1. Receive data

■ Channel Voice Messages

* Not received in Performance mode when the Receive Switch parameter (PERFORM PART) is OFF.

● Note off

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

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

● Note on

Status	2nd byte	3rd byte
9nH	kkH	vvH

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

● Control Change

❍ Bank Select (Controller number 0, 32)

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

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

* Not received in Performance mode when the Receive Bank Select (PERFORM PART) is OFF.

* The Performances, Patches, and Rhythms corresponding to each Bank Select are as follows.

```
+-----+--------+---------+-----------------+-----------+
| BANK SELECT   | PROGRAM | GROUP           | NUMBER    |
| MSB | LSB    | NUMBER  |                 |           |
+-----+--------+---------+-----------------+-----------+
| 085 | 000    | 001 — 008 | User Performance   | 001 — 008 |
|     | 064    | 001 — 032 | Preset Performance | 001 — 032 |
| 086 | 000    | 001 — 002 | User Rhythm        | 001 — 002 |
|     | 064    | 001 — 020 | Preset Rhythm      | 001 — 020 |
| 087 | 000    | 001 — 128 | User Patch         | 001 — 128 |
|     | 064    | 001 — 128 | Preset Patch       | 001 — 128 |
|     | :      |   :     |                 |    :      |
|     | 068    | 001 — 128 | Preset Patch       | 001 — 128 |
| 120 | 000    | 001 — 057 | GM Rhythm          | 001 — 009 |
| 121 | 000 —  | 001 — 128 | GM Patch           | 001 — 256 |
+-----+--------+---------+-----------------+-----------+
```

❍ 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)

❍ Portamento Time (Controller number 5)

Status	2nd byte	3rd byte
BnH	05H	vvH

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

* The Portamento Time parameter (PATCH TONE) will change.

❍ Data Entry (Controller number 6, 38)

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

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

❍ Volume (Controller number 7)

Status	2nd byte	3rd byte
BnH	07H	vvH

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

* In Performance mode, the Part Level parameter (PERFORM PART) will change.

❍ Balance (Controller number 8)

Status	2nd byte	3rd byte
BnH	08H	vvH

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

* The Tone Balance parameter (PATCH COMMON) will change.

❍ Panpot (Controller number 10)

Status	2nd byte	3rd byte
BnH	0AH	vvH

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

* In Performance mode, the Part Pan parameter (PERFORM PART) will change.

❍ Expression (Controller number 11)

Status	2nd byte	3rd byte
BnH	0BH	vvH

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

❍ Effect Control 1 (Controller number 12)

Status	2nd byte	3rd byte
BnH	0CH	vvH

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

❍ Effect Control 2 (Controller number 13)

Status	2nd byte	3rd byte
BnH	0DH	vvH

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

❍ Hold 1 (Controller number 64)

Status	2nd byte	3rd byte
BnH	40H	vvH

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

❍ Portamento (Controller number 65)

Status	2nd byte	3rd byte
BnH	41H	vvH

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

* The Portamento Switch parameter (PATCH TONE) will change.

❍ Sostenuto (Controller number 66)

Status	2nd byte	3rd byte
BnH	42H	vvH

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

❍ Soft (Controller number 67)

Status	2nd byte	3rd byte
BnH	43H	vvH

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

❍ Resonance (Controller number 71)

Status	2nd byte	3rd byte
BnH	47H	vvH

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

* The Resonance parameter (PATCH TONE) will change.

❍ Release Time (Controller number 72)

Status	2nd byte	3rd byte
BnH	48H	vvH

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

* The Release Time parameter (PATCH TONE) will change.

❍ Attack time (Controller number 73)

Status	2nd byte	3rd byte
BnH	49H	vvH

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

* The Attack Time parameter (PATCH TONE) will change.

○Cutoff (Controller number 74)

Status	2nd byte	3rd byte
BnH	4AH	vvH

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

* The Cutoff Frequency parameter (PATCH TONE) will change.

○Decay Time (Controller number 75)

Status	2nd byte	3rd byte
BnH	4BH	vvH

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

* The Decay Time parameter (PATCH TONE) will change.

○Vibrato Rate (Controller number 76)

Status	2nd byte	3rd byte
BnH	4CH	vvH

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

* The LFO Rate parameter (PATCH TONE) will change.

○Vibrato Depth (Controller number 77)

Status	2nd byte	3rd byte
BnH	4DH	vvH

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

* The LFO Depth parameter (PATCH TONE) will change.

○Vibrato Delay (Controller number 78)

Status	2nd byte	3rd byte
BnH	4EH	vvH

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

* The LFO Delay parameter (PATCH TONE) will change.

○Portamento control (Controller number 84)

Status	2nd byte	3rd byte
BnH	54H	kkH

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

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

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

Status	2nd byte	3rd byte
BnH	5BH	vvH

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

* In Performance mode, the Part Reverb Send Level parameter (PERFORM PART) will change.

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

Status	2nd byte	3rd byte
BnH	5DH	vvH

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

* In Performance mode, the Part Chorus Send Level parameter (PERFORM PART) will change.

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

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

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

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

This device receives the following RPNs.

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

* The Pitch Bend Range parameter (PATCH TONE) will change.

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

* The Fine Tune parameter (PATCH TONE) will change.

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

* The Coarse Tune parameter (PATCH TONE) will change.

00H, 05H	mmH, llH	Modularion Depth Range
		mm: 00 00H - 06 00H
		(0 - 16384 x 600 / 16384 cent)

* Not received in Patch mode.

7FH, 7FH	---, ---	RPN null
		RPN and NRPN will be set as "unspecified." Once this setting has been made, subsequent Parameter values that were previously set will not change.
		mm, ll: ignored

● Program Change

Status	2nd byte
CnH	ppH

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

* Not received in Performance mode when the Receive Program Change parameter (PERFORM PART) is OFF.

● Channel Pressure

Status	2nd byte
DnH	vvH

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

● 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)

■ Channel Mode Messages

* Not received in Performance mode when the Receive Switch parameter (PERFORM PART) is OFF.

● All Sounds Off (Controller number 120)

Status	2nd byte	3rd byte
BnH	78H	00H
n = MIDI channel number:	0H - FH (ch.1 - 16)	

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

● Reset All Controllers (Controller number 121)

Status	2nd byte	3rd byte
BnH	79H	00H
n = MIDI channel number:	0H - FH (ch.1 - 16)	

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

Controller	Reset value
Pitch Bend Change	+/-0 (center)
Polyphonic Key Pressure	0 (off)
Channel Pressure	0 (off)
Modulation	0 (off)
Expression	127 (max)
Hold 1	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 Notes Off is received.
* The Solo Switch parameter (PATCH COMMON) will change.

● POLY (Controller number 127)

Status	2nd byte	3rd byte
BnH	7FH	00H
n = MIDI channel number:	0H - FH (ch.1 - 16)	

* The same processing will be carried out as when All Notes Off is received.
* The Solo Switch parameter (PATCH COMMON) will change.

■ System Realtime Message

● Active Sensing

Status
FEH

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

■ System Exclusive Message

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

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

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

● Universal Non-realtime System Exclusive Messages

○ Identity Request Message

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

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

* When this message is received, Identity Reply message (p. 8) will be transmitted.

○ GM1 System On

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

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

* When this messages is received, this instrument will turn to the Performance mode.

○ 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 messages is received, this instrument will turn to the Performance mode.

○GM System Off

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

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

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

● Universal Realtime System Exclusive Messages
○Master Volume

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

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

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

○Master Fine Tuning

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

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

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

* The Master Tune parameter (SYSTEM GENERAL) will change.

○Master Coarse Tuning

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

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

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

* The Master Key Shift parameter (SYSTEM GENERAL) will change.

● Global Parameter Control
* Not received in Patch mode.

○Reverb Parameters

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

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

○Chorus Parameters

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

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

○Channel Pressure

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

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

○Controller

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

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

○Scale/Octave Tuning Adjust

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

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

○Key-based Instrument Controllers

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

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

*   This parameter affects drum instruments only.

● Data Transmission

This instrument can use exclusive messages to exchange many varieties of internal settings with other devices.
The model ID of the exclusive messages used by this instrument is 00H 64H.

○Data Request 1 RQ1 (11H)

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

Status	data byte	status
F0H	41H, dev, 00H, 64H, 11H, aaH, bbH, ccH, ddH, ssH, ttH, uuH, vvH, sum	F7H

Byte	Remarks
F0H	Exclusive status
41H	ID number (Roland)
dev	device ID (dev: 10H - 1FH, 7FH)
00H	model ID #1 (JUNO-D)
64H	model ID #2 (JUNO-D)
11H	command ID (RQ1)
aaH	address MSB
bbH	address
ccH	address
ddH	address LSB
ssH	size MSB
ttH	size
uuH	size
vvH	size LSB
sum	checksum
F7H	EOX (End Of Exclusive)

*   The size of data that can be transmitted at one time is fixed for each type of data. And data requests must be made with a fixed starting address and size. Refer to the address and size given in "Parameter Address Map" (p. 9).

*   For the checksum, refer to p. 24.

*   Not received when the Receive Exclusive parameter (SYSTEM MIDI) is OFF.

○ Data set 1   DT1 (12H)

Status	Data byte	Status
F0H	41H, dev, 00H, 64H, 12H, aaH, bbH, ccH, ddH, eeH, ... ffH, sum	F7H

Byte	Explanation
F0H	Exclusive status
41H	ID number (Roland)
dev	Device ID (dev: 00H - 1FH, 7FH)
00H	Model ID #1 (JUNO-D)
64H	Model ID #2 (JUNO-D)
12H	Command ID (DT1)
aaH	Address MSB: upper byte of the starting address of the data to be sent
bbH	Address: upper middle byte of the starting address of the data to be sent
ccH	Address: lower middle byte of the starting address of the data to be sent
ddH	Address LSB: lower byte of the starting address of the data to be sent.
eeH	Data: the actual data to be sent. Multiple bytes of data are transmitted in order starting from the address.
:	:
ffH	Data
sum	Checksum
F7H	EOX (End Of Exclusive)

* The amount of data that can be transmitted at one time depends on the type of data, and data will be transmitted from the specified starting address and size. Refer to the address and size given in "Parameter Address Map" (p. 9).
* Data larger than 256 bytes will be divided into packets of 256 bytes or less, and each packet will be sent at an interval of about 20 ms.
* Regarding the checksum, please refer to p. 24.
* Not received when the Receive Exclusive parameter (SYSTEM MIDI) is OFF.

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

Byte	Explanation
F0H	Exclusive status
41H	ID number (Roland)
dev	Device ID (dev: 10H - 1FH, 7FH)
42H	Model ID (GS)
12H	Command ID (DT1)
aaH	Address MSB: upper byte of the starting address of the transmitted data
bbH	Address: middle byte of the starting address of the transmitted data
ccH	Address LSB: lower byte of the starting address of the transmitted data
ddH	Data: the actual data to be transmitted. Multiple bytes of data are transmitted starting from the address.
:	:
eeH	Data
sum	Checksum
F7H	EOX (End Of Exclusive)

* The amount of data that can be transmitted at one time depends on the type of data, and data will be transmitted from the specified starting address and size. Refer to the address and size given in "Parameter Address Map" (p. 9).
* Data larger than 256 bytes will be divided into packets of 256 bytes or less, and each packet will be sent at an interval of about 20 ms.
* Regarding the checksum, please refer to p. 24.
* Not received when the Receive Exclusive parameter (SYSTEM MIDI) is OFF.

2. Data Transmission

■ Channel Voice Messages

● Note off

Status	2nd byte	3rd byte
8nH	kkH	vvH
n = MIDI channel number:	0H - FH (ch.1 - 16)	
kk = note number:	00H - 7FH (0 - 127)	
vv = note off velocity:	00H - 7FH (0 - 127)	

● Note on

Status	2nd byte	3rd byte
9nH	kkH	vvH
n = MIDI channel number:	0H - FH (ch.1 - 16)	
kk = note number:	00H - 7FH (0 - 127)	
vv = note on velocity:	01H - 7FH (1 - 127)	

● Control Change

○ Bank Select (Controller number 0, 32)

Status	2nd byte	3rd byte
BnH	00H	mmH
BnH	20H	llH
n = MIDI channel number:	0H - FH (ch.1 - 16)	
mm, ll = Bank number:	00 00H - 7F 7FH (bank.1 - bank.16384)	

* These messages are transmitted when Patch, Rhythm Set or Performance is selected. But not transmitted when Transmit Program Change or Transmit Bank Select parameter (SYSTEM MIDI) is OFF.

○ 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)	

* Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to MODULATION.

○ 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)	

* Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to PORTA TIME.

○ 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)	

* Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to VOLUME.

○ Balance (Controller number 8)

Status	2nd byte	3rd byte
BnH	08H	vvH
n = MIDI channel number:	0H - FH (ch.1 - 16)	
vv = Balance:	00H - 7FH (0 - 127)	

* Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to BALANCE.

○ Panpot (Controller number 10)

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

* Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to PAN.

○**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)

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to EXPRESSION.

○**Effect Control 1 (Controller number 12)**

Status	2nd byte	3rd byte
BnH	0CH	vvH

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

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to MFX PARAMETER1.

○**Effect Control 2 (Controller number 13)**

Status	2nd byte	3rd byte
BnH	0DH	vvH

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

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to MFX PARAMETER2.

○**Hold 1 (Controller number 64)**

Status	2nd byte	3rd byte
BnH	40H	vvH

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

○**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

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to PORTAMENTO.

○**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

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to SOSTENUTO.

○**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

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to SOFT.

○**Resonance (Controller number 71)**

Status	2nd byte	3rd byte
BnH	47H	vvH

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

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to RESONANCE.

○**Release Time (Controller number 72)**

Status	2nd byte	3rd byte
BnH	48H	vvH

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

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to RELEASE TIME.

○**Attack time (Controller number 73)**

Status	2nd byte	3rd byte
BnH	49H	vvH

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

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to ATTACK TIME.

○**Cutoff (Controller number 74)**

Status	2nd byte	3rd byte
BnH	4AH	vvH

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

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to CUTOFF.

○**Decay Time (Controller number 75)**

Status	2nd byte	3rd byte
BnH	4BH	vvH

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

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to DECAY TIME.

○**Vibrato Rate (Controller number 76)**

Status	2nd byte	3rd byte
BnH	4CH	vvH

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

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to LFO RATE.

○**Vibrato Depth (Controller number 77)**

Status	2nd byte	3rd byte
BnH	4DH	vvH

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

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to LFO DEPTH.

○**Vibrato Delay (Controller number 78)**

Status	2nd byte	3rd byte
BnH	4EH	vvH

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

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to LFO DELAY.

○**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)

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to REV SEND LEVEL.

○**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)

*   Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to CHO SEND LEVEL.

● 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)

* These messages are transmitted when Patch, Rhythm Set or Performance is selected. But not transmitted when Transmit Program Change parameter (SYSTEM MIDI) is OFF.

● Channel Pressure

Status	2nd byte
DnH	vvH
n = MIDI channel number:	0H - FH (ch.1 - 16)
vv = Channel Pressure:	00H - 7FH (0 - 127)

* Sent when the Modulation/Pedal/C1-C3 Assign parameter (SYSTEM CONTROLLER) is set to AFTERTOUCH.

● 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)	

■ System Realtime Messages

● Active Sensing

Status
FEH

* This message is transmitted at intervals of approximately 250 msec.
* This message is not sent when Transmit Active Sensing parameter (SYSTEM MIDI) is OFF.

■ System Exclusive Messages

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

● Universal Non-realtime System Exclusive Message

○Identity Reply Message

Receiving Identity Request Message (p. 3), the JUNO-D send this message.

Status	Data byte	Status
F0H	7EH, dev, 06H, 02H, 41H, 64H, 01H,	F7H
	01H, 00H, 00H, 01H, 00H, 01H	

Byte	Explanation
F0H	Exclusive status
7EH	ID number (Universal Non-realtime Message)
dev	Device ID (dev: 10H - 1FH)
06H	Sub ID#1 (General Information)
02H	Sub ID#2 (Identity Reply)
41H	ID number (Roland)
64H 01H	Device family code
01H 00H	Device family number code
00H 01H 00H 01H	Software revision level
F7H	EOX (End of Exclusive)

● Data Transmission

○Data set 1   DT1 (12H)

Status	Data byte	Status
F0H	41H, dev, 00H, 64H, 12H, aaH, bbH,	F7H
	ccH, ddH, eeH, ... ffH, sum	

Byte	Explanation
F0H	Exclusive status
41H	ID number (Roland)
dev	Device ID (dev: 00H - 1FH, 7FH)
00H	Model ID #1 (JUNO-D)
64H	Model ID #2 (JUNO-D)
12H	Command ID (DT1)
aaH	Address MSB: upper byte of the starting address of the data to be sent
bbH	Address: upper middle byte of the starting address of the data to be sent
ccH	Address: lower middle byte of the starting address of the data to be sent
ddH	Address LSB: lower byte of the starting address of the data to be sent.
eeH	Data: the actual data to be sent. Multiple bytes of data are transmitted in order starting from the address.
:	:
ffH	Data
sum	Checksum
F7H	EOX (End Of Exclusive)

* The amount of data that can be transmitted at one time depends on the type of data, and data will be transmitted from the specified starting address and size. Refer to the address and size given in "Parameter Address Map" (p. 9).
* Data larger than 256 bytes will be divided into packets of 256 bytes or less, and each packet will be sent at an interval of about 20 ms.

3. Parameter Address Map

* Transmission of "#" marked address is divided to some packets. For example, ABH in hexadecimal notation will be divided to 0AH and 0BH, and is sent/received in this order.

■ JUNO-D (MODEL ID = 00H 64H)

Start Address	Description
00 00 00 00	Setup
01 00 00 00	System
10 00 00 00	Temporary Performance
11 00 00 00	Temporary Patch/Rhythm (Performance Mode Part 1)
11 02 00 00	Temporary Patch/Rhythm (Performance Mode Part 2)
:	
11 1E 00 00	Temporary Patch/Rhythm (Performance Mode Part 16)
18 00 00 00	Temporary Patch/Rhythm (Patch Mode)
1A 00 00 00	Temporary Arpeggio
1C 00 00 00	Temporary Chord
20 00 00 00	User Performance (001)
20 01 00 00	User Performance (002)
:	
20 07 00 00	User Performance (008)
30 00 00 00	User Patch (001)
30 01 00 00	User Patch (002)
:	
30 7F 00 00	User Patch (128)
40 00 00 00	User Rhythm (01)
40 01 00 00	User Rhythm (02)
50 00 00 00	User Arpeggio (1)
50 01 00 00	User Arpeggio (2)
:	
50 07 00 00	User Arpeggio (8)
60 00 00 00	User Chord (1)
60 01 00 00	User Chord (2)
:	
60 07 00 00	User Chord (8)

* Temporary Patch/Rhythm

Offset Address	Description
00 00 00	Temporary Patch
01 00 00	Temporary Rhythm

* Performance

Offset Address	Description
00 00 00	Performance Common
00 02 00	Performance MFX
00 04 00	Performance Chorus
00 06 00	Performance Reverb
00 10 00	Performance Part (Part 1)
00 11 00	Performance Part (Part 2)
:	
00 1F 00	Performance Part (Part 16)

* Patch

Offset Address	Description
00 00 00	Patch Common
00 02 00	Patch MFX
00 04 00	Patch Chorus
00 06 00	Patch Reverb
00 10 00	Patch Tone (1)
00 11 00	Patch Tone (2)

* Rhythm

Offset Address	Description
00 00 00	Rhythm Common
00 02 00	Rhythm MFX
00 04 00	Rhythm Chorus
00 06 00	Rhythm Reverb
00 10 00	Rhythm Tone (Key # 21)
00 11 00	Rhythm Tone (Key # 22)
:	
00 67 00	Rhythm Tone (Key # 108)

* Arpeggio

Offset Address	Description
00 00 00	Arpeggio Setup
00 10 00	(reserved)

* Chord

Offset Address	Description
00 00 00	Chord Pattern
00 01 00	Chord Pattern
:	
00 0B 00	Chord Pattern
00 10 00	(reserved)

* Setup

Offset Address		Description	
00 00	0000 0aaa	Mode Select	(0 – 4)
		PERFORMANCE, PATCH, GM1, GM2, GS	
00 01	0aaa aaaa	Performance Bank Select MSB (CC# 0)	(0 – 127)
00 02	0aaa aaaa	Performance Bank Select LSB (CC# 32)	(0 – 127)
00 03	0aaa aaaa	Performance Program Number (PC)	(0 – 127)
00 04	0aaa aaaa	Patch Bank Select MSB (CC# 0)	(0 – 127)
00 05	0aaa aaaa	Patch Bank Select LSB (CC# 32)	(0 – 127)
00 06	0aaa aaaa	Patch Program Number (PC)	(0 – 127)
00 07	0000 000a	MFX Switch	(0 – 1)
		BYPASS, ON	
00 08	0000 000a	Chorus Switch	(0 – 1)
		OFF, ON	
00 09	0000 000a	Reverb Switch	(0 – 1)
		OFF, ON	
00 0A	0000 000a	Arpeggio Switch	(0 – 1)
		OFF, ON	
00 0B	0000 000a	Arpeggio Group	(0 – 1)
		USER, PRESET	
00 0C	0000 aaaa	Arpeggio Number	(0 – 8)
		1 – 9	
00 0D	0000 000a	Chord Switch	(0 – 1)
		OFF, ON	
00 0E	0000 000a	Chord Group	(0 – 1)
		USER, PRESET	
00 0F	0000 aaaa	Chord Number	(0 – 15)
		1 – 16	
00 10	000a aaaa	D Beam Assign	(0 – 26)
		MODULATION, PORTA TIME, VOLUME, BALANCE, PAN, EXPRESSION, PORTAMENTO, SOSTENUTO, SOFT, RESONANCE, RELEASE TIME, ATTACK TIME, CUTOFF, DECAY TIME, LFO RATE, LFO DEPTH, LFO DELAY, CHO SEND LEVEL, REV SEND LEVEL, MFX PARAMETER1, MFX PARAMETER2, AFTERTOUCH, BEND UP, BEND DOWN, SEQ START/STOP, SOLO SYNTH, ACTIVE EXP	
00 11	0000 aaaa	D Beam Sens	(1 – 10)
00 12	0000 000a	D Beam Polarity	(0 – 1)
		NORMAL, REVERSE	
00 00 00 13	Total Size		

* System Common

Offset Address		Description	
# 00 00	0000 aaaa		
	0000 bbbb		
	0000 cccc		
	0000 dddd	Master Tune	(24 – 2024)
		–100.0 – 100.0 [cent]	
00 04	00aa aaaa	Master Key Shift	(40 – 88)
		–24 – +24	
00 05	0aaa aaaa	Master Level	(0 – 127)
00 06	0000 000a	Hold Pedal Polarity	(0 – 1)
		STANDARD, REVERSE	
00 07	000a aaaa	Control Pedal Assign	(0 – 23)
		MODULATION, PORTA TIME, VOLUME, BALANCE, PAN, EXPRESSION, PORTAMENTO, SOSTENUTO, SOFT, RESONANCE, RELEASE TIME, ATTACK TIME, CUTOFF, DECAY TIME, LFO RATE, LFO DEPTH, LFO DELAY, CHO SEND LEVEL, REV SEND LEVEL, MFX PARAMETER1, MFX PARAMETER2, AFTERTOUCH, PUNCH IN/OUT, TAP TEMPO	
00 08	000a aaaa	Modulation Assign	(0 – 21)
		MODULATION, PORTA TIME, VOLUME, BALANCE, PAN, EXPRESSION, PORTAMENTO, SOSTENUTO, SOFT, RESONANCE, RELEASE TIME, ATTACK TIME, CUTOFF, DECAY TIME, LFO RATE, LFO DEPTH, LFO DELAY, CHO SEND LEVEL, REV SEND LEVEL, MFX PARAMETER1, MFX PARAMETER2, AFTERTOUCH	
00 09	000a aaaa	C1 Knob Assign	(0 – 22)
		MODULATION, PORTA TIME, VOLUME, BALANCE, PAN, EXPRESSION, PORTAMENTO, SOSTENUTO, SOFT, RESONANCE, RELEASE TIME, ATTACK TIME, CUTOFF, DECAY TIME, LFO RATE, LFO DEPTH, LFO DELAY, CHO SEND LEVEL, REV SEND LEVEL, MFX PARAMETER1, MFX PARAMETER2, AFTERTOUCH, PATCH MODIFY	
00 0A	000a aaaa	C2 Knob Assign	(0 – 22)
		MODULATION, PORTA TIME, VOLUME, BALANCE, PAN, EXPRESSION, PORTAMENTO, SOSTENUTO, SOFT, RESONANCE, RELEASE TIME, ATTACK TIME, CUTOFF, DECAY TIME, LFO RATE, LFO DEPTH, LFO DELAY, CHO SEND LEVEL, REV SEND LEVEL, MFX PARAMETER1, MFX PARAMETER2, AFTERTOUCH, PATCH MODIFY	

```
+-------+-----------+-------------------------------------------------------+
| 00 0B | 000a aaaa | C3 Knob Assign                             (0 — 22)   |
|       |           |            MODULATION, PORTA TIME, VOLUME,            |
|       |           |                   BALANCE, PAN, EXPRESSION,           |
|       |           |              PORTAMENTO, SOSTENUTO, SOFT,             |
|       |           |          RESONANCE, RELEASE TIME, ATTACK TIME,        |
|       |           |                 CUTOFF, DECAY TIME, LFO RATE,         |
|       |           |          LFO DEPTH, LFO DELAY, CHO SEND LEVEL,        |
|       |           |      REV SEND LEVEL, MFX PARAMETER1, MFX PARAMETER2,   |
|       |           |                    AFTERTOUCH, PATCH MODIFY           |
+-------+-----------+-------------------------------------------------------+
| 00 0C | 0000 0aaa | Patch Scale Tune Type                       (0 — 3)   |
|       |           | EQUAL, JUST(MAJOR) in C, JUST(MINOR) in C, ARABIC     |
| 00 0D | 0aaa aaaa | Patch Scale Tune for C                    (0 — 127)   |
|       |           |                                            −64 — +63  |
| 00 0E | 0aaa aaaa | Patch Scale Tune for C#                   (0 — 127)   |
|       |           |                                            −64 — +63  |
| 00 0F | 0aaa aaaa | Patch Scale Tune for D                    (0 — 127)   |
|       |           |                                            −64 — +63  |
| 00 10 | 0aaa aaaa | Patch Scale Tune for D#                   (0 — 127)   |
|       |           |                                            −64 — +63  |
| 00 11 | 0aaa aaaa | Patch Scale Tune for E                    (0 — 127)   |
|       |           |                                            −64 — +63  |
| 00 12 | 0aaa aaaa | Patch Scale Tune for F                    (0 — 127)   |
|       |           |                                            −64 — +63  |
| 00 13 | 0aaa aaaa | Patch Scale Tune for F#                   (0 — 127)   |
|       |           |                                            −64 — +63  |
| 00 14 | 0aaa aaaa | Patch Scale Tune for G                    (0 — 127)   |
|       |           |                                            −64 — +63  |
| 00 15 | 0aaa aaaa | Patch Scale Tune for G#                   (0 — 127)   |
|       |           |                                            −64 — +63  |
| 00 16 | 0aaa aaaa | Patch Scale Tune for A                    (0 — 127)   |
|       |           |                                            −64 — +63  |
| 00 17 | 0aaa aaaa | Patch Scale Tune for A#                   (0 — 127)   |
|       |           |                                            −64 — +63  |
| 00 18 | 0aaa aaaa | Patch Scale Tune for B                    (0 — 127)   |
|       |           |                                            −64 — +63  |
+-------+-----------+-------------------------------------------------------+
| 00 19 | 0000 000a | Receive Program Change                      (0 — 1)   |
|       |           |                                             OFF, ON   |
| 00 1A | 0000 000a | Receive Bank Select                         (0 — 1)   |
|       |           |                                             OFF, ON   |
| 00 1B | 0000 000a | Transmit Program Change                     (0 — 1)   |
|       |           |                                             OFF, ON   |
| 00 1C | 0000 000a | Transmit Bank Select                        (0 — 1)   |
|       |           |                                             OFF, ON   |
| 00 1D | 0000 aaaa | Patch Receive Channel                      (0 — 15)   |
|       |           |                                              1 — 16   |
| 00 1E | 000a aaaa | Patch Transmit Channel                     (0 — 17)   |
|       |           |                                        1 — 16, RxCH, OFF |
| 00 1F | 000a aaaa | Performance Control Channel                (0 — 16)   |
|       |           |                                          1 — 16, OFF   |
+-------+-----------+-------------------------------------------------------+
| 00 20 | 0000 000a | System Clock Source                         (0 — 1)   |
|       |           |                                            INT, MIDI   |
|#  00 21 | 0000 aaaa |                                                       |
|       | 0000 bbbb |                                                       |
|       | 0000 cccc | System Tempo                              (5 — 300)   |
|       |           |                                         5 — 300 [BPM]   |
+----------+--------+-------------------------------------------------------+
| 00 00 00 24 | Total Size                                               |
+----------+----------------------------------------------------------------+
```

* Performance Common

```
+------------------------------------------------------------------------+
| Offset   |                                                             |
|  Address |                    Description                              |
+----------+-------------------------------------------------------------+
| 00 00 | 0aaa aaaa | Performance Name 1                      (32 — 127)   |
|       |           |                                       32 — 127 [ASCII] |
| 00 01 | 0aaa aaaa | Performance Name 2                      (32 — 127)   |
|       |           |                                       32 — 127 [ASCII] |
| 00 02 | 0aaa aaaa | Performance Name 3                      (32 — 127)   |
|       |           |                                       32 — 127 [ASCII] |
| 00 03 | 0aaa aaaa | Performance Name 4                      (32 — 127)   |
|       |           |                                       32 — 127 [ASCII] |
| 00 04 | 0aaa aaaa | Performance Name 5                      (32 — 127)   |
|       |           |                                       32 — 127 [ASCII] |
| 00 05 | 0aaa aaaa | Performance Name 6                      (32 — 127)   |
|       |           |                                       32 — 127 [ASCII] |
| 00 06 | 0aaa aaaa | Performance Name 7                      (32 — 127)   |
|       |           |                                       32 — 127 [ASCII] |
| 00 07 | 0aaa aaaa | Performance Name 8                      (32 — 127)   |
|       |           |                                       32 — 127 [ASCII] |
| 00 08 | 0aaa aaaa | Performance Name 9                      (32 — 127)   |
|       |           |                                       32 — 127 [ASCII] |
| 00 09 | 0aaa aaaa | Performance Name 10                     (32 — 127)   |
|       |           |                                       32 — 127 [ASCII] |
| 00 0A | 0aaa aaaa | Performance Name 11                     (32 — 127)   |
|       |           |                                       32 — 127 [ASCII] |
| 00 0B | 0aaa aaaa | Performance Name 12                     (32 — 127)   |
|       |           |                                       32 — 127 [ASCII] |
+-------+-----------+-------------------------------------------------------+
| 00 0C | 00aa aaaa | Voice Reserve 1                            (0 — 32)   |
| 00 0D | 00aa aaaa | Voice Reserve 2                            (0 — 32)   |
| 00 0E | 00aa aaaa | Voice Reserve 3                            (0 — 32)   |
| 00 0F | 00aa aaaa | Voice Reserve 4                            (0 — 32)   |
| 00 10 | 00aa aaaa | Voice Reserve 5                            (0 — 32)   |
| 00 11 | 00aa aaaa | Voice Reserve 6                            (0 — 32)   |
| 00 12 | 00aa aaaa | Voice Reserve 7                            (0 — 32)   |
| 00 13 | 00aa aaaa | Voice Reserve 8                            (0 — 32)   |
| 00 14 | 00aa aaaa | Voice Reserve 9                            (0 — 32)   |
| 00 15 | 00aa aaaa | Voice Reserve 10                           (0 — 32)   |
| 00 16 | 00aa aaaa | Voice Reserve 11                           (0 — 32)   |
| 00 17 | 00aa aaaa | Voice Reserve 12                           (0 — 32)   |
| 00 18 | 00aa aaaa | Voice Reserve 13                           (0 — 32)   |
| 00 19 | 00aa aaaa | Voice Reserve 14                           (0 — 32)   |
| 00 1A | 00aa aaaa | Voice Reserve 15                           (0 — 32)   |
| 00 1B | 00aa aaaa | Voice Reserve 16                           (0 — 32)   |
+-------+-----------+-------------------------------------------------------+
| 00 1C | 0aaa aaaa | Performance Level                         (0 — 127)   |
| 00 1D | 000a aaaa | MFX Source                                 (0 — 16)   |
|       |           |                             PERFORM, PART1 — PART16   |
+----------+--------+-------------------------------------------------------+
| 00 00 00 1E | Total Size                                               |
+----------+----------------------------------------------------------------+
```

* Performance MFX

Offset Address		Description
00 00	00aa aaaa	MFX Type (0 — 47) 00 THROUGH, 01 STEREO EQ, 02 OVERDRIVE, 03 DISTORTION, 04 PHASER, 05 SPECTRUM, 06 ENHANCER, 07 AUTO WAH, 08 ROTARY, 09 COMPRESSOR, 10 LIMITER, 11 HEXA—CHORUS, 12 TREMOLO CHO, 13 SPACE—D, 14 St CHORUS, 15 St FLANGER, 16 STEP FLANGER, 17 St DELAY, 18 LONG DELAY, 19 MOD DELAY, 20 3 TAP DELAY, 21 4 TAP DELAY, 22 TM CTRL DLY, 23 2V PCH SHIFT, 24 FB PCH SHIFT, 25 REVERB, 26 GATED REVERB, 27 OD>CHORUS, 28 OD>FLANGER, 29 OD>DELAY, 30 DIST>CHORUS, 31 DIST>FLANGER, 32 DIST>DELAY, 33 ENH>CHORUS, 34 ENH>FLANGER, 35 ENH>DELAY, 36 CHORUS>DELAY, 37 FLG>DELAY, 38 CHO>FLANGER, 39 CHORUS/DELAY, 40 FLG/DELAY, 41 CHO/FLANGER, 42 LOFI, 43 SLICER, 44 TREMOLO, 45 AUTO PAN, 46 TUMBLING DELAY, 47 FEEDBACK RIPPER
00 01	0aaa aaaa	MFX Chorus Send Level (0 — 127)
00 02	0aaa aaaa	MFX Reverb Send Level (0 — 127)
00 03	0000 aaaa	MFX Control Assign 1 (0 — 2) OFF, 1 — 2
00 04	0000 aaaa	MFX Control Assign 2 (0 — 2) OFF, 1 — 2
# 00 05	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 1 (12768 — 52768) −20000 — +20000
# 00 09	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 2 (12768 — 52768) −20000 — +20000
# 00 0D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 3 (12768 — 52768) −20000 — +20000
# 00 11	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 4 (12768 — 52768) −20000 — +20000
# 00 15	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 5 (12768 — 52768) −20000 — +20000
# 00 19	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 6 (12768 — 52768) −20000 — +20000
# 00 1D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 7 (12768 — 52768) −20000 — +20000
# 00 21	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 8 (12768 — 52768) −20000 — +20000
# 00 25	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 9 (12768 — 52768) −20000 — +20000
# 00 29	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 10 (12768 — 52768) −20000 — +20000
# 00 2D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 11 (12768 — 52768) −20000 — +20000
# 00 31	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 12 (12768 — 52768) −20000 — +20000
# 00 35	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 13 (12768 — 52768) −20000 — +20000
# 00 39	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 14 (12768 — 52768) −20000 — +20000
# 00 3D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 15 (12768 — 52768) −20000 — +20000
# 00 41	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 16 (12768 — 52768) −20000 — +20000
# 00 45	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 17 (12768 — 52768) −20000 — +20000

```
|  #     00 49 | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 18                     (12768 - 52768)
|              |           |                                     -20000 - +20000
|  #     00 4D | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 19                     (12768 - 52768)
|              |           |                                     -20000 - +20000
|  #     00 51 | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 20                     (12768 - 52768)
|              |           |                                     -20000 - +20000
+--------------+
| 00 00 00 55  | Total Size
+--------------+
```

* Performance Chorus

```
+----------+
| Offset   |
|  Address |              Description
+----------+
|   00 00  | 0000 0aaa | Chorus Type                              (0 - 7)
|          |           |         CHORUS1, CHORUS2, CHORUS3, CHORUS4,
|          |           |             FEEDBACK CHORUS, FLANGER,
|          |           |             SHORT DELAY, SHORT DELAY(FB)
|   00 01  | 0000 0aaa | Chorus Pre-LPF                           (0 - 7)
|   00 02  | 0aaa aaaa | Chorus Level                           (0 - 127)
|   00 03  | 0aaa aaaa | Chorus Feedback                        (0 - 127)
|   00 04  | 0aaa aaaa | Chorus Delay                           (0 - 127)
|   00 05  | 0aaa aaaa | Chorus Rate                            (0 - 127)
|   00 06  | 0aaa aaaa | Chorus Depth                           (0 - 127)
|   00 07  | 0aaa aaaa | Chorus Send Level to Reverb            (0 - 127)
+----------+
| 00 00 00 08 | Total Size
+----------+
```

* Performance Reverb

```
+----------+
| Offset   |
|  Address |              Description
+----------+
|   00 00  | 0000 0aaa | Reverb Type                              (0 - 7)
|          |           |             ROOM1, ROOM2, ROOM3,
|          |           |             HALL1, HALL2, PLATE,
|          |           |             DELAY, PANNING DELAY
|   00 01  | 0000 0aaa | Reverb Character                         (0 - 7)
|   00 02  | 0000 0aaa | Reverb Pre-LPF                           (0 - 7)
|   00 03  | 0aaa aaaa | Reverb Level                           (0 - 127)
|   00 04  | 0aaa aaaa | Reverb Time                            (0 - 127)
|   00 05  | 0aaa aaaa | Reverb Delay Feedback                  (0 - 127)
+----------+
| 00 00 00 06 | Total Size
+----------+
```

* Performance Part

```
+----------+
| Offset   |
|  Address |              Description
+----------+
|   00 00  | 0aaa aaaa | Patch Bank Select MSB (CC# 0)          (0 - 127)
|   00 01  | 0aaa aaaa | Patch Bank Select LSB (CC# 32)         (0 - 127)
|   00 02  | 0aaa aaaa | Patch Program Number (PC)              (0 - 127)
|   00 03  | 0aaa aaaa | Part Level (CC# 7)                     (0 - 127)
|   00 04  | 0aaa aaaa | Part Pan (CC# 10)                      (0 - 127)
|          |           |                             RANDOM, L63 - 63R
|   00 05  | 0000 000a | Part MFX Switch                          (0 - 1)
|          |           |                                  BYPASS, ON
|   00 06  | 0aaa aaaa | Part Chorus Send Level (CC# 93)        (0 - 127)
|   00 07  | 0aaa aaaa | Part Reverb Send Level (CC# 91)        (0 - 127)
|   00 08  | 0000 aaaa | Receive Channel                        (0 - 15)
|          |           |                                     1 - 16
|   00 09  | 0000 000a | Receive Switch                          (0 - 1)
|          |           |                                   OFF, ON
|   00 0A  | 0000 000a | Receive Program Change                   (0 - 1)
|          |           |                                   OFF, ON
|   00 0B  | 0000 000a | Receive Bank Select                      (0 - 1)
|          |           |                                   OFF, ON
|   00 0C  | 0000 0aaa | Part Scale Tune Type                     (0 - 3)
|          |           |  EQUAL, JUST(MAJOR) in C, JUST(MINOR) in C, ARABIC
|   00 0D  | 0aaa aaaa | Part Scale Tune for C                  (0 - 127)
|          |           |                                  -64 - +63
|   00 0E  | 0aaa aaaa | Part Scale Tune for C#                 (0 - 127)
|          |           |                                  -64 - +63
|   00 0F  | 0aaa aaaa | Part Scale Tune for D                  (0 - 127)
|          |           |                                  -64 - +63
|   00 10  | 0aaa aaaa | Part Scale Tune for D#                 (0 - 127)
|          |           |                                  -64 - +63
|   00 11  | 0aaa aaaa | Part Scale Tune for E                  (0 - 127)
|          |           |                                  -64 - +63
|   00 12  | 0aaa aaaa | Part Scale Tune for F                  (0 - 127)
|          |           |                                  -64 - +63
|   00 13  | 0aaa aaaa | Part Scale Tune for F#                 (0 - 127)
|          |           |                                  -64 - +63
|   00 14  | 0aaa aaaa | Part Scale Tune for G                  (0 - 127)
|          |           |                                  -64 - +63
|   00 15  | 0aaa aaaa | Part Scale Tune for G#                 (0 - 127)
|          |           |                                  -64 - +63
|   00 16  | 0aaa aaaa | Part Scale Tune for A                  (0 - 127)
|          |           |                                  -64 - +63
|   00 17  | 0aaa aaaa | Part Scale Tune for A#                 (0 - 127)
|          |           |                                  -64 - +63
|   00 18  | 0aaa aaaa | Part Scale Tune for B                  (0 - 127)
|          |           |                                  -64 - +63
+----------+
| 00 00 00 19 | Total Size
+----------+
```

* Patch Common

Offset Address		Description	
00 00	0aaa aaaa	Patch Name 1	(32 — 127) 32 — 127 [ASCII]
00 01	0aaa aaaa	Patch Name 2	(32 — 127) 32 — 127 [ASCII]
00 02	0aaa aaaa	Patch Name 3	(32 — 127) 32 — 127 [ASCII]
00 03	0aaa aaaa	Patch Name 4	(32 — 127) 32 — 127 [ASCII]
00 04	0aaa aaaa	Patch Name 5	(32 — 127) 32 — 127 [ASCII]
00 05	0aaa aaaa	Patch Name 6	(32 — 127) 32 — 127 [ASCII]
00 06	0aaa aaaa	Patch Name 7	(32 — 127) 32 — 127 [ASCII]
00 07	0aaa aaaa	Patch Name 8	(32 — 127) 32 — 127 [ASCII]
00 08	0aaa aaaa	Patch Name 9	(32 — 127) 32 — 127 [ASCII]
00 09	0aaa aaaa	Patch Name 10	(32 — 127) 32 — 127 [ASCII]
00 0A	0aaa aaaa	Patch Name 11	(32 — 127) 32 — 127 [ASCII]
00 0B	0aaa aaaa	Patch Name 12	(32 — 127) 32 — 127 [ASCII]
00 0C	0aaa aaaa	Patch Category	(0 — 127)
00 0D	0000 00aa	Keyboard Mode	(0 — 2) SINGLE, SPLIT, DUAL
00 0E	0aaa aaaa	Patch Level	(0 — 127)
00 0F	0aaa aaaa	Tone Balance (CC# 8)	(0 — 127) −64(LOWER) — +63(UPPER)
00 10	0aaa aaaa	Split Point	(21 — 108) A0 — C8
00 11	0000 00aa	Split Arpeggio	(0 — 2) UPPER, LOWER, BOTH
00 12	0000 00aa	Solo Switch (MONO ON/POLY ON)	(0 — 3) OFF, ON, UPPER, LOWER
00 13	0000 00aa	Modulation Destination	(0 — 2) UPPER, LOWER, BOTH
00 14	0000 00aa	Pitch Bend Destination	(0 — 2) UPPER, LOWER, BOTH
00 15	0000 00aa	Modify Destination	(0 — 2) UPPER, LOWER, BOTH
00 16	0000 00aa	Expression Destination	(0 — 2) UPPER, LOWER, BOTH
00 17	0000 000a	Active Expression Switch	(0 — 1) OFF, ON
00 00 00 18	Total Size		

* Patch MFX

Offset Address		Description	
00 00	00aa aaaa	MFX Type	(0 — 47) 00 THROUGH, 01 STEREO EQ, 02 OVERDRIVE, 03 DISTORTION, 04 PHASER, 05 SPECTRUM, 06 ENHANCER, 07 AUTO WAH, 08 ROTARY, 09 COMPRESSOR, 10 LIMITER, 11 HEXA—CHORUS, 12 TREMOLO CHO, 13 SPACE—D, 14 St CHORUS, 15 St FLANGER, 16 STEP FLANGER, 17 St DELAY, 18 LONG DELAY, 19 MOD DELAY, 20 3 TAP DELAY, 21 4 TAP DELAY, 22 TM CTRL DLY, 23 2V PCH SHIFT, 24 FB PCH SHIFT, 25 REVERB, 26 GATED REVERB, 27 OD>CHORUS, 28 OD>FLANGER, 29 OD>DELAY, 30 DIST>CHORUS, 31 DIST>FLANGER, 32 DIST>DELAY, 33 ENH>CHORUS, 34 ENH>FLANGER, 35 ENH>DELAY, 36 CHORUS>DELAY, 37 FLG>DELAY, 38 CHO>FLANGER, 39 CHORUS/DELAY, 40 FLG/DELAY, 41 CHO/FLANGER, 42 LOFI, 43 SLICER, 44 TREMOLO, 45 AUTO PAN, 46 TUMBLING DELAY, 47 FEEDBACK RIPPER
00 01	0aaa aaaa	MFX Send Level to Chorus	(0 — 127)
00 02	0aaa aaaa	MFX Send Level to Reverb	(0 — 127)
00 03	0000 aaaa	MFX Control Assign 1	(0 — 2) OFF, 1 — 2
00 04	0000 aaaa	MFX Control Assign 2	(0 — 2) OFF, 1 — 2
# 00 05	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 1	(12768 — 52768) −20000 — +20000
# 00 09	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 2	(12768 — 52768) −20000 — +20000
# 00 0D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 3	(12768 — 52768) −20000 — +20000
# 00 11	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 4	(12768 — 52768) −20000 — +20000
# 00 15	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 5	(12768 — 52768) −20000 — +20000
# 00 19	0000 aaaa 0000 bbbb 0000 cccc		

```
|              | 0000 dddd | MFX Parameter 6                     (12768 − 52768)
|              |           |                                    −20000 − +20000
| #    00 1D   | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 7                     (12768 − 52768)
|              |           |                                    −20000 − +20000
| #    00 21   | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 8                     (12768 − 52768)
|              |           |                                    −20000 − +20000
| #    00 25   | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 9                     (12768 − 52768)
|              |           |                                    −20000 − +20000
| #    00 29   | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 10                    (12768 − 52768)
|              |           |                                    −20000 − +20000
| #    00 2D   | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 11                    (12768 − 52768)
|              |           |                                    −20000 − +20000
| #    00 31   | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 12                    (12768 − 52768)
|              |           |                                    −20000 − +20000
| #    00 35   | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 13                    (12768 − 52768)
|              |           |                                    −20000 − +20000
| #    00 39   | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 14                    (12768 − 52768)
|              |           |                                    −20000 − +20000
| #    00 3D   | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 15                    (12768 − 52768)
|              |           |                                    −20000 − +20000
| #    00 41   | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 16                    (12768 − 52768)
|              |           |                                    −20000 − +20000
| #    00 45   | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 17                    (12768 − 52768)
|              |           |                                    −20000 − +20000
| #    00 49   | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 18                    (12768 − 52768)
|              |           |                                    −20000 − +20000
| #    00 4D   | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 19                    (12768 − 52768)
|              |           |                                    −20000 − +20000
| #    00 51   | 0000 aaaa |
|              | 0000 bbbb |
|              | 0000 cccc |
|              | 0000 dddd | MFX Parameter 20                    (12768 − 52768)
|              |           |                                    −20000 − +20000
| 00 00 00 55  | Total Size
```

* Patch Chorus

```
| Offset
|   Address   |           |           Description
|    00 00    | 0000 0aaa | Chorus Type                               (0 − 7)
|             |           |          CHORUS1, CHORUS2, CHORUS3, CHORUS4,
|             |           |              FEEDBACK CHORUS, FLANGER,
|             |           |           SHORT DELAY, SHORT DELAY(FB)
|    00 01    | 0000 0aaa | Chorus Pre−LPF                            (0 − 7)
|    00 02    | 0aaa aaaa | Chorus Level                             (0 − 127)
|    00 03    | 0aaa aaaa | Chorus Feedback                          (0 − 127)
|    00 04    | 0aaa aaaa | Chorus Delay                             (0 − 127)
|    00 05    | 0aaa aaaa | Chorus Rate                              (0 − 127)
|    00 06    | 0aaa aaaa | Chorus Depth                             (0 − 127)
|    00 07    | 0aaa aaaa | Chorus Send Level to Reverb              (0 − 127)
| 00 00 00 08 | Total Size
```

* Patch Reverb

```
| Offset
|   Address   |           |           Description
|    00 00    | 0000 0aaa | Reverb Type                               (0 − 7)
|             |           |             ROOM1, ROOM2, ROOM3,
|             |           |             HALL1, HALL2, PLATE,
|             |           |             DELAY, PANNING DELAY
|    00 01    | 0000 0aaa | Reverb Character                          (0 − 7)
|    00 02    | 0000 0aaa | Reverb Pre−LPF                            (0 − 7)
|    00 03    | 0aaa aaaa | Reverb Level                             (0 − 127)
|    00 04    | 0aaa aaaa | Reverb Time                              (0 − 127)
|    00 05    | 0aaa aaaa | Reverb Delay Feedback                    (0 − 127)
| 00 00 00 06 | Total Size
```

* Patch Tone

```
+-----------------------+----------------------------------------------------------+
|  Offset               |                                                          |
|     Address           |                    Description                           |
+-----------------------+----------------------------------------------------------+
| #     00 00 | 0000 aaaa |                                                          |
|             | 0000 bbbb |                                                          |
|             | 0000 cccc | Original Tone Number              (0 — 639)              |
|             |           |                                   0 — 639               |
|       00 03 | 0aaa aaaa | Tone Pan                          (0 — 127)              |
|             |           |                                   L64 — 63R             |
|       00 04 | 0000 000a | Tone MFX Switch                   (0 — 1)                |
|             |           |                                   BYPASS, ON            |
|       00 05 | 0aaa aaaa | Tone Chorus Send Level            (0 — 127)             |
|       00 06 | 0aaa aaaa | Tone Reverb Send Level            (0 — 127)             |
|       00 07 | 0aaa aaaa | Coarse Tune (RPN# 2)              (16 — 112)            |
|             |           |                                   −48 — +48            |
|       00 08 | 0aaa aaaa | Fine Tune  (RPN# 1)               (14 — 114)            |
|             |           |                                   −50 — +50            |
|       00 09 | 0aaa aaaa | LFO Rate (CC# 76)                 (0 — 127)             |
|             |           |                                   −64 — +63            |
|       00 0A | 0aaa aaaa | LFO Depth (CC# 77)                (0 — 127)             |
|             |           |                                   −64 — +63            |
|       00 0B | 0aaa aaaa | LFO Delay (CC# 78)                (0 — 127)             |
|             |           |                                   −64 — +63            |
|       00 0C | 0000 000a | LFO Filter Switch                 (0 — 1)               |
|             |           |                                   OFF, ON              |
|       00 0D | 0aaa aaaa | Cutoff Frequency (CC# 74)         (0 — 127)             |
|             |           |                                   −64 — +63            |
|       00 0E | 0aaa aaaa | Resonance (CC# 71)                (0 — 127)             |
|             |           |                                   −64 — +63            |
|       00 0F | 0aaa aaaa | Attack Time (CC# 73)              (0 — 127)             |
|             |           |                                   −64 — +63            |
|       00 10 | 0aaa aaaa | Decay Time (CC# 75)               (0 — 127)             |
|             |           |                                   −64 — +63            |
|       00 11 | 0aaa aaaa | Release Time (CC# 72)             (0 — 127)             |
|             |           |                                   −64 — +63            |
|       00 12 | 0000 000a | Portamento Switch (CC# 65)        (0 — 1)               |
|             |           |                                   OFF, ON              |
|       00 13 | 0aaa aaaa | Portamento Time (CC# 5)           (0 — 127)             |
|       00 14 | 0aaa aaaa | Velocity Sens Depth               (0 — 127)             |
|             |           |                                   −64 — +63            |
|       00 15 | 0aaa aaaa | Velocity Sens Offset              (0 — 127)             |
|             |           |                                   −64 — +63            |
|       00 16 | 000a aaaa | Pitch Bend Range (RPN# 0)         (0 — 24)              |
+-----------------------+----------------------------------------------------------+
| 00 00 00 17 | Total Size                                                         |
+-----------------------+----------------------------------------------------------+
```

* Rhythm Common

```
+-----------------------+----------------------------------------------------------+
|  Offset               |                                                          |
|     Address           |                    Description                           |
+-----------------------+----------------------------------------------------------+
|       00 00 | 0aaa aaaa | Rhythm Name 1                     (32 — 127)            |
|             |           |                                   32 — 127 [ASCII]     |
|       00 01 | 0aaa aaaa | Rhythm Name 2                     (32 — 127)            |
|             |           |                                   32 — 127 [ASCII]     |
|       00 02 | 0aaa aaaa | Rhythm Name 3                     (32 — 127)            |
|             |           |                                   32 — 127 [ASCII]     |
|       00 03 | 0aaa aaaa | Rhythm Name 4                     (32 — 127)            |
|             |           |                                   32 — 127 [ASCII]     |
|       00 04 | 0aaa aaaa | Rhythm Name 5                     (32 — 127)            |
|             |           |                                   32 — 127 [ASCII]     |
|       00 05 | 0aaa aaaa | Rhythm Name 6                     (32 — 127)            |
|             |           |                                   32 — 127 [ASCII]     |
|       00 06 | 0aaa aaaa | Rhythm Name 7                     (32 — 127)            |
|             |           |                                   32 — 127 [ASCII]     |
|       00 07 | 0aaa aaaa | Rhythm Name 8                     (32 — 127)            |
|             |           |                                   32 — 127 [ASCII]     |
|       00 08 | 0aaa aaaa | Rhythm Name 9                     (32 — 127)            |
|             |           |                                   32 — 127 [ASCII]     |
|       00 09 | 0aaa aaaa | Rhythm Name 10                    (32 — 127)            |
|             |           |                                   32 — 127 [ASCII]     |
|       00 0A | 0aaa aaaa | Rhythm Name 11                    (32 — 127)            |
|             |           |                                   32 — 127 [ASCII]     |
|       00 0B | 0aaa aaaa | Rhythm Name 12                    (32 — 127)            |
|             |           |                                   32 — 127 [ASCII]     |
+-----------------------+----------------------------------------------------------+
|       00 0C | 000a aaaa | Original Rhythm Number            (0 — 19)              |
+-----------------------+----------------------------------------------------------+
| 00 00 00 0D | Total Size                                                         |
+-----------------------+----------------------------------------------------------+
```

* Rhythm MFX

```
+-----------------------+----------------------------------------------------------+
|  Offset               |                                                          |
|     Address           |                    Description                           |
+-----------------------+----------------------------------------------------------+
|       00 00 | 00aa aaaa | MFX Type                          (0 — 47)              |
|             |           |       00 THROUGH, 01 STEREO EQ, 02 OVERDRIVE,           |
|             |           |        03 DISTORTION, 04 PHASER, 05 SPECTRUM,           |
|             |           |         06 ENHANCER, 07 AUTO WAH, 08 ROTARY,            |
|             |           |      09 COMPRESSOR, 10 LIMITER, 11 HEXA−CHORUS,         |
|             |           |        12 TREMOLO CHO, 13 SPACE−D, 14 St CHORUS,        |
|             |           |      15 St FLANGER, 16 STEP FLANGER, 17 St DELAY,       |
|             |           |     18 LONG DELAY, 19 MOD DELAY, 20 3 TAP DELAY,        |
|             |           |   21 4 TAP DELAY, 22 TM CTRL DLY, 23 2V PCH SHIFT,      |
|             |           |      24 FB PCH SHIFT, 25 REVERB, 26 GATED REVERB,       |
|             |           |        27 OD>CHORUS, 28 OD>FLANGER, 29 OD>DELAY,        |
|             |           |     30 DIST>CHORUS, 31 DIST>FLANGER, 32 DIST>DELAY,     |
|             |           |       33 ENH>CHORUS, 34 ENH>FLANGER, 35 ENH>DELAY,      |
|             |           |      36 CHORUS>DELAY, 37 FLG>DELAY, 38 CHO>FLANGER,     |
|             |           |     39 CHORUS/DELAY, 40 FLG/DELAY, 41 CHO/FLANGER,      |
|             |           |          42 LOFI, 43 SLICER, 44 TREMOLO,               |
|             |           |       45 AUTO PAN, 46 TUMBLING DELAY,                  |
|             |           |              47 FEEDBACK RIPPER                        |
|       00 01 | 0aaa aaaa | MFX Chorus Send Level             (0 — 127)             |
|       00 02 | 0aaa aaaa | MFX Reverb Send Level             (0 — 127)             |
+-----------------------+----------------------------------------------------------+
|       00 03 | 0000 aaaa | MFX Control Assign 1              (0 — 2)               |
|             |           |                                   OFF, 1 — 2           |
|       00 04 | 0000 aaaa | MFX Control Assign 2              (0 — 2)               |
|             |           |                                   OFF, 1 — 2           |
+-----------------------+----------------------------------------------------------+
```

```
# |    00 05 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 1                 (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 09 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 2                 (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 0D | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 3                 (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 11 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 4                 (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 15 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 5                 (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 19 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 6                 (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 1D | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 7                 (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 21 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 8                 (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 25 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 9                 (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 29 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 10                (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 2D | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 11                (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 31 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 12                (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 35 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 13                (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 39 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 14                (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 3D | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 15                (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 41 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 16                (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 45 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 17                (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 49 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 18                (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 4D | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 19                (12768 — 52768)
  |          |           |                                −20000 — +20000
# |    00 51 | 0000 aaaa |
  |          | 0000 bbbb |
  |          | 0000 cccc |
  |          | 0000 dddd | MFX Parameter 20                (12768 — 52768)
  |          |           |                                −20000 — +20000
+----------+-----------+
 00 00 00 55 | Total Size
+----------+-----------+
```

* Rhythm Chorus

```
+----------------------------------------------------------------------------+
| Offset      |                                                              |
|    Address  |                    Description                               |
+----------------------------------------------------------------------------+
|     00 00   | 0000 0aaa | Chorus Type                          (0 - 7)     |
|             |           |             CHORUS1, CHORUS2, CHORUS3, CHORUS4,   |
|             |           |                       FEEDBACK CHORUS, FLANGER,  |
|             |           |              SHORT DELAY, SHORT DELAY(FB)         |
|     00 01   | 0000 0aaa | Chorus Pre-LPF                       (0 - 7)      |
|     00 02   | 0aaa aaaa | Chorus Level                         (0 - 127)    |
|     00 03   | 0aaa aaaa | Chorus Feedback                      (0 - 127)    |
|     00 04   | 0aaa aaaa | Chorus Delay                         (0 - 127)    |
|     00 05   | 0aaa aaaa | Chorus Rate                          (0 - 127)    |
|     00 06   | 0aaa aaaa | Chorus Depth                         (0 - 127)    |
|     00 07   | 0aaa aaaa | Chorus Send Level to Reverb          (0 - 127)    |
+----------------------------------------------------------------------------+
| 00 00 00 08 | Total Size                                                   |
+----------------------------------------------------------------------------+
```

* Rhythm Reverb

```
+----------------------------------------------------------------------------+
| Offset      |                                                              |
|    Address  |                    Description                               |
+----------------------------------------------------------------------------+
|     00 00   | 0000 0aaa | Reverb Type                          (0 - 7)     |
|             |           |                     ROOM1, ROOM2, ROOM3,          |
|             |           |                     HALL1, HALL2, PLATE,          |
|             |           |                     DELAY, PANNING DELAY         |
|     00 01   | 0000 0aaa | Reverb Character                     (0 - 7)      |
|     00 02   | 0000 0aaa | Reverb Pre-LPF                       (0 - 7)      |
|     00 03   | 0aaa aaaa | Reverb Level                         (0 - 127)    |
|     00 04   | 0aaa aaaa | Reverb Time                          (0 - 127)    |
|     00 05   | 0aaa aaaa | Reverb Delay Feedback                (0 - 127)    |
+----------------------------------------------------------------------------+
| 00 00 00 06 | Total Size                                                   |
+----------------------------------------------------------------------------+
```

* Rhythm Tone

```
+----------------------------------------------------------------------------+
| Offset      |                                                              |
|    Address  |                    Description                               |
+----------------------------------------------------------------------------+
|     00 00   | 0aaa aaaa | Rhythm Tone Pitch                    (0 - 127)    |
|             |           |                                      -60 - +67    |
|     00 01   | 0aaa aaaa | Rhythm Tone Level                    (0 - 127)    |
|     00 02   | 0aaa aaaa | Rhythm Tone Pan                      (0 - 127)    |
|             |           |                             RANDOM, L63 - 63R     |
|     00 03   | 0aaa aaaa | Reverb Send Level                    (0 - 127)    |
|     00 04   | 0aaa aaaa | Chorus Send Level                    (0 - 127)    |
+----------------------------------------------------------------------------+
| 00 00 00 05 | Total Size                                                   |
+----------------------------------------------------------------------------+
```

* Arpeggio Setup

```
+----------------------------------------------------------------------------+
| Offset      |                                                              |
|    Address  |                    Description                               |
+----------------------------------------------------------------------------+
|     00 00   | 0000 000a | Arpeggio Hold                        (0 - 1)      |
|             |           |                                      OFF, ON      |
|     00 01   | 0000 000a | Arpeggio Style Group                 (0 - 1)      |
|             |           |                                      USER, PRESET |
|     00 02   | 0aaa aaaa | Arpeggio Style Number                (0 - 127)    |
|             |           |                                      1 - 128      |
|     00 03   | 0aaa aaaa | Arpeggio Variation                   (0 - 127)    |
|             |           |                                      1 - 128      |
|     00 04   | 00aa aaaa | Arpeggio Motif                       (0 - 9)      |
|             |           |              UP, DOWN, UP&DOWN, RANDOM,           |
|             |           |        NOTE-ORDER, GLISSANDO, CHORD,              |
|             |           |                    AUTO1, AUTO2, PHRASE           |
|     00 05   | 0aaa aaaa | Arpeggio Accent Rate                 (0 - 100)    |
|     00 06   | 0aaa aaaa | Arpeggio Shuffle Rate                (0 - 100)    |
|     00 07   | 0000 000a | Arpeggio Shuffle Resolution          (0 - 1)      |
|             |           |                                      16TH, 8TH    |
|     00 08   | 0aaa aaaa | Arpeggio Keyboard Velocity           (0 - 127)    |
|             |           |                                      REAL, 1 - 127|
|     00 09   | 0000 0aaa | Arpeggio Octave Range                (61 - 67)    |
|             |           |                                      -3 - +3      |
|     00 0A   | 0000 000a | Arpeggio Key Trigger                 (0 - 1)      |
|             |           |                                      OFF, ON      |
+----------------------------------------------------------------------------+
| 00 00 00 0B | Total Size                                                   |
+----------------------------------------------------------------------------+
```

* Chord Pattern

```
+----------------------------------------------------------------------------+
| Offset      |                                                              |
|    Address  |                    Description                               |
+----------------------------------------------------------------------------+
|     00 00   | 0aaa aaaa | Chord Pattern Assign 1               (20 - 108)   |
|             |           |                                      OFF, A0 - C8 |
|     00 01   | 0aaa aaaa | Chord Pattern Assign 2               (20 - 108)   |
|             |           |                                      OFF, A0 - C8 |
|     00 02   | 0aaa aaaa | Chord Pattern Assign 3               (20 - 108)   |
|             |           |                                      OFF, A0 - C8 |
|     00 03   | 0aaa aaaa | Chord Pattern Assign 4               (20 - 108)   |
|             |           |                                      OFF, A0 - C8 |
|     00 04   | 0aaa aaaa | Chord Pattern Assign 5               (20 - 108)   |
|             |           |                                      OFF, A0 - C8 |
|     00 05   | 0aaa aaaa | Chord Pattern Assign 6               (20 - 108)   |
|             |           |                                      OFF, A0 - C8 |
|     00 06   | 0aaa aaaa | Chord Pattern Assign 7               (20 - 108)   |
|             |           |                                      OFF, A0 - C8 |
|     00 07   | 0aaa aaaa | Chord Pattern Assign 8               (20 - 108)   |
|             |           |                                      OFF, A0 - C8 |
+----------------------------------------------------------------------------+
| 00 00 00 08 | Total Size                                                   |
+----------------------------------------------------------------------------+
```

Type 1: STEREO EQ

MFX Parameter		Value	Display
1	Low Freq	0 - 1	200, 400 [Hz]
2	Low Gain	0 - 30	-15 - +15 [dB]
3	High Freq	0 - 2	2000, 4000, 8000 [Hz]
4	High Gain	0 - 30	-15 - +15 [dB]
5	P1 Freq	0 - 16	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000 [Hz]
6	P1 Q	0 - 4	0.5, 1.0, 2.0, 4.0, 8.0
7	P1 Gain	0 - 30	-15 - +15 [dB]
8	P2 Freq	0 - 16	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000 [Hz]
9	P2 Q	0 - 4	0.5, 1.0, 2.0, 4.0, 8.0
10	P2 Gain	0 - 30	-15 - +15 [dB]
11	Level	0 - 127	0 - 127

Type 2: OVERDRIVE

MFX Parameter		Value	Display
1	Drive	0 - 127	0 - 127
2	Pan	0 - 127	L64 - 63R
3	Amp Type	0 - 3	SMALL, BUILT-IN, 2-STACK, 3-STACK
4	Low Gain	0 - 30	-15 - +15 [dB]
5	High Gain	0 - 30	-15 - +15 [dB]
6	Level	0 - 127	0 - 127

Type 3: DISTORTION

MFX Parameter		Value	Display
1	Drive	0 - 127	0 - 127
2	Pan	0 - 127	L64 - 63R
3	Amp Type	0 - 3	SMALL, BUILT-IN, 2-STACK, 3-STACK
4	Low Gain	0 - 30	-15 - +15 [dB]
5	High Gain	0 - 30	-15 - +15 [dB]
6	Level	0 - 127	0 - 127

Type 4: PHASER

MFX Parameter		Value	Display
1	Manual	0 - 125	100 - 8000 [Hz]
2	Rate	1 - 200	0.05 - 10.00 [Hz]
3	Depth	0 - 127	0 - 127
4	Resonance	0 - 127	0 - 127
5	Mix	0 - 127	0 - 127
6	Pan	0 - 127	L64 - 63R
7	Level	0 - 127	0 - 127

Type 5: SPECTRUM

MFX Parameter		Value	Display
1	Band1	0 - 30	-15 - +15 [dB]
2	Band2	0 - 30	-15 - +15 [dB]
3	Band3	0 - 30	-15 - +15 [dB]
4	Band4	0 - 30	-15 - +15 [dB]
5	Band5	0 - 30	-15 - +15 [dB]
6	Band6	0 - 30	-15 - +15 [dB]
7	Band7	0 - 30	-15 - +15 [dB]
8	Band8	0 - 30	-15 - +15 [dB]
9	Q	0 - 4	0.5, 1.0, 2.0, 4.0, 8.0
10	Pan	0 - 127	L64 - 63R
11	Level	0 - 127	0 - 127

Type 6: ENHANCER

MFX Parameter		Value	Display
1	Sens	0 - 127	0 - 127
2	Mix	0 - 127	0 - 127
3	Low Gain	0 - 30	-15 - +15 [dB]
4	High Gain	0 - 30	-15 - +15 [dB]
5	Level	0 - 127	0 - 127

Type 7: AUTO WAH

MFX Parameter		Value	Display
1	Filter Type	0 - 1	LPF, BPF
2	Rate	1 - 200	0.05 - 10.00 [Hz]
3	Depth	0 - 127	0 - 127
4	Sens	0 - 127	0 - 127
5	Manual	0 - 127	0 - 127
6	Peak	0 - 127	0 - 127
7	Level	0 - 127	0 - 127

Type 8: ROTARY

MFX Parameter		Value	Display
1	High Slow Rate	1 - 200	0.05 - 10.00 [Hz]
2	Low Slow Rate	1 - 200	0.05 - 10.00 [Hz]
3	High Fast Rate	1 - 200	0.05 - 10.00 [Hz]
4	Low Fast Rate	1 - 200	0.05 - 10.00 [Hz]
5	Speed	0 - 1	SLOW, FAST
6	High Acceleration	0 - 15	0 - 15
7	Low Acceleration	0 - 15	0 - 15
8	High Level	0 - 127	0 - 127
9	Low Level	0 - 127	0 - 127
10	Separation	0 - 127	0 - 127
11	Level	0 - 127	0 - 127

Type 9: COMPRESSOR

MFX Parameter		Value	Display
1	Sustain	0 - 127	0 - 127
2	Attack	0 - 127	0 - 127
3	Pan	0 - 127	L64 - 63R
4	Post Gain	0 - 3	0, +6, +12, +18 [dB]
5	Low Gain	0 - 30	-15 - +15 [dB]
6	High Gain	0 - 30	-15 - +15 [dB]
7	Level	0 - 127	0 - 127

Type 10: LIMITER

MFX Parameter		Value	Display
1	Threshold	0 - 127	0 - 127
2	Release	0 - 127	0 - 127
3	Ratio	0 - 3	1.5:1, 2:1, 4:1, 100:1
4	Pan	0 - 127	L64 - 63R
5	Post Gain	0 - 3	0, +6, +12, +18 [dB]
6	Low Gain	0 - 30	-15 - +15 [dB]
7	High Gain	0 - 30	-15 - +15 [dB]
8	Level	0 - 127	0 - 127

Type 11: HEXA-CHORUS

MFX Parameter		Value	Display
1	Pre Delay	0 - 125	0.0 - 100 [ms]
2	Rate	1 - 200	0.05 - 10.00 [Hz]
3	Depth	0 - 127	0 - 127
4	Pre Delay Deviation	0 - 20	0 - 20
5	Depth Deviation	0 - 40	-20 - +20
6	Pan Deviation	0 - 20	0 - 20
7	Balance	0 - 100	D100:0W - D0:100W
8	Level	0 - 127	0 - 127

Type 12: TREMOLO CHORUS

MFX Parameter		Value	Display
1	Pre Delay	0 - 125	0.0 - 100 [ms]
2	Chorus Rate	1 - 200	0.05 - 10.00 [Hz]
3	Chorus Depth	0 - 127	0 - 127
4	Tremolo Rate	1 - 200	0.05 - 10.00 [Hz]
5	Tremolo Separation	0 - 127	
6	Tremolo Phase	0 - 90	0 - 180 [deg]
7	Balance	0 - 100	D100:0W - D0:100W
8	Level	0 - 127	0 - 127

Type 13: SPACE-D

MFX Parameter		Value	Display
1	Pre Delay	0 - 125	0.0 - 100 [ms]
2	Rate	1 - 200	0.05 - 10.00 [Hz]
3	Depth	0 - 127	0 - 127
4	Phase	0 - 90	0 - 180 [deg]
5	Low Gain	0 - 30	-15 - +15 [dB]
6	High Gain	0 - 30	-15 - +15 [dB]
7	Balance	0 - 100	D100:0W - D0:100W
8	Level	0 - 127	0 - 127

Type 14: STEREO CHORUS

MFX	Parameter	Value	Display
1	Filter Type	0 - 2	OFF, LPF, HPF
2	Cutoff Freq	0 - 16	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000 [Hz]
3	Pre Delay	0 - 125	0.0 - 100 [ms]
4	Rate	1 - 200	0.05 - 10.00 [Hz]
5	Depth	0 - 127	0 - 127
6	Phase	0 - 90	0 - 180 [deg]
7	Low Gain	0 - 30	-15 - +15 [dB]
8	High Gain	0 - 30	-15 - +15 [dB]
9	Balance	0 - 100	D100:0W - D0:100W
10	Level	0 - 127	0 - 127

Type 15: STEREO FLANGER

MFX	Parameter	Value	Display
1	Filter Type	0 - 2	OFF, LPF, HPF
2	Cutoff Freq	0 - 16	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000 [Hz]
3	Pre Delay	0 - 125	0.0 - 100 [ms]
4	Rate	1 - 200	0.05 - 10.00 [Hz]
5	Depth	0 - 127	0 - 127
6	Phase	0 - 90	0 - 180 [deg]
7	Feedback	0 - 98	-98 - +98 [%]
8	Low Gain	0 - 30	-15 - +15 [dB]
9	High Gain	0 - 30	-15 - +15 [dB]
10	Balance	0 - 100	D100:0W - D0:100W
11	Level	0 - 127	0 - 127

Type 16: STEP FLANGER

MFX	Parameter	Value	Display
1	Pre Delay	0 - 125	0.0 - 100 [ms]
2	Rate	1 - 200	0.05 - 10.00 [Hz]
3	Depth	0 - 127	0 - 127
4	Feedback	0 - 98	-98 - +98 [%]
5	Step Rate	1 - 222	0.1 - 20.00 [Hz] MUSICAL-NOTES
6	Phase	0 - 90	0 - 180 [deg]
7	Balance	0 - 100	D100:0W - D0:100W
8	Reset	0 - 1	OFF, ON
9	Level	0 - 127	0 - 127

Type 17: STEREO DELAY

MFX	Parameter	Value	Display
1	Feedback mode	0 - 1	NORMAL, CROSS
2	Delay Left	0 - 430	0 - 420 [ms] MUSICAL-NOTES
3	Delay Right	0 - 430	0 - 420 [ms] MUSICAL-NOTES
4	Phase Left	0 - 1	NORMAL, INVERT
5	Phase Right	0 - 1	NORMAL, INVERT
6	Feedback	0 - 98	-98 - +98 [%]
7	HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
8	Low Gain	0 - 30	-15 - +15 [dB]
9	High Gain	0 - 30	-15 - +15 [dB]
10	Balance	0 - 100	D100:0W - D0:100W
11	Level	0 - 127	0 - 127

Type 18: LONG DELAY

MFX	Parameter	Value	Display
1	Delay	0 - 850	0 - 840 [ms] MUSICAL-NOTES
2	Feedback	0 - 98	-98 - +98 [%]
3	HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
4	Low Gain	0 - 30	-15 - +15 [dB]
5	High Gain	0 - 30	-15 - +15 [dB]
6	Balance	0 - 100	D100:0W - D0:100W
7	Level	0 - 127	0 - 127

Type 19: MODULATION DELAY

MFX	Parameter	Value	Display
1	Feedback mode	0 - 1	NORMAL, CROSS
2	Delay Left	0 - 370	0 - 370 [ms]
3	Delay Right	0 - 370	0 - 370 [ms]
4	Feedback	0 - 98	-98 - +98 [%]
5	HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
6	Rate	1 - 200	0.05 - 10.00 [Hz]
7	Depth	0 - 127	0 - 127
8	Phase	0 - 90	0 - 180 [deg]
9	Low Gain	0 - 30	-15 - +15 [dB]
10	High Gain	0 - 30	-15 - +15 [dB]
11	Balance	0 - 100	D100:0W - D0:100W
12	Level	0 - 127	0 - 127

Type 20: TRIPLE TAP DELAY

MFX	Parameter	Value	Display
1	Delay Left	0 - 850	0 - 840 [ms] MUSICAL-NOTES
2	Delay Right	0 - 850	0 - 840 [ms] MUSICAL-NOTES
3	Delay Center	0 - 850	0 - 840 [ms] MUSICAL-NOTES
4	Feedback	0 - 98	-98 - +98 [%]
5	HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
6	Left Level	0 - 127	0 - 127
7	Right Level	0 - 127	0 - 127
8	Center Level	0 - 127	0 - 127
9	Low Gain	0 - 30	-15 - +15 [dB]
10	High Gain	0 - 30	-15 - +15 [dB]
11	Balance	0 - 100	D100:0W - D0:100W
12	Level	0 - 127	0 - 127

Type 21: QUADRUPLE TAP DELAY

MFX	Parameter	Value	Display
1	Delay 1	0 - 850	0 - 840 [ms] MUSICAL-NOTES
2	Delay 2	0 - 850	0 - 840 [ms] MUSICAL-NOTES
3	Delay 3	0 - 850	0 - 840 [ms] MUSICAL-NOTES
4	Delay 4	0 - 850	0 - 840 [ms] MUSICAL-NOTES
5	Level 1	0 - 127	0 - 127
6	Level 2	0 - 127	0 - 127
7	Level 3	0 - 127	0 - 127
8	Level 4	0 - 127	0 - 127
9	Feedback	0 - 98	-98 - +98 [%]
10	HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
11	Balance	0 - 100	D100:0W - D0:100W
12	Level	0 - 127	0 - 127

Type 22: TIME CONTROL DELAY

MFX	Parameter	Value	Display
1	Delay	0 - 840	0 - 840 [ms]
2	Feedback	0 - 98	-98 - +98 [%]
3	Acceleration	0 - 15	0 - 15
4	HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
5	Pan	0 - 127	L64 - 63R
6	Low Gain	0 - 30	-15 - +15 [dB]
7	High Gain	0 - 30	-15 - +15 [dB]
8	Balance	0 - 100	D100:0W - D0:100W
9	Level	0 - 127	0 - 127

Type 23: 2VOICE PITCH SHIFTER

MFX	Parameter	Value	Display
1	Mode	0 - 4	1, 2, 3, 4, 5
2	Coarse A	0 - 36	-24 - +12 [semi]
3	Coarse B	0 - 36	-24 - +12 [semi]
4	Fine A	0 - 100	-100 - +100 [cent]
5	Fine B	0 - 100	-100 - +100 [cent]
6	Pre Delay A	0 - 500	0.0 - 500 [ms]
7	Pre Delay B	0 - 500	0.0 - 500 [ms]
8	Pan A	0 - 127	L64 - 63R
9	Pan B	0 - 127	L64 - 63R
10	Level Balance	0 - 100	A100:0B - A0:100B
11	Balance	0 - 100	D100:0W - D0:100W
12	Level	0 - 127	0 - 127

Type 24: FBK PITCH SHIFTER

MFX Parameter		Value	Display
1	Mode	0 - 4	1, 2, 3, 4, 5
2	Coarse	0 - 36	-24 - +12 [semi]
3	Fine	0 - 100	-100 - +100 [cent]
4	Pre Delay	0 - 500	0.0 - 500 [ms]
5	Feedback	0 - 98	-98 - +98 [%]
6	Pan	0 - 127	L64 - 63R
7	Low Gain	0 - 30	-15 - +15 [dB]
8	High Gain	0 - 30	-15 - +15 [dB]
9	Balance	0 - 100	D100:0W - D0:100W
10	Level	0 - 127	0 - 127

Type 25: REVERB

MFX Parameter		Value	Display
1	Type	0 - 5	ROOM1, ROOM2, STAGE1, STAGE2, HALL1, HALL2
2	Pre Delay	0 - 125	0.0 - 100 [ms]
3	Time	0 - 127	0 - 127
4	HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
5	Low Gain	0 - 30	-15 - +15 [dB]
6	High Gain	0 - 30	-15 - +15 [dB]
7	Balance	0 - 100	D100:0W - D0:100W
8	Level	0 - 127	0 - 127

Type 26: GATED REVERB

MFX Parameter		Value	Display
1	Type	0 - 3	NORMAL, REVERSE, SWEEP1, SWEEP2
2	Pre Delay	0 - 125	0.0 - 100 [ms]
3	Time	0 - 99	5 - 500 [ms]
4	Low Gain	0 - 30	-15 - +15 [dB]
5	High Gain	0 - 30	-15 - +15 [dB]
6	Balance	0 - 100	D100:0W - D0:100W
7	Level	0 - 127	0 - 127

Type 27: OVERDRIVE->CHORUS

MFX Parameter		Value	Display
1	OD Drive	0 - 127	0 - 127
2	OD Pan	0 - 127	L64 - 63R
3	Chorus Pre Delay	0 - 125	0.0 - 100 [ms]
4	Chorus Rate	1 - 200	0.05 - 10.00 [Hz]
5	Chorus Depth	0 - 127	0 - 127
6	Chorus Balance	0 - 100	D100:0W - D0:100W
7	Level	0 - 127	0 - 127

Type 28: OVERDRIVE->FLANGER

MFX Parameter		Value	Display
1	OD Drive	0 - 127	0 - 127
2	OD Pan	0 - 127	L64 - 63R
3	FLNG Pre Delay	0 - 125	0.0 - 100 [ms]
4	FLNG Rate	1 - 200	0.05 - 10.00 [Hz]
5	FLNG Depth	0 - 127	0 - 127
6	FLNG Feedback	0 - 98	-98 - +98 [%]
7	FLNG Balance	0 - 100	D100:0W - D0:100W
8	Level	0 - 127	0 - 127

Type 29: OVERDRIVE->DELAY

MFX Parameter		Value	Display
1	OD Drive	0 - 127	0 - 127
2	OD Pan	0 - 127	L64 - 63R
3	Delay Time	0 - 500	0 - 500 [ms]
4	Delay Feedback	0 - 98	-98 - +98 [%]
5	Delay HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
6	Delay Balance	0 - 100	D100:0W - D0:100W
7	Level	0 - 127	0 - 127

Type 30: DISTORTION->CHORUS

MFX Parameter		Value	Display
1	DIST Drive	0 - 127	0 - 127
2	DIST Pan	0 - 127	L64 - 63R
3	Chorus Pre Delay	0 - 125	0.0 - 100 [ms]
4	Chorus Rate	1 - 200	0.05 - 10.00 [Hz]
5	Chorus Depth	0 - 127	0 - 127
6	Chorus Balance	0 - 100	D100:0W - D0:100W
7	Level	0 - 127	0 - 127

Type 31: DISTORTION->FLANGER

MFX Parameter		Value	Display
1	DIST Drive	0 - 127	0 - 127
2	DIST Pan	0 - 127	L64 - 63R
3	FLNG Pre Delay	0 - 125	0.0 - 100 [ms]
4	FLNG Rate	1 - 200	0.05 - 10.00 [Hz]
5	FLNG Depth	0 - 127	0 - 127
6	FLNG Feedback	0 - 98	-98 - +98 [%]
7	FLNG Balance	0 - 100	D100:0W - D0:100W
8	Level	0 - 127	0 - 127

Type 32: DISTORTION->DELAY

MFX Parameter		Value	Display
1	DIST Drive	0 - 127	0 - 127
2	DIST Pan	0 - 127	L64 - 63R
3	Delay Time	0 - 500	0 - 500 [ms]
4	Delay Feedback	0 - 98	-98 - +98 [%]
5	Delay HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
6	Delay Balance	0 - 100	D100:0W - D0:100W
7	Level	0 - 127	0 - 127

Type 33: ENHANCER->CHORUS

MFX Parameter		Value	Display
1	Enhancer Sens	0 - 127	0 - 127
2	Enhancer Mix	0 - 127	0 - 127
3	Chorus Pre Delay	0 - 125	0.0 - 100 [ms]
4	Chorus Rate	1 - 200	0.05 - 10.00 [Hz]
5	Chorus Depth	0 - 127	0 - 127
6	Chorus Balance	0 - 100	D100:0W - D0:100W
7	Level	0 - 127	0 - 127

Type 34: ENHANCER->FLANGER

MFX Parameter		Value	Display
1	Enhancer Sens	0 - 127	0 - 127
2	Enhancer Mix	0 - 127	0 - 127
3	FLNG Pre Delay	0 - 125	0.0 - 100 [ms]
4	FLNG Rate	1 - 200	0.05 - 10.00 [Hz]
5	FLNG Depth	0 - 127	0 - 127
6	FLNG Feedback	0 - 98	-98 - +98 [%]
7	FLNG Balance	0 - 100	D100:0W - D0:100W
8	Level	0 - 127	0 - 127

Type 35: ENHANCER->DELAY

MFX Parameter		Value	Display
1	Enhancer Sens	0 - 127	0 - 127
2	Enhancer Mix	0 - 127	0 - 127
3	Delay Time	0 - 500	0 - 500 [ms]
4	Delay Feedback	0 - 98	-98 - +98 [%]
5	Delay HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
6	Delay Balance	0 - 100	D100:0W - D0:100W
7	Level	0 - 127	0 - 127

Type 36: CHORUS->DELAY

	MFX Parameter	Value	Display
1	Chorus Pre Delay	0 - 125	0.0 - 100 [ms]
2	Chorus Rate	1 - 200	0.05 - 10.00 [Hz]
3	Chorus Depth	0 - 127	0 - 127
4	Chorus Balance	0 - 100	D100:0W - D0:100W
5	Delay Time	0 - 500	0 - 500 [ms]
6	Delay Feedback	0 - 98	-98 - +98 [%]
7	Delay HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
8	Delay Balance	0 - 100	D100:0W - D0:100W
9	Level	0 - 127	0 - 127

Type 37: FLANGER->DELAY

	MFX Parameter	Value	Display
1	FLNG Pre Delay	0 - 125	0.0 - 100 [ms]
2	FLNG Rate	1 - 200	0.05 - 10.00 [Hz]
3	FLNG Depth	0 - 127	0 - 127
4	FLNG Feedback	0 - 98	-98 - +98 [%]
5	FLNG Balance	0 - 100	D100:0W - D0:100W
6	Delay Time	0 - 500	0 - 500 [ms]
7	Delay Feedback	0 - 98	-98 - +98 [%]
8	Delay HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
9	Delay Balance	0 - 100	D100:0W - D0:100W
10	Level	0 - 127	0 - 127

Type 38: CHORUS->FLANGER

	MFX Parameter	Value	Display
1	Chorus Pre Delay	0 - 125	0.0 - 100 [ms]
2	Chorus Rate	1 - 200	0.05 - 10.00 [Hz]
3	Chorus Depth	0 - 127	0 - 127
4	Chorus Balance	0 - 100	D100:0W - D0:100W
5	FLNG Pre Delay	0 - 125	0.0 - 100 [ms]
6	FLNG Rate	1 - 200	0.05 - 10.00 [Hz]
7	FLNG Depth	0 - 127	0 - 127
8	FLNG Feedback	0 - 98	-98 - +98 [%]
9	FLNG Balance	0 - 100	D100:0W - D0:100W
10	Level	0 - 127	0 - 127

Type 39: CHORUS/DELAY

	MFX Parameter	Value	Display
1	Chorus Pre Delay	0 - 125	0.0 - 100 [ms]
2	Chorus Rate	1 - 200	0.05 - 10.00 [Hz]
3	Chorus Depth	0 - 127	0 - 127
4	Chorus Balance	0 - 100	D100:0W - D0:100W
5	Delay Time	0 - 500	0 - 500 [ms]
6	Delay Feedback	0 - 98	-98 - +98 [%]
7	Delay HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
8	Delay Balance	0 - 100	D100:0W - D0:100W
9	Level	0 - 127	0 - 127

Type 40: FLANGER/DELAY

	MFX Parameter	Value	Display
1	FLNG Pre Delay	0 - 125	0.0 - 100 [ms]
2	FLNG Rate	1 - 200	0.05 - 10.00 [Hz]
3	FLNG Depth	0 - 127	0 - 127
4	FLNG Feedback	0 - 98	-98 - +98 [%]
5	FLNG Balance	0 - 100	D100:0W - D0:100W
6	Delay Time	0 - 500	0 - 500 [ms]
7	Delay Feedback	0 - 98	-98 - +98 [%]
8	Delay HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
9	Delay Balance	0 - 100	D100:0W - D0:100W
10	Level	0 - 127	0 - 127

Type 41: CHORUS/FLANGER

	MFX Parameter	Value	Display
1	Chorus Pre Delay	0 - 125	0.0 - 100 [ms]
2	Chorus Rate	1 - 200	0.05 - 10.00 [Hz]
3	Chorus Depth	0 - 127	0 - 127
4	Chorus Balance	0 - 100	D100:0W - D0:100W
5	FLNG Pre Delay	0 - 125	0.0 - 100 [ms]
6	FLNG Rate	1 - 200	0.05 - 10.00 [Hz]
7	FLNG Depth	0 - 127	0 - 127
8	FLNG Feedback	0 - 98	-98 - +98 [%]
9	FLNG Balance	0 - 100	D100:0W - D0:100W
10	Level	0 - 127	0 - 127

Type 42: LOFI

	MFX Parameter	Value	Display
1	BitDown	0 - 11	0 - 11
2	SRateDown	0 - 7	0 - 7
3	Post Gain	0 - 3	0, +6, +12, +18 [dB]
4	Low Gain	0 - 30	-15 - +15 [dB]
5	High Gain	0 - 30	-15 - +15 [dB]
6	Output	0 - 1	MONO, STEREO
7	Level	0 - 127	0 - 127

Type 43: SLICER

	MFX Parameter	Value	Display
1	TimingPtn	0 - 33	1 - 34
2	AccentPtn	0 - 15	1 - 16
3	AccentLvl	0 - 127	0 - 127
4	Attack	0 - 127	0 - 127
5	Rate	1 - 222	0.05 - 10.00 [Hz] MUSICAL-NOTES
6	Reset	0 - 1	OFF, ON
7	Level	0 - 127	0 - 127

Type 44: TREMOLO

	MFX Parameter	Value	Display
1	ModWave	0 - 4	TRI, SQR, SIN, SAW1, SAW2
2	Rate	1 - 222	0.05 - 10.00 [Hz] MUSICAL-NOTES
3	Depth	0 - 127	0 - 127
4	Reset	0 - 1	OFF, ON
5	Low Gain	0 - 30	-15 - +15 [dB]
6	High Gain	0 - 30	-15 - +15 [dB]
7	Level	0 - 127	0 - 127

Type 45: AUTOPAN

	MFX Parameter	Value	Display
1	ModWave	0 - 4	TRI, SQR, SIN, SAW1, SAW2
2	Rate	1 - 222	0.05 - 10.00 [Hz] MUSICAL-NOTES
3	Depth	0 - 127	0 - 127
4	Reset	0 - 1	OFF, ON
5	Low Gain	0 - 30	-15 - +15 [dB]
6	High Gain	0 - 30	-15 - +15 [dB]
7	Level	0 - 127	0 - 127

Type 46: TUMBLING DELAY

	MFX Parameter	Value	Display
1	Type	0 - 5	TYPE1, TYPE2, TYPE3, TYPE4, TYPE5, TYPE6
2	Pre Delay	0 - 500	0 - 500 [ms]
3	Delay Time	0 - 345	0 - 345 [ms]
4	HF Damp	0 - 17	200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, BYPASS [Hz]
5	Feedback	0 - 98	-98 - +98 [%]
6	Balance	0 - 100	D100:0W - D0:100W
7	Level	0 - 127	0 - 127

Type 47: FEEDBACK RIPPER

	MFX Parameter	Value	Display
1	ModWave	0 - 4	TRI, SQR, SIN, SAW1, SAW2
2	Rate	1 - 222	0.05 - 10.00 [Hz] MUSICAL-NOTES
3	Depth	0 - 127	0 - 127
4	Delay Left	0 - 430	0 - 420 [ms] MUSICAL-NOTES
5	Delay Right	0 - 430	0 - 420 [ms] MUSICAL-NOTES
6	Delay Feedback	0 - 98	-98 - +98 [%]
7	Reset	0 - 1	OFF, ON
8	Level	0 - 127	0 - 127

4. Supplementary material

■ Decimal and Hexadecimal Table

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

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

D: decimal
H: hexadecimal

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

<Example1> What is the decimal expression of 5AH?

From the preceding table, 5AH = 90

<Example2> 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

<Example3> 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

<Example4> 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

<Example1> 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.

<Example2> 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.

<Example3> EA 00 28

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

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

<Example4> B3 64 00 65 00 06 0C 26 00 64 7F 65 7F

BnH is the Control Change status, and n is the MIDI channel number. For Control Changes, the 2nd byte is the control number, and the 3rd byte is the value. In a case in which two or more messages consecutive messages have the same status, MIDI has a provision called "running status" which allows the status byte of the second and following messages to be omitted. Thus, the above messages have the following meaning.

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

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

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

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

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

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

* TPQN: Ticks Per Quarter Note

■ Example of an Exclusive Message and Calculating a Checksum

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

● How to calculate the checksum

(hexadecimal numbers are indicated by "H")

The checksum is a value derived by adding the address, size, and checksum itself and inverting the lower 7 bits.

Here's an example of how the checksum is calculated. We will assume that in the Exclusive message we are transmitting, the address is aa bb cc ddH and the data or size is ee ffH.

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

<Example> Setting CHORUS TYPE of PERFORMANCE COMMON to SHORT DELAY (DT1)

According to the "Parameter Address Map" (p. 9), the start address of Temporary Performance is 10 00 00 00H, the offset address of CHORUS at PERFORMANCE COMMON is 04 00H, and the address of CHORUS TYPE is 00 00H. Therefore the address of CHORUS TYPE of PERFORMANCE COMMON is;

```
   10 00 00 00H
         04 00H
+)       00 00H
   10 00 04 00H
```

SHORT DELAY has the value of 06H.

So the system exclusive message should be sent is;

F0	41	10	00 64	12	10 00 04 00	06	??	F7
(1)	(2)	(3)	(4)	(5)	address	data	checksum	(6)

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

Then calculate the checksum.

10H + 00H + 04H + 00H + 02H = 16 + 0 + 4 + 0 + 6 = 26 (sum)
26 (sum) ÷ 128 = 0 (quotient) ... 26 (remainder)
checksum = 128 - 26 (remainder) = 102 = 66H

This means that F0 41 10 00 64 12 10 00 04 00 06 66 F7 is the message should be sent.

■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 JUNO-D, the default settings for the Scale Tune feature produce equal temperament.

❍Just Temperament (Tonic of C)

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

❍Arabian Scale

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

Example Settings

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

The values in the table are given in cents. Convert these values to hexadecimal, and transmit them as Exclusive data.

For example, to set the tune (C-B) of the Part 1 Arabian Scale, send the following data:

F0 41 10 42 12 40 11 40 3A 6D 3E 34 0D 38 6B 3C 6F 40 36 0F 76 F7

■ Data Store Message

This message requests the other device to store data into the internal memory.
To store the USER data, send the following message:

F0 41 10 00 64 11 7F 00 10 00 7F 00 7F 7F 74 F7

To store the SYSTEM data, send the following message:

F0 41 10 00 64 11 7F 00 10 00 5A 00 7F 7F 19 F7

■ ASCII Code Table

Patch Name and Performance Name, etc., of MIDI data are described the ASCII code in the table below.

D	H	Char	D	H	Char	D	H	Char
32	20H	SP	64	40H	@	96	60H	`
33	21H	!	65	41H	A	97	61H	a
34	22H	"	66	42H	B	98	62H	b
35	23H	#	67	43H	C	99	63H	c
36	24H	$	68	44H	D	100	64H	d
37	25H	%	69	45H	E	101	65H	e
38	26H	&	70	46H	F	102	66H	f
39	27H	'	71	47H	G	103	67H	g
40	28H	(	72	48H	H	104	68H	h
41	29H	)	73	49H	I	105	69H	i
42	2AH	*	74	4AH	J	106	6AH	j
43	2BH	+	75	4BH	K	107	6BH	k
44	2CH	,	76	4CH	L	108	6CH	l
45	2DH	−	77	4DH	M	109	6DH	m
46	2EH	.	78	4EH	N	110	6EH	n
47	2FH	/	79	4FH	O	111	6FH	o
48	30H	0	80	50H	P	112	70H	p
49	31H	1	81	51H	Q	113	71H	q
50	32H	2	82	52H	R	114	72H	r
51	33H	3	83	53H	S	115	73H	s
52	34H	4	84	54H	T	116	74H	t
53	35H	5	85	55H	U	117	75H	u
54	36H	6	86	56H	V	118	76H	v
55	37H	7	87	57H	W	119	77H	w
56	38H	8	88	58H	X	120	78H	x
57	39H	9	89	59H	Y	121	79H	y
58	3AH	:	90	5AH	Z	122	7AH	z
59	3BH	;	91	5BH	[	123	7BH	{
60	3CH	<	92	5CH	\	124	7CH		
61	3DH	=	93	5DH	]	125	7DH	}
62	3EH	>	94	5EH	^			
63	3FH	?	95	5FH	_			

D: decimal
H: hexadecimal

* "SP" is space.