

# E-86

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**INTELLIGENT SYNTHESIZER**

**MIDI Implementation**

 **Roland**

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# E-86 INTELLIGENT SYNTHESIZER

MIDI IMPLEMENTATION

Version 1.00

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## ARRANGER SECTION

### 1 Receive data (Arranger Section)

#### - Channel Voice Messages -

##### ■ 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" and the Note number is outside the "Limits".

\*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" and the Note number is outside the "Limits".

##### ■ 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	11H

n=MIDI channel number : 0H - FH (ch.1 - ch.16)  
mm, 11=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 11H=00H).

However, when sending Bank Select messages, you have to send both of the MSB(mm) and LSB(11) together.

\*\*"Bank select" is suspended until receiving "Program change".

To select a Tone of another bank, you have to send Bank select(mm,11) 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	11H

n=MIDI channel number : 0H - FH (ch.1 - ch.16)  
mm,11=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 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	r r H	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	rr H	mmH	TVA level of drum instrument absolute change on specified drum instrument rr: key number of drum instrument mm: 00H-7FH (zero - maximum)
1CH	rr H	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	rr H	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	rr H	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	11H

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

mm =MSB of the RPN

11 =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	Data entry LSB	Description
00H	00H	mmH ---- Pitch bend sensitivity mm: 00H-18H (0 - 24 semitone) Default value=02H (two semitones) 11: ignored (value=00H) (Up to 2 octaves)
00H	01H	mmH 11H Master fine tuning mm, 11: 00 00H-40 00H-7F 7FH (-8192x100/8192 - 0 - +8191x100/8192 cents)
00H	02H	mmH ---- Master coarse tuning mm: 28H-40H-58H (-24 - 0 - +24 semitones) 11: ignored (value=00H)
7FH	7FH	---- ---- RPN null Return to disable condition. The parameter already set retains its value. mm,11: 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 Not-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	11H	mmH

n=MIDI channel number : 0H - FH (ch.1 - ch.16)  
mm, 11=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 specified channel return to the default at 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 Real Time Message

### ■ Active sensing

Status	
FEH	

\*Having received an "active sensing" message, E-86 expects to receive additional active sensing messages at 300ms intervals.  
If the interval is greater than 420ms, E-86 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			
midi1	start		start (record)
midi2		start (play)	start (record)
auto1	start		start (record)
auto2		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 E-86 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 E-86 default mode.

\*It takes about 100 ms to execute this message.

### ■ Data Transfer

E-86 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)

\*E-86 only recognizes 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)

\*E-86 only recognizes 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 E-86 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 E-86 does not send this message if "Midi Tx Channel" = Off

#### ■ Control change

\* The E-86 does not send this message if "Midi Tx Channel" = Off

#### Bank select

Status	Second	Third
BnH	00H	mmH
BnH	20H	11H

n=MIDI channel number : 0H - FH (ch.1 - ch.16)  
mm,I I=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 E-86 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 E-86 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 whith 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 E-86 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 E-86 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 E-86 does not send this message if "Chorus Depth Midi Tx Filter = OFF".

## ■ Program change

Status Second Third  
CnH ppH

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

\*The E-86 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,IIH=Value : 00 00H - 40 00H - 7F 7FH (-8192 - 0 - +8191)

\*The E-86 does not send this message if "Pitch Bender Midi Tx Filter = OFF".

## ■ 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

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

\*The E-86 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 E-86 does not send this message if "Midi TX Str/Stp = OFF".

### Timing clock

Status  
F8H

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

\*The E-86 does not send this message if "Midi TX Clock" = OFF.

## System Exclusive Message

### ■ Data Transfer

E-86 transmits "Data set 1 (DT1)" message when receiving a proper "Request Data 1(RQ1)" message. Refer to section 1(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)

\*E-86 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.

### 3.1 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 - 07EB	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 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 6.

#### [ PATCH PARAMETERS ]

E-86 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
Part 10 (default MIDIch = 10)	x=0	Acc Drums
Part 11 (default MIDIch = 11)	x=A	Lower
Part 12 (default MIDIch = 12)	x=B	Man Bass
Part 13 (default MIDIch = 13)	x=C	Rx only 1
Part 14 (default MIDIch = 14)	x=D	Rx only 2
Part 15 (default MIDIch = 15)	x=E	Rx only 3
Part 16 (default MIDIch = 16)	x=F	Man Drums

\*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 1 01: Room 2 02: Room 3 03: Hall 1 04: Hall 2 05: Plate 06: Delay 07: Panning Delay	04
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.

## **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	*	* guitar	
* piano				00H	00H	18H Nylon-str.Gt
00H	00H	00H	Piano 1	08H	00H	18H Ukulele
08H	00H	00H	Piano 1w	10H	00H	18H Nylon Gt.o
10H	00H	00H	Piano 1d	20H	00H	18H Nylon Gt.2

00H	00H	19H	Steel-str.Gt	* brass			
08H	00H	19H	12-str.Gt	00H	00H	38H	Trumpet
09H	00H	19H	Nylon+Steel	01H	00H	38H	Trumpet 2
10H	00H	19H	Mandolin	*			
20H	00H	19H	Steel-strGT2	00H	00H	39H	Trombone
*				01H	00H	39H	Trombone 2
00H	00H	1AH	Jazz Gt.	*			
08H	00H	1AH	Hawaiian Gt.	00H	00H	3AH	Tuba
*				*			
00H	00H	1BH	Clean Gt.	00H	00H	3BH	Muted Trumpet
08H	00H	1BH	Chorus Gt.	*			
*				00H	00H	3CH	French Horn
00H	00H	1CH	Muted Gt.	01H	00H	3CH	French Horn2
08H	00H	1CH	Funk Gt.	*			
10H	00H	1CH	Funk Gt.2	00H	00H	3DH	Brass 1
*				08H	00H	3DH	Brass 2
00H	00H	1DH	Overdrive Gt.	*			
*				00H	00H	3EH	Synth Brass1
00H	00H	1EH	DistortionGt.	08H	00H	3EH	Synth Brass3
08H	00H	1EH	Feedback Gt.	10H	00H	3EH	AnalogBrass1
*				*			
00H	00H	1FH	Gt.Harmonics	00H	00H	3FH	Synth Brass2
08H	00H	1FH	Gt. Feedback	08H	00H	3FH	Synth Brass4
10H	00H	1FH	Ac.Gt. Harmnx	10H	00H	3FH	AnalogBrass2
*				*			
* bass				* reed			
00H	00H	20H	Acoustic Bs.	00H	00H	40H	Soprano Sax
*				*			
00H	00H	21H	Fingered Bs.	00H	00H	41H	Alto Sax
*				08H	00H	41H	Sax 1
00H	00H	22H	Picked Bs.	*			
*				00H	00H	42H	Tenor Sax
00H	00H	23H	Fretless Bs.	08H	00H	42H	Sax 2
*				*			
00H	00H	24H	Slap Bass 1	00H	00H	43H	Baritone Sax
*				*			
00H	00H	25H	Slap Bass 2	00H	00H	44H	Oboe
*				*			
00H	00H	26H	Synth Bass 1	00H	00H	45H	English Horn
01H	00H	26H	SynthBass101	*			
08H	00H	26H	Synth Bass 3	00H	00H	46H	Bassoon
*				*			
00H	00H	27H	Synth Bass 2	00H	00H	47H	Clarinet
01H	00H	27H	SynthBass 201	*			
08H	00H	27H	Synth Bass 4	0H	00H	48H	Piccolo
10H	00H	27H	Rubber Bass	*			
*				00H	00H	49H	Flute
* strings & orchestral instruments				*			
00H	00H	28H	Violin	00H	00H	4AH	Recorder
08H	00H	28H	Slow Violin	*			
*				00H	00H	4BH	Pan Flute
00H	00H	29H	Viola	*			
*				00H	00H	4CH	Bottle Blow
00H	00H	2AH	Cello	*			
*				00H	00H	4DH	Shakuhachi
00H	00H	2BH	Contrabass	*			
*				00H	00H	4EH	Whistle
00H	00H	2CH	Tremolo Str	*			
*				00H	00H	4FH	Ocarina
00H	00H	2DH	PizzicatoStr	*			
*				00H	00H	49H	Synth lead
00H	00H	2EH	Harp	00H	00H	50H	Square Wave
*				01H	00H	50H	Square
00H	00H	2FH	Timpani	08H	00H	50H	Sine Wave
*				*			
* ensemble				00H	00H	51H	Saw Wave
00H	00H	30H	Strings	01H	00H	51H	Saw
08H	00H	30H	Orchestra	08H	00H	51H	Doctor Solo
*				*			
00H	00H	31H	Slow Strings	00H	00H	52H	Syn.Calliope
*				*			
00H	00H	32H	Syn.Strings1	00H	00H	53H	Chiffer Lead
08H	00H	32H	Syn.Strings3	*			
*				00H	00H	54H	Charang
00H	00H	33H	Syn.Strings2	*			
*				00H	00H	55H	Solo Vox
00H	00H	34H	Choir Aahs	*			
20H	00H	34H	Choir Aahs 2	00H	00H	56H	5th Saw Wave
*				*			
00H	00H	35H	Voice Oohs	00H	00H	57H	Bass & Lead
*				*			
00H	00H	36H	SynVox	* synth pad			
*				00H	00H	58H	Fantasia
00H	00H	37H	OrchestraHit	*			

00H	00H	59H	Warm Pad	02H	00H	7AH	Thunder
*				03H	00H	7AH	Wind
00H	00H	5AH	Polysynth	04H	00H	7AH	Stream
*				05H	00H	7AH	Bubble
00H	00H	5BH	Space Voice	*			
*				00H	00H	7BH	Bird
00H	00H	5CH	Bowed Glass	01H	00H	7BH	Dog
*				02H	00H	7BH	Horse-Gallop
00H	00H	5DH	Metal Pad	03H	00H	7BH	Bird 2
*				*			
00H	00H	5EH	Halo Pad	00H	00H	7CH	Telephone 1
*				01H	00H	7CH	Telephone 2
00H	00H	5FH	Sweep Pad	02H	00H	7CH	DoorCreaking
*				03H	00H	7CH	Door
* synth sfx				04H	00H	7CH	Scratch
00H	00H	60H	Ice Rain	05H	00H	7CH	Windchime
*				*			
00H	00H	61H	Soundtrack	00H	00H	7DH	Helicopter
*				01H	00H	7DH	Car-Engine
00H	00H	62H	Crystal	02H	00H	7DH	Car-Stop
01H	00H	62H	Syn Mallet	03H	00H	7DH	Car-Pass
*				04H	00H	7DH	Car-Crash
00H	00H	63H	Atmosphere	05H	00H	7DH	Siren
*				06H	00H	7DH	Train
00H	00H	64H	Brightness	07H	00H	7DH	Jetplane
*				08H	00H	7DH	Starship
00H	00H	65H	Goblin	09H	00H	7DH	Burst Noise
*				*			
00H	00H	66H	Echo Drops	00H	00H	7EH	Applause
01H	00H	66H	Echo Bell	01H	00H	7EH	Laughing
02H	00H	66H	Echo Pan	02H	00H	7EH	Screaming
*				03H	00H	7EH	Punch
00H	00H	67H	Star Theme	04H	00H	7EH	Heart Beat
*				05H	00H	7EH	Footsteps
* ethnic misc				*			
00H	00H	68H	Sitar	00H	00H	7FH	Gun Shot
01H	00H	68H	Sitar 2	01H	00H	7FH	Machine Gun
*				02H	00H	7FH	Lasergun
00H	00H	69H	Banjo	03H	00H	7FH	Explosion
*				*			
00H	00H	6AH	Shamisen				
*							
00H	00H	6BH	Koto	mmH	iiH	ppH	Set name
08H	00H	6BH	Taisho Koto				
*							
00H	00H	6CH	Kalimba	00H	00H	00H	Standard Set
*				00H	00H	08H	Room set
00H	00H	6DH	Bag Pipe	00H	00H	10H	Power set
*				00H	00H	18H	Elec set
00H	00H	6EH	Fiddle	00H	00H	19H	808 Set
*				00H	00H	20H	Jazz Set
00H	00H	6FH	Shanai	00H	00H	28H	Brush Set
*				00H	00H	30H	Orch. Set
* percussive				00H	00H	38H	Sfx
00H	00H	70H	Tinkle Bell				
*							
00H	00H	71H	Agogo				
*							
00H	00H	72H	Steel Drums				
*							
00H	00H	73H	Woodblock				
08H	00H	73H	Castanets				
*							
00H	00H	74H	Taiko				
08H	00H	74H	Concert BD				
*							
00H	00H	75H	Melo. Tom 1	mmH	iiH	ppH	Description
08H	00H	75H	Melo. Tom 2				
*				78H	00H	00H	User program #A11
00H	00H	76H	Synth Drum	78H	00H	01H	User program #A12
08H	00H	76H	808 Tom	78H	00H	02H	User program #A13
09H	00H	76H	Elec Perc	78H	00H	03H	User program #A14
*				78H	00H	04H	User program #A15
00H	00H	77H	Reverse Cym.	78H	00H	05H	User program #A16
*				78H	00H	06H	User program #A17
* sfx				78H	00H	07H	User program #A18
00H	00H	78H	Gt.FretNoise	78H	00H	08H	User program #A21
01H	00H	78H	Gt.Cut Noise	78H	00H	09H	User program #A22
02H	00H	78H	String Slap	78H	00H	0AH	User program #A23
*				78H	00H	0BH	User program #A24
00H	00H	79H	Breath Noise	78H	00H	0CH	User program #A25
01H	00H	79H	Fl.Key Click	78H	00H	0DH	User program #A26
*				78H	00H	0EH	User program #A27
00H	00H	7AH	Seashore	78H	00H	0FH	User program #A28
01H	00H	7AH	Rain	78H	00H	10H	User program #A31
				78H	00H	11H	User program #A32

### ■ Drum set program change

A Drum set is selected by the message :BnH 00H mmH BnH 20H iiH CnH  
ppHn=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

### ■ User program change

An User Program 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	Description
78H	00H	00H	User program #A11
78H	00H	01H	User program #A12
78H	00H	02H	User program #A13
78H	00H	03H	User program #A14
78H	00H	04H	User program #A15
78H	00H	05H	User program #A16
78H	00H	06H	User program #A17
78H	00H	07H	User program #A18
78H	00H	08H	User program #A21
78H	00H	09H	User program #A22
78H	00H	0AH	User program #A23
78H	00H	0BH	User program #A24
78H	00H	0CH	User program #A25
78H	00H	0DH	User program #A26
78H	00H	0EH	User program #A27
78H	00H	0FH	User program #A28
78H	00H	10H	User program #A31
78H	00H	11H	User program #A32

78H	00H	12H	User program	#A33	78H	00H	66H	User program	#B57
78H	00H	13H	User program	#A34	78H	00H	67H	User program	#B58
78H	00H	14H	User program	#A35	78H	00H	68H	User program	#B61
78H	00H	15H	User program	#A36	78H	00H	69H	User program	#B62
78H	00H	16H	User program	#A37	78H	00H	6AH	User program	#B63
78H	00H	17H	User program	#A38	78H	00H	6BH	User program	#B64
78H	00H	18H	User program	#A41	78H	00H	6CH	User program	#B65
78H	00H	19H	User program	#A42	78H	00H	6DH	User program	#B66
78H	00H	1AH	User program	#A43	78H	00H	6EH	User program	#B67
78H	00H	1BH	User program	#A44	78H	00H	6FH	User program	#B68
78H	00H	1CH	User program	#A45	78H	00H	70H	User program	#B71
78H	00H	1DH	User program	#A46	78H	00H	71H	User program	#B72
78H	00H	1EH	User program	#A47	78H	00H	72H	User program	#B73
78H	00H	1FH	User program	#A48	78H	00H	73H	User program	#B74
78H	00H	20H	User program	#A51	78H	00H	74H	User program	#B75
78H	00H	21H	User program	#A52	78H	00H	75H	User program	#B76
78H	00H	22H	User program	#A53	78H	00H	76H	User program	#B77
78H	00H	23H	User program	#A54	78H	00H	77H	User program	#B78
78H	00H	24H	User program	#A55	78H	00H	78H	User program	#B81
78H	00H	25H	User program	#A56	78H	00H	79H	User program	#B82
78H	00H	26H	User program	#A57	78H	00H	7AH	User program	#B83
78H	00H	27H	User program	#A58	78H	00H	7BH	User program	#B84
78H	00H	28H	User program	#A61	78H	00H	7CH	User program	#B85
78H	00H	29H	User program	#A62	78H	00H	7DH	User program	#B86
78H	00H	2AH	User program	#A63	78H	00H	7EH	User program	#B87
78H	00H	2BH	User program	#A64	78H	00H	7FH	User program	#B88
78H	00H	2CH	User program	#A65					
78H	00H	2DH	User program	#A66	7FH	00H	00H	User program	#00
78H	00H	2EH	User program	#A67					
78H	00H	2FH	User program	#A68					
78H	00H	30H	User program	#A71					
78H	00H	31H	User program	#A72					
78H	00H	32H	User program	#A73					
78H	00H	33H	User program	#A74					
78H	00H	34H	User program	#A75					
78H	00H	35H	User program	#A76					
78H	00H	36H	User program	#A77					
78H	00H	37H	User program	#A78					
78H	00H	38H	User program	#A81	01H	09H	11	ROCK1	
78H	00H	39H	User program	#A82	01H	0AH	12	ROCK2	
78H	00H	3AH	User program	#A83	21H	02H	13	RAP	
78H	00H	3BH	User program	#A84	02H	0DH	14	HOUSE	
78H	00H	3CH	User program	#A85	02H	0EH	15	TECHNO	
78H	00H	3DH	User program	#A86	02H	0FH	16	DANCE	
78H	00H	3EH	User program	#A87	03H	06H	17	FUNK1	
78H	00H	3FH	User program	#A88	03H	07H	18	FUNK2	
78H	00H	40H	User program	#B11					
78H	00H	41H	User program	#B12	06H	09H	21	8BEAT1	
78H	00H	42H	User program	#B13	06H	0AH	22	8BEAT2	
78H	00H	43H	User program	#B14	06H	0BH	23	8BEAT3	
78H	00H	44H	User program	#B15	06H	0CH	24	8BEAT4	
78H	00H	45H	User program	#B16	07H	0AH	25	16BEAT1	
78H	00H	46H	User program	#B17	07H	0BH	26	16BEAT2	
78H	00H	47H	User program	#B18	07H	0CH	27	16BEAT3	
78H	00H	48H	User program	#B21	07H	0DH	28	16BEAT4	
78H	00H	49H	User program	#B22					
78H	00H	4AH	User program	#B23	09H	03H	31	BOOGIE	
78H	00H	4BH	User program	#B24	0AH	0CH	32	ROCK'N1	
78H	00H	4CH	User program	#B25	0AH	0DH	33	ROCK'N2	
78H	00H	4DH	User program	#B26	0AH	0EH	34	TWIST	
78H	00H	4EH	User program	#B27	05H	07H	35	SL ROCK1	
78H	00H	4FH	User program	#B28	05H	08H	36	SL ROCK2	
78H	00H	50H	User program	#B31	04H	08H	37	BALLAD1	
78H	00H	51H	User program	#B32	04H	09H	38	BALLAD2	
78H	00H	52H	User program	#B33					
78H	00H	53H	User program	#B34	0DH	05H	41	SLSWING1	
78H	00H	54H	User program	#B35	0DH	06H	42	SLSWING2	
78H	00H	55H	User program	#B36	2CH	03H	43	BLUES	
78H	00H	56H	User program	#B37	0CH	05H	44	SWING	
78H	00H	57H	User program	#B38	0EH	03H	45	BIG BAND	
78H	00H	58H	User program	#B41	0FH	03H	46	SHUFFLE	
78H	00H	59H	User program	#B42	0BH	03H	47	DIXIE	
78H	00H	5AH	User program	#B43	0BH	04H	48	CHARLEST	
78H	00H	5BH	User program	#B44					
78H	00H	5CH	User program	#B45	16H	07H	51	BOSSA1	
78H	00H	5DH	User program	#B46	16H	08H	52	BOSSA2	
78H	00H	5EH	User program	#B47	16H	09H	53	LATIN	
78H	00H	5FH	User program	#B48	18H	03H	54	CHACHA	
78H	00H	60H	User program	#B51	17H	03H	55	RHUMBA	
78H	00H	61H	User program	#B52	27H	06H	56	POPROCK	
78H	00H	62H	User program	#B53	27H	07H	57	BEGUINE	
78H	00H	63H	User program	#B54	1AH	04H	58	TANGO	
78H	00H	64H	User program	#B55					
78H	00H	65H	User program	#B56	1BH	06H	61	SAMBA1	
					1BH	07H	62	SAMBA2	
					19H	02H	63	SALSA	

### ■ 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 TECHNO
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 16BEAT1
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 :

$200 \times (-3072) / (-8192) = -75$  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 mode. 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 = sum  
sum / 128 = quotient / remainder  
128 - remainder = 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(sum)

115(sum) / 128 = 0(quotient) 115(remainder)

checksum = 128 - 115(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(sum)

143(sum) / 128 = 1(quotient) 15(remainder)

checksum = 128 - 15(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[cents] = 234 + 1024 = 1258 =(hexadecimal)=> 04 EAH =(nibblized)=> 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(sum)

93(sum) / 128 = 0(quotient) 93(remainder)

checksum = 128 - 93(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 SYNTHESIZER]  
Model E-86

(Arranger Section)

Date: June 1993  
Version: 1.00

FUNCTION		TRANSMITTED	RECOGNIZED	REMARKS	
<b>Basic</b>	Default	1-2-3-4-5-6-7-8-9-10-11-12-14-16	1-2-3-4-5-6-7-8-9-10-11-12-14-16	1 = Acc 1 2 = Acc Bass 3 = Acc 2 4 = upper 1 5 = Acc 3 6 = Upper 2 7 = Acc 4 8 = Acc 5	09 = Acc 6 10 = Acc Drums, Style Pg 11 = Lower 12 = Man Bass 13 = Rx 1, NTA1 14 = Rx 2, Basic Midi Ch 15 = Rx 3, NTA 2 16 = Man Drums
<b>Channel</b>	Changed	1-16, OFF	1-16, OFF		
<b>Mode</b>	Default Messages Altered	Mode 3 Mode 3, 4 (M=1) *****	Mode 3 Mode 3, 4 (M=1) *****	*2	
<b>Note Number:</b>	True voice	0-127 *****	0-127 0-127	*1	
<b>Velocity</b>	Note ON Note OFF	O X	*1  O X	*1  *1	
<b>After Touch</b>	Key's Ch's	X X	O O	*1 *1	
<b>Pitch Bender</b>		O	*1	O	*1
<b>Control</b>	0,32	O	*1	O (MSB only)	*1
	1	O	*1	O	*1
	5	O		O	*1
	6,38	O		O	*1
	7	O	*1	O	*1
	10	O	*1	O	*1
	11	O	*1	O	*1
	64	O	*1	O	*1
	65	O		O	*1
	66	X		O	*1
	67	X		O	*1
	84	O		O	*1
	91	O	*1	O (Reverb)	*1
	93	O	*1	O (Chorus)	*1
	98,99	O	*1	O	*1
	100,101	O		O	*1
	120	X		O	RPN LSB, MSB
	121	X		O	RPN LSB, MSB
					All sound off
					Reset all controllers
<b>Prog change:</b>	True #	O *****	*1 *****	O 0-127	*1
<b>System Exclusive</b>		O		O	Prog. 1-128
<b>System Common</b>	: Song Pos : Song Sel : Tune	O O X	*3 *3 X	O O X	*3 *3
<b>System Real Time</b>	: Clock : Commands	O O	*1 *1	O O	*1 *1
<b>Aux Messages</b>	: Local ON/OFF : All Notes OFF : Active Sense : Reset	O X O X		X O (123-125) O X	
<b>Notes</b>		*1 O X is selectable *2 Recognize as M=1 even if M%1 *2 Recognized as "Midi File Recorder" Play Only			

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

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

O: YES  
X: NO

# E-86 INTELLIGENT SYNTHESIZER

MIDI IMPLEMENTATION

Version 1.00

Date: June 1993

## SOUND MODULE AND KEYBOARD SECTION, STANDARD MIDI FILE PLAYER

### 1 Receive data (Sound Module & Keyboard Section)

#### - Channel Voice Messages -

##### ■ 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".

\*In the drum part, recognized when "Rx.Note off = ON" for each instrument.

\*Velocity is ignored.

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	IIH

n=MIDI channel number : 0H - FH (ch.1 - ch.16)  
mm,II=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 "Rx.Volume = 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".

##### ■ 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	IIH

n=MIDI channel number : 0H - FH (ch.1 - ch.16)  
mm, II=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 IIH=00H).

However, when sending Bank Select messages, you have to send both of the MSB(mm) and LSB(II) together.

\*\*Bank select" is suspended until receiving "Program change".

To select a Tone of another bank, you have to send Bank select(mm,II)

## 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.Hold1 = 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

\*Ignored when "Rx.Portamento = OFF".

## 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 90 40 40	Portamento Control from C4 Note on E4	no change 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
01H	09H	mmH
01H	0AH	mmH
01H	20H	mmH
01H	21H	mmH
01H	63H	mmH

Vibrato rate  
relative change on specified channel  
mm: 0EH-40H-72H (-50 - 0 - +50)

Vibrato depth  
relative change on specified channel  
mm: 0EH-40H-72H (-50 - 0 - +50)

Vibrato delay  
relative change on specified channel  
mm: 0EH-40H-72H (-50 - 0 - +50)

TVF cutoff frequency  
relative change on specified channel  
mm: 0EH-40H-72H (-50 - 0 - +50)

TVF resonance  
relative change on specified channel  
mm: 0EH-40H-72H (-50 - 0 - +50)

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	rr H	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	rr H	mmH	TVA level of drum instrument absolute change on specified drum instrument rr: key number of drum instrument mm: 00H-7FH (zero - maximum)
1CH	rr H	mmH	Panpot of drum instrument absolute change on specified drum instrument rr: key number of drum instrument mm: 00H-7FH (zero - maximum)
1DH	rr H	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	rr H	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	IIH

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

mm =MSB of the RPN

II =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) II: ignored (value=00H) (Up to 2 octaves)
00H	01H	mmH	IIH	Master fine tuning mm, II: 00 00H-40 00H-7F 7FH (-8192x100/8192 - 0 - +8191x100/8192 cents)
00H	02H	mmH	---	Master coarse tuning mm: 28H-40H-58H (-24 - 0 - +24 semitones) II: ignored (value=00H)
7FH	7FH	---	---	RPN null Return to disable condition. The parameter already set retains its value. mm, II: 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 Not-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	IIH	mmH

n=MIDI channel number : 0H - FH (ch.1 - ch.16)  
mm, II=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 specified channel returns to the default at 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)
Hold1	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 Real Time Message

### ■ Active sensing

Status  
FEH

\*Having received an "active sensing" message, GS expects to receive additional active sensing messages at 300ms intervals.  
If the interval is greater than 420ms, GS 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 stops.

### ■ 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	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 E-86 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 E-86 default mode.

\*It takes about 100 ms to execute this message.

### ■ Data Transfer

E-86 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).

E-86 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)	

\*E-86 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 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)	

\*E-86 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)

### - Channel Voice Message -

#### ■ 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	11H

n=MIDI channel number : 0H - FH (ch.1 - ch.16)  
mm, 11=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)

## Volume

Status Second Third  
BnH 07H vvH

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

## 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)

## 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

## 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

\*Tramsmitted if "Midi Tx Str/Stp" is On.

### Sequencer stop

Status  
FCH

\*Tramsmitted if "Midi Tx Str/Stp" is On.

### Timing clock

Status  
F8H

\*Tramsmitted if "Midi Tx Clock" is On.

## System Exclusive Message

### ■ Data Transfer

E-86 transmits "Data set 1 (DT1)" message when receiving a proper "Request Data 1(RQ1)" message. Refer to section 1(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)

\*E-86 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.

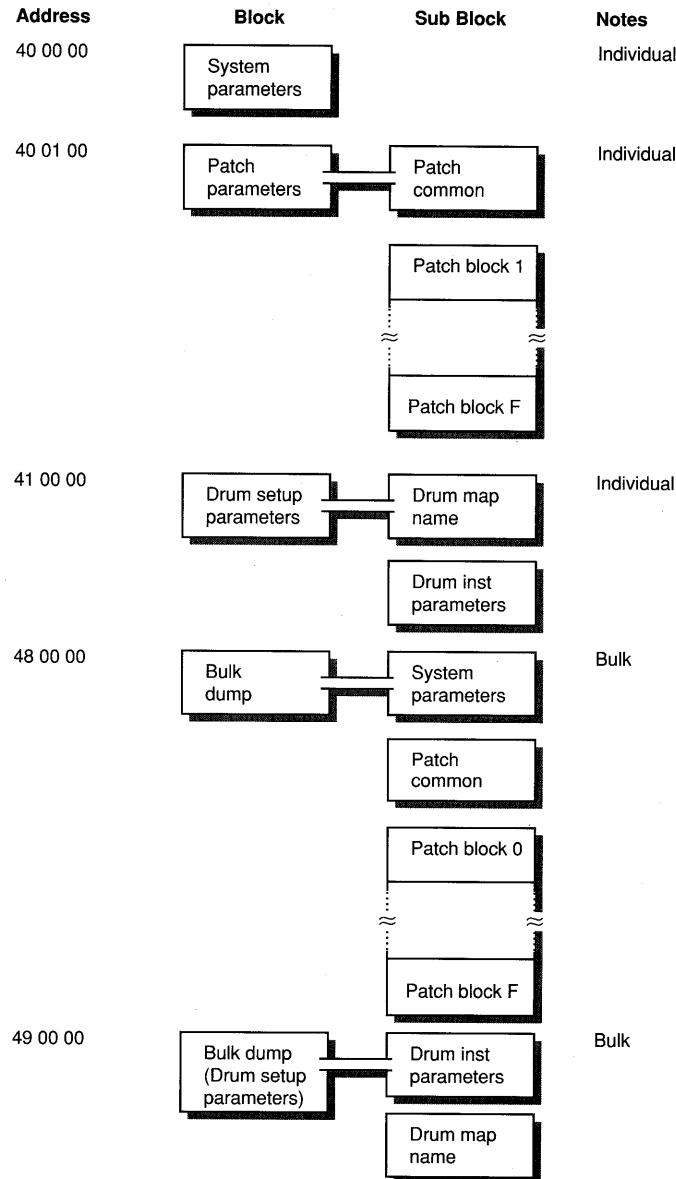
\*Refer to Section 4 to calculate a Checksum.

### 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 01	00 - 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	00 = GS Reset	40
40 00 07F	00 00 01	00, 7F	MODE SET (Rx Only)	127 = Exit GS	

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

### [ PATCH PARAMETERS ]

E-86 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
	Part 2 (default MIDIch = 2)	x=2
	:	:
	Part 9 (default MIDIch = 9)	x=9
	Part10 (default MIDIch = 10)	x=0
	Part11 (default MIDIch = 11)	x=A
	Part12 (default MIDIch =12)	x=B
	:	:
	Part16 (default MIDIch =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 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 1B#				:	
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 number of the maximum polyphony of E-86 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 07: Panning Delay	04
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.



## DRUM SETUP PARAMETERS

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

\*rr:drum part note number (00H - 7FH)

Address(H)	SIZE(H)	Data(H)	Parameter	Description
41 m0 00   # 41 m0 0B#	00 00 0C	20 - 7F	DRUM MAP NAME	ASCII Character
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) Non, 1 - 127
41 m3 rr	00 00 01	00 - 7F	ASSIGN GROUP NUMBER	Random, -63(LEFT) - +63(RIGHT) (=Bn 63 1C 62 rr 06 vv)
41 m4 rr	00 00 01	00 - 7F	PANPOT	0.0 - 1.0 Multiplicand of the part reverb depth (=Bn 63 1D 62 rr 06 vv)
41 m5 rr	00 00 01	00 - 7F	REVERB SEND LEVEL	0.0 - 1.0 Multiplicand of the part chorus depth (=Bn 63 1E 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

## DRUM SETUP PARAMETERS

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

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

## 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

### 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:

$28\text{ 00H} - 40\text{ 00H} = 40 \times 128 + 0 - (64 \times 128 + 0) = 5120 - 8192 = -3072$

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 -3072 (00 00H) is defined as -200 cents,

The actual pitch bend value of this message is:  $-200 \times (-3072) / (-8192) = -75$  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 sequencer and it is operated in fast forward or backward mode. 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 sequencer 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 sequencers 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 sequencer 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.)

\*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, $(12 \times 128 + 52) = 2356$

<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, $((10 \times 16 + 3) \times 16 + 9) \times 16 + 13 = 41885$

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

<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 :

<b>F0 41 10 42 12 40 01 30 02 ?? F7</b>	(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 :

<b>F0 41 10 42 11 41 02 4B 00 00 01 ?? F7</b>	(1)Exclusive Status	(4)Model ID (GS)
	(2)ID (Roland)	(5)Command ID (RQ1)
(1) (2) (3) (4) (5) address data 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[cents] = 234 + 1024 = 1258 =(hexadecimal)=> 04 EAH =(nibblized)=> 00  
04 0E 0AH

So, the message should be :

<b>F0 41 10 42 12 41 00 00 00 04 0A ?? F7</b>	(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 SYNTHESIZER]  
Model E-86

(Sound Module & Keyboard Section, SMF Player)

Date: June 1993  
Version: 1.00

FUNCTION		TRANSMITTED	RECOGNIZED	REMARKS	
<b>Basic Channel</b>	Default Changed	4 1-16, OFF	1-16 1-16, OFF	4 = Upper 1    6 = Upper 2	
<b>Mode</b>	Default Messages Altered	Mode 3 Mode 3, 4 (M=1) *****	Mode 3 Mode 3, 4 (M=1)	*2	
<b>Note Number:</b>	True voice	0-127 *****	0-127 0-127		
<b>Velocity</b>	Note ON Note OFF	O X	*3 O X		
<b>After Touch</b>	Key's Ch's	X X	O O	*1 *1	
<b>Pitch Bender</b>		O	*3 O	*1	
<b>Control Change</b>	0,32	O	*3 O	O (MSB only)	*1 Bank select
	1	O	*3 O	O	*1 Modulation
	5	X	O	O	*1 Portamento time
	6,38	X	O	O	*1 Data entry
	7	O	*3 O	O	*1 Volume
	10	O	*3 O	O	*1 Panpot
	11	X	O	O	*1 Expression
	64	O	*3 O	O	*1 Hold 1
	65	X	O	O	*1 Portamento
	66	X	O	O	*1 Sostenuto
	67	X	O	O	*1 Soft
	84	X	O	O	*1 Portamento control
	91	O	*3 O	O (Reverb)	*1 Effect 1 depth
	93	O	*3 O	O (Chorus)	*1 Effect 3 depth
	98,99	X	O	O	*1 NRPN LSB, MSB
<b>Prog change:</b>	100,101	X	O	O	*1 RPN LSB, MSB
	120	X	O	O	All sound off
	121	X	O	O	Reset all controllers
	True #	O *****	*3 0-127	*1	Prog. 1-128
<b>System Exclusive</b>		O	O		
<b>System Common</b>	: Song Pos : Song Sel : Tune	O O X	O O X	Midi File Play Midi File Play	
<b>System Real Time</b>	: Clock : Commands	O O	*1 *1	O O	*1 Midi File Record/Play *1 Midi File Record/Play
<b>Aux Messages</b>	: Local ON/OFF : All Notes OFF : Active Sense : Reset	X X O X	X O (123-125) O X		
<b>Notes</b>		*1 O X is selectable *2 Recognize as M=1 even if M%1 *3 O X is selectable, transmitted only when Upper1 or Upper2 GM Melody Assign is not OFF			

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

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

O: YES  
X: NO

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