	00 - 01	Rx. PITCH BEND	OFF / ON	01
40 1x 05	00 00 01	00 - 01	Rx. PROGRAM CHANGE	OFF / ON	01
40 1x 0A	00 00 01	00 - 01	Rx. NRPN	OFF / ON	00(01')

* Rx. NRPN is set to ON by "GS RESET".

40 1x 0B	00 00 01	00 - 01	Rx. MODULATION	OFF / ON01	
40 1x 0C	00 00 01	00 - 01	Rx. VOLUME	OFF / ON01	
40 1x 0D	00 00 01	00 - 01	Rx. PANPOT	OFF / ON01	(*)
40 1x 0E	00 00 01	00 - 01	Rx. EXPRESSION	OFF / ON01	(*)
40 1x 0F	00 00 01	00 - 01	Rx. HOLD1	OFF / ON01	
40 1x 13	00 00 01	00 - 01	MONO/POLY MODE	Mono / Poly (=Bn 7E 01 / Bn 7F 00)	01 (*)
40 1x 16	00 00 01	28 - 58	PITCH KEY SHIFT	-24 - +24 [semitone]	40 (*)
40 1x 17	00 00 02	08 - F8	PITCH OFFSET FINE	-12.0 - +12.0 [Hz] Use nibblized data.	08 00 (*)
40 1x 18#					
40 1x 19	00 00 01	00 - 7F	PART LEVEL	0 - 127 (=Bn 07 vv)	64
40 1x 1C	00 00 01	00 - 7F	PART PANPOT	Random, -63(LEFT) - +63(RIGHT)40 (=Bn 0A vv, except random)	
40 1x 21	00 00 01	00 - 7F	CHORUS SEND LEVEL	0 - 127 (=Bn 5D vv)	00
40 1x 22	00 00 01	00 - 7F	REVERB SEND LEVEL	0 - 127 (=Bn 5B vv)	28
40 1x 30	00 00 01	0E - 72	TONE MODIFY	1-50 - +5040 (*) Vibrato rate (=Bn 63 01 62 08 06 vv)	
40 1x 31	00 00 01	0E - 72	TONE MODIFY	2-50 - +5040 (*) Vibrato depth (=Bn 63 01 62 09 06 vv)	
40 1x 32	00 00 01	0E - 72	TONE MODIFY	3-50 - +5040 (*) TVF cutoff freq. (=Bn 63 01 62 20 06 vv)	
40 1x 33	00 00 01	0E - 72	TONE MODIFY	4-50 - +5040 (*) TVF resonance (=Bn 63 01 62 21 06 vv)	
40 1x 34	00 00 01	0E - 72	TONE MODIFY	5-50 - +5040 (*)	

40 1x 40	00 00 0C	00 - 7F	SCALE TUNING	C-64 - +63 [cent]	40
40 1x 41#		00 - 7F	SCALE TUNING	C#-64 - +63 [cent]	40
40 1x 42#		00 - 7F	SCALE TUNING	D-64 - +63 [cent]	40
40 1x 43#		00 - 7F	SCALE TUNING	D#-64 - +63 [cent]	40
40 1x 44#		00 - 7F	SCALE TUNING	E-64 - +63 [cent]	40
40 1x 45#		00 - 7F	SCALE TUNING	F-64 - +63 [cent]	40
40 1x 46#		00 - 7F	SCALE TUNING	F#-64 - +63 [cent]	40
40 1x 47#		00 - 7F	SCALE TUNING	G-64 - +63 [cent]	40
40 1x 48#		00 - 7F	SCALE TUNING	G#-64 - +63 [cent]	40
40 1x 49#		00 - 7F	SCALE TUNING	A-64 - +63 [cent]	40
40 1x 4A#		00 - 7F	SCALE TUNING	A#-64 - +63 [cent]	40
40 1x 4B#		00 - 7F	SCALE TUNING	B-64 - +63 [cent]	40
40 2x 10	00 00 01	40 - 58	BEND PITCH CONTRO	L0 - 24 [semitone]	42 (*)

(*) The parameter is not transmitted by RA-95.

■ Tone program change

A 'GM/GS' tone is selected by the message:
 BnH 00H mmH BnH 20H iiH CnH ppH
 n=MIDI channel number :
 0H-FH(0-15) 0=ch.1 15=ch.16

mmH	iiH	ppH	Sound Name
PIANO			
00H	00H	00H	Piano 1
08H	00H	00H	Piano 1w
10H	00H	00H	Piano 1d
*			
00H	00H	01H	Piano 2
08H	00H	01H	Piano 2w
*			
00H	00H	02H	Piano 3
08H	00H	02H	Piano 3w
*			
00H	00H	03H	Honky-tonk
08H	00H	03H	Honky-tonk w
*			
00H	00H	04H	E.Piano 1
08H	00H	04H	Detuned EP 1
10H	00H	04H	E.Piano 1 v
18H	00H	04H	60's E.Piano
*			
00H	00H	05H	E.Piano 2
08H	00H	05H	Detuned EP 2
10H	00H	05H	E.Piano 2v
*			
00H	00H	06H	Harpsichord
08H	00H	06H	Coupled Hps.
10H	00H	06H	Harpsi.w
18H	00H	06H	Harpsi.o
*			
00H	00H	07H	Clav.
*			
CHROMATIC PERCUSSION			
00H	00H	08H	Celesta
*			
00H	00H	09H	Glockenspiel
*			
00H	00H	0AH	Music Box
*			
00H	00H	0BH	Vibraphone
08H	00H	0BH	Vib.w
*			
00H	00H	0CH	Marimba
08H	00H	0CH	Marimba w
*			
00H	00H	0DH	Xylophone
*			
00H	00H	0EH	Tubular-bell
08H	00H	0EH	Church Bell
09H	00H	0EH	Carillon
*			
00H	00H	0FH	Santur

ORGAN

00H 00H 10H Organ 1
 01H 00H 10H Organ 101
 08H 00H 10H Detuned Or.1
 09H 00H 10H Organ 109
 10H 00H 10H 60's Organ 1
 11H 00H 10H 60's Organ 2
 12H 00H 10H 60's Organ 3
 20H 00H 10H Organ 4
 21H 00H 10H Even Bars
 .

00H 00H 11H Organ 2
 01H 00H 11H Organ 201
 08H 00H 11H Detuned Or.2
 20H 00H 11H Organ 5
 .

00H 00H 12H Organ 3
 .
 00H 00H 13H Church Org.1
 08H 00H 13H Church Org.2
 10H 00H 13H Church Org.3
 .

00H 00H 14H Reed Organ
 .
 00H 00H 15H Accordion Fr
 08H 00H 15H Accordion It
 .

00H 00H 16H Harmonica
 01H 00H 16H Harmonica 2
 .
 00H 00H 17H Bandoneon
 .

GIUITAR

00H 00H 18H Nylon-str.Gt
 08H 00H 18H Ukulele
 10H 00H 18H Nylon Gt.o
 20H 00H 18H Nylon Gt.2
 .

00H 00H 19H Steel-str.Gt
 08H 00H 19H 12-str.Gt
 09H 00H 19H Nylon+Steel
 10H 00H 19H Mandolin
 20H 00H 19H Steel-strGT2
 .

00H 00H 1AH Jazz Gt.
 08H 00H 1AH Hawaiian Gt.
 .

00H 00H 1BH Clean Gt.
 08H 00H 1BH Chorus Gt.
 .

00H 00H 1CH Muted Gt.
 08H 00H 1CH Funk Gt.
 10H 00H 1CH Funk Gt.2
 .

00H 00H 1DH Overdrive Gt.
 .

00H 00H 1EH DistortionGt.
 08H 00H 1EH Feedback Gt.
 .

00H 00H 1FH Gt.Harmonics
 08H 00H 1FH Gt. Feedback
 10H 00H 1FH Ac.Gt. Harmnx
 .

BASS

00H 00H 20H Acoustic Bs.
 .

00H 00H 21H Fingered Bs.
 .

00H 00H 22H Picked Bs.
 .

00H 00H 23H Fretless Bs.
 .

00H 00H 24H Slap Bass 1
 .

00H 00H 25H Slap Bass 2
 .

00H 00H 26H Synth Bass 1
 01H 00H 26H SynthBass101
 08H 00H 26H Synth Bass 3
 .

00H 00H 27H Synth Bass 2
 01H 00H 27H SynthBass 201
 08H 00H 27H Synth Bass 4
 10H 00H 27H Rubber Bass

STRINGS & ORCHESTRAL INSTRUMENTS

00H 00H 28H Violin
 08H 00H 28H Slow Violin
 .

00H 00H 29H Viola
 .

00H 00H 2AH Cello
 .

00H 00H 2BH Contrabass
 .

00H 00H 2CH Tremolo Str
 .

00H 00H 2DH PizzicatoStr
 .

00H 00H 2EH Harp
 .

00H 00H 2FH Timpani
 .

ENSEMBLE

00H 00H 30H Strings
 08H 00H 30H Orchestra
 .

00H 00H 31H Slow Strings
 .

00H 00H 32H Syn.Strings1
 08H 00H 32H Syn.Strings3
 .

00H 00H 33H Syn.Strings2
 .

00H 00H 34H Choir Aahs
 20H 00H 34H Choir Aahs 2
 .

00H 00H 35H Voice Oohs
 .

00H 00H 36H SynVox
 .

00H 00H 37H OrchestraHit
 .

BRASS

00H 00H 38H Trumpet
 01H 00H 38H Trumpet 2
 .

00H 00H 39H Trombone
 01H 00H 39H Trombone 2
 .

00H 00H 3AH Tuba
 .

00H 00H 3BH MutedTrumpet
 .

00H 00H 3CH French Horn
 01H 00H 3CH French Horn2
 .

00H 00H 3DH Brass 1
 08H 00H 3DH Brass 2
 .

00H 00H 3EH Synth Brass1
 08H 00H 3EH Synth Brass3
 10H 00H 3EH AnalogBrass1
 .

00H 00H 3FH Synth Brass2
 08H 00H 3FH Synth Brass4
 10H 00H 3FH AnalogBrass2
 .

00H 00H 3FH Synth Brass2
 08H 00H 3FH Synth Brass4
 10H 00H 3FH AnalogBrass2
 .

00H 00H 3FH Synth Brass2
 08H 00H 3FH Synth Brass4
 10H 00H 3FH AnalogBrass2
 .

00H 00H 3FH Synth Brass2
 08H 00H 3FH Synth Brass4
 10H 00H 3FH AnalogBrass2
 .

00H 00H 3FH Synth Brass2
 08H 00H 3FH Synth Brass4
 10H 00H 3FH AnalogBrass2
 .

00H 00H 3FH Synth Brass2
 08H 00H 3FH Synth Brass4
 10H 00H 3FH AnalogBrass2
 .

00H 00H 3FH Synth Brass2
 08H 00H 3FH Synth Brass4
 10H 00H 3FH AnalogBrass2
 .

REED

00H 00H 40H Soprano Sax
 .

00H 00H 41H Alto Sax
 08H 00H 41H Sax 1
 .

00H 00H 42H Tenor Sax
 08H 00H 42H Sax 2
 .

00H 00H 43H Baritone Sax
 .

00H 00H 44H Oboe
 .

00H 00H 45H English Horn
 .

00H 00H 46H Bassoon
 .

00H 00H 47H Clarinet

■ Drum set program change

A Drum set is selected by the message :
 BnH 00H mmH BnH 20H iiH CnH ppH
 n=MIDI channel number:
 0H-FH(0-15) 0=ch.1 15=ch.16

mmH	iiH	ppH	Set name
00H	00H	00H	Standard Set
00H	00H	08H	Room set
00H	00H	10H	Power set
00H	00H	18H	Elec set
00H	00H	19H	808 Set
00H	00H	20H	Jazz Set
00H	00H	28H	Brush Set
00H	00H	30H	Orch. Set
00H	00H	38H	Sfx

■ Style program change

A Style is selected by the message :
 BnH 00H mmH BnH 20H iiH CnH ppH
 n=MIDI channel number :
 0H-FH(0-15) 0=ch.1 15=ch.16

mmH	iiH	Description
01H	09H	11 ROCK1
01H	0AH	12 ROCK2
21H	02H	13 RAP
02H	0DH	14 HOUSE
02H	0EH	15 TECHN0
02H	0FH	16 DANCE
03H	06H	17 FUNK1
03H	07H	18 FUNK2
06H	09H	21 8BEAT1
06H	0AH	22 8BEAT2
06H	0BH	23 8BEAT3
06H	0CH	24 8BEAT4
07H	0AH	25 16BEAT
07H	0BH	26 16BEAT2
07H	0CH	27 16BEAT3
07H	0DH	28 16BEAT4
09H	03H	31 BOOGIE
0AH	0CH	32 ROCK'N1
0AH	0DH	33 ROCK'N2
0AH	0EH	34 TWIST
05H	07H	35 SL ROCK1
05H	08H	36 SL ROCK2
04H	08H	37 BALLAD1
04H	09H	38 BALLAD2
0DH	05H	41 SLSWING1
0DH	06H	42 SLSWING2
2CH	03H	43 BLUES
0CH	05H	44 SWING
0EH	03H	45 BIG BAND
0FH	03H	46 SHUFFLE
0BH	03H	47 DIXIE
0BH	04H	48 CHARLEST
16H	07H	51 BOSSA1
16H	08H	52 BOSSA2
16H	09H	53 LATIN
18H	03H	54 CHACHA
17H	03H	55 RHUMBA
27H	06H	56 POPROCK
27H	07H	57 BEGUINE
1AH	04H	58 TANGO
1BH	06H	61 SAMBA1
1BH	07H	62 SAMBA2
19H	02H	63 SALSA
26H	03H	64 MAMBO1
26H	04H	65 MAMBO2
23H	02H	66 CALYPSO
08H	04H	67 REGGAE
1CH	02H	68 FUSION
12H	05H	71 SL WALTZ
11H	0BH	72 SW WALTZ
11H	0CH	73 WALTZ
14H	05H	74 MARCH
22H	03H	75 FOXTROT

13H	06H	76 POLKA
15H	02H	77 BAROQUE
10H	05H	78 COUNTRY
78H	00H	U1 User Style
78H	01H	U2 User Style
78H	02H	U3 User Style
78H	03H	U4 User Style
78H	04H	U5 User Style
78H	05H	U6 User Style
78H	06H	U7 User Style
78H	07H	U8 User Style

■ Values of ppH

ppH	Description
00H	Original Basic
01H	Original Advanced
08H	Variation Basic
09H	Variation Advanced
40H	Intro Basic
41H	Intro Advanced
48H	Ending Basic
49H	Ending Advanced
58H	Fill in to Original Basic
59H	Fill in to Original Advanced
60H	Fill in to Variation Basic
61H	Fill in to Variation Advanced
70H	Break Mute
50H	Fill in to Variation <
51H	Fill in to Original <
52H	Intro < E- series compatibility
53H	Ending <
54H	Break Mute <

4 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, Bank number, 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 more resolution.

i.e. The number "ad bbH" in 7-bit Hexadecimal is "ad x 128 + bb" in Decimal form.

*A signed number (with a sign +/-) is indicated as 00H = -64, 40H = %0, 7FH = +63.

So the signed number "aaH" in 7-bit Hexadecimal is "ad - 64" (ad is the decimal number of aaH).

In case of two bytes, it is regarded as 00 00H = -8192, 40 00H = %0, 7F 7FH = +8191.

So the signed number "ad bbH" in 7-bit Hexadecimal is "ad bbH - 40 00H = ad x 128 + bb - 64 x 128", where, ad and bb is the decimal number of aaH and bbH respectively.

*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 0D" 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 = 41885

■ Example of actual MIDI messages

<Example 1> 92 3E 5F

"9n" 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 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 GS).

<Example 3> EA 00 28

"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 (28H) is an MSB of a Pitch bend value (%signed).

The Pitch bend value is:

28 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 x (-3072) % (-8192) = -75 cent

<Example 4> B3 64 00 65 00 06 0C 26 00 64 7F 65 7F

"Bn" is a status of a Control change message, and "n" is a MIDI channel number.

The second byte is a Control number and the third is the value.

This packet uses the running status rule, that is, when you send a series of messages with the same status, you can omit the following status bytes.

This message contains :

```

B3 64 00  MIDI CH = 4  LSB of RPN parameter number  : 00H
(B3) 65 00  MIDI CH = 4  MSB of RPN parameter number  : 00H
(B3) 06 0C  MIDI CH = 4  MSB of Data entry             : 0CH
(B3) 26 00  MIDI CH = 4  LSB of Data entry             : 00H
(B3) 64 7F  MIDI CH = 4  LSB of RPN parameter number  : 7FH
(B3) 65 7F  MIDI CH = 4  MSB of RPN parameter number  : 7FH
    
```

This message string means 'send data "0C 00H" to RPN parameter number"00 00H", after that, set RPN parameter number to "7F 7F".

RPN parameter number "00 00H" is Pitch bend sensitivity and the unit of the MSB value is a semitone, so 0CH = 12 is a value

to set the Pitch bend sensitivity = 12 semitones (one octave).

GS devices ignore the LSB value of Pitch bend sensitivity. However, you had better send both MSB and LSB(=00H) to maintain data compatibility.

Once an RPN or NRPN number is set, all the Data entry messages sent after are effective.

Sometimes this rule may cause a problem if the MIDI data is played by a recorder and it is operated in fast forward or backward made. It is recommended, therefore, to set the RPN or NRPN number to 7F 7FH after sending the Data entry messages.

*To use running-status for several MIDI event like <example 4> in a song data (e.g. Standard MIDI File data) is not recommended.

There may be a recorder which can not handle such data correctly when it is operated in fast forward or backward. Putting the status byte for every event is the reliable way.

*The parameter number and the value of RPN or NRPN must be sent in correct order. As some recorders may send those recorded data in different order if an event is too close to another, it is recommended to place each event in a different tick. (1-CLK for TPQN=92, or 5-CLK for TPQN=480 is recommended.)

The send order may be different as each recorder if the events are in the same clock in sequence data.

Checksum of Roland System Exclusive messages

Roland System Exclusive messages (RQ1 and DT1) have a Checksum at the end of the data (just before EOX) to be able to check for communication errors.

The Checksum is determined by values of address and data (or size) included in the message.

<How to calculate Checksums> ("H" indicates Hexadecimal.)

The error checking process employs a sum-check error detection. It provides binary bit figures whose lower 7 bits are zero when values for an address, data (or size) and the Checksum are summed.

One practical equation to determine Checksum is:

If the address is "ad bb ccH" and the data(or the size) is "dd ee ffH"

$ad + bb + cc + dd + ee + ff = \text{sum}$
 $\text{sum} \% 128 = \text{quotient} \% \text{remainder}$
 $128 - \text{remainder} = \text{checksum}$

<Example 1> Set "REVERB MACRO" to "ROOM 3"

According to the Parameter Address Map, the Address of REVERB MACRO is 40 01 30H, and the Value correspond to ROOM 3 is 02H.
So, the message should be :

F0 41 10 42 12 40 01 30 02 ?? F7 (1)Exclusive Status (4)Model ID (GS)
(2)ID (Roland) (5)Command ID (DT1)
(1) (2) (3) (4) (5) address data checksum (6) (3)Device ID (16) (6)End of Exclusive

The Checksum is :
 $40H + 01H + 30H + 02H = 64 + 1 + 48 + 2 = 115(\text{sum})$
 $115(\text{sum}) \% 128 = 0(\text{quotient}) \% 115(\text{remainder})$
 $\text{checksum} = 128 - 115(\text{remainder}) = 13 = 0DH$

Therefore, the message to send is : F0 41 10 42 12 40 01 30 02 0D F7

<Example 2> To request LEVEL of NOTE NUMBER 75(D#5; Claves) in DRUM MAP 1

NOTE NUMBER 75(D#5) is 4BH in Hexadecimal.
The Address of "LEVEL of NOTE NUMBER 75(D#5; Claves) in DRUM MAP 1" is 41 02 4BH, and the size is 00 00 01H. So, the message should be :

F0 41 10 42 11 41 02 4B 00 00 01 ?? F7 (1)Exclusive Status(4)Model ID (GS)
(2)ID (Roland) (5)Command ID (RQ1)
(1) (2) (3) (4) (5) address size checksum (6) (3)Device ID (16) (6)End of Exclusive

The Checksum is :
 $41H + 02H + 4BH + 00H + 00H + 01H = 65 + 2 + 75 + 0 + 0 + 1 = 143(\text{sum})$
 $143(\text{sum}) \% 128 = 1(\text{quotient}) \% 15(\text{remainder})$
 $\text{checksum} = 128 - 15(\text{remainder}) = 113 = 71H$

Therefore, the message to send is : F0 41 10 42 11 41 02 4B 00 00 01 71 F7

<Example 3> Set "MASTER TUNE" to +23.4 cents by System Exclusive
The Address of "MASTER TUNE" is 40 00 00H, and the Size is 00 00 04H.
The Value should be nibblized data whose resolution is 0.1 cents, and which is a signed value
(00 04 00 00H (= 1024) = %0).
 $+23.4[\text{cents}] = 234 + 1024 = 1258 = (\text{hexadecimal}) \Rightarrow 04 \text{ EAH} = (\text{nibblized}) \Rightarrow 00 04 0E 0AH$
So, the message should be :

F0 41 10 42 12 41 00 00 00 04 0E 0A ?? F7 (1)Exclusive Status (4)Model ID (GS)
(2)ID (Roland) (5)Command ID (DT1)
(1) (2) (3) (4) (5) address data checksum (6) (3)Device ID (16) (6)End of Exclusive

The Checksum is :
 $41H + 00H + 00H + 00H + 04H + 0EH + 0AH = 65 + 0 + 0 + 0 + 4 + 14 + 10 = 93(\text{sum})$
 $93(\text{sum}) \% 128 = 0(\text{quotient}) \% 93(\text{remainder})$
 $\text{checksum} = 128 - 93(\text{remainder}) = 35 = 23H$

Therefore, the message to send is : F0 41 10 42 11 41 00 00 00 04 0E 0A 23 F7

MIDI IMPLEMENTATION CHART

[INTELLIGENT ARRANGER]
Model RA-95

(Arranger Section)
MIDI Implementation Chart (MIDI 1)

Date: Jan 1995
Version: 1.00

FUNCTION	TRANSMITTED	RECOGNIZED	REMARKS TX	REMARKS RX
Basic Default	1-2-3-4-5-7-8-9-10	1-16	1=Acc 1 9=Acc 6 2=Acc Bass 10=Acc Drums, 3=Acc 2 Style Pgl 4=Upper 1 5=Acc 3 7=Acc 4	*5
Channel Changed	X	X		
Mode Default Messages Altered	Mode 3 Mode 3 *****	Mode 3 Mode 3, 4(M=1) *2		
Note Number: True voice	0-127 *****	0-127 *1 0-127		
Velocity Note ON Note OFF	O X	O X		
After Touch Key's Ch's	X X	O *1 O *1		
Pitch Bender	O *3	O *1		
Control Change	0,32 O *1 1 O *3 5 X 6,38 O 7 O *1 10 O *3 11 O *3 64 O *1 65 X 66 X 67 X 84 X 91 O *3 93 O *3 98,99 O *3 100,101 X 120 X 121 X	O (MSB only) *1 O *1 O *1 O *1 O *1 O *1 O *1 O *1 O *1 O *1 O *1 O (Reverb) *1 O (Chorus) *1 X *1 O *1 O O	Bank select Modulation Portamento time Data entry Volume Panpot Expression Hold1 Portamento Sostenuto Soft Portamento control Effect1 depth Effect3 depth NRPN LSB, MSB RPN LSB, MSB All sound off Reset all controllers	
Prog change: True #	O *1 *****	O *1 0-127	Prog. 1-128	
System Exclusive	O	O		
System Common : Song Pos : Song Sel : Tune	X X X	X X X		
System Real Time : Clock : Commands	O O	O O		
Aux Messages : Local ON/OFF : All Notes OFF : Active Sense : Reset	X X O X	X O (123-125) O X		
<p>Notes</p> <p>*1 O X is selectable *2 Recognize as M=1 even if M%1 *3 Transmission depending on Tx Arranger on/off parameter</p>				

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

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

O: YES
X: NO

MIDI IMPLEMENTATION CHART

[INTELLIGENT ARRANGER]
Model RA-95

(Arranger Section)
MIDI Implementation Chart of ACCORDION1 MODE (MIDI 2)

Date: Jan 1995
Version: 1.00

FUNCTION	TRANSMITTED	RECOGNIZED	REMARKS TX	REMARKS RX
Basic Default	1-2-3-4-5-7-8-9-10	1-16	1=Acc 1 9=Acc 6 2=Acc Bass 10=Acc Drums 3=Acc 2 4=Upper 5=Acc 3 7=Acc 4 8=Acc 5	1=Upper 2=Nta
Channel Changed	X	X		
Mode Default Messages Altered	Mode 3 Mode 3 *****	Mode 3 Mode 3, 4(M=1) *2		
Note Number: True voice	0-127 *****	0-127 0-127		
Velocity Note ON Note OFF	O X	O X		
After Touch Key's Ch's	X X	O *1 O *1		
Pitch Bender	O *3	O *1		
Control Change	0,32 O *1 1 O *3 5 X 6,38 O *3 7 O *1 10 O *3 11 O *3 64 O *1 65 X 66 X 67 X 84 X 91 O *3 93 O *3 98,99 O *3 100,101 X 120 X 121 X	O (MSB only) *1 O *1 O *1 O *1 O *1 O *1 O *1 O *1 O *1 O *1 O *1 O (Reverb) *1 O (Chorus) *1 X O O	*1 Bank select *1 Modulation *1 Portamento time *1 Data entry *1 Volume *1 Panpot *1 Expression *1 Hold1 *1 Portamento *1 Sostenuto *1 Soft *1 Portamento control *1 Effect1 depth *1 Effect3 depth *1 NRPN LSB, MSB *1 RPN LSB, MSB All sound off Reset all controllers	
Prog change: True #	O *1 *****	O *1 0-127	Prog. 1-128	
System Exclusive	O	X		
System Common : Song Pos : Song Sel : Tune	X X X	X X X		
System Real Time : Clock : Commands	O O	O O		
Aux Messages : Local ON/OFF : All Notes OFF : Active Sense : Reset	X X O X	X O (123-125) O X		
Notes	*1 O X is selectable *2 Recognize as M=1 even if M%1 *3 Transmission depending on Tx Arranger on/off parameter			

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

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

O: YES
X: NO

RA-95 MIDI IMPLEMENTATION

MIDI IMPLEMENTATION

Version 1.00

Date: Jan 1995

SOUND MODULE & SMF PLAYER SECTION

1 Receive data (Sound Module, Standard Midi file Player)

- Channel Voice Message -

■ Note off

Status	Second	Third
8nH	kkH	vvH
9nH	kkH	00H

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
kk=Note number: 00H - 7FH (0 - 127)
vv=Velocity: 00H - 7FH (0 - 127)

- * Ignored when "Rx.Note message = OFF".
- * In the drum part, recognized when "Rx.Note off = ON" for each instrument.
- * Velocity is ignored.

■ Note on

Status	Second	Third
9nH	kkH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
kk=Note number: 00H - 7FH (0 - 127)
vv=Velocity: 01H - 7FH (1 - 127)

- * Ignored when "Rx.Note message = OFF".
- * In the drum part, ignored when "Rx.Note on = OFF" for each instrument.

■ Polyphonic key pressure

Status	Second	Third
AnH	kkH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
kk=Note number: 00H - 7FH (0 - 127)
vv=Value: 00H - 7FH (0 - 127)

- * Ignored when "Rx.Polyphonic key pressure = OFF".
- * Effect to the parameter set on "PAf controller function".
The default setting has no effect.

■ Control change

- * Ignored all control change messages other than channel mode messages when "Rx.Control change = OFF".
- * The values set by Control change messages won't reset by receiving new Program change messages.

Bank select

Status	Second	Third
BnH	00H	mmH
BnH	20H	llH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
mm,ll=Bank number: 00H,00H - 7FH,7FH (bank1 - bank16384)
Default Value = 00 00H (bank.1)

- * Ignored when "Rx Bank Select = OFF"
"Rx.Bank Select" is set to ON by "GS RESET".(Power-on default value is ON.)
- * The LSB 7-bits are ignored (always regards as llH=00H).
However, when sending Bank Select messages, you have to send both of the MSB(mm) and LSB(ll) together.
- * "Bank select" is suspended until receiving "Program change".
To select a Tone of another bank, you have to send Bank select(mm,ll) before sending the Program change.
- * The "Variation number" of GS Format is defined as the decimal expression of the MSB value (Control change number 00H) of the Bank select.

Modulation

Status	Second	Third
BnH	01H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
vv=Modulation depth: 00H - 7FH (0 - 127)

- * Ignored when "Rx Modulation = OFF".
- * Effect to the parameter set on "MOD controller function".
The default setting is pitch modulation depth.

Portamento time

Status	Second	Third
BnH	05H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
vv=Portamento time: 00H - 7FH (0 - 127) Default Value = 00H (0)

- * The Portamento time value changes the rate of pitch change when Portamento is ON or when using portamento control messages.
Value 0 is the fastest.

Data entry

Status	Second	Third
BnH	06H	mmH
BnH	26H	llH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
mm,ll=Value of the parameter specified with RPN and/or NRPN

Volume

Status	Second	Third
BnH	07H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
vv=Volume: 00H - 7FH (0 - 127)

- * Volume messages control the volume level of the specified channel (part).
Use Volume messages to control volume balance of each part.
- * Ignored when "Volume Midi Rx Filter = OFF".

Panpot

Status	Second	Third
BnH	0AH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
vv=Panpot: 00H - 40H - 7FH (Left - Center - Right)

- * 127 steps from Left to Center to Right.
- * Within the Drum Part, the panpot provides overall control of a stereophonic image.
- * Ignored when "Rx Panpot = OFF".

Expression

Status	Second	Third
BnH	0BH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
vv=Expression: 00H - 7FH (0 - 127)

- * Expression and Volume messages are cumulative, and the result will control the overall volume.
Use Expression messages for expression pedal, or creating expressive effects, such as crescendo, decrescendo, while playing.
- * Ignored when "Rx Expression = OFF".

Hold1

Status	Second	Third
BnH	40H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Control Value: 00H - 7FH (0 - 127) 0 - 63 = OFF, 64 - 127 = ON

* Ignored when "Rx Hold 1 = OFF".

Portamento

Status	Second	Third
BnH	41H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Control Value: 00H - 7FH (0 - 127) 0-63=OFF 64-127=ON

Sostenuto

Status	Second	Third
BnH	42H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Control Value: 00H - 7FH (0 - 127) 0-63=OFF 64-127=ON

* Ignored when "Rx Sostenuto = OFF".

Soft

Status	Second	Third
BnH	43H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Control Value: 00H - 7FH (0 - 127)

* Ignored when "Rx Soft = OFF".

Portamento Control

Status	Second	Third
BnH	54H	kkH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 kk= source note number for pitch reference: 00H - 7FH (0 - 127)

* When a Note On message is received after a Portamento Control message, the voice's pitch will glide from the pitch specified by the source note number of the Portamento Control message at the rate set by the portamento time controller (regardless portamento on/off.) If there is a currently sounding voice whose note number is coincident with the source note number, the voice's pitch will glide to the new Note On's pitch according to the portamento time without re-triggering (played in legato). Then no new voice should be assigned.

Example 1.

On MIDI	Description	Result
90 3C 40	Note on C4	C4 on
B0 54 3C	Portamento Control from C4	no change (C4 voice still sounding)
90 40 40	Note on E4	glide from C4 to E4
80 3C 40	Note off C4	no change
80 40 40	Note off E4	E4 off

Example 2.

On MIDI	Description	Result
B0 54 3C	Portamento Control from C4	no change
90 40 40	Note on E4	E4 is played with glide from C4 to E4
80 40 40	Note off E4	E4 off

Effect1 depth (Reverb send level)

Status	Second	Third
BnH	5BH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Reverb send level: 00H - 7FH (0 - 127)

* Effect1 depth messages control the Send Level of the specified channel (part) to the internal Reverb unit.

Effect3 depth (Chorus send level)

Status	Second	Third
BnH	5DH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Chorus send level: 00H - 7FH (0 - 127)

* Effect3 depth messages control the Send Level of the specified channel (part) to the internal Chorus unit.

NRPN MSB/LSB

Status	Second	Third
BnH	63H	mmH
BnH	62H	llH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 mm=MSB of the NRPN
 ll=LSB of the NRPN

* Recognized when "Rx.NRPN = ON". "Rx.NRPN" is set ON by "GS RESET".

* The values set by NRPN won't reset by receiving new Program Change messages or Reset All Controllers.

NRPN

An NRPN (Non Registered Parameter Number) is an expanded control change message.

Each function of an NRPN is described by the individual manufacturer.

To use NRPN, set NRPN number (MSB/LSB) before sending data. Then send data by Data entry message(Control Change # 6/38).

And then, it is recommended to send RPN null (RPN number = 7FH/7FH) to prevent the data from being unexpectedly change. For more explanation, refer to Chapter 4. Useful Information. Example of actual MIDI messages <EXAMPLE 4>.

You can change the following parameters by using NRPN.

NRPN	Data entry	Description
MSB LSB	MSB	
01H 08H	mmH	Vibrato rate relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
01H 09H	mmH	Vibrato depth relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
01H 0AH	mmH	Vibrato delay relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
01H 20H	mmH	TVF cutoff frequency relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
01H 21H	mmH	TVF resonance relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
01H 63H	mmH	TVF&TVA Env. Attack time relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
01H 64H	mmH	TVF&TVA Env. Decay time relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
01H 66H	mmH	TVF&TVA Env. Release time relative change on specified channel mm: 0EH - 40H - 72H (-50 - 0 - +50)
18H rrH	mmH	Pitch coarse of drum instrument relative change on specified drum instrument rr: key number of drum instrument mm: 00H - 40H - 7FH (-64 - 0 - +63 semitone)
1AH rrH	mmH	TVA level of drum instrument absolute change on specified drum instrument rr: key number of drum instrument mm: 00H - 7FH (zero - maximum)

1CH rrH	mmH	Panpot of drum instrument absolute change on specified drum instrument rr: key number of drum instrument mm: 00H, 01H - 40H - 7FH (Random, Left-Center-Right)
1DH rrH	mmH	Reverb send level of drum instrument absolute change on specified drum instrument rr: key number of drum instrument mm: 00H - 7FH (zero - maximum)
1EH rrH	mmH	Chorus send level of drum instrument absolute change on specified drum instrument rr: key number of drum instrument mm: 00H - 7FH (zero - maximum)

- * Data entry LSB is ignored.
- * The relative change means that the parameter value (e.g. -50 - 0 - +50) will be added to the preset value.
- * The absolute change means that the parameter value will be replaced by the received value.

■ RPN MSB/LSB

Status	Second	Third
BnH	65H	mmH
BnH	64H	llH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
mm=MSB of the RPN
ll=MSB of the RPN

- * Ignored when "Rx. RPN = OFF".
- * The values set by an RPN won't be reset by receiving new Program Change messages or Reset All Controllers.

RPN

An RPN (Registered Parameter Number) is an expanded control change message.

Each function of an RPN is described by the MIDI Standard.

To use RPN, set RPN number (MSB/LSB) before sending data. Then send data by Data entry message(Control Change # 6/38). And then, it is recommended to send RPN null (RPN number = 7FH/7FH) to prevent the data from being unexpectedly change. For more explanation, refer to Chapter 4. Useful Information, Example of actual MIDI messages <EXAMPLE 4>.

You can change the following parameters by using RPN.

RPN MSB LSB	Data entry MSB LSB	Description
00H 00H	mmH	Pitch bend sensitivity mm: 00H - 18H (0 - 24 semitone) Default value = 02H (two semitones) ll: ignored (value=00H) (Up to 2 octaves)
00H 01H	mmH llH	Master fine tuning mm,ll: 00 00H - 40 00H - 7F 7FH (-8192 x 100/8192 - 0 - +8191 x 100/8192 cents)
00H 02H	mmH	Master coarse tuning mm: 28H - 40H - 58H (-24 - 0 - +24 semitones) ll: ignored (value=00H)
7FH 7FH	---	RPN null Return to disable condition. The parameter already set retains its value. mm,ll: ignored

■ Program change

Status	Second
CnH	ppH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
pp=Program number: 00H - 7FH (prog.1 - prog.128)

- * The Tone of the voices already ON before receiving a program change message isn't affected.
The Tone will be changed by a new Note-on message after the program change is received.
- * Ignored when "Rx. Program Change = OFF".
- * In the drum part. Program change messages are ignored when the Bank is set at 129 - 16384 (ie. the value of the control change number 0 is not 00H).

■ Channel pressure

Status	Second
DnH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
vv=Value:00H - 7FH (0 - 127)

- * Effect to the parameter set on "MOD controller function".
The default setting has no effect.
- * Ignored when "Rx. Channel pressure = OFF".

■ Pitch bend change

Status	Second	Third
EnH	llH	mmH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
mm,ll=Value:00 00H - 40 00H - 7F 7FH (-8192 - 0 - +8191)

- * Effect to the parameter set on "MOD controller function".
The default setting is pitch bend.
- * Ignored when "Rx. Pitch Bend change = OFF".

- Channel Mode Messages -

■ All sounds off

Status	Second	Third
BnH	78H	00H

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

- * When "All sounds off" is received, all sounds on a specified channel turn off immediately.
However, the state of channel messages does not change. You must not use "All sound off" message for "Note off".

■ Reset all controllers

Status	Second	Third
BnH	79H	00H

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

- * When "reset all controllers" is received, the controller value of a specified channel returns to the default values as follows.

Controller	Default Value
Pitch bend change	%0(Center)
Polyphonic key pressure	0(off)
Channel pressure	0(off)
Modulation	0(off)
Expression	127(maximum)
Hold 1	0(off)
Portamento	0(off)
Sostenuto	0(off)
Soft	0(off)
RPN disabled.	The parameter already set retains its old value.
NRPN disabled.	The parameter already set retains its old value.

■ All notes off

Status	Second	Third
BnH	7BH	00H

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

- * When "All notes off" is received, all notes are turned off in the specified channel.
However, sound continues while hold1 and/or sostenuto is on.

■ OMNI OFF

Status	Second	Third
BnH	7CH	00H

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

- * OMNI OFF is only recognized as "all notes off". Mode doesn't change.

■ **OMNI ON**

Status	Second	Third
BnH	7DH	00H

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

* OMNI ON is only recognized as "all notes off". Mode doesn't change (OMNI OFF remains).

■ **MONO**

Status	Second	Third
BnH	7EH	mmH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
mm=number of mono:00H - 10H (0 - 16)

* MONO is recognized as "all sounds off". The specified channel turns to Mode4 (M=1), even if mm is not equal to 1 (mm is ignored).

■ **POLY**

Status	Second	Third
BnH	7FH	00H

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

* POLY is recognized as "all sounds off". The specified channel turns to Mode3.

- **System Realtime Message -**

■ **Active sensing**

Status
FEH

* Having received an "active sensing" message, RA-95 expects to receive additional active sensing messages at 300ms intervals. If the interval is greater than 420ms, RA-95 executes "All sounds off", "All notes off" and "Reset all controllers" and returns to normal operation. (Monitoring of active sensing messages will terminate.)

■ **Sequencer start**

Status
FAH

When "Sequencer start" is received the internal recorder starts.

■ **Sequencer stop**

Status
FCH

When "Sequencer stop" is received the internal recorder and/or the internal arranger stop.

■ **Timing clock**

Status
F8H

When "Timing clock" is received the internal recorder is synchronized with an external clock.

note: This message is received when the parameter "Midi Rx Mode" is "MIDI2" or "AUTO2" if the Midi File Player is in Play and when the parameter "Midi Rx Mode" is not "Internal" if the Midi File Player is in Record.

- **System Exclusive Message -**

Status	Second	Third
F0H	iiH,ddH,.....,eeH	F7H

F0H: System exclusive
ii=ID number: The ID number identifies the manufacturer of a MIDI device that triggers an exclusive message. Value 7EH and 7FH are reserved to use as universal messages which are used for extension of the MIDI Standard.

41H: Roland's Manufacturer-ID.
7EH: Universal Non-Realtime Message
7FH: Universal Realtime Message
dd.....ee=data:00H-7FH (0-127)
F7H: EOX (End of Exclusive/System common)

■ **System Exclusive Messages of Mode Change**

System Exclusive Messages of Mode Change are the messages used to initialize the internal parameters of the device to General MIDI mode or GS default mode. "GS reset" and "Exit GS mode" use a form of Roland Exclusive Message. "Turn General MIDI System On" and "Turn General MIDI System Off" use a form of Universal Non-real Time Message.

■ **GS reset**

Status	Data Byte	Status
F0H	41H, 10H, 42H, 12H, 40H, 00H, 7FH, 00H, 41H	F7H
Byte	Description	
F0H	Exclusive status	
41H	ID number	(Roland)
10H	Device ID	(dev => 10H)
42H	Model ID	(GS)
12H	Command ID	(DT1)
40H	Address MSB	
00H	:	
7FH	Address LSB	
00H	Data	(GS reset)
41H	Checksum	
F7H	EOX	(End of exclusive)

* Upon receiving this message, all the internal parameters are set to the default settings of the GS Format. (Rx.NRPN SW will be turned ON by this message.)
* It takes about 100 ms to execute this message.

■ **Exit GS mode**

Status	Data Byte	Status
F0H	41H, 10H, 42H, 12H, 40H, 00H, 7FH, 7FH, 42H	F7H
Byte	Description	
F0H	Exclusive status	
41H	ID number	(Roland)
10H	Device ID	(dev => 10H)
42H	Model ID	(GS)
12H	Command ID	(DT1)
40H	Address MSB	
00H	:	
7FH	Address LSB	
7FH	Data	(Exit GS mode)
42H	Checksum	
F7H	EOX	(End of exclusive)

* Upon receiving this message, the unit changes from GS to RA-95 default mode.
* It takes about 100 ms to execute this message.

■ **Turn General MIDI System On**

Status	Data Byte	Status
F0H	7EH, 7FH, 09H, 01H	F7H
Byte	Description	
F0H	Exclusive status	
7EH	ID number	(Universal non-real time message)
7FH	ID of target device	(Broadcast)
09H	sub-ID#1	(General MIDI message)
01H	sub-ID#2	(General MIDI On)
F7H	EOX	(End of exclusive)

* Upon receiving this message, all the internal parameters are set to the default settings of General MIDI System Level 1.
* It takes about 100 ms to execute this message.

■ Turn General MIDI System Off

Status	Data Byte	Status
F0H	7EH, 7FH, 09H, 02H	F7H

Byte	Description
F0H	Exclusive status
7EH	ID number (Universal non-real time message)
7FH	ID of target device (Broadcast)
09H	sub-ID#1 (General MIDI message)
02H	sub-ID#2 (General MIDI Off)
F7H	EOX (End of exclusive)

- * Upon receiving this message, the unit changes from General MIDI mode to RA-95 default mode.
- * It takes about 100 ms to execute this message.

■ Data Transfer

RA-95 can transmit and receive the various parameters using System Exclusive messages of the following data format.

GS Common Exclusive messages use Model ID = 42H and Device ID = 17(10H). RA-95 have a unique Exclusive communication function which has it's own Model IDs in addition to the GS Common Exclusive messages.

■ Request data 1 RQ1

This message is sent out to request the remote device to send back the required data. It contains data for the address and size that specify designation and length, respectively. On receiving a proper RQ1 message for the device, the device will transmit a "Data set 1 (DT1)" message, which contains the requested data. Otherwise, the device will not send anything.

Status	Data Byte	Status
F0H	41H, 10H, 42H, 11H, aaH, bbH, ccH, ssH, ttH, uuH, sum	F7H

Byte	Description
F0H	Exclusive status
41H	Manufacturer's ID (Roland)
10H	Device ID (dev => 10H)
42H	Model ID (GS)
11H	Command ID (RQ1)
aaH	Address MSB
bbH	:
ccH	Address LSB
ssH	Size MSB
ttH	:
uuH	Size LSB
sum	Checksum
F7H	EOX (End of exclusive)

- * RA-95 only recognize the RQ1 messages whose address and size match the Parameter Address Map (Section 3).
- * The error checking process uses a Checksum. Refer to Section 4 to calculate a Checksum.

■ Data set 1 DT1

This message corresponds to the actual data transfer process. On receiving a DT1 message, the device writes the data to internal memory according to the address.

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

Byte	Description
F0H	Exclusive status
41H	Manufacturer's ID (Roland)
10H	Device ID (dev => 10H)
42H	Model ID (GS)
12H	Command ID (DT1)
aaH	Address MSB
bbH	:
ccH	Address LSB
ddH	Data
:	:
eeH	Data
sum	Checksum
F7H	EOX (End of exclusive)

- * RA-95 only recognize the DT1 messages whose address and size match the Parameter Address Map (Section 3).
- * To send large DT1 messages at a time, insert 40ms - intervals at least in between each packet.
- * The error checking process uses a Checksum. Refer to Section 4 to calculate a Checksum.

2 Transmit data (Sound Module, Keyboard Section, Standard Midi File Player)

- Channel Voice Messages -

■ Note off

Status	Second	Third
9nH	kkH	00H

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 kk=Note number: 00H - 7FH (0 - 127)
 vv=Velocity: 00H (0)

■ Note on

Status	Second	Third
9nH	kkH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 kk=Note number: 00H - 7FH (0 - 127)
 vv=Velocity: 01H - 7FH (1 - 127)

■ Control change

Bank select

Status	Second	Third
BnH	00H	mmH
BnH	20H	llH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 mm,ll=Bank number: 00H,00H - 7FH,7FH (bank1 - bank16384)

Modulation

Status	Second	Third
BnH	01H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Modulation depth: 00H - 7FH (0 - 127)

* The RA-95 does not send this message if "Modulation Midi Tx Filter = OFF".

Volume

Status	Second	Third
BnH	07H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Volume: 00H - 7FH (0 - 127)

Pan pot

Status	Second	Third
BnH	0AH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Panpot: 00H - 40H - 7FH (Left - Center - Right)

Hold1

Status	Second	Third
BnH	40H	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Control Value: 00H - 7FH (0 - 127) 0 - 63 = OFF, 64 - 127 = ON

Effect1 depth (Reverb send level)

Status	Second	Third
BnH	5BH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Reverb send level: 00H - 7FH (0 - 127)

* Effect1 depth messages control the Send Level of the specified channel (part) to the internal Reverb unit.

Effect3 depth (Chorus send level)

Status	Second	Third
BnH	5DH	vvH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 vv=Chorus send level: 00H - 7FH (0 - 127)

* Effect3 depth messages control the Send Level of the specified channel (part) to the internal Chorus unit.

■ **Program change**

Status	Second
CnH	ppH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 pp=Program number: 00H - 7FH (prog.1 - prog.128)

■ **Pitch bend change**

Status	Second	Third
EnH	llH	mmH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 mm,ll=Value: 00 00H - 40 00H - 7F 7FH (-8192 - 0 - +8191)

- **Channel Mode Messages -**

■ **MONO**

Status	Second	Third
BnH	7EH	mmH

n=MIDI channel number: 0H - FH (ch.1 - ch.16)
 mm=number of mono: 00H - 10H (0 - 16)

*The specified channel turns to Mode4 (M=1).

■ **POLY**

Status	Second	Third
BnH	7FH	00H

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

*The specified channel turns to Mode3.

- **System Realtime Message -**

■ **Active sensing**

Status
FEH

* Transmits at about 250ms intervals.

■ **Sequencer start**

Status
FAH

* Transmitted if "Midi Tx Str/Stp" is On.

■ **Sequencer stop**

Status
FCH

* Transmitted if "Midi Tx Str/Stp" is On.

■ **Timing clock**

Status
F8H

* Transmitted if "Midi Tx Clock" is On.

- **System Exclusive Message -**

■ **Data Transfer**

RA-95 transmits "Data set 1 (DT1)" message when receiving a proper "Request Data 1(RQ1)" message. Refer to section1(System Exclusive Message)

■ **Data set 1 DT1(12H)**

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

Byte	Description
F0H	Exclusive status
41H	Manufacturer's ID (Roland)
10H	Device ID (dev => 10H)
42H	Model ID (GS)
12H	Command ID (DT1)
aaH	Address MSB
bbH	Address
ccH	Address LSB
ddH	Data
:	:
eeH	Data
sum	Checksum
F7H	EOX (End of exclusive)

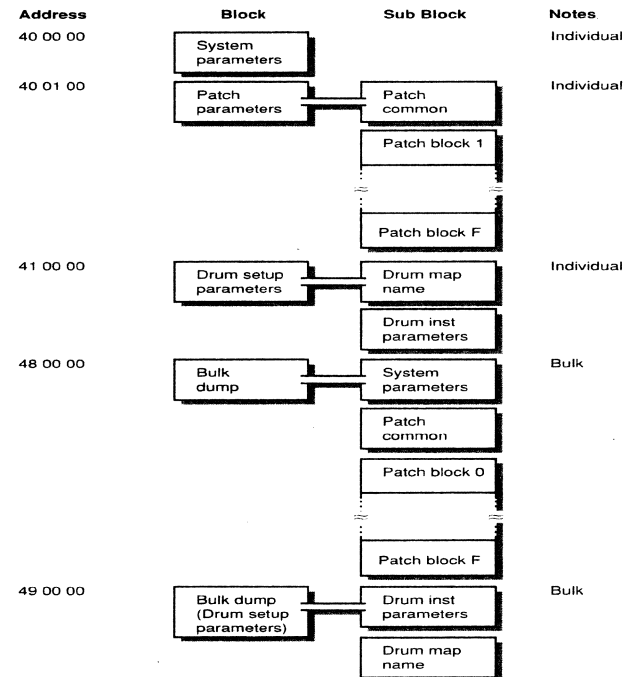
- * RA-95 only send the DT1 messages whose address and size match the Parameter Address Map (Section 3).
- * If the data to send is a large data (more than 128 bytes), then the data will be sent out in separate packets.
- * Refer to Section 4 to calculate a Checksum.

3 Parameter address map (Model ID=42H)

This map indicates address, size, Data (range), Parameter, Description, and Default Value of parameters which can be transferred using "Request data 1 (RQ1)" and "Data set 1 (DT1)". All the numbers of address, size, Data, and Default Value are indicated in 7-bit Hexadecimal-form.

■ **Address Block map**

An outlined address map of the Exclusive Communication is shown below;



There are two types of GS Exclusive message. One is an individual parameter communication, the other is a bulk dump communication.

■ Individual parameter

You can use individual parameter communication to send or request an individual parameter value. One packet of System Exclusive messages "F0 F7" can only have one parameter (which may contain several bytes). You cannot use any address having "#" for the top address in a System Exclusive message.

■ System Parameters

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)
40 00 00	00 00 04	0018 - 07E8	MASTER TUNE	-100.0 - +100.0 [cent] Use nibblized data.	00 04 00 00
40 00 01#					
40 00 02#					
40 00 03#					
40 00 04	00 00 010	0 - 7F	MASTER VOLUME	0 - 127 7F	
40 00 05	00 00 01	28 - 58	MASTER KEY-SHIFT	24 - +24 semitones	40
40 00 06	00 00 01	01 - 7F	MASTER PAN		40
40 00 7F	00 00 01	00, 7F	MODE SET (Rx Only)	00 = GS Reset 127 = Exit GS	

Refer to "System Exclusive Messages of Mode Change" Page ...)

■ Patch Parameters

RA-95 has 16 parts The parameters of each part are called PATCH PARAMETERS. To send or request a PATCH PARAMETER, use not the part number (which is usually same as the MIDI channel number) but the BLOCK NUMBER in the message.

*x...BLOCK NUMBER (0 - F), Part 1 (default MIDlch = 1) x=1
 Part 2 (default MIDlch = 2) x=2
 :
 :
 Part 9 (default MIDlch = 9) x=9
 Part10 (default MIDlch =10) x=0
 Part11 (default MIDlch =11) x=A
 Part12 (default MIDlch =12) x=B
 :
 :
 Part16 (default MIDlch =16) x=F

*n...MIDI channel number (0 - F) of the BLOCK.

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)
40 01 00	00 00 10	20 - 7F	PATCH NAME	16 ASCII Characters	
40 01 #					
40 01 0F#					
40 01 10	00 00 10	00 - 18	VOICE RESERVE	Part 10(Drum Part)	02
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 #				:	
40 01 1F#				Part 16	00

The sum total of voices in the voice reserve function must be equal or less than the number of the maximum polyphony. The the number of the maximum polyphony of RA-95 is 28. For the compatibility to other GS models, it is recommended to be equal or less than 24.

40 01 30	00 00 01	00 - 07	REVERB MACRO	00: Room 1 01: Room 2 02: Room 3 03: Hall 1 04: Hall 2 05: Plate 06: Delay	04
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40 01 31	00 00 01	00 - 07	REVERB CHARACTER		04
40 01 32	00 00 01	00 - 07	REVERB PRE-LPF		00
40 01 33	00 00 01	00 - 7F	REVERB LEVEL		40
40 01 34	00 00 01	00 - 7F	REVERB TIME		40
40 01 35	00 00 01	00 - 7F	REVERB DELAY FEEDBACK		00
40 01 36	00 00 01	00 - 7F	REVERB SEND LEVEL TO CHORUS		00

REVERB MACRO is a parameter used to select the preset type of the effect. When set to another REVERB MACRO, all other reverb parameters will reset to the values set for each type of REVERB MACRO.

40 01 38	00 00 01	00 - 07	CHORUS MACRO	00: Chorus 1 01: Chorus 2 02: Chorus 3 03: Chorus 4 04: Feedback Chorus 05: Flanger 06: Short Delay 07: Short Delay(FB)	02
40 01 39	00 00 01	00 - 07	CHORUS PRE-LPF		00
40 01 3A	00 00 01	00 - 7F	CHORUS LEVEL		40
40 01 3B	00 00 01	00 - 7F	CHORUS FEEDBACK		08
40 01 3C	00 00 01	00 - 7F	CHORUS DELAY		50
40 01 3D	00 00 01	00 - 7F	CHORUS RATE		03
40 01 3E	00 00 01	00 - 7F	CHORUS DEPTH		13
40 01 3F	00 00 01	00 - 7F	CHORUS SEND LEVEL TO REVERB		00

CHORUS MACRO is a parameter used to select the preset type of effect. When set to another CHORUS MACRO, then all other chorus parameters will reset to the values set for each type of CHORUS MACRO.

40 1x 00	00 00 02	00 - 7F	TONE NUMBER	CC#00 VALUE	00
40 1x 01#	00 - 7F			P.C. VALUE	00
40 1x 02	00 00 01	00 - 10	Rx. CHANNEL	1 - 16,OFF	same as the Part#
40 1x 03	00 00 01	00 - 01	Rx. PITCH BEND	OFF / ON	01
40 1x 04	00 00 01	00 - 01	Rx. CH PRESSURE	(CA)OFF / ON	01
40 1x 05	00 00 01	00 - 01	Rx. PROGRAM CHANGE	OFF / ON	01
40 1x 06	00 00 01	00 - 01	Rx. CONTROL CHANGE	OFF / ON	01
40 1x 07	00 00 01	00 - 01	Rx. POLY PRESSURE	(PA)OFF / ON	01
40 1x 08	00 00 01	00 - 01	Rx. NOTE MESSAGE	OFF / ON	01
40 1x 09	00 00 01	00 - 01	Rx. RPN	OFF / ON	01
40 1x 0A	00 00 01	00 - 01	Rx. NRPN	OFF / ON	00(01')

* Rx. NRPN is set to ON by "GS RESET".

40 1x 0B	00 00 01	00 - 01	Rx. MODULATION	OFF / ON	01
40 1x 0C	00 00 01	00 - 01	Rx. VOLUME	OFF / ON	01
40 1x 0D	00 00 01	00 - 01	Rx. PANPOT	OFF / ON	01
40 1x 0E	00 00 01	00 - 01	Rx. EXPRESSION	OFF / ON	01
40 1x 0F	00 00 01	00 - 01	Rx. HOLD1	OFF / ON	01
40 1x 10	00 00 01	00 - 01	Rx. PORTAMENTO	OFF / ON	01
40 1x 11	00 00 01	00 - 01	Rx. SOSTENUTO	OFF / ON	01
40 1x 12	00 00 01	00 - 01	Rx. SOFT	OFF / ON	01
40 1x 13	00 00 01	00 - 01	MONO/POLY MODE	Mono / Poly (=Bn 7E 01 / Bn 7F 00)	01
40 1x 14	00 00 01	00 - 02	ASSIGN MODE	0 = SINGLE 1 =LIMITED-MULTI 2 = FULL-MULTI	00 at x=0 01 at x%0

ASSIGN MODE is a parameter used to select the voice assign manner when "multiple Note Ons" occur(the same note number on the same channel at the same time). The best assign modes (SINGLE(0) for Drum part and LIMITED-MULTI(1) for the other parts) are selected automatically. so you don't need reset this parameter.

40 1x 15	00 00 01	00 - 02	USE FOR RHYTHM PART	0 = OFF 1 = MAP101 at x=0 2 = MAP2	00 at x%0
----------	----------	---------	---------------------	--	-----------

USE FOR RHYTHM PART is a parameter to define the part to be used as an ordinary part (0), as a drum part using DRUM MAP1(1), or a drum part using DRUM MAP2(2). The default is MAP1(1) for Part10 (MIDI CH-10,x=0), and all other parts are set to ordinary parts(OFF(0)).

40 1x 16	00 00 01	28 - 58	PITCH KEY SHIFT	-24 - +24 [semitone]	40
40 1x 17	00 00 02	08 - F8	PITCH OFFSET FINE	-12.0 - +12.0 [Hz]08	00
40 1x 18#				Use nibblized data.	

40 1x 19	00 00 01	00 - 7F	PART LEVEL	0 - 127 (=Bn 07 vv)	64	
40 1x 1A	00 00 01	00 - 7F	VELOCITY SENSE DEPTH	0 - 127	40	
40 1x 1B	00 00 01	00 - 7F	VELOCITY SENSE OFFSET	0 - 127	40	
40 1x 1C	00 00 01	00 - 7F	PART PANPOT	Random, -63(LEFT) - +63(RIGHT)40 (=Bn 0A vv, except random)		
40 1x 1D	00 00 01	00 - 7F	KEY RANGE LOW	C-1 - G9	00	
40 1x 1E	00 00 01	00 - 7F	KEY RANGE HIGH	C-1 - G9	7F	
40 1x 1F	00 00 01	00 - 5F	CC1 CONTROLLER NUMBER	0 - 95	10	
40 1x 20	00 00 01	00 - 5F	CC2 CONTROLLER NUMBER	0 - 95	11	
40 1x 21	00 00 01	00 - 7F	CHORUS SEND LEVEL	0 - 127 (=Bn 5D vv)	00	
40 1x 22	00 00 01	00 - 7F	REVERB SEND LEVEL	0 - 127 (=Bn 5B vv)	28	
40 1x 23	00 00 01	00 - 01	Rx. Bank Select	OFF / ON	01	\$\$\$
Rx. Bank Select is set to ON by power-on reset or by "GS RESET".						
40 1x 30	00 00 01	0E - 72	TONE MODIFY	1-50 - +50 (=Bn 63 01 62 08 06 vv)	40	
40 1x 31	00 00 01	0E - 72	Vibrato rate	2-50 - +50 (=Bn 63 01 62 09 06 vv)	40	
40 1x 32	00 00 01	0E - 72	TONE MODIFY	3-50 - +50 (=Bn 63 01 62 20 06 vv)	40	
40 1x 33	00 00 01	0E - 72	TVF cutoff freq.	4-50 - +50	40	\$\$\$
40 1x 34	00 00 01	0E - 72	TONE MODIFY	5-50 - +50 (=Bn 63 01 62 21 06 vv)	40	
40 1x 35	00 00 01	0E - 72	TVF&TVA Env.attack	6-50 - +50 (=Bn 63 01 62 64 06 vv)	40	
40 1x 36	00 00 01	0E - 72	TONE MODIFY	7-50 - +50 (=Bn 63 01 62 66 06 vv)	40	
40 1x 37	00 00 01	0E - 72	TVF&TVA Env.decay	8-50 - +50 (=Bn 63 01 62 0A 06 vv)	40	
40 1x 37	00 00 01	0E - 72	TONE MODIFY	8-50 - +50 (=Bn 63 01 62 0A 06 vv)	40	
40 1x 37	00 00 01	0E - 72	Vibrato delay	8-50 - +50 (=Bn 63 01 62 0A 06 vv)	40	
40 1x 40	00 00 0C	00 - 7F	SCALE TUNING	C-64 - +63 [cent]	40	
40 1x 41#	00 00 0C	00 - 7F	SCALE TUNING	C#-64 - +63 [cent]	40	
40 1x 42#	00 00 0C	00 - 7F	SCALE TUNING	D-64 - +63 [cent]	40	
40 1x 43#	00 00 0C	00 - 7F	SCALE TUNING	D#-64 - +63 [cent]	40	
40 1x 44#	00 00 0C	00 - 7F	SCALE TUNING	E-64 - +63 [cent]	40	
40 1x 45#	00 00 0C	00 - 7F	SCALE TUNING	F-64 - +63 [cent]	40	
40 1x 46#	00 00 0C	00 - 7F	SCALE TUNING	F#-64 - +63 [cent]	40	
40 1x 47#	00 00 0C	00 - 7F	SCALE TUNING	G-64 - +63 [cent]	40	
40 1x 48#	00 00 0C	00 - 7F	SCALE TUNING	G#-64 - +63 [cent]	40	
40 1x 49#	00 00 0C	00 - 7F	SCALE TUNING	A-64 - +63 [cent]	40	
40 1x 4A#	00 00 0C	00 - 7F	SCALE TUNING	A#-64 - +63 [cent]	40	
40 1x 4B#	00 00 0C	00 - 7F	SCALE TUNING	B-64 - +63 [cent]	40	
40 2x 00	00 00 01	28 - 58	MOD PITCH CONTROL	-24 - +24 [semitone]	40	
40 2x 01	00 00 01	00 - 7F	MOD TVF CUTOFF CONTROL	-9600 - +9600 [cent]	40	
40 2x 02	00 00 01	00 - 7F	MOD AMPLITUDE CONTROL	-100.0 - +100.0 [%]	40	
40 2x 03	00 00 01	00 - 7F	MOD LFO1 RATE CONTROL	-10.0 - +10.0 [Hz]	40	
40 2x 04	00 00 01	00 - 7F	MOD LFO1 PITCH DEPTH	-600 [cent]	0A	
40 2x 05	00 00 01	00 - 7F	MOD LFO1 TVF DEPTH	-2400 [cent]	00	
40 2x 06	00 00 01	00 - 7F	MOD LFO1 TVA DEPTH	-100.0 [%]	00	
40 2x 07	00 00 01	00 - 7F	MOD LFO2 RATE CONTROL	-10.0 - +10.0 [Hz]	40	
40 2x 08	00 00 01	00 - 7F	MOD LFO2 PITCH DEPTH	-600 [cent]	00	
40 2x 09	00 00 01	00 - 7F	MOD LFO2 TVF DEPTH	-2400 [cent]	00	
40 2x 0A	00 00 01	00 - 7F	MOD LFO2 TVA DEPTH	-100.0 [%]	00	
40 2x 10	00 00 01	40 - 58	BEND PITCH CONTROL	-24 [semitone]	42	
40 2x 11	00 00 01	00 - 7F	BEND TVF CUTOFF CONTROL	-9600 - +9600 [cent]	40	
40 2x 12	00 00 01	00 - 7F	BEND AMPLITUDE CONTROL	-100.0 - +100.0 [%]	40	
40 2x 13	00 00 01	00 - 7F	BEND LFO1 RATE CONTROL	-10.0 - +10.0 [Hz]	40	
40 2x 14	00 00 01	00 - 7F	BEND LFO1 PITCH DEPTH	-600 [cent]	00	
40 2x 15	00 00 01	00 - 7F	BEND LFO1 TVF DEPTH	-2400 [cent]	00	
40 2x 16	00 00 01	00 - 7F	BEND LFO1 TVA DEPTH	-100.0 [%]	00	
40 2x 17	00 00 01	00 - 7F	BEND LFO2 RATE CONTROL	-10.0 - +10.0 [Hz]	40	
40 2x 18	00 00 01	00 - 7F	BEND LFO2 PITCH DEPTH	-600 [cent]	00	
40 2x 19	00 00 01	00 - 7F	BEND LFO2 TVF DEPTH	-2400 [cent]	00	
40 2x 1A	00 00 01	00 - 7F	BEND LFO2 TVA DEPTH	-100.0 [%]	00	
40 2x 20	00 00 0	128 - 58	CAI PITCH CONTROL	-24 - +24 [semitone]	40	
40 2x 21	00 00 0	100 - 7F	CAI TVF CUTOFF CONTROL	-9600 - +9600 [cent]	40	
40 2x 22	00 00 0	100 - 7F	CAI AMPLITUDE CONTROL	-100.0 - +100.0 [%]	40	
40 2x 23	00 00 01	00 - 7F	CAI LFO1 RATE CONTROL	-10.0 - +10.0 [Hz]	40	
40 2x 24	00 00 01	00 - 7F	CAI LFO1 PITCH DEPTH	-600 [cent]	00	
40 2x 25	00 00 01	00 - 7F	CAI LFO1 TVF DEPTH	-2400 [cent]	00	
40 2x 26	00 00 01	00 - 7F	CAI LFO1 TVA DEPTH	-100.0 [%]	00	
40 2x 27	00 00 01	00 - 7F	CAI LFO2 RATE CONTROL	-10.0 - +10.0 [Hz]	40	
40 2x 28	00 00 01	00 - 7F	CAI LFO2 PITCH DEPTH	-600 [cent]	00	
40 2x 29	00 00 01	00 - 7F	CAI LFO2 TVF DEPTH	-2400 [cent]	00	
40 2x 2A	00 00 01	00 - 7F	CAI LFO2 TVA DEPTH	-100.0 [%]	00	

40 2x 30	00 00 0	128 - 58	PAI PITCH CONTROL	-24 - +24 [semitone]	40	
40 2x 31	00 00 0	100 - 7F	PAI TVF CUTOFF CONTROL	-9600 - +9600 [cent]	40	
40 2x 32	00 00 0	100 - 7F	PAI AMPLITUDE CONTROL	-100.0 - +100.0 [%]	40	
40 2x 33	00 00 0	100 - 7F	PAI LFO1 RATE CONTROL	-10.0 - +10.0 [Hz]	40	
40 2x 34	00 00 0	100 - 7F	PAI LFO1 PITCH DEPTH	-600 [cent]	00	
40 2x 35	00 00 0	100 - 7F	PAI LFO1 TVF DEPTH	-2400 [cent]	00	
40 2x 36	00 00 0	100 - 7F	PAI LFO1 TVA DEPTH	-100.0 [%]	00	
40 2x 37	00 00 0	100 - 7F	PAI LFO2 RATE CONTROL	-10.0 - +10.0 [Hz]	40	
40 2x 38	00 00 0	100 - 7F	PAI LFO2 PITCH DEPTH	-600 [cent]	00	
40 2x 39	00 00 0	100 - 7F	PAI LFO2 TVF DEPTH	-2400 [cent]	00	
40 2x 3A	00 00 0	100 - 7F	PAI LFO2 TVA DEPTH	-100.0 [%]	00	
40 2x 40	00 00 0	128 - 58	CC1 PITCH CONTROL	-24 - +24 [semitone]	40	
40 2x 41	00 00 0	100 - 7F	CC1 TVF CUTOFF CONTROL	-9600 - +9600 [cent]	40	
40 2x 42	00 00 0	100 - 7F	CC1 AMPLITUDE CONTROL	-100.0 - +100.0 [%]	40	
40 2x 43	00 00 0	100 - 7F	CC1 LFO1 RATE CONTROL	-10.0 - +10.0 [Hz]	40	
40 2x 44	00 00 0	100 - 7F	CC1 LFO1 PITCH DEPTH	-600 [cent]	00	
40 2x 45	00 00 0	100 - 7F	CC1 LFO1 TVF DEPTH	-2400 [cent]	00	
40 2x 46	00 00 0	100 - 7F	CC1 LFO1 TVA DEPTH	-100.0 [%]	00	
40 2x 47	00 00 0	100 - 7F	CC1 LFO2 RATE CONTROL	-10.0 - +10.0 [Hz]	40	
40 2x 48	00 00 0	100 - 7F	CC1 LFO2 PITCH DEPTH	-600 [cent]	00	
40 2x 49	00 00 0	100 - 7F	CC1 LFO2 TVF DEPTH	-2400 [cent]	00	
40 2x 4A	00 00 0	100 - 7F	CC1 LFO2 TVA DEPTH	-100.0 [%]	00	
40 2x 50	00 00 0	128 - 58C	C2 PITCH CONTROL	-24 - +24 [semitone]	40	
40 2x 51	00 00 0	100 - 7FC	C2 TVF CUTOFF CONTROL	-9600 - +9600 [cent]	40	
40 2x 52	00 00 0	100 - 7FC	C2 AMPLITUDE CONTROL	-100.0 - +100.0 [%]	40	
40 2x 53	00 00 0	100 - 7FC	C2 LFO1 RATE CONTROL	-10.0 - +10.0 [Hz]	40	
40 2x 54	00 00 0	100 - 7FC	C2 LFO1 PITCH DEPTH	-600 [cent]	00	
40 2x 55	00 00 0	100 - 7FC	C2 LFO1 TVF DEPTH	-2400 [cent]	00	
40 2x 56	00 00 0	100 - 7FC	C2 LFO1 TVA DEPTH	-100.0 [%]	00	
40 2x 57	00 00 0	100 - 7FC	C2 LFO2 RATE CONTROL	-10.0 - +10.0 [Hz]	40	
40 2x 58	00 00 0	100 - 7FC	C2 LFO2 PITCH DEPTH	-600 [cent]	00	
40 2x 59	00 00 0	100 - 7FC	C2 LFO2 TVF DEPTH	-2400 [cent]	00	
40 2x 5A	00 00 0	100 - 7FC	C2 LFO2 TVA DEPTH	-100.0 [%]	00	

■ DRUM SETUP PARAMETERS

*m:Map number (0 = MAP1, 1 = MAP2)
*rr:drum part note number (OOH - 7FH)

Address(H)	Size(H)	Data(H)	Parameter	Description
41 m0 00	00 00 0	C20 - 7F	DRUM MAP NAME	ASCII Character
41 m0 0B#		#		
41 m1 rr	00 00 01	00 - 7F	PLAY NOTE NUMBER	Pitch coarse
41 m2 rr	00 00 01	00 - 7F	LEVEL	TVA level (=Bn 63 1A 62 rr 06 vv)
41 m3 rr	00 00 01	00 - 7F	ASSIGN GROUP NUMBER	Non, 1 - 127
41 m4 rr	00 00 01	00 - 7F	PANPOT	Random, -63(LEFT) - +63(RIGHT) (=Bn 63 1C 62 rr 06 vv)
41 m5 rr	00 00 01	00 - 7F	REVERB SEND LEVEL	0.0 - 1.0 Multiplicand of the part reverb depth (=Bn 63 1D 62 rr 06 vv)
41 m6 rr	00 00 01	00 - 7F	CHORUS SEND LEVEL	0.0 - 1.0 Multiplicand of the part chorus depth (=Bn 63 1E 62 rr 06 vv)
41 m7 rr	00 00 01	00 - 01	Rx. NOTE OFF	OFF / ON
41 m8 rr	00 00 01	00 - 01	Rx. NOTE ON	OFF / ON

When you change Drum Sets, all values of the DRUM SETUP PARAMETERS will be initialized.

■ Bulk Dump

You can send or request bulk data which contains a large amount of parameter data by using Bulk Dump communication.

It is used for storing bulk data in a sequencer or a computer.

To send or request bulk data, use the Address and Size indicated in the following map.

You cannot use any address having "#" for the top address in a System Exclusive message except the following case.

Messages which include large data (more than 128 bytes) are sent out in separate packets, then, the top address of the following messages may be the address marked "#".

To send several packets of large DT1 messages at a time, insert intervals of at least 40ms in between those packets.

■ All Parameters (System Parameters and all Patch Parameters)

Address(H)	Size(H)	Description	Number of packets
48 00 00 # 48 1D 0F#	00 1D 10	ALL	30 packets

■ System Parameters

Address(H)	Size(H)	Description	Number of packets
48 00 00 # 48 00 0F#	00 00 10	SYSTEM PARAMETERS	1 packet

■ Patch Parameters

Address(H)	Size(H)	Description	Number of packets
48 00 10 # 48 01 0F#	00 01 00	PATCH COMMON	1 packet
48 01 10 # 48 02 6F#	00 01 60	BLOCK 0	2 packets
48 02 70 # 48 04 4F#	00 01 60	BLOCK 1	2 packets
48 04 50 # 48 06 2F#	00 01 60	BLOCK 2	2 packets
48 06 30 # 48 08 0F#	00 01 60	BLOCK 3	2 packets
48 08 10 # 48 09 6F#	00 01 60	BLOCK 4	2 packets
48 09 70 # 48 0B 4F#	00 01 60	BLOCK 5	2 packets
48 0B 50 # 48 0D 2F#	00 01 60	BLOCK 6	2 packets
48 0D 30 # 48 0F 0F#	00 01 60	BLOCK 7	2 packets
48 0F 10 # 48 10 6F#	00 01 60	BLOCK 8	2 packets
48 10 70 # 48 12 4F#	00 01 60	BLOCK 9	2 packets
48 12 50 # 48 14 2F#	00 01 60	BLOCK A	2 packets
48 14 30 # 48 16 0F#	00 01 60	BLOCK B	2 packets
48 16 10 # 48 17 6F#	00 01 60	BLOCK C	2 packets
48 17 70 # 48 19 4F#	00 01 60	BLOCK D	2 packets
48 19 50 # 48 1B 2F#	00 01 60	BLOCK E	2 packets

48 1B 30 # 48 1D 0F#	00 01 60	BLOCK F	2 packets
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■ DRUM SETUP PARAMETERS

*m: map number (0 = MAP1, 1 = MAP2)

Address(H)	Size(H)	Description	Number of packets
49 m0 00 49 m1 7F	00 02 00	PLAY NOTE NUMBER	2 packets
49 m2 00 49 m3 7F	00 02 00	LEVEL	2 packets
49 m4 00 49 m5 7F	00 02 00	ASSIGN GROUP NUMBER	2 packets
49 m6 00 49 m7 7F	00 02 00	PANPOT	2 packets
49 m8 00 49 m9 7F	00 02 00	REVERB SEND LEVEL	2 packets
49 mA 00 49 mB 7F	00 02 00	CHORUS SEND LEVEL	2 packets
49 mC 00 49 MD 7F	00 02 00	Rx. NOTE ON/OFF	2 packets
49 ME 00 49 ME 17	00 00 18	DRUM MAP NAME	1 packet

4 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, Bank number, 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 more resolution.

i.e. The number "ad bbH" in 7-bit Hexadecimal is "ad x 128 + bb" in Decimal form.

*A signed number (with a sign +/-) is indicated as 00H = -64, 40H = %0, 7FH = +63.

So the signed number "aaH" in 7-bit Hexadecimal is "ad - 64" (ad is the decimal number of aaH).

In case of two bytes, it is regarded as 00 00H = -8192, 40 00H = %0, 7F 7FH = +8191.

So the signed number "ad bbH" in 7-bit Hexadecimal is "ad bbH - 40 00H = ad x 128 + bb - 64 x 128", where, ad and bb is the decimal number of aaH and bbH respectively.

*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 0D" 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 = 41885

Example of actual MIDI messages

<Example 1> 92 3E 5F

"9n" 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 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 GS).

<Example 3> EA 00 28

"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 (28H) is an MSB of a Pitch bend value (%signed).

The Pitch bend value is:

28 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 x (-3072) % (-8192) = -75 cent

<Example 4> B3 64 00 65 00 06 0C 26 00 64 7F 65 7F

"Bn" is a status of a Control change message, and "n" is a MIDI channel number.

The second byte is a Control number and the third is the value.

This packet uses the running status rule, that is, when you send a series of messages with the same status, you can omit the following status bytes.

This message contains :

```

B3 64 00  MIDI CH = 4  LSB of RPN parameter number  : 00H
(B3) 65 00  MIDI CH = 4  MSB of RPN parameter number  : 00H
(B3) 06 0C  MIDI CH = 4  MSB of Data entry             : 0CH
(B3) 26 00  MIDI CH = 4  LSB of Data entry             : 00H
(B3) 64 7F  MIDI CH = 4  LSB of RPN parameter number  : 7FH
(B3) 65 7F  MIDI CH = 4  MSB of RPN parameter number  : 7FH
    
```

This message string means 'send data "0C 00H" to RPN parameter number "00 00H", after that, set RPN parameter number to "7F 7F".

RPN parameter number "00 00H" is Pitch bend sensitivity and the unit of the MSB value is a semitone, so 0CH = 12 is a value

to set the Pitch bend sensitivity = 12 semitones (one octave).

GS devices ignore the LSB value of Pitch bend sensitivity. However, you had better send both MSB and LSB(=00H) to maintain data compatibility.

Once an RPN or NRPN number is set, all the Data entry messages sent after are effective.

Sometimes this rule may cause a problem if the MIDI data is played by a recorder and it is operated in fast forward or backward made. It is recommended, therefore, to set the RPN or NRPN number to 7F 7FH after sending the Data entry messages.

*To use running-status for several MIDI event like <example 4> in a song data (e.g. Standard MIDI File data) is not recommended.

There may be a recorder which can not handle such data correctly when it is operated in fast forward or backward. Putting the status byte for every event is the reliable way.

*The parameter number and the value of RPN or NRPN must be sent in correct order. As some recorders may send those recorded data in different order if an event is too close to another, it is recommended to place each event in a different tick. (1-CLK for TPQN=92, or 5-CLK for TPQN=480 is recommended.)

The send order may be different as each recorder if the events are in the same clock in sequence data.

Checksum of Roland System Exclusive messages

Roland System Exclusive messages (RQ1 and DT1) have a Checksum at the end of the data (just before EOX) to be able to check for communication errors.

The Checksum is determined by values of address and data (or size) included in the message.

<How to calculate Checksums> ("H" indicates Hexadecimal.)

The error checking process employs a sum-check error detection. It provides binary bit figures whose lower 7 bits are zero when values for an address, data (or size) and the Checksum are summed.

One practical equation to determine Checksum is:

If the address is "ad bb ccH" and the data(or the size) is "dd ee ffH"
 $ad + bb + cc + dd + ee + ff = \text{sum}$
 $\text{sum} \% 128 = \text{quotient} \% \text{remainder}$
 $128 - \text{remainder} = \text{checksum}$

<Example 1> Set "REVERB MACRO" to "ROOM 3"

According to the Parameter Address Map, the Address of REVERB MACRO is 40 01 30H, and the Value correspond to ROOM 3 is 02H.
So, the message should be :

F0 41 10 42 12 40 01 30 02 ?? F7 (1)Exclusive Status (4)Model ID (GS)
(2)ID (Roland) (5)Command ID (DT1)
(1) (2) (3) (4) (5) address data checksum (6) (3)Device ID (16) (6)End of Exclusive

The Checksum is :

$40H + 01H + 30H + 02H = 64 + 1 + 48 + 2 = 115(\text{sum})$
 $115(\text{sum}) \% 128 = 0(\text{quotient}) \% 115(\text{remainder})$
 $\text{checksum} = 128 - 115(\text{remainder}) = 13 = 0DH$

Therefore, the message to send is : F0 41 10 42 12 40 01 30 02 0D F7

<Example 2> To request LEVEL of NOTE NUMBER 75(D#5; Claves) in DRUM MAP 1

NOTE NUMBER 75(D#5) is 4BH in Hexadecimal.
The Address of "LEVEL of NOTE NUMBER 75(D#5; Claves) in DRUM MAP 1" is 41 02 4BH, and the size is 00 00 01H. So, the message should be :

F0 41 10 42 11 41 02 4B 00 00 01 ?? F7 (1)Exclusive Status (4)Model ID (GS)
(2)ID (Roland) (5)Command ID (RQ1)
(1) (2) (3) (4) (5) address size checksum (6) (3)Device ID (16) (6)End of Exclusive

The Checksum is :

$41H + 02H + 4BH + 00H + 00H + 01H = 65 + 2 + 75 + 0 + 0 + 1 = 143(\text{sum})$
 $143(\text{sum}) \% 128 = 1(\text{quotient}) \% 15(\text{remainder})$
 $\text{checksum} = 128 - 15(\text{remainder}) = 113 = 71H$

Therefore, the message to send is : F0 41 10 42 11 41 02 4B 00 00 01 71 F7

<Example 3> Set "MASTER TUNE" to +23.4 cents by System Exclusive
The Address of "MASTER TUNE" is 40 00 00H, and the Size is 00 00 04H.
The Value should be nibblized data whose resolution is 0.1 cents, and which is a signed value
(00 04 00 00H (= 1024) = %0).
 $+23.4[\text{cents}] = 234 + 1024 = 1258 = (\text{hexadecimal}) \Rightarrow 04 \text{ EAH} = (\text{nibblized}) \Rightarrow 00 04 0E 0AH$
So, the message should be :

F0 41 10 42 12 41 00 00 00 04 0E 0A ?? F7 (1)Exclusive Status (4)Model ID (GS)
(2)ID (Roland) (5)Command ID (DT1)
(1) (2) (3) (4) (5) address data checksum (6) (3)Device ID (16) (6)End of Exclusive

The Checksum is :

$41H + 00H + 00H + 00H + 04H + 0EH + 0AH = 65 + 0 + 0 + 0 + 4 + 14 + 10 = 93(\text{sum})$
 $93(\text{sum}) \% 128 = 0(\text{quotient}) \% 93(\text{remainder})$
 $\text{checksum} = 128 - 93(\text{remainder}) = 35 = 23H$

Therefore, the message to send is : F0 41 10 42 12 41 00 00 00 04 0E 0A 23 F7

MIDI IMPLEMENTATION CHART

[INTELLIGENT ARRANGER]
Model RA-95

(Sound module, SMF Player)
MIDI Implementation Chart (MIDI 1)

Date: Jan 1995
Version: 1.00

FUNCTION	TRANSMITTED	RECOGNIZED	REMARKS
Basic Channel Default Changed	1-16 X	1-16 1-16, OFF	
Mode Default Messages Altered	Mode 3 Mode 3 *****	Mode 3 Mode 3, 4(M=1)	*2
Note Number: True voice	0-127 *****	0-127 0-127	
Velocity Note ON Note OFF	O O	O X	v=1-127
After Touch Key's Ch's	O O	O O	*1 *1
Pitch Bender	O	O	O
Control Change	0,32 O *1 1 O *1 5 O *3 6,38 O *3 7 O *1 10 O *3 11 O *3 64 O *1 65 O *3 66 O *3 67 O *3 84 O *3 91 O *3 93 O *3 98,99 O *3 100,101 O *3 120 O *3 121 O *3	O (MSB only) *1 O *1 O *1 O *1 O *1 O *1 O *1 O *1 O *1 O *1 O *1 O *1 O *1 O (Reverb) *1 O (Chorus) *1 O *1 O *1 O *1 O *1	*1 Bank select *1 Modulation *1 Portamento time *1 Data entry *1 Volume *1 Panpot *1 Expression *1 Hold1 *1 Portamento *1 Sostenuto *1 Soft *1 Portamento control *1 Effect1 depth *1 Effect3 depth *1 NRPN LSB, MSB *1 RPN LSB, MSB All sound off Reset all controllers
Prog change: True #	O *1 *****	O *1 0-127	Prog. 1-128
System Exclusive	O	O	
System Common : Song Pos : Song Sel : Tune	O O X	O O X	
System Real Time : Clock : Commands	O O	O O	Midi file Record/Play Midi file Record/Play
Aux Messages : Local ON/OFF : All Notes OFF : Active Sense : Reset	X X O X	X O (123-125) O X	
Notes *1 O X is selectable *2 Recognize as M=1 even if M%1 *3 Transmission depending on Tx Song on/off parameter			

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

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

O: YES
X: NO

RA-95

RES 079-95

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