

DisCover 5 MIDI Implementation

The DisCover 5 implements additional functionality and parameters over and above previous Roland Instruments, which itself was an expansion of the GS sound generator format. These functions and parameters are marked by a [DisCover 5] symbol. If MIDI messages marked by a [DisCover 5] symbol are transmitted to another GS-format sound generator, those messages may not be recognized.

- The Vocal Harmonizer parameters cannot be controlled via MIDI.

1. Receive data

■ Channel Voice Messages

● 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)

- For Drum Parts, these messages are received when Rx.NOTE OFF = ON for each Instrument.
- The velocity values of Note Off messages are ignored.

● 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)

- Not received when Rx.NOTE MESSAGE = OFF. (Initial value is ON)
- For Drum Parts, these messages are not received when Rx.NOTE ON = OFF for each Instrument.

● 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 = key pressure: 00H–7FH (0–127)

- Not received when Rx.POLY PRESSURE (PAF) = OFF. (Initial value is ON)
- The resulting effect is determined by System Exclusive messages. With the initial settings, there will be no effect.

● Control Change

- When Rx.CONTROL CHANGE = OFF, all control change messages except for Channel Mode messages will be ignored.
- The value specified by a Control Change message will not be reset even by a Program Change, etc.

○ 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 = Bank number MSB: 00H–7FH (GS Variation number 0–127)
 Initial value = 00H

ll = Bank number LSB: 00H–04H (MAP), Initial value = 00H

- Not received when Rx.BANK SELECT = OFF.
- "Rx.BANK SELECT" is set to OFF by "GM1 System On," and Bank Select messages will be ignored.
- Rx.BANK SELECT is set to ON by "GM2 System On."
- Rx.BANK SELECT is set to ON by power-on reset or by receiving "GS Reset."
- When Rx.BANK SELECT LSB = OFF, Bank number LSB (llH) will be handled as 00H regardless of the received value. However, when sending Bank Select messages, you have to send both the MSB (mmH) and LSB (llH, the value should be 00H) together.
- Bank Select processing will be suspended until a Program Change message is received.
- The GS format "Variation number" is the value of the Bank Select MSB (Controller number 0) expressed in decimal.
- Some other GS devices do not recognize the Bank Select LSB (CC32).

○ 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 Rx.MODULATION = OFF (Initial value is ON)
- The resulting effect is determined by System Exclusive messages. With the initial settings, this is Pitch Modulation Depth.

○ 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), Initial value = 00H (0)

- This adjusts the rate of pitch change when Portamento is ON or when using the Portamento Control. A value of 0 results in the fastest 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), Initial value = 64H (100)

- Volume messages are used to adjust the volume balance of each Part.
- Not received when Rx.VOLUME = OFF. (Initial value is ON)

○ Pan (Controller number 10)

Status	2nd byte	3rd byte
BnH	0AH	vvH

n = MIDI channel number: 0H–FH (Ch.1–16)
 vv = pan: 00H–40H–7FH (Left–Center–Right),
 Initial value = 40H (Center)

- The stereo position can be adjusted over 127 steps.
- For Rhythm Parts, this is a relative adjustment of each Instrument's pan setting.
- Not received when Rx.PANPOT = OFF. (Initial value is ON)

○ 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), Initial value = 7FH (127)

- This adjusts the volume of a Part. It can be used independently from Volume messages. Expression messages are used for musical expression within a performance; e.g., expression pedal movements, crescendo and decrescendo.
- Not received when Rx.EXPRESSION = OFF. (Initial value is ON)

○ 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)

- Not received when Rx.HOLD1 = OFF. (Initial value is ON)

○ 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

- Not received when Rx.PORTAMENTO = OFF. (Initial value is ON)

○ 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

- Not received when Rx.SOSTENUTO = OFF. (Initial value is 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

- Not received when Rx.SOFT = OFF. (Initial value is ON)

○ Filter Resonance (Timbre/Harmonic Intensity) (Controller number 71) [DisCover 5]

Status	2nd byte	3rd byte
BnH	47H	vvH

n = MIDI channel number: 0H–FH (Ch.1–16)
 vv = Resonance value (relative change): 00H–7FH (-64–0–+63),
 Initial value = 40H (no change)

○ Release Time (Controller number 72) [DisCover 5]

Status	2nd byte	3rd byte
BnH	48H	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv= Release Time value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ Attack time (Controller number 73) [DisCover 5]

Status	2nd byte	3rd byte
BnH	49H	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv= Attack time value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ Cutoff (Controller number 74) [DisCover 5]

Status	2nd byte	3rd byte
BnH	4AH	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv= Cutoff value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ Decay Time (Controller number 75) [DisCover 5]

Status	2nd byte	3rd byte
BnH	4BH	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv= Decay Time value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ Vibrato Rate (Controller number 76) [DisCover 5]

Status	2nd byte	3rd byte
BnH	4CH	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv= Vibrato Rate value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ Vibrato Depth (Controller number 77) [DisCover 5]

Status	2nd byte	3rd byte
BnH	4DH	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv= Vibrato Depth value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ Vibrato Delay (Controller number 78) [DisCover 5]

Status	2nd byte	3rd byte
BnH	4EH	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv= Vibrato Delay value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ 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), Initial value = 28H (40)

- This message adjusts the Reverb Send Level of each Part.

○ 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), Initial value = 00H (0)

- This message adjusts the Chorus Send Level of each Part.

○ NRPN MSB/LSB (Controller number 99, 98)

Status	2nd byte	3rd byte
BnH	63H	mmH
BnH	62H	llH

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

- Rx.NRPN is set to OFF by power-on reset or by receiving "GM1 System On" or "GM2 System On," and NRPN message will be ignored. NRPN message will be received when Rx.NRPN= ON, or by receiving "GS RESET."
- The value set by NRPN will not be reset even if Program Change or Reset All Controllers is received.

NRPN

The NRPN (Non Registered Parameter Number) message allows an extended range of control changes to be used. On the DisCover 5, NRPN messages can be used to modify sound parameters, etc. To use these messages, you must first use NRPN messages (Controller number 98 and 99, their order does not matter) to specify the parameter to be controlled, and then use Data Entry messages (Controller number 6) to specify the value of the specified parameter. Once an NRPN parameter has been specified, all Data Entry messages received on that channel will modify the value of that parameter. To prevent accidents, it is recommended that you set RPN Null (RPN Number = 7FH 7FH) when you have

finished setting the value of the desired parameter. Refer to "5. Supplementary material", Examples of actual MIDI messages, [Example 4] (page 20). On the DisCover 5, Data entry LSB (Controller number 38) of NRPN is ignored, so it is no problem to send Data entry MSB (Controller number 6) only (without Data entry LSB).

On the DisCover 5, NRPN can be used to modify the following parameters.

NRPN	Data entry	Function and range
MSB LSB	MSB	
01H 08H	mmH	Vibrato Rate (relative change) mm: 00H-40H-7FH (-64-0-+63)
01H 09H	mmH	Vibrato Depth (relative change) mm: 00H-40H-7FH (-64-0-+63)
01H 0AH	mmH	Vibrato Delay (relative change) mm: 00H-40H-7FH (-64-0-+63)
01H 20H	mmH	TVF Cutoff Frequency (relative change) mm: 00H-40H-7FH (-64-0-+63)
01H 21H	mmH	TVF Resonance (relative change) mm: 00H-40H-7FH (-64-0-+63)
01H 63H	mmH	TVF&TVA Envelope Attack Time (relative change) mm: 00H-40H-7FH (-64-0-+63)
01H 64H	mmH	TVF&TVA Envelope Decay Time (relative change) mm: 00H-40H-7FH (-64-0-+63)
01H 66H	mmH	TVF&TVA Envelope Release Time (relative change) mm: 00H-40H-7FH (-64-0-+63)
18H rrH	mmH	Drum Instrument Pitch Coarse (relative change) rr: Drum Instrument note number mm: 00H-40H-7FH (-64-0-+63 semitone)
1AH rrH	mmH	Drum Instrument TVA Level (absolute change) rr: Drum Instrument note number mm: 00H-7FH (0-max)
1CH rrH	mmH	Drum Instrument Panpot (absolute change) rr: Drum Instrument note number mm: 00H, 01H-40H-7FH (random, left-center-right)
1DH rrH	mmH	Drum Instrument Reverb Send Level (absolute change) rr: Drum Instrument note number mm: 00H-7FH (0-max)
1EH rrH	mmH	Drum Instrument Chorus Send Level (absolute change) rr: Drum Instrument note number mm: 00H-7FH (0-max)
4FH 10H	mmH	Part 4 On / Off (Upper) [DisCover 5] mm: 00H-7FH (00-3FH =Off-40-7FH= On)
4FH 11H	mmH	Part 11 On / Off (Lower) mm: 00H- 7FH (00-3FH =Off-40-7FH= On)
4FH 14H	mmH	Part 16 On / Off (Man Drums) mm: 00H-7FH (00-3FH =Off-40-7FH= On)

- Parameters marked "relative change" will change relatively to the preset value(40H). Even among different GS devices, "relative change" parameters may sometimes differ in the way the sound changes or in the range of change.
- Parameters marked "absolute change" will be set to the absolute value of the parameter, regardless of the preset value.
- Data entry LSB (llH) is ignored.
- Part On/Off NRPN are received and transmitted through the Basic MIDI Channel.

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

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

- Not received when Rx.RPN = OFF.
- The value specified by RPN will not be reset even by messages such as Program Change or Reset All Controller.

RPN

The RPN (Registered Parameter Number) messages are expanded control changes, and each function of an RPN is described by the MIDI Standard. To use these messages, you must first use RPN (Controller number 101 and 100, their order does not matter) to specify the parameter to be controlled, and then use Data Entry messages (Controller number 6, 38) to specify the value of the specified parameter. Once an RPN parameter has been specified, all Data Entry messages received on that channel will modify the value of that parameter. To prevent accidents, it is recommended that you set RPN Null (RPN Number = 7FH 7FH) when you have finished setting the value of the desired parameter. Refer to "5. Supplementary material", Examples of actual MIDI messages, [Example 4] (page 20).

On the DisCover 5, RPN can be used to modify the following parameters.

RPN	Data Entry	LSB	Explanation
MSB LSB	MSB		
00H 00H	mmH	---	Pitch Bend Sensitivity mm: 00H-18H (0-24 semitones) Initial value = 02H (2 semitones) ll: ignored (processed as 00H) specify up to 2 octaves in semitone steps
00H 01H	mmH	llH	Master Fine Tuning mm, ll: 00 00H-40 00H-7F 7FH (-100-0-+99.99 cents), Initial value = 40 00H (+/- 0 cent)
Refer to "5. Supplementary material", About the Tuning (page 20).			
00H 02H	mmH	---	Master Coarse Tuning mm: 28H-40H-58H (-24-0-+24 semitones), Initial value = 40H (+/- 0 semitone) ll: ignored (processed as 00H)
00H 05H	mmH	llH	Modulation Depth Range

RPN	Data Entry	MSB	LSB	Explanation
				mm: 00H-04H (0-4 semitones) ll: 00H-7FH (0-100 cents) 100/128 Cent/Value
7FH 7FH	---	---		RPN null Set condition where RPN and NRPN are unspecified. The data entry messages after set RPN null will be ignored. (No Data entry messages are required after RPN null). Settings already made 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 Rx.PROGRAM CHANGE = OFF. (Initial value is ON)
 - After a Program Change message is received, the sound will change beginning with the next Note-on. Voices already sounding when the Program Change message was received will not be affected.
 - For Drum Parts, Program Change message will not be received on the lower byte of the bank numbers (the the value of CC00 is other than "0" (00H)).

○ 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 Rx.CH PRESSURE (CA) = OFF. (Initial value is ON)
 - The resulting effect is determined by System Exclusive messages. With the initial settings there will be no effect.

○ 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 Rx.PITCH BEND = OFF. (Initial value is ON)
 - The resulting effect is determined by System Exclusive messages. With the initial settings the effect is Pitch Bend.

■ Channel Mode Messages

● 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 currently sounding notes on the corresponding channel will be turned off immediately.

● 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)
Expression	127 (max)
Hold 1	0 (off)
Portamento	0 (off)
Sostenuto	0 (off)
Soft	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 Sounds Off and All Notes Off is received, and the corresponding channel will be set to Mode 4 (M = 1) regardless of the value of "mm (mono number)."

● 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 Sounds Off and All Notes Off is received, and the corresponding channel will be set to Mode 3.

■ User Program Change

User Programs can be selected via the following messages:

Status	2nd byte	3rd byte
BnH	00H	mmH
BnH	20H	iiH
CnH	ppH	

- n = MIDI Channel number 00H-FH (Ch 1-16)
mm = Bank number MSB 7AH
ii = Bank number LSB 00H
pp = User Program Number 00H-7FH (User Prog A11-B88)

00H	(CC 0)	20H	(CC 32)	ppH (Prg Change)	User Program
7AH (122)	00H (0)	00H	(1)	00H	(1) A 11
7AH (122)	00H (0)	01H	(2)	01H	(2) A 12
7AH (122)	00H (0)	02H	(3)	02H	(3) A 13
7AH (122)	00H (0)	03H	(4)	03H	(4) A 14
7AH (122)	00H (0)	04H	(5)	04H	(5) A 15
7AH (122)	00H (0)	05H	(6)	05H	(6) A 16
7AH (122)	00H (0)	06H	(7)	06H	(7) A 17
7AH (122)	00H (0)	07H	(8)	07H	(8) A 18
7AH (122)	00H (0)	08H	(9)	08H	(9) A 21
7AH (122)	00H (0)	09H	(10)	09H	(10) A 22
7AH (122)	00H (0)	0AH	(11)	0AH	(11) A 23
7AH (122)	00H (0)	0BH	(12)	0BH	(12) A 24
7AH (122)	00H (0)	0CH	(13)	0CH	(13) A 25
7AH (122)	00H (0)	0DH	(14)	0DH	(14) A 26
7AH (122)	00H (0)	0EH	(15)	0EH	(15) A 27
7AH (122)	00H (0)	0FH	(16)	0FH	(16) A 28
7AH (122)	00H (0)	10H	(17)	10H	(17) A 31
7AH (122)	00H (0)	11H	(18)	11H	(18) A 32
7AH (122)	00H (0)	12H	(19)	12H	(19) A 33
7AH (122)	00H (0)	13H	(20)	13H	(20) A 34
7AH (122)	00H (0)	14H	(21)	14H	(21) A 35
7AH (122)	00H (0)	15H	(22)	15H	(22) A 36
7AH (122)	00H (0)	16H	(23)	16H	(23) A 37
7AH (122)	00H (0)	17H	(24)	17H	(24) A 38
7AH (122)	00H (0)	18H	(25)	18H	(25) A 41
7AH (122)	00H (0)	19H	(26)	19H	(26) A 42
7AH (122)	00H (0)	1AH	(27)	1AH	(27) A 43
7AH (122)	00H (0)	1BH	(28)	1BH	(28) A 44
7AH (122)	00H (0)	1CH	(29)	1CH	(29) A 45
7AH (122)	00H (0)	1DH	(30)	1DH	(30) A 46
7AH (122)	00H (0)	1EH	(31)	1EH	(31) A 47
7AH (122)	00H (0)	1FH	(32)	1FH	(32) A 48
7AH (122)	00H (0)	20H	(33)	20H	(33) A 51
7AH (122)	00H (0)	21H	(34)	21H	(34) A 52
7AH (122)	00H (0)	22H	(35)	22H	(35) A 53
7AH (122)	00H (0)	23H	(36)	23H	(36) A 54
7AH (122)	00H (0)	24H	(37)	24H	(37) A 55
7AH (122)	00H (0)	25H	(38)	25H	(38) A 56
7AH (122)	00H (0)	26H	(39)	26H	(39) A 57
7AH (122)	00H (0)	27H	(40)	27H	(40) A 58
7AH (122)	00H (0)	28H	(41)	28H	(41) A 61
7AH (122)	00H (0)	29H	(42)	29H	(42) A 62
7AH (122)	00H (0)	2AH	(43)	2AH	(43) A 63
7AH (122)	00H (0)	2BH	(44)	2BH	(44) A 64
7AH (122)	00H (0)	2CH	(45)	2CH	(45) A 65
7AH (122)	00H (0)	2DH	(46)	2DH	(46) A 66
7AH (122)	00H (0)	2EH	(47)	2EH	(47) A 67
7AH (122)	00H (0)	2FH	(48)	2FH	(48) A 68
7AH (122)	00H (0)	30H	(49)	30H	(49) A 71
7AH (122)	00H (0)	31H	(50)	31H	(50) A 72
7AH (122)	00H (0)	32H	(51)	32H	(51) A 73
7AH (122)	00H (0)	33H	(52)	33H	(52) A 74
7AH (122)	00H (0)	34H	(53)	34H	(53) A 75
7AH (122)	00H (0)	35H	(54)	35H	(54) A 76

7AH	(122)	00H	(0)	36H	(55)	A 77
7AH	(122)	00H	(0)	37H	(56)	A 78
7AH	(122)	00H	(0)	38H	(57)	A 81
7AH	(122)	00H	(0)	39H	(58)	A 82
7AH	(122)	00H	(0)	3AH	(59)	A 83
7AH	(122)	00H	(0)	3BH	(60)	A 84
7AH	(122)	00H	(0)	3CH	(61)	A 85
7AH	(122)	00H	(0)	3DH	(62)	A 86
7AH	(122)	00H	(0)	3EH	(63)	A 87
7AH	(122)	00H	(0)	3FH	(64)	A 88
7AH	(122)	00H	(0)	40H	(65)	B 11
7AH	(122)	00H	(0)	41H	(66)	B 12
7AH	(122)	00H	(0)	42H	(67)	B 13
7AH	(122)	00H	(0)	43H	(68)	B 14
7AH	(122)	00H	(0)	44H	(69)	B 15
7AH	(122)	00H	(0)	45H	(70)	B 16
7AH	(122)	00H	(0)	46H	(71)	B 17
7AH	(122)	00H	(0)	47H	(72)	B 18
7AH	(122)	00H	(0)	48H	(73)	B 21
7AH	(122)	00H	(0)	49H	(74)	B 22
7AH	(122)	00H	(0)	4AH	(75)	B 23
7AH	(122)	00H	(0)	4BH	(76)	B 24
7AH	(122)	00H	(0)	4CH	(77)	B 25
7AH	(122)	00H	(0)	4DH	(78)	B 26
7AH	(122)	00H	(0)	4EH	(79)	B 27
7AH	(122)	00H	(0)	4FH	(80)	B 28
7AH	(122)	00H	(0)	50H	(81)	B 31
7AH	(122)	00H	(0)	51H	(82)	B 32
7AH	(122)	00H	(0)	52H	(83)	B 33
7AH	(122)	00H	(0)	53H	(84)	B 34
7AH	(122)	00H	(0)	54H	(85)	B 35
7AH	(122)	00H	(0)	55H	(86)	B 36
7AH	(122)	00H	(0)	56H	(87)	B 37
7AH	(122)	00H	(0)	57H	(88)	B 38
7AH	(122)	00H	(0)	58H	(89)	B 41
7AH	(122)	00H	(0)	59H	(90)	B 42
7AH	(122)	00H	(0)	5AH	(91)	B 43
7AH	(122)	00H	(0)	5BH	(92)	B 44
7AH	(122)	00H	(0)	5CH	(93)	B 45
7AH	(122)	00H	(0)	5DH	(94)	B 46
7AH	(122)	00H	(0)	5EH	(95)	B 47
7AH	(122)	00H	(0)	5FH	(96)	B 48
7AH	(122)	00H	(0)	60H	(97)	B 51
7AH	(122)	00H	(0)	61H	(98)	B 52
7AH	(122)	00H	(0)	62H	(99)	B 53
7AH	(122)	00H	(0)	63H	(100)	B 54
7AH	(122)	00H	(0)	64H	(101)	B 55
7AH	(122)	00H	(0)	65H	(102)	B 56
7AH	(122)	00H	(0)	66H	(103)	B 57
7AH	(122)	00H	(0)	67H	(104)	B 58
7AH	(122)	00H	(0)	68H	(105)	B 61
7AH	(122)	00H	(0)	69H	(106)	B 62
7AH	(122)	00H	(0)	6AH	(107)	B 63
7AH	(122)	00H	(0)	6BH	(108)	B 64
7AH	(122)	00H	(0)	6CH	(109)	B 65
7AH	(122)	00H	(0)	6DH	(110)	B 66
7AH	(122)	00H	(0)	6EH	(111)	B 67
7AH	(122)	00H	(0)	6FH	(112)	B 68
7AH	(122)	00H	(0)	70H	(113)	B 71
7AH	(122)	00H	(0)	71H	(114)	B 72
7AH	(122)	00H	(0)	72H	(115)	B 73
7AH	(122)	00H	(0)	73H	(116)	B 74
7AH	(122)	00H	(0)	74H	(117)	B 75
7AH	(122)	00H	(0)	75H	(118)	B 76
7AH	(122)	00H	(0)	76H	(119)	B 77
7AH	(122)	00H	(0)	77H	(120)	B 78
7AH	(122)	00H	(0)	78H	(121)	B 81
7AH	(122)	00H	(0)	79H	(122)	B 82
7AH	(122)	00H	(0)	7AH	(123)	B 83
7AH	(122)	00H	(0)	7BH	(124)	B 84
7AH	(122)	00H	(0)	7CH	(125)	B 85
7AH	(122)	00H	(0)	7DH	(126)	B 86
7AH	(122)	00H	(0)	7EH	(127)	B 87
7AH	(122)	00H	(0)	7FH	(128)	B 88
7FH	(127)	00H	(0)	00H	(1)	Cancel

■ System Realtime Message

● Active Sensing

Status

FEH

- When Active Sensing is received, the DisCover 5 will begin monitoring the intervals of all further messages. If the interval between messages exceeds 420 ms, the same process 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.

○ Song Start

Status

FAH

- When "Sequencer Start" is received, the SMF Player starts according to the following table.

○ Song Stop

Status

FCH

- When "Sequencer Stop" is received, the SMF Player stops.

○ Song Continue

Status

FBH

- When "Sequencer Continue" is received, the SMF Player continues to play from the current position.

○ Song Position Pointer

Status	2nd byte	3rd byte
F2H	XXH	YYH

XX = Song Position (Bar) LSB

YY = Song Position (Bar) MSB

○ Timing Clock

Status

F8H

- When "Timing Clock" is received, the Song is synchronized to an external clock according to the following table.

Song Sync RX

Internal

Response

A Song will neither start/stop nor follow the tempo of the external Timing Clock (F8) and "Start/Stop" (FA/FC) messages.

Auto

If a Song receives MIDI "Start/Stop" (FA/FC), it will follow automatically Internal or External "Timing" related to the presence or not of the incoming "MIDI Clock" (F8) messages.

MIDI

If a Song receives MIDI "Start/Stop" (FA/FC) it will follow only External "Timing" and maybe wait for the "MIDI Clock" (F8) messages.

Remote

If a Song receives MIDI "Start/Stop" (FA/FC) it will follow only Internal "Timing" ignoring the presence or not of the incoming "MIDI Clock" (F8) messages.

■ 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)

The System Exclusive Messages received by the DisCover 5 are: messages related to mode settings, Universal Realtime System Exclusive messages, Data Requests (RQ1), and Data Set (DT1).

● System Exclusive messages related to mode settings

These messages are used to initialize a device to GS or General MIDI mode, or change the operating mode. When creating performance data, a "GM1 System On" message should be inserted at the beginning of a General MIDI 1 score, a "GM2 System On" message at the beginning of a General MIDI 2 score, and a "GS Reset" message at the beginning of a GS music data. Each song should contain only one mode message as appropriate for the type of data. (Do not insert two or more mode setting messages in a single song.)

"GM System On" uses Universal Non-realtime Message format. "GS Reset" uses Roland system Exclusive format "Data Set 1 (DT1)."

○ GM1 System On

This is a command message that resets the internal settings of the unit to the General MIDI 1 initial state. After receiving this message, the DisCover 5 will automatically be set to the proper condition for correctly playing a General MIDI score.

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)

- When this message is received, Rx.BANK SELECT will be OFF and Rx.NRPN will be OFF.
- There must be an interval of at least 50 ms between this message and the next message.

○ 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)	

- When this message is received, the DisCover 5 can receive the messages specified by General MIDI 2, and use the General MIDI 2 sound map.

○ GM System Off

"GM System Off" is a command message that resets the internal state of the DisCover 5 from the GM state to its native condition. The DisCover 5 will reset to the GS default state.

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 message is received, the DisCover 5 will reset to the GS default state.

○ GS Reset

GS Reset is a message that resets the internal settings of a device to the GS initial state. This message appears at the beginning of GS music data, and a GS device that receives this message will automatically be set to the proper state to correctly play back GS music data.

Status	Data byte	Status
F0H	41H, dev, 42H, 12H, 40H, 00H, 7FH, 00H, 41H	F7H
Byte	Explanation	
F0H	Exclusive status	
41H	ID number (Roland)	
dev	Device ID (dev: 00H~1FH (1~32), Initial value is 10H (17))	
42H	Model ID (GS)	
12H	Command ID (DT1)	
40H	Address MSB	
00H	Address	
7FH	Address LSB	
00H	Data (GS reset)	
41H	Checksum	
F7H	EOX (End Of Exclusive)	

- When this message is received, Rx.NRPN will be ON.
- There must be an interval of at least 50 ms between this message and the next.

● Universal Realtime System Exclusive Messages

○ Master Volume

Status	Data byte	Status
F0H	7FH, 7FH, 04H, 01H, 11H, mmH	F7H
Byte	Explanation	
F0H	Exclusive status	
7FH	ID number (universal realtime message)	
7FH	Device ID (Broadcast)	
04H	Sub ID#1 (Device Control messages)	
01H	Sub ID#2 (Master Volume)	
11H	Master Volume lower byte	
mmH	Master Volume upper byte	
F7H	EOX (End Of Exclusive)	

- The lower byte (11H) of Master Volume will be handled as 00H.

● Global Parameter Control

Parameters of the Global Parameter Control are newly provided for the General MIDI 2.

○ Reverb Parameters

Status	Data byte	Status
F0H	7FH,7FH,04H,05H,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.	
F7H	EOX (End Of Exclusive)	

pp=0

Reverb Type

- vv = 00H Small Room (Room1)
- vv = 01H Medium Room (Room2)
- vv = 02H Large Room (Room3)
- vv = 03H Medium Hall (Hall1)
- vv = 04H Large Hall (Hall2)
- vv = 08H Plate (Plate)

- The DisCover 5 displays Reverb Type as described in parentheses.

pp=1

Reverb Time

- vv = 00H~7FH0~127

○ 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 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.	
F7H	EOX (End Of Exclusive)	

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~7FH0~127

pp=2

Mod Depth

- vv = 00H~7FH0~127

pp=3

Feedback

- vv = 00H~7FH0~127

pp=4

Send To Reverb

- vv = 00H~7FH0~127

○ 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	
F7H	EOX (End Of Exclusive)	

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]

Status	Data byte	Status
pp=5	LFO Amplitude Depth rr = 00H-7FH	0~100%
○ 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	
F7H	EOX (End Of Exclusive)	
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%

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 byte1 bits 0 to 1 = channel 15 to 16 bit 2 to 6 = Undefined	
ggH	Channel byte2 bits 0 to 6 = channel 8 to 14	
hhH	Channel byte3 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)	

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 (00-0F)	
kkH	Key Number	
nnH	Control Number	
vvH	Value	
F7H	EOX (End Of Exclusive)	
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)

- This parameter affects drum instruments only.

2. Transmit data

■ Channel Voice Messages

● Note off

Status	2nd byte	3rd byte
9nH	kkH	00H
n = MIDI channel number:		0H-FH (Ch.1-16)
kk = note number:		00H-7FH (0-127)
vv = note off velocity:		00H (0)

● 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)

● 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 = Bank number MSB:		00H-7FH (GS Variation number 0-127)
ll = Bank number LSB:		00H-04H (MAP)

- Not transmitted when "Program Change" Tx is off.
- Some other GS devices do not recognize the Bank Select LSB (Controller number 32).

○ 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 transmitted when "Control Change" Tx is off.

○ 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), Initial value = 00H (0)

- This adjusts the rate of pitch change when Portamento is ON or when using the Portamento Control. A value of 0 results in the fastest 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), Initial value = 64H (100)

- Volume messages are used to adjust the volume balance of each Part.
- Not transmitted when "Control Change" Tx is off.

○ Pan (Controller number 10)

Status	2nd byte	3rd byte
BnH	0AH	vvH
n = MIDI channel number:		0H-FH (Ch.1-16)
vv = pan:		00H-40H-7FH (Left-Center-Right), Initial value = 40H (Center)

- The stereo position can be adjusted over 127 steps.
- Not transmitted when "Control Change" Tx is off.

○ 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), Initial value = 7FH (127)

- This adjusts the volume of a Part. It can be used independently from Volume messages. Expression messages are used for musical expression within a performance; e.g., expression pedal movements, crescendo and decrescendo.
- Not transmitted when "Control Change" Tx 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)

- Not transmitted when "Control Change" Tx 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

○ 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

○ Filter Resonance (Timbre/Harmonic Intensity) (Controller number 71) [DisCover 5]

Status	2nd byte	3rd byte
BnH	47H	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv = Resonance value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ Release Time (Controller number 72) [DisCover 5]

Status	2nd byte	3rd byte
BnH	48H	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv = Release Time value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ Attack time (Controller number 73) [DisCover 5]

Status	2nd byte	3rd byte
BnH	49H	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv = Attack time value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ Cutoff (Controller number 74) [DisCover 5]

Status	2nd byte	3rd byte
BnH	4AH	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv = Cutoff value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ Decay Time (Controller number 75) [DisCover 5]

Status	2nd byte	3rd byte
BnH	4BH	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv = Decay Time value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ Vibrato Rate (Controller number 76) [DisCover 5]

Status	2nd byte	3rd byte
BnH	4CH	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv = Vibrato Rate value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ Vibrato Depth (Controller number 77) [DisCover 5]

Status	2nd byte	3rd byte
BnH	4DH	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv = Vibrato Depth value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ Vibrato Delay (Controller number 78) [DisCover 5]

Status	2nd byte	3rd byte
BnH	4EH	vvH

n = MIDI channel number: 0H-FH (Ch.1-16)
 vv = Vibrato Delay value (relative change): 00H-7FH (-64-0-+63), Initial value = 40H (no change)

○ 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), Initial value = 28H (40)
 • This message adjusts the Reverb Send Level of each Part.
 • Not transmitted when "Control Change" Tx is off.

○ 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), Initial value = 00H (0)
 • This message adjusts the Chorus Send Level of each Part.
 • Not transmitted when "Control Change" Tx is off.

○ NRPN MSB/LSB (Controller number 99, 98)

Status	2nd byte	3rd byte
BnH	63H	mmH
BnH	62H	llH

n = MIDI channel number: 0H-FH (Ch.1-16)
 mm = upper byte (MSB) of the parameter number specified by NRPN
 ll = lower byte (LSB) of the parameter number specified by NRPN
 • Not transmitted when "Control Change" Tx is off.

NRPN

The NRPN (Non Registered Parameter Number) message allows an extended range of control changes to be used, letting you use control functions which are not defined in the MIDI Specification.

NRPNs provide a great deal of freedom, and can be used with any manufacturer's devices. As a result, any particular parameter number can easily mean one thing when used for a certain device, and mean something completely different on another device. Note that RPNs and NRPNs require that a multiple number of messages be processed in the correct order. However, a majority of the sequencers currently on the market cannot always be relied on to consistently send messages in the proper order if the messages are located at almost exactly the same point in time.

On the GS instruments, NRPN can be used to modify the following parameters. The range of values for relative change parameters will be different with certain models. Please see the explanation that follows the chart.

NRPN	Data Entry	Function and range
MSB LSB	MSB	LSB
01H 08H	mmH	Vibrato Rate (relative change) mm: 00H-40H-7FH (-64-0-+63)
01H 09H	mmH	Vibrato Depth (relative change) mm: 00H-40H-7FH (-64-0-+63)
01H 0AH	mmH	Vibrato Delay (relative change) mm: 00H-40H-7FH (-64-0-+63)
01H 20H	mmH	TVF Cutoff Frequency (relative change) mm: 00H-40H-7FH (-64-0-+63)
01H 21H	mmH	TVF Resonance (relative change) mm: 00H-40H-7FH (-64-0-+63)
01H 63H	mmH	TVF&TVA Envelope Attack Time (relative change) mm: 00H-40H-7FH (-64-0-+63)
01H 64H	mmH	TVF&TVA Envelope Decay Time (relative change) mm: 00H-40H-7FH (-64-0-+63)
01H 66H	mmH	TVF&TVA Envelope Release Time (relative change) mm: 00H-40H-7FH (-64-0-+63)
18H rrH	mmH	Drum Instrument Pitch Coarse (relative change) rr: Drum Instrument note number mm: 00H-40H-7FH (-64-0-+63 semitone)
1AH rrH	mmH	Drum Instrument TVA Level (absolute change) rr: Drum Instrument note number mm: 00H-7FH (0-max)
1CH rrH	mmH	Drum Instrument Panpot (absolute change) rr: Drum Instrument note number mm: 00H, 01H-40H-7FH (random, left-center-right)
1DH rrH	mmH	Drum Instrument Reverb Send Level (absolute change) rr: Drum Instrument note number mm: 00H-7FH (0-max)
1EH rrH	mmH	Drum Instrument Chorus Send Level (absolute change) rr: Drum Instrument note number mm: 00H-7FH (0-max)
4FH 10H	mmH	Part 4 On / Off (Upper) mm: 00H-7FH (00-3FH =Off-40-7FH= On)
4FH 11H	mmH	Part 11 On / Off (Lower) mm: 00H-7FH (00-3FH =Off-40-7FH= On)
4FH 14H	mmH	Part 16 On / Off (Man Drums) mm: 00H-7FH (00-3FH =Off-40-7FH= On)

- Parameters marked "relative change" will change relatively to the preset value(40H). Even among different GS devices, "relative change" parameters may sometimes differ in the way the sound changes or in the range of change.
- Parameters marked "absolute change" will be set to the absolute value of the parameter, regardless of the preset value.
- Data entry LSB (llH) is ignored.

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

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
 • Not transmitted when "Control Change" Tx is off.

RPN

The RPN (Registered Parameter Number) message allows an extended range of control changes to be used, letting you use additional control functions which are part of the MIDI Specification.

On the DisCover 5, RPN can be used to modify the following parameters.

RPN	Data Entry	Explanation
MSB LSB	MSB	LSB
00H 00H	mmH	Pitch Bend Sensitivity mm: 00H-18H (0-24 semitones)

RPN MSB LSB	Data Entry MSB LSB		Explanation
00H 01H	mmH	llH	ll: ignored (processed as 00H) specify up to 2 octaves in semitone steps Master Fine Tuning mm, ll: 00 00H-40 00H-7F 7FH (-100-0+99.99 cents), Initial value = 40 00H (+/- 0 cent)
Refer to "5. Supplementary material", About the Tuning (page 20).			
00H 02H	mmH	---	Master Coarse Tuning mm: 28H-40H-58H (-24-0+24 semitones), Initial value = 40H (+/-0 semitone)
00H 05H	mmH	llH	ll: ignored (processed as 00H) Modulation Depth Range mm: 00H-04H (0-4 semitones) ll: 00H-7FH (0-100 cents) 100/128 Cent/Value
7FH 7FH	---	---	RPN null Set condition where RPN and NRPN are unspecified. The data entry messages after set RPN null will be ignored. (No Data entry messages are required after RPN null). Settings already made 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 transmitted when "Program Change" Tx 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 transmitted when "Pitch Bender" Tx is off.

■ Channel Mode Messages

● 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 transmitted, all currently sounding notes on the corresponding channel will be turned off immediately.

● 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 transmitted, the following controllers will be set to their reset values.

Controller	Reset value
Pitch Bend Change	+/-0 (center)
Channel Pressure	0 (off)
Modulation	0 (off)
Hold 1	0 (off)
Sostenuto	0 (off)
Soft	0 (off)

● 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 corresponding channel will be set to Mode 4 (M=1).

● POLY (Controller number 127)

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

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

- The corresponding channel will be set to Mode 3.

■ User Program Change

User Programs send the following messages when selected on the DisCover 5:

Status	2nd byte	3rd byte
BnH	00H	mmH
BnH	20H	iiH
CnH	ppH	

n = MIDI Channel number 00H-FH (Ch 1-16)

mm = Bank number MSB 7AH

ii = Bank number LSB 00H

pp = User Program Number 00H-7FH (User Prog A11-B88)

00H	(CC 0)	20H	(CC 32)	ppH (Prg Change)	User Program
7AH	(122)	00H	(0)	00H	(1) A 11
7AH	(122)	00H	(0)	01H	(2) A 12
7AH	(122)	00H	(0)	02H	(3) A 13
7AH	(122)	00H	(0)	03H	(4) A 14
7AH	(122)	00H	(0)	04H	(5) A 15
7AH	(122)	00H	(0)	05H	(6) A 16
7AH	(122)	00H	(0)	06H	(7) A 17
7AH	(122)	00H	(0)	07H	(8) A 18
7AH	(122)	00H	(0)	08H	(9) A 21
7AH	(122)	00H	(0)	09H	(10) A 22
7AH	(122)	00H	(0)	0AH	(11) A 23
7AH	(122)	00H	(0)	0BH	(12) A 24
7AH	(122)	00H	(0)	0CH	(13) A 25
7AH	(122)	00H	(0)	0DH	(14) A 26
7AH	(122)	00H	(0)	0EH	(15) A 27
7AH	(122)	00H	(0)	0FH	(16) A 28
7AH	(122)	00H	(0)	10H	(17) A 31
7AH	(122)	00H	(0)	11H	(18) A 32
7AH	(122)	00H	(0)	12H	(19) A 33
7AH	(122)	00H	(0)	13H	(20) A 34
7AH	(122)	00H	(0)	14H	(21) A 35
7AH	(122)	00H	(0)	15H	(22) A 36
7AH	(122)	00H	(0)	16H	(23) A 37
7AH	(122)	00H	(0)	17H	(24) A 38
7AH	(122)	00H	(0)	18H	(25) A 41
7AH	(122)	00H	(0)	19H	(26) A 42
7AH	(122)	00H	(0)	1AH	(27) A 43
7AH	(122)	00H	(0)	1BH	(28) A 44
7AH	(122)	00H	(0)	1CH	(29) A 45
7AH	(122)	00H	(0)	1DH	(30) A 46
7AH	(122)	00H	(0)	1EH	(31) A 47
7AH	(122)	00H	(0)	1FH	(32) A 48
7AH	(122)	00H	(0)	20H	(33) A 51
7AH	(122)	00H	(0)	21H	(34) A 52
7AH	(122)	00H	(0)	22H	(35) A 53
7AH	(122)	00H	(0)	23H	(36) A 54
7AH	(122)	00H	(0)	24H	(37) A 55
7AH	(122)	00H	(0)	25H	(38) A 56
7AH	(122)	00H	(0)	26H	(39) A 57
7AH	(122)	00H	(0)	27H	(40) A 58
7AH	(122)	00H	(0)	28H	(41) A 61
7AH	(122)	00H	(0)	29H	(42) A 62
7AH	(122)	00H	(0)	2AH	(43) A 63
7AH	(122)	00H	(0)	2BH	(44) A 64
7AH	(122)	00H	(0)	2CH	(45) A 65
7AH	(122)	00H	(0)	2DH	(46) A 66
7AH	(122)	00H	(0)	2EH	(47) A 67
7AH	(122)	00H	(0)	2FH	(48) A 68
7AH	(122)	00H	(0)	30H	(49) A 71
7AH	(122)	00H	(0)	31H	(50) A 72
7AH	(122)	00H	(0)	32H	(51) A 73
7AH	(122)	00H	(0)	33H	(52) A 74
7AH	(122)	00H	(0)	34H	(53) A 75
7AH	(122)	00H	(0)	35H	(54) A 76
7AH	(122)	00H	(0)	36H	(55) A 77
7AH	(122)	00H	(0)	37H	(56) A 78
7AH	(122)	00H	(0)	38H	(57) A 81
7AH	(122)	00H	(0)	39H	(58) A 82
7AH	(122)	00H	(0)	3AH	(59) A 83
7AH	(122)	00H	(0)	3BH	(60) A 84
7AH	(122)	00H	(0)	3CH	(61) A 85
7AH	(122)	00H	(0)	3DH	(62) A 86
7AH	(122)	00H	(0)	3EH	(63) A 87
7AH	(122)	00H	(0)	3FH	(64) A 88
7AH	(122)	00H	(0)	40H	(65) B 11
7AH	(122)	00H	(0)	41H	(66) B 12
7AH	(122)	00H	(0)	42H	(67) B 13
7AH	(122)	00H	(0)	43H	(68) B 14
7AH	(122)	00H	(0)	44H	(69) B 15
7AH	(122)	00H	(0)	45H	(70) B 16
7AH	(122)	00H	(0)	46H	(71) B 17
7AH	(122)	00H	(0)	47H	(72) B 18
7AH	(122)	00H	(0)	48H	(73) B 21
7AH	(122)	00H	(0)	49H	(74) B 22
7AH	(122)	00H	(0)	4AH	(75) B 23
7AH	(122)	00H	(0)	4BH	(76) B 24
7AH	(122)	00H	(0)	4CH	(77) B 25
7AH	(122)	00H	(0)	4DH	(78) B 26

7AH	(122)	00H	(0)	4EH	(79)	B 27
7AH	(122)	00H	(0)	4FH	(80)	B 28
7AH	(122)	00H	(0)	50H	(81)	B 31
7AH	(122)	00H	(0)	51H	(82)	B 32
7AH	(122)	00H	(0)	52H	(83)	B 33
7AH	(122)	00H	(0)	53H	(84)	B 34
7AH	(122)	00H	(0)	54H	(85)	B 35
7AH	(122)	00H	(0)	55H	(86)	B 36
7AH	(122)	00H	(0)	56H	(87)	B 37
7AH	(122)	00H	(0)	57H	(88)	B 38
7AH	(122)	00H	(0)	58H	(89)	B 41
7AH	(122)	00H	(0)	59H	(90)	B 42
7AH	(122)	00H	(0)	5AH	(91)	B 43
7AH	(122)	00H	(0)	5BH	(92)	B 44
7AH	(122)	00H	(0)	5CH	(93)	B 45
7AH	(122)	00H	(0)	5DH	(94)	B 46
7AH	(122)	00H	(0)	5EH	(95)	B 47
7AH	(122)	00H	(0)	5FH	(96)	B 48
7AH	(122)	00H	(0)	60H	(97)	B 51
7AH	(122)	00H	(0)	61H	(98)	B 52
7AH	(122)	00H	(0)	62H	(99)	B 53
7AH	(122)	00H	(0)	63H	(100)	B 54
7AH	(122)	00H	(0)	64H	(101)	B 55
7AH	(122)	00H	(0)	65H	(102)	B 56
7AH	(122)	00H	(0)	66H	(103)	B 57
7AH	(122)	00H	(0)	67H	(104)	B 58
7AH	(122)	00H	(0)	68H	(105)	B 61
7AH	(122)	00H	(0)	69H	(106)	B 62
7AH	(122)	00H	(0)	6AH	(107)	B 63
7AH	(122)	00H	(0)	6BH	(108)	B 64
7AH	(122)	00H	(0)	6CH	(109)	B 65
7AH	(122)	00H	(0)	6DH	(110)	B 66
7AH	(122)	00H	(0)	6EH	(111)	B 67
7AH	(122)	00H	(0)	6FH	(112)	B 68
7AH	(122)	00H	(0)	70H	(113)	B 71
7AH	(122)	00H	(0)	71H	(114)	B 72
7AH	(122)	00H	(0)	72H	(115)	B 73
7AH	(122)	00H	(0)	73H	(116)	B 74
7AH	(122)	00H	(0)	74H	(117)	B 75
7AH	(122)	00H	(0)	75H	(118)	B 76
7AH	(122)	00H	(0)	76H	(119)	B 77
7AH	(122)	00H	(0)	77H	(120)	B 78
7AH	(122)	00H	(0)	78H	(121)	B 81
7AH	(122)	00H	(0)	79H	(122)	B 82
7AH	(122)	00H	(0)	7AH	(123)	B 83
7AH	(122)	00H	(0)	7BH	(124)	B 84
7AH	(122)	00H	(0)	7CH	(125)	B 85
7AH	(122)	00H	(0)	7DH	(126)	B 86
7AH	(122)	00H	(0)	7EH	(127)	B 87
7AH	(122)	00H	(0)	7FH	(128)	B 88
7FH	(127)	00H	(0)	00H	(1)	Cancel

■ System Realtime Messages

○ Active Sensing

Status

FEH

Transmitted about every 250ms.

○ Song Start

Status

FAH

- This message is transmitted when the internal sequencer is started.

○ Song Stop

Status

FCH

- This message is transmitted when the internal sequencer is stopped.

○ Song Continue

Status

FBH

- This message is transmitted when the sequencer is started not from the beginning.

○ Song Position Pointer

Status 2nd byte 3rd byte

F2H XXH YYH

XX = Song Position (Bar) LSB

YY = Song Position (Bar) MSB

○ Timing Clock

Status

F8H

● System Exclusive messages related to mode settings

These messages are used to initialize a device to GS or General MIDI mode, or change the operating mode. When creating performance data, a "GM1 System On" message should be inserted at the beginning of a General MIDI 1 score, a "GM2 System On" message at the beginning of a General MIDI 2 score, and a "GS Reset" message at the beginning of a GS music data. Each song should contain only one mode message

as appropriate for the type of data. (Do not insert two or more mode setting messages in a single song.)
 "GM System On" uses the Universal Non-realtime Message format. "GS Reset" uses Roland system Exclusive format "Data Set 1 (DT1)."

○ GM1 System On

This is a command message that resets the internal settings of the unit to the General MIDI 1 initial state. After receiving this message, the DisCover 5 will automatically be set to the proper condition for correctly playing a General MIDI score.

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)

- When this message is received, Rx.BANK SELECT will be OFF and Rx.NRPN will be OFF.
- There must be an interval of at least 50 ms between this message and the next message.

○ 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)

- When this message is received, the DisCover 5 will be able to receive the messages specified by General MIDI 2, and use the General MIDI 2 sound map.

○ GM System Off

"GM System Off" is a command message that resets the internal state of the DisCover 5 from the GM state to its native condition. The DisCover 5 will reset to the GS default state.

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 message is received, the DisCover 5 will reset to the GS default state.

○ GS Reset

GS Reset is a command message that resets the internal settings of a device to the GS initial state. This message appears at the beginning of GS music data, and a GS device that receives this message will automatically be set to the proper state to correctly play back GS music data.

Status	Data byte	Status
F0H	41H, dev, 42H, 12H, 40H, 00H, 7FH, 00H, 41H	F7H

Byte Explanation

F0H	Exclusive status
41H	ID number (Roland)
dev	Device ID (dev: 00H~1FH (1~32), Initial value is 10H (17))
42H	Model ID (GS)
12H	Command ID (DT1)
40H	Address MSB
00H	Address
7FH	Address LSB
00H	Data (GS reset)
41H	Checksum
F7H	EOX (End Of Exclusive)

- When this message is received, Rx.NRPN will be ON.
- There must be an interval of at least 50 ms between this message and the next.

■ System Exclusive Messages

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)

The System Exclusive Messages Transmitted and received by the DisCover 5 are: messages related to Mode Setting, Universal Realtime System Exclusive messages, Data Requests (RQ1), and Data Set (DT1).

3. Individual Parameter Transmission (Model ID=42)

Individual Parameter Transmission transmits data (or requests data) for one parameter as one exclusive message (one packet of "F0 F7").

In Individual Parameter Transmission, you must use the Address and Size listed in the following "Parameter Address Map". Addresses marked at "#" cannot be used as starting addresses.

■ System Realtime Message

● Active sensing

Status

FEH

* This will be transmitted constantly at intervals of approximately 250 ms.

■ System Exclusive messages

"Identity Reply" and "Data Set 1 (DT1)" are the only System Exclusive messages transmitted by the DisCover 5.

When an appropriate "Identity Request Message" and "Data Request 1 (RQ1)" message are received, the requested internal data will be transmitted.

○ Identity Reply

<u>Status</u>	<u>Data byte</u>	<u>Status</u>
F0H	7EH, dev, 06H, 02H, 41H, 42H, 00H, 00H, 06H, ssH, ssH, ssH, ssH	F7H

<u>Byte</u>	<u>Explanation</u>
FOH	Exclusive status
7EH	ID number (Universal Non-realtime Message)
dev	Device ID (use the same as the device ID of Roland)
06H	Sub ID#1 (General Information)
02H	Sub ID#2 (Identity Reply)
41H	ID number (Roland)
42H	Device family code (LSB)
00H	Device family code (MSB)
00H	Device family number code (LSB)
06H	Device family number code (MSB)
ssH	Software revision level
ssH	Software revision level
ssH	Software revision level
ssH	Software revision level
F7H	EOX (End of Exclusive)

* Reply to the message by the unique device ID (dev) when the device has received the "Identity Request Message" in the Broadcast.

○ Data set 1

DT1 (12H)

<u>Status</u>	<u>Data byte</u>	<u>Status</u>
F0H	41H, dev, 42H, 12H, aaH, bbH, ccH, ddH, ... eeH, sum	F7H

<u>Byte</u>	<u>Explanation</u>
F0H	Exclusive status
41H	ID number (Roland)
dev	Device ID (dev: 00H~1FH, Initial value is 10H)
42H	Model ID (GS)
12H	Command ID (DT1)
aaH	Address MSB: upper byte of the starting address of the data to be sent
bbH	Address: middle byte of the starting address of the data to be sent
ccH	Address LSB: lower byte of the starting address of the data to be sent.
ddH	Data: the actual data to be sent. Multiple bytes of data are transmitted in order 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.

* Data larger than 128 bytes will be divided into packets of 128 bytes or less, and each packet will be sent at an interval of about 40 ms.

* Regarding the checksum, refer to "5. Supplementary material", Example of an Exclusive message and calculating a checksum (page 20).

● Patch parameters

○ Patch common parameters

The parameters common to all Parts in each module are called Patch Common parameters.

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)	Description
40 00 00	00 00 04	0018-07E8	MASTER TUNE	-100.0~+100.0 [cents]	00 04 00 00	0 [cents]
40 00 01#				Use nibblized data.		
40 00 02#						
40 00 03#						

- Refer to section "5. Supplementary material", About the Tuning (page 20).

40 00 04	00 00 01	00-7F	MASTER VOLUME	0-127 (= F0 7F 7F 04 01 00 vv F7)	7F	127
40 00 05	00 00 01	28-58	MASTER KEY-SHIFT	-24~+24 [semitones]	40	0 [semitones]
40 00 06	00 00 01	01-7F	MASTER PAN	-63 (LEFT)~+63 (RIGHT)	40	0 (CENTER)
40 00 7F	00 00 01	00	MODE SET	00 = GS Reset (Rx. only)		

40 01 00	00 00 10	20-7F	PATCH NAME	16 ASCII Characters		
40 01 :	#					
40 01 0F#						
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	Hall 2
40 01 31	00 00 01	00-07	REVERB CHARACTER	0-7	04	4
40 01 32	00 00 01	00-07	REVERB PRE-LPF	0-7	00	0
40 01 33	00 00 01	00-7F	REVERB LEVEL	0-127	40	64
40 01 34	00 00 01	00-7F	REVERB TIME	0-127	40	64
40 01 35	00 00 01	00-7F	REVERB DELAY FEEDBACK	0-127	00	0
40 01 37	00 00 01	00-7F	REVERB PREDELAY TIME	0-127 [ms]	00	0

- REVERB MACRO is a macro parameter that allows global setting of reverb parameters. When you select the reverb type with REVERB MACRO, each reverb parameter will be set to their most suitable value.
- REVERB CHARACTER is a parameter that changes the reverb algorithm. The value of REVERB CHARACTER corresponds to the REVERB MACRO of the same number.

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)	Description
40 01 38	00 00 01	00-07	CHORUS MACRO	00: Chorus 1 01: Chorus 2 02: Chorus 3 03: Chorus 4 04: Feedback Chorus 05: Flanger 06: Short Delay 07: Short Delay(FB)	02	Chorus 3
40 01 39	00 00 01	00-07	CHORUS PRE-LPF	0-7	00	0
40 01 3A	00 00 01	00-7F	CHORUS LEVEL	0-127	40	64
40 01 3B	00 00 01	00-7F	CHORUS FEEDBACK	0-127	08	8
40 01 3C	00 00 01	00-7F	CHORUS DELAY	0-127	50	80
40 01 3D	00 00 01	00-7F	CHORUS RATE	0-127	03	3
40 01 3E	00 00 01	00-7F	CHORUS DEPTH	0-127	13	19
40 01 3F	00 00 01	00-7F	CHORUS SEND LEVEL TO REVERB	0-127	00	0

- CHORUS MACRO is a macro parameter that allows global setting of chorus parameters. When you select the chorus type with CHORUS MACRO, each Chorus parameter will be set to their most suitable value.

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)	Description
40 03 00	00 00 02	00-7F	MFX TYPE		00 00	00: Thru

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)	Description
40 03 17	00 00 01	00-7F	MFX SEND LEVEL TO REVERB	0-127	28	40

- MFX TYPE is a macro parameter which sets various Insertion Effect parameters as a group. When you use MFX TYPE to select an Insertion Effect type, each effect parameter will be set to the most suitable value.

M-FX EFFECT LIST

00 Thru	Effect Type	F0 41 10 42 12 40 03 00 00 00 3D F7	Thru
01 Enhancer	Effect Type	F0 41 10 42 12 40 03 00 01 02 3A F7	Enhancer
	Sens = 127	F0 41 10 42 12 40 03 03 7F 3B F7	Value Hex. 00-7F
	Mix = 64	F0 41 10 42 12 40 03 04 40 79 F7	Value Hex. 00-7F
02 Overdrv1	Effect Type	F0 41 10 42 12 40 03 00 01 10 2C F7	Overdrive
	Amp Type Small	F0 41 10 42 12 40 03 04 00 39 F7	Small
	Drive = 48	F0 41 10 42 12 40 03 03 30 0A F7	Value Hex. 00-7F
	Pan = 64	F0 41 10 42 12 40 03 15 40 68 F7	Value Hex. 00-7F
03 Overdrv2	Effect Type	F0 41 10 42 12 40 03 00 01 10 2C F7	Overdrive
	Amp Type Bltn	F0 41 10 42 12 40 03 04 01 38 F7	Bltn (Default)
	Drive = 48	F0 41 10 42 12 40 03 03 30 0A F7	Value Hex. 00-7F
	Pan = 64	F0 41 10 42 12 40 03 15 40 68 F7	Value Hex. 00-7F

04 Overdrv3	Effect Type Amp Type 2-Stk Drive = 48 Pan = 64	F0 41 10 42 12 40 03 00 01 10 2C F7 F0 41 10 42 12 40 03 04 02 37 F7 F0 41 10 42 12 40 03 03 30 0A F7 F0 41 10 42 12 40 03 15 40 68 F7	Overdrive 2-Stk Value Hex. 00-7F Value Hex. 00-7F
05 Overdrv4	Effect Type Amp Type 3-Stk Drive = 48 Pan = 64	F0 41 10 42 12 40 03 00 01 10 2C F7 F0 41 10 42 12 40 03 04 03 36 F7 F0 41 10 42 12 40 03 03 30 0A F7 F0 41 10 42 12 40 03 15 40 68 F7	Overdrive 3-Stk Value Hex. 00-7F Value Hex. 00-7F
06 Distort1	Effect Type Amp Type Small Drive = 76 Pan = 64	F0 41 10 42 12 40 03 00 01 11 2B F7 F0 41 10 42 12 40 03 04 00 39 F7 F0 41 10 42 12 40 03 03 4C 6E F7 F0 41 10 42 12 40 03 15 40 68 F7	Distortion Small Value Hex. 00-7F Value Hex. 00-7F
07 Distort2	Effect Type Amp Type Bltin Drive = 76 Pan = 64	F0 41 10 42 12 40 03 00 01 11 2B F7 F0 41 10 42 12 40 03 04 01 38 F7 F0 41 10 42 12 40 03 03 4C 6E F7 F0 41 10 42 12 40 03 15 40 68 F7	Distortion Bltin Value Hex. 00-7F Value Hex. 00-7F
08 Distort3	Effect Type Amp Type 2-Stk Drive = 76 Pan = 64	F0 41 10 42 12 40 03 00 01 11 2B F7 F0 41 10 42 12 40 03 04 02 37 F7 F0 41 10 42 12 40 03 03 4C 6E F7 F0 41 10 42 12 40 03 15 40 68 F7	Distortion 2-Stk Value Hex. 00-7F Value Hex. 00-7F
09 Distort4	Effect Type Amp Type 3-Stk Drive = 76 Pan = 64	F0 41 10 42 12 40 03 00 01 11 2B F7 F0 41 10 42 12 40 03 04 03 36 F7 F0 41 10 42 12 40 03 03 4C 6E F7 F0 41 10 42 12 40 03 15 40 68 F7	Distortion 3-Stk (Default) Value Hex. 00-7F Value Hex. 00-7F
10 Phaser	Effect Type Manual = 36 Rate = 16	F0 41 10 42 12 40 03 00 01 20 1C F7 F0 41 10 42 12 40 03 03 24 16 F7 F0 41 10 42 12 40 03 04 10 29 F7	Phaser ValueHex.00-24-7F Value Hex. 00-7F
11 Auto Wah	Effect Type Manual = 68 Rate = 40	F0 41 10 42 12 40 03 00 01 21 1B F7 F0 41 10 42 12 40 03 05 44 74 F7 F0 41 10 42 12 40 03 07 28 0E F7	Auto Wah Value Hex. 00-7F Value Hex. 00-7F
12 Rotary	Effect Type Speed = 0 Level = 127	F0 41 10 42 12 40 03 00 01 22 1A F7 F0 41 10 42 12 40 03 0D 00 30 F7 F0 41 10 42 12 40 03 16 7F 28 F7	Rotary (Slow) Value Hex. 00-7F Value Hex. 00-7F
12 Rotary	Effect Type Speed = 127 Level = 127	F0 41 10 42 12 40 03 00 01 22 1A F7 F0 41 10 42 12 40 03 0D 7F 31 F7 F0 41 10 42 12 40 03 16 7F 28 F7	Rotary (Fast) Value Hex. 00-7F Value Hex. 00-7F
13 StFlangr	Effect Type Rate = 11 Feedback = 104	F0 41 10 42 12 40 03 00 01 23 19 F7 F0 41 10 42 12 40 03 06 0B 2C F7 F0 41 10 42 12 40 03 08 68 4D F7	Stereo Flanger Value Hex. 00-7F Value Hex. 0F-71
14 SpFlangr	Effect Type Feedback = 39 Step Rate= 54	F0 41 10 42 12 40 03 00 01 24 18 F7 F0 41 10 42 12 40 03 06 27 10 F7 F0 41 10 42 12 40 03 08 36 7F F7	Step Flanger Value Hex. 0F-71 Value Hex. 00-7F
15 Compress	Effect Type Pan = 64 Level = 104	F0 41 10 42 12 40 03 00 01 30 0C F7 F0 41 10 42 12 40 03 15 40 68 F7 F0 41 10 42 12 40 03 16 68 3F F7	Compressor Value Hex. 00-7F Value Hex. 00-7F
16 Limiter	Effect Type Pan = 64 Level = 127	F0 41 10 42 12 40 03 00 01 31 0B F7 F0 41 10 42 12 40 03 15 40 68 F7 F0 41 10 42 12 40 03 16 7F 28 F7	Limiter Value Hex. 00-7F Value Hex. 00-7F
17 Hexa Cho	Effect Type Rate = 32 Balance = 64	F0 41 10 42 12 40 03 00 01 40 7C F7 F0 41 10 42 12 40 03 04 20 19 F7 F0 41 10 42 12 40 03 12 40 6B F7	Hexa Chorus Value Hex. 00-7F Value Hex. 00-7F
18 Trem Cho	Effect Type Trem Rate = 60 Balance = 55	F0 41 10 42 12 40 03 00 01 41 7B F7 F0 41 10 42 12 40 03 07 3C 7A F7 F0 41 10 42 12 40 03 12 37 74 F7	Tremolo Chorus Value Hex. 00-7F Value Hex. 00-7F
19 StChorus	Effect Type Rate = 16 Balance = 40	F0 41 10 42 12 40 03 00 01 42 7A F7 F0 41 10 42 12 40 03 06 10 27 F7 F0 41 10 42 12 40 03 12 28 03 F7	Stereo Chorus Value Hex. 00-7F Value Hex. 00-7F
20 Space D	Effect Type Rate = 16 Balance = 64	F0 41 10 42 12 40 03 00 01 43 79 F7 F0 41 10 42 12 40 03 04 10 29 F7 F0 41 10 42 12 40 03 12 40 6B F7	Space D Value Hex. 00-7F Value Hex. 00-7F

21 St Delay Effect Type Feedback = 80 Balance = 40	F0 41 10 42 12 40 03 00 01 50 6C F7 F0 41 10 42 12 40 03 05 50 68 F7 F0 41 10 42 12 40 03 12 28 03 F7	Stereo Delay Value Hex. 0F-71 Value Hex. 00-7F
22 Mod Delay Effect Type Mod Rate = 12 Balance = 40	F0 41 10 42 12 40 03 00 01 51 6B F7 F0 41 10 42 12 40 03 07 0C 2A F7 F0 41 10 42 12 40 03 12 28 03 F7	Mod Delay Value Hex. 00-7F Value Hex. 00-7F
23 3Tap Delay Effect Type Feedback = 80 Balance = 48	F0 41 10 42 12 40 03 00 01 52 6A F7 F0 41 10 42 12 40 03 06 50 67 F7 F0 41 10 42 12 40 03 12 30 7B F7	3 Tap Delay Value Hex. 0F-71 Value Hex. 00-7F
24 4Tap Delay Effect Type Feedback = 41 Balance = 48	F0 41 10 42 12 40 03 00 01 53 6B F7 F0 41 10 42 12 40 03 0B 29 09 F7 F0 41 10 42 12 40 03 12 30 7B F7	4 Tap Delay Value Hex. 0F-71 Value Hex. 00-7F
25 TmCtrDly Effect Type Dly Time = 60 Feedback = 41	F0 41 10 42 12 40 03 00 01 54 68 F7 F0 41 10 42 12 40 03 03 3C 7E F7 F0 41 10 42 12 40 03 05 29 0F F7	Tm Ctrl Delay Value Hex. 00-7F Value Hex. 00-7F
26 Reverb Effect Type Time = 100 Balance = 50	F0 41 10 42 12 40 03 00 01 55 67 F7 F0 41 10 42 12 40 03 05 64 54 F7 F0 41 10 42 12 40 03 12 32 79 F7	Reverb Value Hex. 00-7F Value Hex. 00-7F
27 GteRevNr Effect Type Type Norm Balance = 33 Level = 120	F0 41 10 42 12 40 03 00 01 56 66 F7 F0 41 10 42 12 40 03 03 00 3A F7 F0 41 10 42 12 40 03 12 21 0A F7 F0 41 10 42 12 40 03 16 78 2F F7	Gate Reverb Norm (Default) Value Hex. 00-7F Value Hex. 00-7F
28 GteRevRv Effect Type Type Reverse Balance = 42 Level = 112	F0 41 10 42 12 40 03 00 01 56 66 F7 F0 41 10 42 12 40 03 03 01 39 F7 F0 41 10 42 12 40 03 12 2A 01 F7 F0 41 10 42 12 40 03 16 70 37 F7	Gate Reverb Reverse Value Hex. 00-7F Value Hex. 00-7F
29 GteRevS1 Effect Type Type Sweep1 Balance = 35 Level = 120	F0 41 10 42 12 40 03 00 01 56 66 F7 F0 41 10 42 12 40 03 03 02 38 F7 F0 41 10 42 12 40 03 12 23 08 F7 F0 41 10 42 12 40 03 16 78 2F F7	Gate Reverb Sweep1 Value Hex. 00-7F Value Hex. 00-7F
30 GteRevS2 Effect Type Type Sweep2 Balance = 42 Level = 112	F0 41 10 42 12 40 03 00 01 56 66 F7 F0 41 10 42 12 40 03 03 03 37 F7 F0 41 10 42 12 40 03 12 2A 01 F7 F0 41 10 42 12 40 03 16 70 37 F7	Gate Reverb Sweep2 Value Hex. 00-7F Value Hex. 00-7F
31 PitchShf Effect Type Coarse1 = 71 Coarse2 = 59	F0 41 10 42 12 40 03 00 01 60 5C F7 F0 41 10 42 12 40 03 03 47 73 F7 F0 41 10 42 12 40 03 07 3B 7B F7	2 Pitch Shifter Value Hex. 28-4C Value Hex. 28-4C
32 Fb P.Shift Effect Type P.Coarse = 71 Feedback = 76	F0 41 10 42 12 40 03 00 01 61 5B F7 F0 41 10 42 12 40 03 03 47 73 F7 F0 41 10 42 12 40 03 05 4C 6C F7	Fb P.Shifter Value Hex. 28-4C Value Hex. 0F-71
33 OD--Chors Effect Type OD Pan = 64 Cho Bal = 64	F0 41 10 42 12 40 03 00 02 00 3B F7 F0 41 10 42 12 40 03 04 40 79 F7 F0 41 10 42 12 40 03 0C 40 71 F7	OD--Chorus Value Hex. 00-7F Value Hex. 00-7F
34 OD--Flger Effect Type OD Pan = 64 FL Bal = 32	F0 41 10 42 12 40 03 00 02 01 3A F7 F0 41 10 42 12 40 03 04 40 79 F7 F0 41 10 42 12 40 03 0C 20 11 F7	OD--Flanger Value Hex. 00-7F Value Hex. 00-7F
35 OD--Delay Effect Type OD Pan = 64 Dly Bal = 48	F0 41 10 42 12 40 03 00 02 02 39 F7 F0 41 10 42 12 40 03 04 40 79 F7 F0 41 10 42 12 40 03 0C 30 01 F7	OD--Delay Value Hex. 00-7F Value Hex. 00-7F
36 DS--Chors Effect Type DS Pan = 64 Cho Bal = 64	F0 41 10 42 12 40 03 00 02 03 38 F7 F0 41 10 42 12 40 03 04 40 79 F7 F0 41 10 42 12 40 03 0C 40 71 F7	DS--Chorus Value Hex. 00-7F Value Hex. 00-7F
37 DS--Flger Effect Type DS Pan = 64 FL Bal = 32	F0 41 10 42 12 40 03 00 02 04 37 F7 F0 41 10 42 12 40 03 04 40 79 F7 F0 41 10 42 12 40 03 0C 20 11 F7	DS--Flanger Value Hex. 00-7F Value Hex. 00-7F
38 DS--Delay Effect Type DS Pan = 64 Dly Bal = 48	F0 41 10 42 12 40 03 00 02 05 36 F7 F0 41 10 42 12 40 03 04 40 79 F7 F0 41 10 42 12 40 03 0C 30 01 F7	DS--Delay Value Hex. 00-7F Value Hex. 00-7F
39 EH--Chors Effect Type EH Sens = 64 Cho Bal = 64	F0 41 10 42 12 40 03 00 02 06 35 F7 F0 41 10 42 12 40 03 03 40 7A F7 F0 41 10 42 12 40 03 0C 40 71 F7	EH--Chorus Value Hex. 00-7F Value Hex. 00-7F

40 EH→Flger	Effect Type EH Sens = 64 FL Bal = 48	F0 41 10 42 12 40 03 00 02 07 34 F7 F0 41 10 42 12 40 03 03 40 7A F7 F0 41 10 42 12 40 03 0C 30 01 F7	EH→Flanger Value Hex. 00~7F Value Hex. 00~7F
41 EH→Delay	Effect Type EH Sens = 64 Dly Bal = 48	F0 41 10 42 12 40 03 00 02 08 33 F7 F0 41 10 42 12 40 03 03 40 7A F7 F0 41 10 42 12 40 03 0C 30 01 F7	EH→Delay Value Hex. 00~7F Value Hex. 00~7F
42 Cho→Dly	Effect Type Cho Bal = 64 Dly Bal = 48	F0 41 10 42 12 40 03 00 02 09 32 F7 F0 41 10 42 12 40 03 07 40 76 F7 F0 41 10 42 12 40 03 0C 30 01 F7	Cho→Delay Value Hex. 00~7F Value Hex. 00~7F
43 FL→Delay	Effect Type FL Fb = 104 Dly Bal = 48	F0 41 10 42 12 40 03 00 02 0A 31 F7 F0 41 10 42 12 40 03 06 68 4F F7 F0 41 10 42 12 40 03 0C 30 01 F7	FL→Delay Value Hex. 0F~71 Value Hex. 00~7F
44 Cho→Flger	Effect Type Cho Bal = 64 FL Bal = 64	F0 41 10 42 12 40 03 00 02 0B 30 F7 F0 41 10 42 12 40 03 07 40 76 F7 F0 41 10 42 12 40 03 0C 40 71 F7	Cho→Flanger Value Hex. 00~7F Value Hex. 00~7F
45 Cho/Delay	Effect Type Cho Bal = 64 Dly Bal = 40	F0 41 10 42 12 40 03 00 11 00 2C F7 F0 41 10 42 12 40 03 07 40 76 F7 F0 41 10 42 12 40 03 0C 28 09 F7	Cho / Delay Value Hex. 00~7F Value Hex. 00~7F
46 FL/Delay	Effect Type FL Bal = 64 Dly Bal = 48	F0 41 10 42 12 40 03 00 11 01 2B F7 F0 41 10 42 12 40 03 07 40 76 F7 F0 41 10 42 12 40 03 0C 30 01 F7	FL / Delay Value Hex. 00~7F Value Hex. 00~7F
47 Cho/Flger	Effect Type Cho Bal = 64 FL Bal = 64	F0 41 10 42 12 40 03 00 11 02 2A F7 F0 41 10 42 12 40 03 07 40 76 F7 F0 41 10 42 12 40 03 0C 40 71 F7	Cho / Flanger Value Hex. 00~7F Value Hex. 00~7F

Effect Type only from MIDI or SMF

— Equalizer	Effect Type	F0 41 10 42 12 40 03 00 01 00 3C F7	Stereo-EQ
— Spectrum	Effect Type	F0 41 10 42 12 40 03 00 01 01 3B F7	Spectrum

○ Patch Part parameters

The DisCover 5 has 19 Parts:

3 Parts are controlled via the keyboard, 16 Parts are for Songs, and there is 1 logical part (for Program Changes allowing to select User Programs).

If you like to send messages to the 3 Parts relative to the Keyboard, you have to use the address 50 xx xx.

If you like to send messages to the 16 Parts relative to Songs, you have to use the address 40 xx xx.

The 19 Parts are:

Keyboard Parts			Song Parts			
TRACK	NAME	MIDI CHANNEL	TRACK	NAME	MIDI CHANNEL	SYS EX X=
			1	Part 1	Ch 1	X=1
			2	Part 2	Ch 2	X=2
			3	Part 3	Ch 3	X=3
4	Upper	Ch 4	4	Part 4 UP1	Ch 4	X=4
			5	Part 5	Ch 5	X=5
			6	Part 6	Ch 6	X=6
			7	Part 7	Ch 7	X=7
			8	Part 8	Ch 8	X=8
			9	Part 9	Ch 9	X=9
			10	Part 10	Ch 10	X=0
11	Lower	Ch 11	11	Part 11	Ch 11	X=A
			12	Part 12	Ch 12	X=B
			13	Part 13	Ch 13	X=C
			14	Part 14	Ch 14	X=D
			15	Part 15	Ch 15	X=E
16	Manual Drums	Ch 16	16	Part 16	Ch 16	X=F

In the following map, the control numbers of the control changes are indicated as CC#.

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)	Description
40 1x 00	00 00 02	00~7F	TONE NUMBER	CC#00 VALUE 0~127	00	0
40 1x 01#		00~7F		P.C. VALUE 1~128	00	1
40 1x 02	00 00 01	00~10	Rx. CHANNEL	1~16, OFF	Same as the Part Number	
40 1x 03	00 00 01	00, 01	Rx. PITCH BEND	OFF/ON	01	ON
40 1x 04	00 00 01	00, 01	Rx. CH PRESSURE(CAf)	OFF/ON	01	ON
40 1x 05	00 00 01	00, 01	Rx. PROGRAM CHANGE	OFF/ON	01	ON
40 1x 06	00 00 01	00, 01	Rx. CONTROL CHANGE	OFF/ON	01	ON
40 1x 07	00 00 01	00, 01	Rx. POLY PRESSURE(PAf)	OFF/ON	01	ON
40 1x 08	00 00 01	00, 01	Rx. NOTE MESSAGE	OFF/ON	01	ON
40 1x 09	00 00 01	00, 01	Rx. RPN	OFF/ON	01	ON
40 1x 0A	00 00 01	00, 01	Rx. NRPN	OFF/ON	00 (01*)	OFF (ON*)

• When "GM1 System On" and "GM2 System On" are received, Rx. NRPN will be set OFF. When "GS Reset" is received, it will be set ON.

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)	Description
40 1x 0B	00 00 01	00, 01	Rx. MODULATION	OFF/ON	01	ON
40 1x 0C	00 00 01	00, 01	Rx. VOLUME	OFF/ON	01	ON
40 1x 0D	00 00 01	00, 01	Rx. PANPOT	OFF/ON	01	ON

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)	Description
40 1x 0E	00 00 01	00, 01	Rx. EXPRESSION	OFF/ON	01	ON
40 1x 0F	00 00 01	00, 01	Rx. HOLD1	OFF/ON	01	ON
40 1x 10	00 00 01	00, 01	Rx. PORTAMENTO	OFF/ON	01	ON
40 1x 11	00 00 01	00, 01	Rx. SOSTENUTO	OFF/ON	01	ON
40 1x 12	00 00 01	00, 01	Rx. SOFT	OFF/ON	01	ON
40 1x 13	00 00 01	00, 01	MONO/POLY MODE	Mono/Poly (=CC# 126 01/CC# 127 00)	01	Poly
40 1x 14	00 00 01	00-02	ASSIGN MODE	0 = SINGLE 1 = LIMITED-MULTI 2 = FULL-MULTI		LIMITED-MULTI SINGLE (Drum Part) LIMITED-MULTI (Normal Part)

Single: If the same note is played multiple times in succession, the previously-sounding note will be completely silenced, and then the new note will be sounded.
 LimitedMulti: If the same note is played multiple times in succession, the previously-sounding note will be continued to a certain extent even after the new note is sounded (default setting).
 FullMulti: If the same note is played multiple times in succession, the previously-sounding note(s) will continue sounding for their natural length even after the new note is sounded.

• ASSIGN MODE is the parameter that determines how voice assignment will be handled when sounds overlap on identical note numbers in the same channel (i.e., repeatedly struck notes). This is initialized to a mode suitable for each Part, so for general purposes there is no need to change this.

40 1x 15	00 00 01	00-02	USE FOR RHYTHM PART	0 = OFF 1 = MAP1 2 = MAP2		
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• This parameter sets the Drum Map of the Part used as the Drum Part. The DisCover 5 can simultaneously (in different Parts) use up to two Drum Maps (MAP1, MAP2). With the initial settings, Part10 (MIDI CH=10, x=0) is set to MAP1 (1), and other Parts are set to normal instrumental Parts (OFF(0)).

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)	Description
40 1x 16	00 00 01	28-58	PITCH KEY SHIFT	-24--+24 [semitones]	40	0 [semitones]
40 1x 17	00 00 02	08-F8	PITCH OFFSET FINE	-12.0--+12.0 [Hz] Use nibblized data.	08 00	0 [Hz]
40 1x 18#						

• PITCH OFFSET FINE allows you to alter, by a specified frequency amount, the pitch at which notes will sound. This parameter differs from the conventional Fine Tuning (RPN #1) parameter in that the amount of frequency alteration (in Hertz) will be identical no matter which note is played. When a multiple number of Parts, each of which has been given a different setting for PITCH OFFSET FINE, are sounded by means of an identical note number, you can obtain a Celeste effect.

40 1x 19	00 00 01	00-7F	PART LEVEL	0-127 (=CC# 7)	64	100
40 1x 1A	00 00 01	00-7F	VELOCITY SENSE DEPTH	0-127	40	64
40 1x 1B	00 00 01	00-7F	VELOCITY SENSE OFFSET	0-127	40	64
40 1x 1C	00 00 01	00-7F	PART PANPOT	-64 (RANDOM), -63 (LEFT)~+63 (RIGHT) (=CC# 10, except RAN- DOM)	40	0 (CENTER)
40 1x 1D	00 00 01	00-7F	KEYBOARD RANGE LOW	(C-1)-(G9)	00	C-1
40 1x 1E	00 00 01	00-7F	KEYBOARD RANGE HIGH	(C-1)-(G9)	7F	G 9
40 1x 1F	00 00 01	00-5F	CC1 CONTROLLER NUMBER	0-95	10	16
40 1x 20	00 00 01	00-5F	CC2 CONTROLLER NUMBER	0-95	11	17
40 1x 21	00 00 01	00-7F	CHORUS SEND LEVEL	0-127 (=CC# 93)	00	0
40 1x 22	00 00 01	00-7F	REVERB SEND LEVEL	0-127 (=CC# 91)	28	40

40 1x 23 00 00 01 00, 01 Rx.BANK SELECT OFF/ON 01(00*) ON(OFF*)
 • When "GM1 System On" is received, Rx.BANK SELECT will be set to OFF.
 • When "GS RESET" or "GM2 System On" is received, Rx.BANK SELECT will be set to ON.

40 1x 24	00 00 01	00, 01	RX BANK SELECT LSB	OFF/ON	01	ON
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• When RX BANK SELECT LSB = OFF, Bank Select LSB (Bn 20 11) will be treated as 00H regardless of its value.

40 1x 2A	00 00 02	00 00-40 00-7F 7F	PITCH FINE TUNE	-100-0--+100 [cents] (= RPN#1)	40 00	0
40 1x 2B#						
40 1x 30	00 00 01	00-7F	TONE MODIFY1 Vibrato Rate	-64--+63 (=NRPN# 8/CC#76)	40	0
40 1x 31	00 00 01	00-7F	TONE MODIFY2 Vibrato Depth	-64--+63 (=NRPN# 9/CC#77)	40	0
40 1x 32	00 00 01	00-7F	TONE MODIFY3 TVF Cutoff Freq	-64--+63 (=NRPN# 32/CC#74)	40	0
40 1x 33	00 00 01	00-7F	TONE MODIFY4 TVF Resonance	-64--+63 (=NRPN# 33/CC#71)	40	0
40 1x 34	00 00 01	00-7F	TONE MODIFY5 TVF&TVA Env.attack	-64--+63 (=NRPN# 99/CC#73)	40	0
40 1x 35	00 00 01	00-7F	TONE MODIFY6 TVF&TVA Env.decay	-64--+63 (=NRPN# 100/CC#75)	40	0
40 1x 36	00 00 01	00-7F	TONE MODIFY7 TVF&TVA Env.release	-64--+63 (=NRPN# 102/CC#72)	40	0
40 1x 37	00 00 01	00-7F	TONE MODIFY8 Vibrato Delay	-64--+63 (=NRPN# 10/CC#78)	40	0
40 1x 40	00 00 0C	00-7F	SCALE TUNING C	-64--+63 [cents]	40	0 [cents]
40 1x 41#		00-7F	SCALE TUNING C#	-64--+63 [cents]	40	0 [cents]
40 1x 42#		00-7F	SCALE TUNING D	-64--+63 [cents]	40	0 [cents]
40 1x 43#		00-7F	SCALE TUNING D#	-64--+63 [cents]	40	0 [cents]
40 1x 44#		00-7F	SCALE TUNING E	-64--+63 [cents]	40	0 [cents]
40 1x 45#		00-7F	SCALE TUNING F	-64--+63 [cents]	40	0 [cents]
40 1x 46#		00-7F	SCALE TUNING F#	-64--+63 [cents]	40	0 [cents]
40 1x 47#		00-7F	SCALE TUNING G	-64--+63 [cents]	40	0 [cents]
40 1x 48#		00-7F	SCALE TUNING G#	-64--+63 [cents]	40	0 [cents]
40 1x 49#		00-7F	SCALE TUNING A	-64--+63 [cents]	40	0 [cents]

Address(H)	Size(H)	Data(H)	Parameter	Description	Default Value (H)	Description
40 1x 4A#		00-7F	SCALE TUNING A#	-64--+63 [cents]	40	0 [cents]
40 1x 4B#		00-7F	SCALE TUNING B	-64--+63 [cents]	40	0 [cents]
<ul style="list-style-type: none"> • SCALE TUNING is a function that allows fine adjustment to the pitch of each note in the octave. The pitch of each identically-named note in all octaves will change simultaneously. A setting of +/- 0 cents (40H) is equal temperament (page 21). 						
40 2x 00	00 00 01	28-58	MOD PITCH CONTROL	-24--+24 [semitones]	40	0 [semitones]
40 2x 01	00 00 01	00-7F	MOD TVF CUTOFF CONTROL	-9600--+9600 [cents]	40	0 [cents]
40 2x 02	00 00 01	00-7F	MOD AMPLITUDE CONTROL	-100.0--+100.0 [%]	40	0 [%]
40 2x 03	00 00 01	00-7F	MOD LFO1 RATE CONTROL	-10.0--+10.0 [Hz]	40	0 [Hz]
40 2x 04	00 00 01	00-7F	MOD LFO1 PITCH DEPTH	0-600 [cents]	0A	10 [cents]
40 2x 05	00 00 01	00-7F	MOD LFO1 TVF DEPTH	0-2400 [cents]	00	0 [cents]
40 2x 06	00 00 01	00-7F	MOD LFO1 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 07	00 00 01	00-7F	MOD LFO2 RATE CONTROL	-10.0--+10.0 [Hz]	40	0 [Hz]
40 2x 08	00 00 01	00-7F	MOD LFO2 PITCH DEPTH	0-600 [cents]	00	0 [cents]
40 2x 09	00 00 01	00-7F	MOD LFO2 TVF DEPTH	0-2400 [cents]	00	0 [cents]
40 2x 0A	00 00 01	00-7F	MOD LFO2 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 10	00 00 01	40-58	BEND PITCH CONTROL	0-24 [semitones]	42	2 [semitones]
40 2x 11	00 00 01	00-7F	BEND TVF CUTOFF CONTROL	-9600--+9600 [cents]	40	0 [cents]
40 2x 12	00 00 01	00-7F	BEND AMPLITUDE CONTROL	-100.0--+100.0 [%]	40	0 [%]
40 2x 13	00 00 01	00-7F	BEND LFO1 RATE CONTROL	-10.0--+10.0 [Hz]	40	0 [Hz]
40 2x 14	00 00 01	00-7F	BEND LFO1 PITCH DEPTH	0-600 [cents]	00	0 [cents]
40 2x 15	00 00 01	00-7F	BEND LFO1 TVF DEPTH	0-2400 [cents]	00	0 [cents]
40 2x 16	00 00 01	00-7F	BEND LFO1 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 17	00 00 01	00-7F	BEND LFO2 RATE CONTROL	-10.0--+10.0 [Hz]	40	0 [Hz]
40 2x 18	00 00 01	00-7F	BEND LFO2 PITCH DEPTH	0-600 [cents]	00	0 [cents]
40 2x 19	00 00 01	00-7F	BEND LFO2 TVF DEPTH	0-2400 [cents]	00	0 [cents]
40 2x 1A	00 00 01	00-7F	BEND LFO2 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 20	00 00 01	28-58	CAf PITCH CONTROL	-24--+24 [semitones]	40	0 [semitones]
40 2x 21	00 00 01	00-7F	CAf TVF CUTOFF CONTROL	-9600--+9600 [cents]	40	0 [cents]
40 2x 22	00 00 01	00-7F	CAf AMPLITUDE CONTROL	-100.0--+100.0 [%]	40	0 [%]
40 2x 23	00 00 01	00-7F	CAf LFO1 RATE CONTROL	-10.0--+10.0 [Hz]	40	0 [Hz]
40 2x 24	00 00 01	00-7F	CAf LFO1 PITCH DEPTH	0-600 [cents]	00	0 [cents]
40 2x 25	00 00 01	00-7F	CAf LFO1 TVF DEPTH	0-2400 [cents]	00	0 [cents]
40 2x 26	00 00 01	00-7F	CAf LFO1 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 27	00 00 01	00-7F	CAf LFO2 RATE CONTROL	-10.0--+10.0 [Hz]	40	0 [Hz]
40 2x 28	00 00 01	00-7F	CAf LFO2 PITCH DEPTH	0-600 [cents]	00	0 [cents]
40 2x 29	00 00 01	00-7F	CAf LFO2 TVF DEPTH	0-2400 [cents]	00	0 [cents]
40 2x 2A	00 00 01	00-7F	CAf LFO2 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 30	00 00 01	28-58	PAf PITCH CONTROL	-24--+24 [semitones]	40	0 [semitones]
40 2x 31	00 00 01	00-7F	PAf TVF CUTOFF CONTROL	-9600--+9600 [cents]	40	0 [cents]
40 2x 32	00 00 01	00-7F	PAf AMPLITUDE CONTROL	-100.0--+100.0 [%]	40	0 [%]
40 2x 33	00 00 01	00-7F	PAf LFO1 RATE CONTROL	-10.0--+10.0 [Hz]	40	0 [Hz]
40 2x 34	00 00 01	00-7F	PAf LFO1 PITCH DEPTH	0-600 [cents]	00	0 [cents]
40 2x 35	00 00 01	00-7F	PAf LFO1 TVF DEPTH	0-2400 [cents]	00	0 [cents]
40 2x 36	00 00 01	00-7F	PAf LFO1 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 37	00 00 01	00-7F	PAf LFO2 RATE CONTROL	-10.0--+10.0 [Hz]	40	0 [Hz]
40 2x 38	00 00 01	00-7F	PAf LFO2 PITCH DEPTH	0-600 [cents]	00	0 [cents]
40 2x 39	00 00 01	00-7F	PAf LFO2 TVF DEPTH	0-2400 [cents]	00	0 [cents]
40 2x 3A	00 00 01	00-7F	PAf LFO2 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 40	00 00 01	28-58	CC1 PITCH CONTROL	-24--+24 [semitones]	40	0 [semitones]
40 2x 41	00 00 01	00-7F	CC1 TVF CUTOFF CONTROL	-9600--+9600 [cents]	40	0 [cents]
40 2x 42	00 00 01	00-7F	CC1 AMPLITUDE CONTROL	-100.0--+100.0 [%]	40	0 [%]
40 2x 43	00 00 01	00-7F	CC1 LFO1 RATE CONTROL	-10.0--+10.0 [Hz]	40	0 [Hz]
40 2x 44	00 00 01	00-7F	CC1 LFO1 PITCH DEPTH	0-600 [cents]	00	0 [cents]
40 2x 45	00 00 01	00-7F	CC1 LFO1 TVF DEPTH	0-2400 [cents]	00	0 [cents]
40 2x 46	00 00 01	00-7F	CC1 LFO1 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 47	00 00 01	00-7F	CC1 LFO2 RATE CONTROL	-10.0--+10.0 [Hz]	40	0 [Hz]
40 2x 48	00 00 01	00-7F	CC1 LFO2 PITCH DEPTH	0-600 [cents]	00	0 [cents]
40 2x 49	00 00 01	00-7F	CC1 LFO2 TVF DEPTH	0-2400 [cents]	00	0 [cents]
40 2x 4A	00 00 01	00-7F	CC1 LFO2 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 50	00 00 01	28-58	CC2 PITCH CONTROL	-24--+24 [semitones]	40	0 [semitones]
40 2x 51	00 00 01	00-7F	CC2 TVF CUTOFF CONTROL	-9600--+9600 [cents]	40	0 [cents]
40 2x 52	00 00 01	00-7F	CC2 AMPLITUDE CONTROL	-100.0--+100.0 [%]	40	0 [%]
40 2x 53	00 00 01	00-7F	CC2 LFO1 RATE CONTROL	-10.0--+10.0 [Hz]	40	0 [Hz]
40 2x 54	00 00 01	00-7F	CC2 LFO1 PITCH DEPTH	0-600 [cents]	00	0 [cents]
40 2x 55	00 00 01	00-7F	CC2 LFO1 TVF DEPTH	0-2400 [cents]	00	0 [cents]
40 2x 56	00 00 01	00-7F	CC2 LFO1 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 57	00 00 01	00-7F	CC2 LFO2 RATE CONTROL	-10.0--+10.0 [Hz]	40	0 [Hz]
40 2x 58	00 00 01	00-7F	CC2 LFO2 PITCH DEPTH	0-600 [cents]	00	0 [cents]
40 2x 59	00 00 01	00-7F	CC2 LFO2 TVF DEPTH	0-2400 [cents]	00	0 [cents]
40 2x 5A	00 00 01	00-7F	CC2 LFO2 TVA DEPTH	0-100.0 [%]	00	0 [%]
<ul style="list-style-type: none"> • You may not always be able to obtain the desired effect by modifying the LFO 1 and LFO 2 parameters. 						
40 4x 00	00 00 01	00-04	TONE MAP NUMBER (= CC#32: Bank number LSB)	MAP 0-4 00: SELECTED 04: DisCover 5	00	
<ul style="list-style-type: none"> • When "GS Reset" is received, this will be 00: SELECTED. 						
40 4x 01	00 00 01	01-04	TONE MAP-0 NUMBER	04: DisCover 5	04	
40 4x 22	00 00 01	00, 01	PART MFX ASSIGN	00: BYPASS 01: MFX	00	BYPASS
41 m6 rr	00 00 01	00-7F	CHORUS SEND LEVEL	0.0-1.0 Multiplicand of the part Chorus level		

<u>Address(H)</u>	<u>Size(H)</u>	<u>Data(H)</u>	<u>Parameter</u>	<u>Description</u> (=NRPN# 30)	<u>Default Value (H)</u>	<u>Description</u>
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		
<u>Address(H)</u>	<u>Size(H)</u>	<u>Data(H)</u>	<u>Parameter</u>	<u>Description</u>	<u>Default Value (H)</u>	<u>Description</u>
00 10 10 21	00 00 0C	00~7F	SCALE TUNING C	-64--+63 [cents]	40	0 [cents]
00 10 10 22#		00~7F	SCALE TUNING C#	-64--+63 [cents]	40	0 [cents]
00 10 10 23#		00~7F	SCALE TUNING D	-64--+63 [cents]	40	0 [cents]
00 10 10 24#		00~7F	SCALE TUNING D#	-64--+63 [cents]	40	0 [cents]
00 10 10 25#		00~7F	SCALE TUNING E	-64--+63 [cents]	40	0 [cents]
00 10 10 26#		00~7F	SCALE TUNING F	-64--+63 [cents]	40	0 [cents]
00 10 10 27#		00~7F	SCALE TUNING F#	-64--+63 [cents]	40	0 [cents]
00 10 10 28#		00~7F	SCALE TUNING G	-64--+63 [cents]	40	0 [cents]
00 10 10 29#		00~7F	SCALE TUNING G#	-64--+63 [cents]	40	0 [cents]
00 10 10 2A#		00~7F	SCALE TUNING A	-64--+63 [cents]	40	0 [cents]
00 10 10 2B#		00~7F	SCALE TUNING A#	-64--+63 [cents]	40	0 [cents]
00 10 10 2C#		00~7F	SCALE TUNING B	-64--+63 [cents]	40	0 [cents]

4. Bulk Dump

Bulk Dump allows you to transmit a large amount of data at once, and is convenient for storing settings for the entire unit on a computer or sequencer.

To make the DisCover 5 perform a Bulk Dump transmission, send it a "Bulk Dump Request" message. Bulk Dump Request uses the Data Request 1 (RQ1) format, but unlike when transmitting individual parameters, the "Size" specified by the request message refers not to size of the data but rather specifies the contents of the data. For the data contents corresponding to each Size, refer to "Parameter dump."

When the DisCover 5 receives a Bulk Dump Request, it will transmit a Bulk Dump in the format given below.

The DisCover 5 is also able to transmit a list of its internal sounds. This function can be used to display a list of sounds on a computer.

■ Dumping a list of internal sounds

● Instrument list dump

○ Instrument list dump request (receive only)

This command requests a bulk dump of a list of the preset sounds (Instruments) in internal memory, and uses "Data Request 1 (RQ1)" format. The Size specifies the contents of the requested data.

Address: 0C 00 01

Size: 00 00 04: DisCover 5

○ Instrument list dump (transmit only)

When Instrument List Dump Request is received, the sound names of the specified map will be transmitted continuously in the format given below, where 16 bytes are used for each sound name. The Address of the transmitted data is 0C 00 01 for all packets. User bank sound names are not transmitted.

DUMP FORMAT

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
CC0	MAP	PC	00	TONE NAME(ASCII 12 Characters)											

CC0: Variation number

MAP: MAP number 04 = DisCover 5

PC: Program number

● Drum set list dump

○ Drum set list dump request (receive only)

This command requests a bulk dump transmission of a list of Preset Drum Sets in internal memory, and uses "Data Request 1 (RQ1)" format. The Size specifies the desired data contents.

Address: 0C 00 02

Size: 00 00 04: DisCover 5

○ Drum set list dump (transmit only)

When a Drum Set List Dump Request is received, the Drum Set names of the specified MAP will be transmitted successively in the format given below, where 16 bytes are used for each sound. The Address of the transmitted data will be 0C 00 02 for each packet.

DUMP FORMAT

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	MAP	PC	00	DRUM TONE NAME(ASCII 12 Characters)											

MAP: MAP number 04 = DisCover 5

PC: Program number

● Drum instrument list dump

○ Drum instrument list dump request (receive only)

This command requests a bulk dump transmission of the Instrument list of an internal Preset Drum Sets, and uses "Data Request 1 (RQ1)" format. The Size specifies the desired data contents.

Address: 0C 00 03

Size: 00 00 04: DisCover 5

○ Drum instrument list dump (transmit only)

When a Drum Instrument List Dump Request is received, the Drum Instrument names of the specified Drum Set will be transmitted in the following format where 16 bytes are used for each Drum Instrument name. The address of the transmitted data will be 0C 00 03 for each packet.

DUMP FORMAT

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	MAP	PC	KEY	DRUM TONE NAME(ASCII 12 Characters)											

MAP: MAP number 04 = DisCover 5

PC: Program number

KEY: Note number

● Insertion effect list dump

○ Insertion effect list dump request (receive only)

This command requests a bulk dump transmission of the Insertion effect list of an internal memory, and uses "Data Request 1 (RQ1)" format. The Size specifies the desired data contents.

Address: 0C 00 04

Size: 00 00 00: ALL

○ Insertion effect list dump (transmit only)

When an Insertion Effect List Dump Request is received, the specified Insertion Effect names will be transmitted in the following format where 20 bytes are used for each Effect name. The address of the transmitted data will be 0C 00 04 for each packet.

DUMP FORMAT

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	10	11	12
MSB	LSB	00	00	EFFECT NAME(ASCII 16 Characters)														

MSB: Category

LSB: Type

5. 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.

Dec.	Hex.	Dec.	Hex.	Dec.	Hex.	Dec.	Hex.
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

- 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 (Flute in GS).

[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 by -200 cents, so in this case -200 x (-3072) ÷ (-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 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 ccH and the data or size is dd ee ffH.

```
aa+bb+cc+dd+ee+ff = sum
sum ÷ 128 = quotient ... remainder
128 - remainder = checksum
```

[Example 1] Setting REVERB MACRO to ROOM 3

According to the "Parameter Address Map (p.247)," the REVERB MACRO Address is 40 01 30H, and ROOM 3 is a value of 02H. Thus:

```
F0 41 10 42 12 40 01 30 02 ?? F7
(1) (2) (3) (4) (5) address data checksum (6)
```

(1) Exclusive Status, (2) ID (Roland), (3) Device ID (17),
(4) Model ID (GS), (5) Command ID (DT1), (6) End of Exclusive

Next, we calculate the checksum.

```
40H+01H+30H+02H = 64+1+48+2 = 115 (sum)
115 (sum) ÷ 128 = 0 (quotient) ... 115 (remainder)
checksum = 128 - 115 (remainder) = 13 = 0DH
```

This means that F0 41 10 42 12 40 01 30 02 0D F7 is the message we transmit.

[Example 2] Setting REVERB LEVEL to 12

According to the "Parameter Address Map (p.248)," the REVERB LEVEL Address is 40 01 33H, and the parameter value is 0CH. Thus,

```
F0 41 10 42 12 40 01 33 0C ?? F7
(1) (2) (3) (4) (5) address data checksum (6)
```

(1) Exclusive Status, (2) ID (Roland), (3) Device ID (17),
(4) Model ID (GS), (5) Command ID (DT1), (6) End of Exclusive

Next we calculate the checksum.

```
40H + 01H + 33H + 0CH = 64 + 1 + 51 + 12 = 128 (sum)
128 (sum) ÷ 128 = 0 (quotient) ... 0 (remainder)
checksum = 128 - 0 (remainder) = 128 = 80H
```

In this case, however, the checksum value should be 00H, not 80H. You should use 00H if the remainder is 0.

This means that F0 41 10 42 12 40 01 33 0C 00 F7 is the message we transmit.

■ About the Tuning

In MIDI, individual Parts are tuned by sending RPN #1 (Master Fine Tuning) to the appropriate MIDI channel.

In MIDI, an entire device is tuned by either sending RPN #1 to all MIDI channels being used, or by sending a System Exclusive MASTER TUNE (address 40 00 00H).

RPN #1 allows tuning to be specified in steps of approximately 0.012 cents (to be precise, 100/8192 cent), and System Exclusive MASTER TUNE allows tuning in steps of 0.1 cent. One cent is 1/100th of a semitone.

The values of RPN #1 (Master Fine Tuning) and System Exclusive MASTER TUNE are added together to determine the actual pitch sounded by each Part.

Frequently used tuning values are given in the following table for your reference. Values are in hexadecimal (decimal in parentheses).

Hz at A4	Cents	RPN #1	Sys.Ex. 40 00 00
445.0	+19.56	4C 43 (+1603)	00 04 0C 04 (+196)
444.0	+15.67	4A 03 (+1283)	00 04 09 0D (+157)
443.0	+11.76	47 44 (+ 964)	00 04 07 06 (+118)
442.0	+ 7.85	45 03 (+ 643)	00 04 04 0F (+ 79)
441.0	+ 3.93	42 42 (+ 322)	00 04 02 07 (+ 39)
440.0	0	40 00 (0)	00 04 00 00 (0)
439.0	- 3.94	3D 3D (- 323)	00 03 0D 09 (- 39)
438.0	- 7.89	3A 7A (- 646)	00 03 0B 01 (- 79)

[Example] Setting the tuning of MIDI channel 3 to A4 = 442.0 Hz

Send RPN#1 to MIDI channel 3. From the above table, the value is 45 03H.

```
B2 64 00 MIDI ch.3, lower byte of RPN parameter number: 00H
(B2) 65 01 (MIDI ch.3) upper byte of RPN parameter number: 01H
(B2) 06 45 (MIDI ch.3) upper byte of parameter value: 45H
(B2) 26 03 (MIDI ch.3) lower byte of parameter value: 03H
(B2) 64 7F (MIDI ch.3) lower byte of RPN parameter number: 7FH
(B2) 65 7F (MIDI ch.3) upper byte of RPN parameter number: 7FH
```

● **The Scale Tune Feature (address: 40 1x 40)**

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 DisCover 5, 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.

○ **Arabic 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 Arabic Scale.

Example Settings

<u>Note name</u>	<u>Equal Temperament</u>	<u>Just Temperament</u> <u>(Keytone C)</u>	<u>Arabic Scale</u>
C	0	0	-6
C#	0	-8	+45
D	0	+4	-2
D#	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
A#	0	+14	-10
B	0	-12	-49

The values in the table are given in cents. Refer to the explanation of Scale Tuning on page 20 to convert these values to hexadecimal, and transmit them as Exclusive data. For example, to set the tune (C-B) of the Part1 Arabic Scale, send the following data:

F0 41 10 42 12 40 11 40 3A 6D 3E 34 0D 38 6B 3C 6F 40 36 0F 76 F70

MIDI Implementation Chart

[Real Time Orchestrator]

Date: June 2002

Model: DisCover 5

Version: 1.00

Function...		Transmitted	Recognized	Remarks
Basic Channel	Default Changed	1~16 1~16, Off	1~16 1~16, Off	19 parts Upper= 4, Lower= 11, M.Drums= 16, 1 logical part
Mode	Default Message Altered	Mode 3 Mode 3, 4 (M=1) *****	Mode 3 Mode 3, 4 (M=1)	*2
Note Number	True Voice	0~127 *****	0~127 0~127	
Velocity	Note ON Note OFF	O X	O X	
After Touch	Key's Ch's	X X	O O	
Pitch Bend		O *1	O *1	
Control Change	0,32	O *1	O *1	Bank Select
	1	O *1	O *1	Modulation
	5	O *1	O *1	Portamento Time
	6, 38	O *1	O *1	Data Entry
	7	O *1	O *1	Volume
	10	O *1	O *1	Panpot
	11	O *1	O *1	Expression
	64	O *1	O *1	Hold 1
	65	O *1	O *1	Portamento On/Off
	66	O *1	O *1	Sostenuto
	67	O *1	O *1	Soft
	71	O *1	O *1	Filter Resonance
	72	O *1	O *1	Release Time
	73	O *1	O *1	Attack Time
	74	O *1	O *1	Cutoff
	75	O *1	O *1	Decay Time
	76	O *1	O *1	Vibrato Rate
77	O *1	O *1	Vibrato Depth	
78	O *1	O *1	Vibrato Delay	
91	O *1	O (Reverb) *1	Effect 1 Depth	
93	O *1	O (Chorus) *1	Effect 3 Depth	
98, 99	O *1	O *1	NRPN LSB, MSB	
100, 101	O *1	O *1	RPN LSB, MSB	
Program Change	True #	O *****	O 0~127	Program Number 1~128
System Exclusive		O *1	O *1	
System Common	Song Position Pointer Song Sel Tune	O X X	O X X	
System Real Time	Clock Commands	O *1 O *1	O O	
Aux Messages	All Sounds Off Reset All Controllers Local On/Off All Notes Off Active Sense Reset	X X O *1 X O X	O (120, 126, 127) O (121) O O (123-125) O X	
Notes		*1 O X is selectable *2 Recognized as M=1 even if M≠1		

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

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

O: Yes
X: No