MIDI Implementation

Model: SD-50
Date: Mar.17, 2010
Version: 1.00

1. Receive data

■Channel Voice Messages

* Not received when the Receive Switch parameter is OFF.

●Note off

Status	2nd byte	3rd byte
8nH	kkH	vvH
9nH	kkH	00H

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

●Note on

Status	2nd byte	3rd byte
9nH	kkH	vvH

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

●Polyphonic Key Pressure

Status	2nd byte	3rd byte
AnH	kkH	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
kk = note number: 00H - 7FH (0 - 127)
vv = Polyphonic Key Pressure: 00H - 7FH (0 - 127)

* Not received when the Receive Poly Key Pressure parameter is OFF.

●Control Change

❍Bank Select (Controller number 0, 32)

Status	2nd byte	3rd byte
BnH	00H	mmH
BnH	20H	llH

n = MIDI channel number: 0H - FH (ch.1 - 16)
mm, ll = Bank number: 00 00H - 7F 7FH (bank.1 - bank.16384)

* Not received when the Receive Bank Select is OFF.

BANK SELECT MSB	LSB	PROGRAM NUMBER	GROUP	NUMBER
000	000 -	001 - 128	GM Patch	001 - 256
:				
063	000 -	001 - 128	GM Patch	001 - 256
086	000	001 - 014	Preset Rhythm	001 - 014
087	000	001 - 128	Preset	001 - 128
	001	001 - 128	Preset	129 - 256
	002	001 - 128	Preset	257 - 384
	003	001 - 128	Preset	385 - 512
	004	001 - 128	Preset	513 - 640
089	064	041 - 078	Solo	001 - 003
120		001 - 057	GM Rhythm	001 - 009
121	000 -	001 - 128	GM Patch	001 - 256

* Not received when the Sound Mode is GM1.

❍Modulation (Controller number 1)

Status	2nd byte	3rd byte
BnH	01H	vvH

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

* Not received when the Receive Modulation parameter is OFF.

❍Breath type (Controller number 2)

Status	2nd byte	3rd byte
BnH	02H	vvH

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

❍Foot type (Controller number 4)

Status	2nd byte	3rd byte
BnH	04H	vvH

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

❍Portamento Time (Controller number 5)

Status	2nd byte	3rd byte
BnH	05H	vvH

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

* The Part Portament Time parameter will change.

❍Data Entry (Controller number 6, 38)

Status	2nd byte	3rd byte
BnH	06H	mmH
BnH	26H	llH

n = MIDI channel number: 0H - FH (ch.1 - 16)
mm, ll = the value of the parameter specified by RPN/NRPN
mm = MSB, ll = LSB

❍Volume (Controller number 7)

Status	2nd byte	3rd byte
BnH	07H	vvH

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

* Not received when the Receive Volume parameter is OFF.
* The Part Level parameter will change.

❍Balance (Controller number 8)

Status	2nd byte	3rd byte
BnH	08H	vvH

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

❍Panpot (Controller number 10)

Status	2nd byte	3rd byte
BnH	0AH	vvH

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

* Not received when the Receive Pan parameter is OFF.
* The Part Pan parameter will change.

❍Expression (Controller number 11)

Status	2nd byte	3rd byte
BnH	0BH	vvH

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

* Not received when Receive Expression parameter is OFF.

❍Hold 1 (Controller number 64)

Status	2nd byte	3rd byte
BnH	40H	vvH

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

* Not received when Receive Hold-1 parameter is OFF.

❍Portamento (Controller number 65)

Status	2nd byte	3rd byte
BnH	41H	vvH

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

* The Part Portamento Switch parameter will change.

❍Sostenuto (Controller number 66)

Status	2nd byte	3rd byte
BnH	42H	vvH

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

❍Soft (Controller number 67)

Status	2nd byte	3rd byte
BnH	43H	vvH

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

❍Legato Foot Switch (Controller number 68)

Status	2nd byte	3rd byte
BnH	44H	vvH

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

* The Part Legato Switch parameter will change.

❍Hold-2 (Controller number 69)

Status	2nd byte	3rd byte
BnH	45H	vvH

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

* A hold movement isn't done.

❍Resonance (Controller number 71)

Status	2nd byte	3rd byte
BnH	47H	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
vv= Resonance value (relative change): 00H - 40H - 7FH (-64 - 0 - +63)

* The Part Resonance Offset parameter will change.

❍Release Time (Controller number 72)

Status	2nd byte	3rd byte
BnH	48H	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
vv = Release Time value (relative change): 00H - 40H - 7FH (-64 - 0 - +63)

* The Part Release Time Offset parameter will change.

❍Attack time (Controller number 73)

Status	2nd byte	3rd byte
BnH	49H	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
vv = Attack time value (relative change): 00H - 40H - 7FH (-64 - 0 - +63)

* The Part Attack Time Offset parameter will change.

❍Cutoff (Controller number 74)

Status	2nd byte	3rd byte
BnH	4AH	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
vv = Cutoff value (relative change): 00H - 40H - 7FH (-64 - 0 - +63)

* The Part Cutoff Offset parameter will change.

❍Decay Time (Controller number 75)

Status	2nd byte	3rd byte
BnH	4BH	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
vv = Decay Time value (relative change): 00H - 40H - 7FH (-64 - 0 - +63)

* The Part Decay Time Offset parameter will change.

❍Vibrato Rate (Controller number 76)

Status	2nd byte	3rd byte
BnH	4CH	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
vv = Vibrato Rate value (relative change): 00H - 40H - 7FH (-64 - 0 - +63)

* The Part Vibrato Rate parameter will change.

❍Vibrato Depth (Controller number 77)

Status	2nd byte	3rd byte
BnH	4DH	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
vv = Vibrato Depth Value (relative change): 00H - 40H - 7FH (-64 - 0 - +63)

* The Part Vibrato Depth parameter will change.

❍Vibrato Delay (Controller number 78)

Status	2nd byte	3rd byte
BnH	4EH	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
vv = Vibrato Delay value (relative change): 00H - 40H - 7FH (-64 - 0 - +63)

* The Part Vibrato Delay parameter will change.

❍General Purpose Controller 5 (Controller number 80)

Status	2nd byte	3rd byte
BnH	50H	vvH

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

❍General Purpose Controller 6 (Controller number 81)

Status	2nd byte	3rd byte
BnH	51H	vvH

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

❍General Purpose Controller 7 (Controller number 82)

Status	2nd byte	3rd byte
BnH	52H	vvH

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

❍Portamento control (Controller number 84)

Status	2nd byte	3rd byte
BnH	54H	kkH

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

* A Note-on received immediately after a Portamento Control message will change continuously in pitch, starting from the pitch of the Source Note Number.
* If a voice is already sounding for a note number identical to the Source Note Number, this voice will continue sounding (i.e., legato) and will, when the next Note-on is received, smoothly change to the pitch of that Note-on.
* The rate of the pitch change caused by Portamento Control is determined by the Portamento Time value.

❍Effect 1 (Reverb Send Level) (Controller number 91)

Status	2nd byte	3rd byte
BnH	5BH	vvH

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

* The Part Reverb Send Level parameter will change.

❍Effect 3 (Chorus Send Level) (Controller number 93)

Status	2nd byte	3rd byte
BnH	5DH	vvH

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

* The Part Chorus Send Level parameter will change.

❍RPN MSB/LSB (Controller number 100, 101)

Status	2nd byte	3rd byte
BnH	65H	mmH
BnH	64H	llH

n = MIDI channel number: 0H - FH (ch.1 - 16)
mm = upper byte (MSB) of parameter number specified by RPN
ll = lower byte (LSB) of parameter number specified by RPN

<<< RPN >>>

Control Changes include RPN (Registered Parameter Numbers), which are extended.
When using RPNs, first RPN (Controller numbers 100 and 101; they can be sent in any order) should be sent in order to select the parameter, then
Data Entry (Controller numbers 6 and 38) should be sent to set the value. Once RPN messages are received, Data Entry messages that is received at the same MIDI channel after that are recognized as changing toward the value of the RPN messages. In order not to make any mistakes, transmitting RPN Null is recommended after setting parameters you need.

This device receives the following RPNs.

RPN	Data entry	Notes
MSB, LSB	MSB, LSB	Pitch Bend Sensitivity
00H, 00H	mmH, llH	mm: 00H - 18H (0 - 24 semitones) ll: ignored (processed as 00H) Up to 2 octave can be specified in semitone steps.

* The Part Bend Range parameter will change.

00H, 01H	mmH, llH	Channel Fine Tuning mm, ll: 20 00H - 40 00H - 60 00H (-4096 x 100 / 8192 - 0 - +4096 x 100 / 8192 cent)

* The Part Fine Tune parameter will change.

00H, 02H	mmH, llH	Channel Coarse Tuning mm: 10H - 40H - 70H (-48 - 0 - +48 semitones) ll: ignored (processed as 00H)

* The Part Coarse Tune parameter will change.

00H, 05H	mmH, llH	Modularion Depth Range mm: 00 00H - 06 00H (0 - 16384 x 600 / 16384 cent)
7FH, 7FH	---, ---	RPN null RPN and NRPN will be set as "unspecified." Once this setting has been made, subsequent Parameter values that were previously set will not change. mm, ll: ignored

●Program Change

Status	2nd byte
CnH	ppH

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

* Not received when the Receive Program Change parameter is OFF.

●Channel Pressure

Status	2nd byte
DnH	vvH

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

* Not received when the Receive Channel Pressure parameter is OFF.

●Pitch Bend Change

Status	2nd byte	3rd byte
EnH	llH	mmH

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

* Not received when the Receive Pitch Bend parameter is OFF.

■Channel Mode Messages

* Not received when the Receive Switch parameter is OFF.

●All Sounds Off (Controller number 120)

Status	2nd byte	3rd byte
BnH	78H	00H

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

* When this message is received, all notes currently sounding on the corresponding channel will be turned off.

❍Reset All Controllers (Controller number 121)

Status	2nd byte	3rd byte
BnH	79H	00H

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

* When this message is received, the following controllers will be set to their reset values.

Controller	Reset value
Pitch Bend Change	+/-0 (center)
Polyphonic Key Pressure	0 (off)
Channel Pressure	0 (off)
Modulation	0 (off)
Breath Type	0 (min)
Expression	127 (max) However the controller will be at minimum.
Hold 1	0 (off)
Sostenuto	0 (off)
Soft	0 (off)
Hold 2	0 (off)
RPN	unset; previously set data will not change
NRPN	unset; previously set data will not change

●All Notes Off (Controller number 123)

Status	2nd byte	3rd byte
BnH	7BH	00H

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

* When All Notes Off is received, all notes on the corresponding channel will be turned off. However, if Hold 1 or Sostenuto is ON, the sound will be continued until these are turned off.

●OMNI OFF (Controller number 124)

Status	2nd byte	3rd byte
BnH	7CH	00H

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

* The same processing will be carried out as when All Notes Off is received.

●OMNI ON (Controller number 125)

Status	2nd byte	3rd byte
BnH	7DH	00H

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

* The same processing will be carried out as when All Notes Off is received. OMNI ON will not be turned on.

●MONO (Controller number 126)

Status	2nd byte	3rd byte
BnH	7EH	mmH

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

* The same processing will be carried out as when All Notes Off is received.
* The Part Mono/Poly parameter will change.

●POLY (Controller number 127)

Status	2nd byte	3rd byte
BnH	7FH	00H

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

* The same processing will be carried out as when All Notes Off is received.
* The Part Mono/Poly parameter will change.

■System Realtime Message

●Timing Clock

Status
F8H

* This is received when Sync Mode parameter is SLAVE.

●Active Sensing

Status
FEH

* When Active Sensing is received, the unit will begin monitoring the intervals of all further messages. While monitoring, if the interval between messages exceeds 420 ms, the same processing will be carried out as when All Sounds Off, All Notes Off and Reset All Controllers are received, and message interval monitoring will be halted.

■System Exclusive Message

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

F0H: System Exclusive Message status
ii = ID number: An ID number (manufacturer ID) to indicate the manufacturer whose Exclusive message this is. Roland's manufacturer ID is 41H.
ID numbers 7EH and 7FH are extensions of the MIDI standard; Universal Non-realtime Messages (7EH) and Universal Realtime Messages (7FH).
dd,...,ee = data: 00H - 7FH (0 - 127)
F7H: EOX (End Of Exclusive)

Of the System Exclusive messages received by this device, the Universal Non-realtime messages and the Universal Realtime messages and the Data Request (RQ1) messages and the Data Set (DT1) messages will be set automatically.

●Universal Non-realtime System Exclusive Messages

❍Identity Request Message

Status	Data byte	Status
F0H	7EH, 10H, 06H, 01H	F7H

Byte	Explanation
F0H	Exclusive status
7EH	ID number (Universal Non-realtime Message)
10H	Device ID (dev: 10H)
06H	Sub ID#1 (General Information)
01H	Sub ID#2 (Identity Request)
F7H	EOX (End Of Exclusive)

* When this message is received, Identity Reply message (p. 7) will be transmitted.

❍GM1 System On

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

Byte	Explanation
F0H	Exclusive status
7EH	ID number (Universal Non-realtime Message)
7FH	Device ID (Broadcast)
09H	Sub ID#1 (General MIDI Message)
01H	Sub ID#2 (General MIDI 1 On)
F7H	EOX (End Of Exclusive)

* Not received when the Receive GM1 System On parameter is OFF.

❍GM2 System On

Status	Data byte	Status
F0H	7EH 7FH 09H 03H	F7H

Byte	Explanation
F0H	Exclusive status
7EH	ID number (Universal Non-realtime Message)
7FH	Device ID (Broadcast)
09H	Sub ID#1 (General MIDI Message)
03H	Sub ID#2 (General MIDI 2 On)
F7H	EOX (End Of Exclusive)

* Not received when the Receive GM2 System On parameter is OFF.

❍GM System Off

Status	Data byte	Status
F0H	7EH, 7F, 09H, 02H	F7H

Byte	Explanation
F0H	Exclusive status
7EH	ID number (Universal Non-realtime Message)
7FH	Device ID (Broadcast)
09H	Sub ID#1 (General MIDI Message)
02H	Sub ID#2 (General MIDI Off)
F7H	EOX (End Of Exclusive)

* When this messages is received, this instrument will return to the Studio Set mode.

●Universal Realtime System Exclusive Messages

❍Master Volume

Status	Data byte	Status
F0H	7FH, 7FH, 04H, 01H, llH, mmH	F7H

Byte	Explanation
F0H	Exclusive status
7FH	ID number (universal realtime message)
7FH	Device ID (Broadcast)
04H	Sub ID#1 (Device Control)
01H	Sub ID#2 (Master Volume)
llH	Master Volume lower byte
mmH	Master Volume upper byte
F7H	EOX (End Of Exclusive)

* The lower byte (llH) of Master Volume will be handled as 00H.
* The Master Level parameter will change.

❍Master Fine Tuning

Status	Data byte	Status
F0H	7FH, 7FH, 04H, 03H, llH, mmH	F7H

Byte	Explanation
F0H	Exclusive status
7FH	ID number (universal realtime message)
7FH	Device ID (Broadcast)
04H	Sub ID#1 (Device Control)
03H	Sub ID#2 (Master Fine Tuning)
llH	Master Fine Tuning LSB
mmH	Master Fine Tuning MSB
F7H	EOX (End Of Exclusive)

mm, ll: 00 00H - 40 00H - 7F 7FH (-100 - 0 - +99.9 [cents])

* The Master Tune parameter will change.

❍Master Coarse Tuning

Status	Data byte	Status
F0H	7FH, 7FH, 04H, 04H, llH, mmH	F7

Byte	Explanation
F0H	Exclusive status
7FH	ID number (universal realtime message)
7FH	Device ID (Broadcast)
04H	Sub ID#1 (Device Control)
04H	Sub ID#2 (Master Coarse Tuning)
llH	Master Coarse Tuning LSB
mmH	Master Coarse Tuning MSB
F7H	EOX (End Of Exclusive)

llH:	ignored (processed as 00H)
mmH:	28H - 40H - 58H (-24 - 0 - +24 [semitones])

* The Master Key Shift parameter will change.

●Global Parameter Control

❍Reverb Parameters

Status	Data byte	Status
F0H	7FH, 7FH, 04H, 05H, 01H, 01H, 01H, 01H, 01H, ppH, vvH	F7H

Byte	Explanation
F0H	Exclusive status
7FH	ID number (universal realtime message)
7FH	Device ID (Broadcast)
04H	Sub ID#1 (Device Control)
05H	Sub ID#2 (Global Parameter Control)
01H	Slot path length
01H	Parameter ID width
01H	Value width
01H	Slot path MSB
01H	Slot path LSB (Effect 0101: Reverb)
ppH	Parameter to be controlled.
vvH	Value for the parameter.
	pp=0 Reverb Type
	vv = 00H Small Room
	vv = 01H Medium Room
	vv = 02H Large Room
	vv = 03H Medium Hall
	vv = 04H Large Hall
	vv = 08H Plate
	pp=1 Reverb Time
	vv = 00H - 7FH 0 - 127
F7H	EOX (End Of Exclusive)

❍Chorus Parameters

Status	Data byte	Status
F0H	7FH, 7FH, 04H, 05H, 01H, 01H, 01H, 01H, 02H, ppH, vvH	F7H

Byte	Explanation
F0H	Exclusive status
7FH	ID number (universal realtime message)
7FH	Device ID (Broadcast)
04H	Sub ID#1 (Device Control)
05H	Sub ID#2 (Global Parameter Control)
01H	Slot path length
01H	Parameter ID width
01H	Value width
01H	Slot path MSB
02H	Slot path LSB (Effect 0102: Chorus)
ppH	Parameter to be controlled.
vvH	Value for the parameter.
	pp=0 Chorus Type
	vv=0 Chorus1
	vv=1 Chorus2
	vv=2 Chorus3
	vv=3 Chorus4
	vv=4 FB Chorus
	vv=5 Flanger
	pp=1 Mod Rate
	vv= 00H - 7FH 0 - 127
	pp=2 Mod Depth
	vv = 00H - 7FH 0 - 127
	pp=3 Feedback
	vv = 00H - 7FH 0 - 127
	pp=4 Send To Reverb
	vv = 00H - 7FH 0 - 127
F7H	EOX (End Of Exclusive)

❍Channel Pressure

Status	Data byte	Status
F0H	7FH, 7FH, 09H, 01H, 0nH, ppH, rrH	F7H

Byte	Explanation
F0H	Exclusive status
7FH	ID number (universal realtime message)
7FH	Device ID (Broadcast)
09H	Sub ID#1 (Controller Destination Setting)
01H	Sub ID#2 (Channel Pressure)
0nH	MIDI Channel (00 - 0F)
ppH	Controlled parameter
rrH	Controlled range
	pp=0 Pitch Control
	rr = 28H - 58H -24 - +24 [semitones]
	pp=1 Filter Cutoff Control
	rr = 00H - 7FH -9600 - +9450 [cents]
	pp=2 Amplitude Control
	rr = 00H - 7FH 0 - 200%
	pp=3 LFO Pitch Depth
	rr = 00H - 7FH 0 - 600 [cents]
	pp=4 LFO Filter Depth
	rr = 00H - 7FH 0 - 2400 [cents]
	pp=5 LFO Amplitude Depth
	rr = 00H - 7FH 0 - 100%
F7H	EOX (End Of Exclusive)

❍Controller

Status	Data byte	Status
F0H	7FH, 7FH, 09H, 03H, 0nH, ccH, ppH, rrH	F7H

Byte	Explanation
F0H	Exclusive status
7FH	ID number (universal realtime message)
7FH	Device ID (Broadcast)
09H	Sub ID#1 (Controller Destination Setting)
03H	Sub ID#2 (Control Change)
0nH	MIDI Channel (00 - 0F)
ccH	Controller number (01 - 1F, 40 - 5F)
ppH	Controlled parameter
rrH	Controlled range
	pp=0 Pitch Control
	rr = 28H - 58H -24 - +24 [semitones]
	pp=1 Filter Cutoff Control
	rr = 00H - 7FH -9600 - +9450 [cents]
	pp=2 Amplitude Control
	rr = 00H - 7FH 0 - 200%
	pp=3 LFO Pitch Depth
	rr = 00H - 7FH 0 - 600 [cents]
	pp=4 LFO Filter Depth
	rr = 00H - 7FH 0 - 2400 [cents]
	pp=5 LFO Amplitude Depth
	rr = 00H - 7FH 0 - 100%
F7H	EOX (End Of Exclusive)

❍Scale/Octave Tuning Adjust

Status	Data byte	Status
F0H	7EH, 7FH, 08H, 08H, ffH, ggH, hhH, ssH...	F7

Byte	Explanation
F0H	Exclusive status
7EH	ID number (Universal Non-realtime Message)
7FH	Device ID (Broadcast)
08H	Sub ID#1 (MIDI Tuning Standard)
08H	Sub ID#2 (scale/octave tuning 1-byte form)
ffH	Channel/Option byte 1
	bits 0 to 1 = channel 15 to 16
	bit 2 to 6 = Undefined
ggH	Channel byte 2
	bits 0 to 6 = channel 8 to 14
hhH	Channel byte 3
	bits 0 to 6 = channel 1 to 7
ssH	12 byte tuning offset of 12 semitones from C to B
	00H = -64 [cents]
	40H = 0 [cents] (equal temperament)
	7FH = +63 [cents]
F7H	EOX (End Of Exclusive)

❍Key-based Instrument Controllers

Status	Data byte	Status
F0H	7FH, 7FH, 0AH, 01H, 0nH, kkH, nnH, vvH	F7H

Byte	Explanation	
F0H	Exclusive status	
7FH	ID number (universal realtime message)	
7FH	Device ID (Broadcast)	
0AH	Sub ID#1 (Key-Based Instrument Control)	
01H	Sub ID#2 (Controller)	
0nH	MIDI Channel (00 - 0FH)	
kkH	Key Number	
nnH	Control Number	
vvH	Value	
	nn=07H Level	
	vv = 00H - 7FH	0 - 200% (Relative)
	nn=0AH	Pan
	vv = 00H - 7FH	Left - Right (Absolute)
	nn=5BH	Reverb Send
	vv = 00H - 7FH	0 - 127 (Absolute)
	nn=5D	Chorus Send
	vv = 00H - 7FH	0 - 127 (Absolute)
:	:	
F7	EOX (End Of Exclusive)	

* This parameter affects drum instruments only.

●Data Transmission

This instrument can use exclusive messages to exchange many varieties of internal settings with other devices.
The model ID of the exclusive messages used by this instrument is 00H 00H 4AH.

❍Data Request 1 RQ1 (11H)

This message requests the other device to transmit data. The address and size indicate the type and amount of data that is requested.
When a Data Request message is received, if the device is in a state in which it is able to transmit data, and if the address and size are appropriate, the requested data is transmitted as a Data Set 1 (DT1) message. If the conditions are not met, nothing is transmitted.

Status	Data byte	Status
F0H	41H, 10H, 00H, 00H, 4AH, 11H, aaH, bbH, ccH, ddH, ssH, ttH, uuH, vvH, sum	F7H

Byte	Explanation
F0H	Exclusive status
41H	ID number (Roland)
10H	device ID (dev: 10H)
00H	model ID #1 (SD-50)
00H	model ID #2 (SD-50)
4AH	model ID #3 (SD-50)
11H	command ID (RQ1)
aaH	address MSB
bbH	address
ccH	address
ddH	address LSB
ssH	size MSB
ttH	size
uuH	size
vvH	size LSB
sum	checksum
F7H	EOX (End Of Exclusive)

* The size of data that can be transmitted at one time is fixed for each type of data. And data requests must be made with a fixed starting address and size.
Refer to the address and size given in "Parameter Address Map" (p. 8).
* For the checksum, refer to (p. 16).
* Not received when the Receive Exclusive parameter is OFF.

❍Data set 1 DT1 (12H)

Status	Data byte	Status
F0H	41H, 10H, 00H, 00H, 4AH, 12H, aaH, bbH, ccH, ddH, eeH, ... ffH, sum	F7H

Byte	Explanation
F0H	Exclusive status
41H	ID number (Roland)
10H	Device ID (dev: 10H)
00H	Model ID #1 (SD-50)
00H	Model ID #2 (SD-50)
4AH	Model ID #3 (SD-50)
12H	Command ID (DT1)
aaH	Address MSB: upper byte of the starting address of the data to be sent
bbH	Address: upper middle byte of the starting address of the data to be sent
ccH	Address: lower middle byte of the starting address of the data to be sent
ddH	Address LSB: lower byte of the starting address of the data to be sent.
eeH	Data: the actual data to be sent. Multiple bytes of data are transmitted in order starting from the address.
:	:
ffH	Data
sum	Checksum
F7H	EOX (End Of Exclusive)

* The amount of data that can be transmitted at one time depends on the type of data, and data will be transmitted from the specified starting address and size.
Refer to the address and size given in "Parameter Address Map" (p. 8).
* Data larger than 256 bytes will be divided into packets of 256 bytes or less, and each packet will be sent at an interval of about 20 ms.
* Regarding the checksum, please refer to (p. 16)
* Not received when the Receive Exclusive parameter is OFF.

❍**Data set 1 DT1 (12H)**

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

Byte	Explanation	
F0H	Exclusive status	
41H	ID number (Roland)	
10H	Device ID (dev: 10H)	
42H	Model ID (GS)	
12H	Command ID (DT1)	
aaH	Address MSB:	upper byte of the starting address of the transmitted data
bbH	Address:	middle byte of the starting address of the transmitted data
ccH	Address LSB:	lower byte of the starting address of the transmitted data
ddH	Data:	the actual data to be transmitted. Multiple bytes of data are transmitted starting from the address.
:	:	
eeH	Data	
sum	Checksum	
F7H	EOX (End Of Exclusive)	

* The amount of data that can be transmitted at one time depends on the type of data, and data will be transmitted from the specified starting address and size.
  Refer to the address and size given in "Parameter Address Map" (p. 8).
* Data larger than 256 bytes will be divided into packets of 256 bytes or less, and each packet will be sent at an interval of about 20 ms.
* Regarding the checksum, please refer to (p. 16)
* Not received when the Receive Exclusive parameter is OFF.

2. Data Transmission

■System Realtime Messages

●Active Sensing

Status
FEH

* This message is transmitted at intervals of approximately 250 msec.

■System Exclusive Message

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

F0H:	System Exclusive Message status
ii = ID number:	an ID number (manufacturer ID) to indicate the manufacturer whose Exclusive message this is. Roland's manufacturer ID is 41H. ID numbers 7EH and 7FH are extensions of the MIDI standard; Universal Non-realtime Messages (7EH) and Universal Realtime Messages (7FH).
dd,...,ee = data:	00H - 7FH (0 - 127)
F7H:	EOX (End Of Exclusive)

Universal Non-realtime System Exclusive Message and Data Set 1 (DT1) are the only System Exclusive messages transmitted by the SD-50.

●Universal Non-realtime System Exclusive Message

❍**Identity Reply Message (SD-50)**

Receiving Identity Request Message, the SD-50 send this message.

Status	Data byte	Status
F0H	7EH, 10H, 06H, 02H, 41H, 4AH, 02H, 00H 00H, 00H, 00H, 00H, 00H	F7H

Byte	Explanation
F0H	Exclusive status
7EH	ID number (Universal Non-realtime Message)
10H	Device ID (dev: 10H)
06H	Sub ID#1 (General Information)
02H	Sub ID#2 (Identity Reply)
41H	ID number (Roland)
4AH 02H	Device family code
00H 00H	Device family number code
00H 00H 00H 00H	Software revision level
F7H	EOX (End of Exclusive)

●Data Transmission

❍**Data set 1 DT1 (12H)**

Status	Data byte	Status
F0H	41H, 10H, 00H, 00H, 4AH, 12H, aaH, bbH, ccH, ddH, eeH, ... ffH, sum	F7H

Byte	Explanation	
F0H	Exclusive status	
41H	ID number (Roland)	
10H	Device ID (dev: 10H)	
00H	Model ID #1 (SD-50)	
00H	Model ID #2 (SD-50)	
4AH	Model ID #3 (SD-50)	
12H	Command ID (DT1)	
aaH	Address MSB:	upper byte of the starting address of the data to be sent
bbH	Address:	upper middle byte of the starting address of the data to be sent
ccH	Address:	lower middle byte of the starting address of the data to be sent
ddH	Address LSB:	lower byte of the starting address of the data to be sent.
eeH	Data:	the actual data to be sent. Multiple bytes of data are transmitted in order starting from the address.
:	:	
ffH	Data	
sum	Checksum	
F7H	EOX (End Of Exclusive)	

* The amount of data that can be transmitted at one time depends on the type of data, and data will be transmitted from the specified starting address and size. Refer to the address and size given in "Parameter Address Map" (p. 8).
* Data larger than 256 bytes will be divided into packets of 256 bytes or less, and each packet will be sent at an interval of about 20 ms.

3. Parameter Address Map

* Transmission of "#" marked address is divided to some packets. For example, ABH in hexadecimal notation will be divided to 0AH and 0BH, and is sent/received in this order.
* "<*>" marked address or parameters are ignored when the SD-50 received them.

SD-50 (ModelID = 00H 00H 4AH)

Start Address	Description
01 00 00 00	Setup
02 00 00 00	System
18 00 00 00	Temporary Studio Set

*** System**

Offset Address	Description
00 00 00	System Common
00 02 00	System Mastering

*** Studio Set**

Offset Address	Description
00 00 00	Studio Set Common
00 04 00	Studio Set Common Chorus
00 06 00	Studio Set Common Reverb
00 20 00	Studio Set Part (Part 1)
00 21 00	Studio Set Part (Part 2)
:	
00 2F 00	Studio Set Part (Part 16)
00 40 00	Studio Set Tone Modify (Part 1)
00 41 00	Studio Set Tone Modify (Part 2)
:	
00 4F 00	Studio Set Tone Modify (Part 16)

*** Setup**

Offset Address		Description	
00 00	0000 0aaa	Sound Mode	(1 - 4) STUDIO, GM1, GM2, GS
00 01	0aaa aaaa	(reserve) <*>	
00 02	0aaa aaaa	(reserve) <*>	
00 03	0aaa aaaa	(reserve) <*>	
00 04	0aaa aaaa	(reserve) <*>	
00 05	0aaa aaaa	(reserve) <*>	
00 06	0aaa aaaa	(reserve) <*>	
00 07	0aaa aaaa	(reserve) <*>	
00 08	0aaa aaaa	(reserve) <*>	
00 09	0000 0aaa	(reserve) <*>	
00 0A	0aaa aaaa	(reserve) <*>	
00 0B	0aaa aaaa	(reserve) <*>	
00 0C	0000 000a	(reserve) <*>	
00 0D	0000 000a	(reserve) <*>	
00 0E	0000 000a	(reserve) <*>	
00 0F	0000 000a	(reserve) <*>	
00 10	0000 000a	(reserve) <*>	
00 11	0000 000a	(reserve) <*>	
00 12	0000 aaaa	GM Map	(0 - 1) CLASSICAL, CONTEMPORALY
00 00 00 13	Total Size		

*** System Common**

Offset Address		Description	
# 00 00	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Master Tune	(24 - 2024) -100.0 - 100.0 [cent]
00 04	00aa aaaa	Master Key Shift	(40 - 88) -24 - +24
00 05	0aaa aaaa	Master Level	(0 - 127)
00 06	0000 000a	Scale Tune Switch	(0 - 1) OFF, ON
00 07	0000 000a	Tone Remain	(0 - 1) OFF, ON
00 08	0000 000a	(reserve) <*>	
00 09	000a aaaa	(reserve) <*>	
00 0A	000a aaaa	(reserve) <*>	
00 0B	000a aaaa	(reserve) <*>	
00 0C	000a aaaa	(reserve) <*>	
00 0D	000a aaaa	(reserve) <*>	
00 0E	000a aaaa	(reserve) <*>	
00 0F	000a aaaa	(reserve) <*>	
00 10	000a aaaa	(reserve) <*>	
00 11	000a aaaa	(reserve) <*>	
00 12	0aaa aaaa	(reserve) <*>	

	00 13	0aaa aaaa	(reserve) <*>
	00 14	0aaa aaaa	(reserve) <*>
	00 15	0aaa aaaa	(reserve) <*>
	00 16	0aaa aaaa	(reserve) <*>
	00 17	0aaa aaaa	(reserve) <*>
	00 18	0aaa aaaa	(reserve) <*>
	00 19	0aaa aaaa	(reserve) <*>
	00 1A	0aaa aaaa	(reserve) <*>
	00 1B	0aaa aaaa	(reserve) <*>
	00 1C	0aaa aaaa	(reserve) <*>
	00 1D	0aaa aaaa	(reserve) <*>
	00 1E	0aaa aaaa	(reserve) <*>
	00 1F	0aaa aaaa	(reserve) <*>
	00 20	0aaa aaaa	System Control 1 Source (0 - 97) OFF, CC01 - CC31, CC33 - CC95, BEND, AFT
	00 21	0aaa aaaa	System Control 2 Source (0 - 97) OFF, CC01 - CC31, CC33 - CC95, BEND, AFT
	00 22	0aaa aaaa	System Control 3 Source (0 - 97) OFF, CC01 - CC31, CC33 - CC95, BEND, AFT
	00 23	0aaa aaaa	System Control 4 Source (0 - 97) OFF, CC01 - CC31, CC33 - CC95, BEND, AFT
	00 24	0000 000a	Control Source (0 - 1) SYS, TEMP
	00 25	0000 000a	System Clock Source (0 - 1) INT, MIDI
#	00 26	0000 aaaa	
		0000 bbbb	System Tempo (20 - 250)
	00 28	0000 000a	Tempo Override (0 - 1) OFF, ON
	00 29	0000 000a	Receive Program Change (0 - 1) OFF, ON
	00 2A	0000 000a	Receive Bank Select (0 - 1) OFF, ON
	00 00 00 2B	Total Size	

*** System Mastering**

Offset Address		Description
00 00	0000 00aa	Mastering Type (0 - 3) OFF, SHARP, CLEAR, POWER
00 01	0aaa aaaa	Low band Attack time (0 - 100)
00 02	0aaa aaaa	Low band Release time (0 - 100)
00 03	00aa aaaa	Low band Threshold (0 - 36) -36, -35, -34, -33, -32, -31, -30, -29, -28, -27, -26, -25, -24, -23, -22, -21, -20, -19, -18, -17, -16, -15, -14, -13, -12, -11, -10, -9, -8, -7, -6, -5, -4, -3, -2, -1, 0 [dB]
00 04	0000 aaaa	Low band Ratio (0 - 13) 1:1.0, 1:1.1, 1:1.2, 1:1.4, 1:1.6, 1:1.8, 1:2.0, 1:2.5, 1:3.2, 1:4.0, 1:5.6, 1:8.0, 1:16, 1:INF
00 05	000a aaaa	Low band Level (0 - 24) 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 [dB]
00 06	0aaa aaaa	Mid band Attack time (0 - 100)
00 07	0aaa aaaa	Mid band Release time (0 - 100)
00 08	00aa aaaa	Mid band Threshold (0 - 36) -36, -35, -34, -33, -32, -31, -30, -29, -28, -27, -26, -25, -24, -23, -22, -21, -20, -19, -18, -17, -16, -15, -14, -13, -12, -11, -10, -9, -8, -7, -6, -5, -4, -3, -2, -1, 0 [dB]
00 09	0000 aaaa	Mid band Ratio (0 - 13) 1:1.0, 1:1.1, 1:1.2, 1:1.4, 1:1.6, 1:1.8, 1:2.0, 1:2.5, 1:3.2, 1:4.0, 1:5.6, 1:8.0, 1:16, 1:INF
00 0A	000a aaaa	Mid band Level (0 - 24) 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 [dB]
00 0B	0aaa aaaa	High band Attack time (0 - 100)
00 0C	0aaa aaaa	High band Release time (0 - 100)
00 0D	00aa aaaa	High band Threshold (0 - 36) -36, -35, -34, -33, -32, -31, -30, -29, -28, -27, -26, -25, -24, -23, -22, -21, -20, -19, -18, -17, -16, -15, -14, -13, -12, -11, -10, -9, -8, -7, -6, -5, -4, -3, -2, -1, 0 [dB]
00 0E	0000 aaaa	High band Ratio (0 - 13) 1:1.0, 1:1.1, 1:1.2, 1:1.4, 1:1.6, 1:1.8, 1:2.0, 1:2.5, 1:3.2, 1:4.0, 1:5.6, 1:8.0, 1:16, 1:INF
00 0F	000a aaaa	High band Level (0 - 24) 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 [dB]
00 10	0000 0aaa	Split Freq Low (0 - 6) 200, 250, 315, 400, 500, 630, 800 [Hz]
00 11	0000 0aaa	Split Freq High (0 - 6) 2000, 2500, 3150, 4000, 5000, 6300, 8000 [Hz]
00 00 00 12	Total Size	

*** Studio Set Common**

Offset Address		Description	
00 00	0aaa aaaa	Studio Set Name 1	(32 – 127) 32 – 127 [ASCII]
00 01	0aaa aaaa	Studio Set Name 2	(32 – 127) 32 – 127 [ASCII]
00 02	0aaa aaaa	Studio Set Name 3	(32 – 127) 32 – 127 [ASCII]
00 03	0aaa aaaa	Studio Set Name 4	(32 – 127) 32 – 127 [ASCII]
00 04	0aaa aaaa	Studio Set Name 5	(32 – 127) 32 – 127 [ASCII]
00 05	0aaa aaaa	Studio Set Name 6	(32 – 127) 32 – 127 [ASCII]
00 06	0aaa aaaa	Studio Set Name 7	(32 – 127) 32 – 127 [ASCII]
00 07	0aaa aaaa	Studio Set Name 8	(32 – 127) 32 – 127 [ASCII]
00 08	0aaa aaaa	Studio Set Name 9	(32 – 127) 32 – 127 [ASCII]
00 0A	0aaa aaaa	Studio Set Name 11	(32 – 127) 32 – 127 [ASCII]
00 0B	0aaa aaaa	Studio Set Name 12	(32 – 127) 32 – 127 [ASCII]
00 0C	0aaa aaaa	Studio Set Name 13	(32 – 127) 32 – 127 [ASCII]
00 0D	0aaa aaaa	Studio Set Name 14	(32 – 127) 32 – 127 [ASCII]
00 0E	0aaa aaaa	Studio Set Name 15	(32 – 127) 32 – 127 [ASCII]
00 0F	0aaa aaaa	Studio Set Name 16	(32 – 127) 32 – 127 [ASCII]
00 10	0aaa aaaa	Studio Set Level	(0 – 127)
00 11	00aa aaaa	(reserve) <*>	
00 12	00aa aaaa	(reserve) <*>	
00 13	00aa aaaa	(reserve) <*>	
00 14	0000 000a	(reserve) <*>	
00 15	0000 000a	(reserve) <*>	
00 16	0000 000a	(reserve) <*>	
00 17	0000 000a	(reserve) <*>	
00 18	0aaa aaaa	Voice Reserve 1	(0 – 64) 0 – 63, FULL
00 19	0aaa aaaa	Voice Reserve 2	(0 – 64) 0 – 63, FULL
00 1A	0aaa aaaa	Voice Reserve 3	(0 – 64) 0 – 63, FULL
00 1B	0aaa aaaa	Voice Reserve 4	(0 – 64) 0 – 63, FULL
00 1C	0aaa aaaa	Voice Reserve 5	(0 – 64) 0 – 63, FULL
00 1D	0aaa aaaa	Voice Reserve 6	(0 – 64) 0 – 63, FULL
00 1E	0aaa aaaa	Voice Reserve 7	(0 – 64) 0 – 63, FULL
00 1F	0aaa aaaa	Voice Reserve 8	(0 – 64) 0 – 63, FULL
00 20	0aaa aaaa	Voice Reserve 9	(0 – 64) 0 – 63, FULL
00 21	0aaa aaaa	Voice Reserve 10	(0 – 64) 0 – 63, FULL
00 22	0aaa aaaa	Voice Reserve 11	(0 – 64) 0 – 63, FULL
00 23	0aaa aaaa	Voice Reserve 12	(0 – 64) 0 – 63, FULL
00 24	0aaa aaaa	Voice Reserve 13	(0 – 64) 0 – 63, FULL
00 25	0aaa aaaa	Voice Reserve 14	(0 – 64) 0 – 63, FULL
00 26	0aaa aaaa	Voice Reserve 15	(0 – 64) 0 – 63, FULL
00 27	0aaa aaaa	Voice Reserve 16	(0 – 64) 0 – 63, FULL
00 28	0aaa aaaa	(reserve) <*>	
00 29	0aaa aaaa	(reserve) <*>	
00 2A	0aaa aaaa	(reserve) <*>	
00 2B	0aaa aaaa	(reserve) <*>	
00 2C	0aaa aaaa	(reserve) <*>	
00 2D	0aaa aaaa	(reserve) <*>	
00 2E	0aaa aaaa	(reserve) <*>	
00 2F	0aaa aaaa	(reserve) <*>	
00 30	0aaa aaaa	(reserve) <*>	
00 31	0aaa aaaa	(reserve) <*>	
00 32	0aaa aaaa	(reserve) <*>	
00 33	0aaa aaaa	(reserve) <*>	
00 34	0aaa aaaa	(reserve) <*>	
00 35	0aaa aaaa	(reserve) <*>	
00 36	0aaa aaaa	(reserve) <*>	
00 37	0aaa aaaa	(reserve) <*>	
00 38	0000 aaaa	(reserve) <*>	
00 39	0aaa aaaa	Tone Control 1 Source	(0 – 97) OFF, CC01 – CC31, CC33 – CC95, BEND, AFT
00 3A	0aaa aaaa	Tone Control 2 Source	(0 – 97) OFF, CC01 – CC31, CC33 – CC95, BEND, AFT
00 3B	0aaa aaaa	Tone Control 3 Source	(0 – 97) OFF, CC01 – CC31, CC33 – CC95, BEND, AFT
00 3C	0aaa aaaa	Tone Control 4 Source	(0 – 97) OFF, CC01 – CC31, CC33 – CC95, BEND, AFT
00 3D	0000 000a	Part Solo Switch 1	(0 – 1) OFF, ON
00 3E	0000 000a	Part Solo Switch 2	(0 – 1) OFF, ON
00 3F	0000 000a	Part Solo Switch 3	(0 – 1) OFF, ON
00 40	0000 000a	Part Solo Switch 4	(0 – 1)

			OFF, ON
00 41	0000 000a	Part Solo Switch 5	(0 - 1) OFF, ON
00 42	0000 000a	Part Solo Switch 6	(0 - 1) OFF, ON
00 43	0000 000a	Part Solo Switch 7	(0 - 1) OFF, ON
00 44	0000 000a	Part Solo Switch 8	(0 - 1) OFF, ON
00 45	0000 000a	Part Solo Switch 9	(0 - 1) OFF, ON
00 46	0000 000a	Part Solo Switch 10	(0 - 1) OFF, ON
00 47	0000 000a	Part Solo Switch 11	(0 - 1) OFF, ON
00 48	0000 000a	Part Solo Switch 12	(0 - 1) OFF, ON
00 49	0000 000a	Part Solo Switch 13	(0 - 1) OFF, ON
00 4A	0000 000a	Part Solo Switch 14	(0 - 1) OFF, ON
00 4B	0000 000a	Part Solo Switch 15	(0 - 1) OFF, ON
00 4C	0000 000a	Part Solo Switch 16	(0 - 1) OFF, ON
00 00 00 4D	Total Size		

*** Studio Set Common Chorus**

Offset Address		Description	
00 00	0000 aaaa	Chorus Type	(0 - 3) OFF, (reserve), DELAY, CHORUS
00 01	0aaa aaaa	Chorus Level	(0 - 127)
00 02	0000 00aa	(reserve) <*>	
00 03	0000 00aa	(reserve) <*>	
# 00 04	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	DELAY: Delay Left (sync sw) CHORUS: Pre-LPF	(0 - 1) OFF, ON (0 - 7)
# 00 08	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	DELAY: Delay Left (msec) CHORUS: Level	(0 - 1000) (0 -127)
# 00 0C	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	DELAY: Delay Left (note) CHORUS: Feedback	(0 - 21) (0 - 127)
# 00 10	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	DELAY: Delay Right (sync sw) CHORUS: Delay	(0 - 1) OFF, ON (0 - 127)
# 00 14	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	DELAY: Delay Right (msec) CHORUS: Rate	(0 - 1000) (0 - 127)
# 00 18	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	DELAY: Delay Right (note) CHORUS: Depth	(0 - 21) (0 - 127)
# 00 1C	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	DELAY: Delay Center (sync sw) CHORUS: Send Level to Reverb	(0 - 1) OFF, ON (0 - 127)
# 00 20	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	DELAY: Delay Center (msec)	(0 - 1000)
# 00 24	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	DELAY: Delay Center (note)	(0 - 21)
# 00 28	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	DELAY: Center Feedback	(0 - 98) -98 - +98 [%]
# 00 2C	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	DELAY: HF Damp	(0 - 17) 200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
# 00 30	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	DELAY: Left Level	(0 -127)
# 00 34	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	DELAY: Right Level	(0 -127)
# 00 38	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	DELAY: Center Level	(0 -127)
# 00 3C	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	(reserve) <*> (reserve) <*> (reserve) <*> (reserve) <*>	
# 00 40	0000 aaaa 0000 bbbb	(reserve) <*> (reserve) <*>	

	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
		(reserve) <*>	
#	00 44	0000 aaaa	(reserve) <*>
		0000 bbbb	(reserve) <*>
		0000 cccc	(reserve) <*>
		0000 dddd	(reserve) <*>
			(reserve) <*>
#	00 48	0000 aaaa	(reserve) <*>
		0000 bbbb	(reserve) <*>
		0000 cccc	(reserve) <*>
		0000 dddd	(reserve) <*>
			(reserve) <*>
#	00 4C	0000 aaaa	(reserve) <*>
		0000 bbbb	(reserve) <*>
		0000 cccc	(reserve) <*>
		0000 dddd	(reserve) <*>
			(reserve) <*>
#	00 50	0000 aaaa	(reserve) <*>
		0000 bbbb	(reserve) <*>
		0000 cccc	(reserve) <*>
		0000 dddd	(reserve) <*>
00 00 00 54		Total Size	

*** Studio Set Common Reverb**

Offset Address		Description	
00 00	0000 aaaa	(reserve) <*>	
00 01	0aaa aaaa	Reverb Level	(0 - 127)
00 02	0000 00aa	(reserve) <*>	
# 00 03	0000 aaaa		
	0000 bbbb		
	0000 cccc		
	0000 dddd	Type	(0 - 7)
# 00 07	0000 aaaa		
	0000 bbbb		
	0000 cccc		
	0000 dddd	Pre-LPF	(0 - 7)
# 00 0B	0000 aaaa		
	0000 bbbb		
	0000 cccc		
	0000 dddd	Level	(0 - 127)
# 00 0F	0000 aaaa		
	0000 bbbb		
	0000 cccc		
	0000 dddd	Time	(0 - 127)
# 00 13	0000 aaaa		
	0000 bbbb		
	0000 cccc		
	0000 dddd	Feedback	(0 - 127)
# 00 17	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
# 00 1B	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
# 00 1F	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
# 00 23	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
# 00 27	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
# 00 2B	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
# 00 2F	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
# 00 33	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
# 00 37	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
# 00 3B	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
# 00 3F	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
# 00 43	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
# 00 47	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
# 00 4B	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
# 00 4F	0000 aaaa	(reserve) <*>	
	0000 bbbb	(reserve) <*>	
	0000 cccc	(reserve) <*>	
	0000 dddd	(reserve) <*>	
00 00 00 53		Total Size	

*** Studio Set Part**

Offset Address		Description	
00 00	0000 aaaa	Receive Channel	(0 - 15) 1 - 16
00 01	0000 000a	Part Switch	(0 - 1) OFF, ON
00 02	0000 000a	Receive Src1	(0 - 1) OFF, ON
00 03	0000 000a	Receive Src2	(0 - 1) OFF, ON
00 04	0000 000a	Receive Src3	(0 - 1) OFF, ON
00 05	0000 000a	Receive Src4	(0 - 1) OFF, ON
00 06	0aaa aaaa	Tone Bank Select MSB (CC# 0)	(0 - 127)
00 07	0aaa aaaa	Tone Bank Select LSB (CC# 32)	(0 - 127)
00 08	0aaa aaaa	Tone Program Number (PC)	(0 - 127)
00 09	0aaa aaaa	Part Level (CC# 7)	(0 - 127)
00 0A	0aaa aaaa	Part Pan (CC# 10)	(0 - 127) L64 - 63R
00 0B	0aaa aaaa	Part Coarse Tune (RPN# 2)	(16 - 112) -48 - +48
00 0C	0aaa aaaa	Part Fine Tune (RPN# 1)	(14 - 114) -50 - +50
00 0D	0000 00aa	Part Mono/Poly (MONO ON/POLY ON)	(0 - 2) MONO, POLY, TONE
00 0E	0000 00aa	Part Legato Switch (CC# 68)	(0 - 2) OFF, ON, TONE
00 0F	000a aaaa	Part Pitch Bend Range (RPN# 0)	(0 - 25) 0 - 24, TONE
00 10	0000 00aa	Part Portamento Switch (CC# 65)	(0 - 2) OFF, ON, TONE
# 00 11	0000 aaaa 0000 bbbb	Part Portamento Time (CC# 5)	(0 - 128) 0 - 127, TONE
00 13	0aaa aaaa	Part Cutoff Offset (CC# 74)	(0 - 127) -64 - +63
00 14	0aaa aaaa	Part Resonance Offset (CC# 71)	(0 - 127) -64 - +63
00 15	0aaa aaaa	Part Attack Time Offset (CC# 73)	(0 - 127) -64 - +63
00 16	0aaa aaaa	Part Decay Time Offset (CC# 75)	(0 - 127) -64 - +63
00 17	0aaa aaaa	Part Release Time Offset (CC# 72)	(0 - 127) -64 - +63
00 18	0aaa aaaa	Part Vibrato Rate (CC# 76)	(0 - 127) -64 - +63
00 19	0aaa aaaa	Part Vibrato Depth (CC# 77)	(0 - 127) -64 - +63
00 1A	0aaa aaaa	Part Vibrato Delay (CC# 78)	(0 - 127) -64 - +63
00 1B	0000 0aaa	Part Octave Shift	(61 - 67) -3 - +3
00 1C	0aaa aaaa	Part Velocity Sens Offset	(1 - 127) -63 - +63
00 1D	0aaa aaaa	Keyboard Range Lower	(0 - 127) C-1 - UPPER
00 1E	0aaa aaaa	Keyboard Range Upper	(0 - 127) LOWER - G9
00 1F	0aaa aaaa	Keyboard Fade Width Lower	(0 - 127)
00 20	0aaa aaaa	Keyboard Fade Width Upper	(0 - 127)
00 21	0aaa aaaa	Velocity Range Lower	(1 - 127) 1 - UPPER
00 22	0aaa aaaa	Velocity Range Upper	(0 - 127) LOWER - 127
00 23	0aaa aaaa	Velocity Fade Width Lower	(0 - 127)
00 24	0aaa aaaa	Velocity Fade Width Upper	(0 - 127)
00 25	0000 000a	Mute Switch	(0 - 1) OFF, MUTE
00 26	0aaa aaaa	Part Dry Send Level	(0 - 127)
00 27	0aaa aaaa	Part Chorus Send Level (CC# 93)	(0 - 127)
00 28	0aaa aaaa	Part Reverb Send Level (CC# 91)	(0 - 127)
00 29	0000 aaaa	(reserve) <*>	
00 2A	0000 00aa	(reserve) <*>	
00 2B	0aaa aaaa	Part Scale Tune Type	(0 - 2) CUSTOM, EQUAL, JUST
00 2C	0aaa aaaa	Part Scale Tune Key	(0 - 11) C, C#, D, D#, E, F, F#, G, G#, A, A#, B
00 2D	0aaa aaaa	Part Scale Tune for C	(0 - 127) -64 - +63
00 2E	0aaa aaaa	Part Scale Tune for C#	(0 - 127) -64 - +63
00 2F	0aaa aaaa	Part Scale Tune for D	(0 - 127) -64 - +63
00 30	0aaa aaaa	Part Scale Tune for D#	(0 - 127) -64 - +63
00 31	0aaa aaaa	Part Scale Tune for E	(0 - 127) -64 - +63
00 32	0aaa aaaa	Part Scale Tune for F	(0 - 127) -64 - +63
00 33	0aaa aaaa	Part Scale Tune for F#	(0 - 127) -64 - +63
00 34	0aaa aaaa	Part Scale Tune for G	(0 - 127) -64 - +63
00 35	0aaa aaaa	Part Scale Tune for G#	(0 - 127) -64 - +63
00 36	0aaa aaaa	Part Scale Tune for A	(0 - 127) -64 - +63
00 37	0aaa aaaa	Part Scale Tune for A#	(0 - 127) -64 - +63
00 38	0aaa aaaa	Part Scale Tune for B	(0 - 127) -64 - +63
00 39	0000 000a	Receive Program Change	(0 - 1) OFF, ON
00 3A	0000 000a	Receive Bank Select	(0 - 1) OFF, ON
00 3B	0000 000a	Receive Bender	(0 - 1)

00 3C	0000 000a	Receive Polyphonic Key Pressure	OFF, ON (0 - 1)
00 3D	0000 000a	Receive Channel Pressure	OFF, ON (0 - 1)
00 3E	0000 000a	Receive Modulation	OFF, ON (0 - 1)
00 3F	0000 000a	Receive Volume	OFF, ON (0 - 1)
00 40	0000 000a	Receive Pan	OFF, ON (0 - 1)
00 41	0000 000a	Receive Expression	OFF, ON (0 - 1)
00 42	0000 000a	Receive Hold-1	OFF, ON (0 - 1)
00 43	0000 0aaa	Velocity Curve Type	OFF, ON (0 - 4) OFF, 1 - 4
00 00 00 44	Total Size		

*** Studio Set Tone Modify**

Offset Address		Description	
00 00	0aaa aaaa	Tone Modify Type (read only)	(0 - 16)
00 01	0aaa aaaa	Modify Parameter 1	(0 - 127)
00 02	0aaa aaaa	Modify Parameter 2	(0 - 127)
00 03	0aaa aaaa	Modify Parameter 3	(0 - 127)
00 04	0aaa aaaa	Modify Parameter 4	(0 - 127)
00 05	0aaa aaaa	Modify Parameter 5	(0 - 127)
00 06	0aaa aaaa	Modify Parameter 6	(0 - 127)
00 07	0aaa aaaa	Modify Parameter 7	(0 - 127)
00 08	0aaa aaaa	Modify Parameter 8	(0 - 127)
00 09	0aaa aaaa	Modify Parameter 9	(0 - 127)
00 0A	0aaa aaaa	Modify Parameter 10	(0 - 127)
00 0B	0aaa aaaa	Modify Parameter 11	(0 - 127)
00 0C	0aaa aaaa	Modify Parameter 12	(0 - 127)
00 0D	0aaa aaaa	Modify Parameter 13	(0 - 127)
00 0E	0aaa aaaa	Modify Parameter 14	(0 - 127)
00 0F	0aaa aaaa	Modify Parameter 15	(0 - 127)
00 10	0aaa aaaa	Modify Parameter 16	(0 - 127)
00 11	0aaa aaaa	Modify Parameter 17	(0 - 127)
00 12	0aaa aaaa	Modify Parameter 18	(0 - 127)
00 13	0aaa aaaa	Modify Parameter 19	(0 - 127)
00 14	0aaa aaaa	Modify Parameter 20	(0 - 127)
00 15	0aaa aaaa	Modify Parameter 21	(0 - 127)
00 16	0aaa aaaa	Modify Parameter 22	(0 - 127)
00 17	0aaa aaaa	Modify Parameter 23	(0 - 127)
00 18	0aaa aaaa	Modify Parameter 24	(0 - 127)
00 19	0aaa aaaa	Modify Parameter 25	(0 - 127)
00 1A	0aaa aaaa	Modify Parameter 26	(0 - 127)
00 1B	0aaa aaaa	Modify Parameter 27	(0 - 127)
00 1C	0aaa aaaa	Modify Parameter 28	(0 - 127)
00 1D	0aaa aaaa	Modify Parameter 29	(0 - 127)
00 1E	0aaa aaaa	Modify Parameter 30	(0 - 127)
00 1F	0aaa aaaa	Modify Parameter 31	(0 - 127)
00 20	0aaa aaaa	Modify Parameter 32	(0 - 127)
00 21	0aaa aaaa	(reserve) <*>	
00 22	0aaa aaaa	(reserve) <*>	
00 23	0aaa aaaa	(reserve) <*>	
00 24	0aaa aaaa	(reserve) <*>	
00 00 00 25	Total Size		

4. Supplementary Material

■Decimal and Hexadecimal Table

(An "H" is appended to the end of numbers in hexadecimal notation.)
In MIDI documentation, data values and addresses/sizes of Exclusive messages, etc. are expressed as hexadecimal values for each 7 bits.
The following table shows how these correspond to decimal numbers.

D	H	D	H	D	H	D	H
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

D: decimal
H: hexadecimal

* Decimal values such as MIDI channel, bank select, and program change are listed as one greater than the values given in the above table.
* A 7-bit byte can express data in the range of 128 steps. For data where greater precision is required, we must use two or more bytes. For example, two hexadecimal numbers aa bbH expressing two 7-bit bytes would indicate a value of aa x 128+bb.
* In the case of values which have a +/- sign, 00H = -64, 40H = +/-0, and 7FH = +63, so that the decimal expression would be 64 less than the value given in the above chart. In the case of two types, 00 00H = -8192, 40 00H = +/-0, and 7F 7FH = +8191. For example, if aa bbH were expressed as decimal, this would be aa bbH - 40 00H = aa x 128+bb - 64 x 128.
* Data marked "Use nibbled data" is expressed in hexadecimal in 4-bit units. A value expressed as a 2-byte nibble 0a 0bH has the value of a x 16+b.

<Example 1>
What is the decimal expression of 5AH?
From the preceding table, 5AH = 90

<Example 2>
What is the decimal expression of the value 12 34H given as hexadecimal for each 7 bits?
From the preceding table, since 12H = 18 and 34H = 52
18 x 128+52 = 2356

<Example 3>
What is the decimal expression of the nibbled value 0A 03 09 0D?
From the preceding table, since 0AH = 10, 03H = 3, 09H = 9, 0DH = 13
((10 x 16+3) x 16+9) x 16+13 = 41885

<Example 4>
What is the nibbled expression of the decimal value 1258?

```
16 ) 1258
16 )   78 ...10
16 )    4 ...14
        0 ... 4
```

Since from the preceding table, 0 = 00H, 4 = 04H, 14 = 0EH, 10 = 0AH, the result is: 00 04 0E 0AH.

■Examples of Actual MIDI Messages

<Example 1> 92 3E 5F
9n is the Note-on status, and n is the MIDI channel number. Since 2H = 2, 3EH = 62, and 5FH = 95, this is a Note-on message with MIDI CH = 3, note number 62 (note name is D4), and velocity 95.

<Example 2> CE 49
CnH is the Program Change status, and n is the MIDI channel number. Since EH = 14 and 49H = 73, this is a Program Change message with MIDI CH = 15, program number 74.

<Example 3> EA 00 28
EnH is the Pitch Bend Change status, and n is the MIDI channel number. The 2nd byte (00H = 0) is the LSB and the 3rd byte (28H = 40) is the MSB, but Pitch Bend Value is a signed number in which 40 00H (= 64 x 12+80 = 8192) is 0, so this Pitch Bend Value is
28 00H - 40 00H = 40 x 12+80 - (64 x 12+80) = 5120 - 8192 = -3072

If the Pitch Bend Sensitivity is set to 2 semitones, -8192 (00 00H) will cause the pitch to change -200 cents, so in this case -200 x (-3072) Ëôá (-8192) = -75 cents of Pitch Bend is being applied to MIDI channel 11.

<Example 4> B3 64 00 65 00 06 0C 26 00 64 7F 65 7F
BnH is the Control Change status, and n is the MIDI channel number. For Control Changes, the 2nd byte is the control number, and the 3rd byte is the value. In a case in which two or more messages consecutive messages have the same status, MIDI has a provision called "running status" which allows the status byte of the second and following messages to be omitted. Thus, the above messages have the following meaning.

B3	64 00	MIDI ch.4, lower byte of RPN parameter number:	00H
(B3)	65 00	(MIDI ch.4) upper byte of RPN parameter number:	00H
(B3)	06 0C	(MIDI ch.4) upper byte of parameter value:	0CH
(B3)	26 00	(MIDI ch.4) lower byte of parameter value:	00H
(B3)	64 7F	(MIDI ch.4) lower byte of RPN parameter number:	7FH
(B3)	65 7F	(MIDI ch.4) upper byte of RPN parameter number:	7FH

In other words, the above messages specify a value of 0C 00H for RPN parameter number 00 00H on MIDI channel 4, and then set the RPN parameter number to 7F 7FH.

RPN parameter number 00 00H is Pitch Bend Sensitivity, and the MSB of the value indicates semitone units, so a value of 0CH = 12 sets the maximum pitch bend range to +/-12 semitones (1 octave). (On GS sound generators the LSB of Pitch Bend Sensitivity is ignored, but the LSB should be transmitted anyway (with a value of 0) so that operation will be correct on any device.)

Once the parameter number has been specified for RPN or NRPN, all Data Entry messages transmitted on that same channel will be valid, so after the desired value has been transmitted, it is a good idea to set the parameter number to 7F 7FH to prevent accidents. This is the reason for the (B3) 64 7F (B3) 65 7F at the end.

It is not desirable for performance data (such as Standard MIDI File data) to contain many events with running status as given in <Example 4>. This is because if playback is halted during the song and then rewound or fast-forwarded, the sequencer may not be able to transmit the correct status, and the sound generator will then misinterpret the data. Take care to give each event its own status.

It is also necessary that the RPN or NRPN parameter number setting and the value setting be done in the proper order. On some sequencers, events occurring in the same (or consecutive) clock may be transmitted in an order different than the order in which they were received. For this reason it is a good idea to slightly skew the time of each event (about 1 tick for TPQN = 96, and about 5 ticks for TPQN = 480).

* TPQN: Ticks Per Quarter Note

■ Example of an Exclusive Message and Calculating a Checksum

Roland Exclusive messages (RQ1, DT1) are transmitted with a checksum at the end (before F7) to make sure that the message was correctly received. The value of the checksum is determined by the address and data (or size) of the transmitted Exclusive message.

●How to calculate the checksum

(hexadecimal numbers are indicated by "H")
The checksum is a value derived by adding the address, size, and checksum itself and inverting the lower 7 bits.
Here's an example of how the checksum is calculated. We will assume that in the Exclusive message we are transmitting, the address is aa bb cc ddH and the data or size is ee ffH.

aa + bb + cc + dd + ee + ff = sum
sum √∑ 128 = quotient ... remainder
128 - remainder = checksum

<Example> Setting CHORUS TYPE of STUDIO SET COMMON to DELAY (DT1)
According to the "Parameter Address Map" (p. 8), the start address of Temporary Studio Set is 10 00 00 00H, the offset address of CHORUS at STUDIO SET COMMON is 04 00H, and the address of CHORUS TYPE is 00 00H. Therefore the address of CHORUS TYPE of STUDIO SET COMMON is;

```
  18 00 00 00H
        04 00H
+)      00 00H
  18 00 04 00H
```

DELAY has the value of 02H.
So the system exclusive message should be sent is;

F0	41	10	00 00 4A	12	18 00 04 00	02	??	F7
(1)	(2)	(3)	(4)	(5)	address	data	checksum	(6)

(1) Exclusive Status (2) ID (Roland) (3) Device ID (17)
(4) Model ID (SD-50) (5) Command ID (DT1) (6) End of Exclusive

Then calculate the checksum.

18H + 00H + 04H + 00H + 02H = 24 + 0 + 4 + 0 + 2 = 30 (sum)
30 (sum) √∑ 128 = 0 (quotient) ... 30 (remainder)
checksum = 128 - 30 (remainder) = 98 = 62H

This means that F0 41 10 00 00 4A 12 18 00 04 00 02 62 F7 is the message should be sent.

■The Scale Tune Feature

The scale Tune feature allows you to finely adjust the individual pitch of the notes from C through B. Though the settings are made while working with one octave, the fine adjustments will affect all octaves. By making the appropriate Scale Tune settings, you can obtain a complete variety of tuning methods other than equal temperament. As examples, three possible types of scale setting are explained below.

❍Equal Temperament

This method of tuning divides the octave into 12 equal parts. It is currently the most widely used form of tuning, especially in occidental music. On the SD-50, the default settings for the Scale Tune feature produce equal temperament.

❍Just Temperament (Tonic of C)

The principal triads resound much more beautifully than with equal temperament, but this benefit can only be obtained in one key. If transposed, the chords tend to become ambiguous. The example given involves settings for a key in which C is the keynote.

❍Arabian Scale

By altering the setting for Scale Tune, you can obtain a variety of other tunings suited for ethnic music. For example, the settings introduced below will set the unit to use the Arabian Scale.

Example Settings

Note name	Equal Temperament	Just Temperament (Key-tone C)	Arabian Scale
C	0	0	-6
C#	0	-8	+45
D	0	+4	-2
Eb	0	+16	-12
E	0	-14	-51
F	0	-2	-8
F#	0	-10	+43
G	0	+2	-4
G#	0	+14	+47
A	0	-16	0
Bb	0	+14	-10
B	0	-12	-49

The values in the table are given in cents. Convert these values to hexadecimal, and transmit them as Exclusive data.
For example, to set the tune (C-B) of the Part 1 Arabian Scale, send the following data:

F0 41 10 00 00 4A 12 18 00 20 2C 00 3A 6D 3E 34 0D 38 6B 3C 6F 40 36 0F 23 F7

■ASCII Code Table

Studio Set Name, etc., of MIDI data are described the ASCII code in the table below.

D	H	Char	D	H	Char	D	H	Char
32	20H	SP	64	40H	@	96	60H	`
33	21H	!	65	41H	A	97	61H	a
34	22H	"	66	42H	B	98	62H	b
35	23H	#	67	43H	C	99	63H	c
36	24H	$	68	44H	D	100	64H	d
37	25H	%	69	45H	E	101	65H	e
38	26H	&	70	46H	F	102	66H	f
39	27H	`	71	47H	G	103	67H	g
40	28H	(	72	48H	H	104	68H	h
41	29H	)	73	49H	I	105	69H	i
42	2AH	*	74	4AH	J	106	6AH	j
43	2BH	+	75	4BH	K	107	6BH	k
44	2CH	,	76	4CH	L	108	6CH	l
45	2DH	-	77	4DH	M	109	6DH	m
46	2EH	.	78	4EH	N	110	6EH	n
47	2FH	/	79	4FH	O	111	6FH	o
48	30H	0	80	50H	P	112	70H	p
49	31H	1	81	51H	Q	113	71H	q
50	32H	2	82	52H	R	114	72H	r
51	33H	3	83	53H	S	115	73H	s
52	34H	4	84	54H	T	116	74H	t
53	35H	5	85	55H	U	117	75H	u
54	36H	6	86	56H	V	118	76H	v
55	37H	7	87	57H	W	119	77H	w
56	38H	8	88	58H	X	120	78H	x
57	39H	9	89	59H	Y	121	79H	y
58	3AH	:	90	5AH	Z	122	7AH	z
59	3BH	;	91	5BH	[	123	7BH	{
60	3CH	<	92	5CH	\	124	7CH	|
61	3DH	=	93	5DH	]	125	7DH	}
62	3EH	>	94	5EH	^			
63	3FH	?	95	5FH	_			

D: decimal
H: hexadecimal

"SP" is space.