▌ MIDI Implementation

```
Model:    JD-XA
Date:     May 13, 2015
Version:  1.00
```

1. Data Reception (Sound Source Section)

■ Channel Voice Messages

● Note off

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

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

● Note on

Status	2nd byte	3rd byte
9nH	kkH	vvH

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

● Polyphonic Key Pressure

Status	2nd byte	3rd byte
AnH	kkH	vvH

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

* Not received when the Rx PolyPress parameter (PART EDIT:PART MIDI) is OFF.

● Control Change

* If the corresponding Controller number is selected for the MFX Control Src 1, 2, 3 or 4 parameter (EFFECTS EDIT:MFX CTRL) or the Analog Synth Matrix Control Src parameter (TONE EDIT:MATRIX CTRL1-4), the corresponding effect will occur.

* When the Src Sel parameter (SYSTEM:CONTROL) is set to SYSTEM, if a controller number that corresponds to the Sys Ctrl 1, 2, 3 or 4 parameter (SYSTEM:CONTROL) is selected, the specified effect will apply if the MFX Control Src 1, 2, 3 or 4 parameter (EFFECTS EDIT:MFX CTRL) or the Analog Synth Matrix Control Src parameter (TONE EDIT:MATRIX CTRL1-4) is set to SYS1, SYS2, SYS3 or SYS4.

* When the Src Sel parameter (SYSTEM:CONTROL) is set to PROGRAM, if a controller number that corresponds to the Ctrl Src 1, 2, 3 or 4 parameter (PROGRAM EDIT:PROGRAM CTRL) is selected, the specified effect will apply if the MFX Control Src 1, 2, 3 or 4 parameter (EFFECTS EDIT:MFX CTRL) or the Analog Synth Matrix Control Src parameter (TONE EDIT:MATRIX CTRL1-4) is set to SYS1, SYS2, SYS3 or SYS4.

○ Bank Select (Controller number 0, 32)

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

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

* Not received when the Rx Bank Sel parameter (SYSTEM:MIDI RX) is OFF.

The Programs corresponding to each Bank Select are as follows.

BANK SELECT MSB	LSB	PROGRAM NUMBER	GROUP	NUMBER
085	000 - 001	001 - 128	Internal Program	INT:A01 - P16
	032 - 033	001 - 128	USB Memory Program	USB:A01 - P16

○ Modulation (Controller number 1)

Status	2nd byte	3rd byte
BnH	01H	vvH

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

* Not received when the Rx Mod parameter (PART EDIT:PART MIDI) is OFF.

○ Portamento Time (Controller number 5)

Status	2nd byte	3rd byte
BnH	05H	vvH

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

* The Porta Time parameter (TONE EDIT:TONE COMMON) will change.

○ Data Entry (Controller number 6, 38)

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

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

○ Volume (Controller number 7)

Status	2nd byte	3rd byte
BnH	07H	vvH

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

* Not received when the Rx Volume parameter (PART EDIT:PART MIDI) is OFF.
* The Level parameter (PART EDIT:PART) 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),
```

* Not received when the Rx Pan parameter (PART EDIT:PART MIDI) is OFF.
* The Pan parameter (PART EDIT: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)
```

* Not received when the Rx Express parameter (PART EDIT:PART MIDI) is OFF.

○ Hold 1 (Controller number 64)

Status	2nd byte	3rd byte
BnH	40H	vvH

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

* Not received when the Rx Hold-1 parameter (PART EDIT:PART MIDI) is OFF.

○ **Portamento (Controller number 65)**

Status	2nd byte	3rd byte
BnH	41H	vvH

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

○ **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)

○ **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)

○ **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)

○ **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)

○ **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)

○ **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)

* Not received on the Analog part.

○ **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)

* Not received on the Analog part.

○ **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)

* Not received on the Analog part.

○ **General Purpose Effect 1 (Reverb Send Level) (Controller number 91)**

Status	2nd byte	3rd byte
BnH	5BH	vvH

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

* The Rev Send parameter (PART EDIT:PART) will change.

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

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

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

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

* For more about the NRPN that JD-XA receive, refer to Parameter Guide "CC Assignments."

○ **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 Bend Range parameter (PART VIEW:PITCH) 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 (PART VIEW:PITCH) 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 (PART VIEW:PITCH) will change.

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

● **Program Change**

Status	2nd byte
CnH	ppH

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

* Not received when the Rx Prog Chg parameter (SYSTEM:MIDI RX) is OFF.

● Channel Pressure

Status	2nd byte
DnH	vvH

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

* Not received when the Rx Ch Press parameter (PART EDIT:PART MIDI) is OFF.

● Pitch Bend Change

Status	2nd byte	3rd byte
EnH	llH	mmH

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

* Not received when the Rx Bender parameter (PART EDIT:PART MIDI) is OFF.

■ Channel Mode Messages

● All Sounds Off (Controller number 120)

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

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

* When this message is 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)
Channel Pressure	0 (off)
Modulation	0 (off)
Expression	127 (max)
	However the controller will be at minimum.
Hold 1	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 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.
* Not received on the Analog part.

● 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.
* Not received on the Analog part.

■ System Realtime Message

● Timing Clock

Status
F8H

* Received when Sync Mode parameter (SYSTEM:SYNC/TEMPO) is set to SLAVE.

● Active Sensing

Status
FEH

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

■ System Exclusive Message

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

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

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

● **Universal Non-realtime System Exclusive Messages**

○ **Identity Request Message**

Status	Data byte	Status
F0H	7EH, 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. 6) will be transmitted.

● **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:SOUND) 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 MasterTune parameter (SYSTEM:SOUND) 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 MasterKeySft parameter (SYSTEM:SOUND) will change.

● **Data Transmission**

This instrument can use exclusive messages to exchange many varieties of internal settings with other devices.
The model ID of the exclusive messages used by this instrument is 00H 00H 00H 0FH.

○ **Data Request 1 (RQ1)**

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, 00H, 00H, 0FH, 11H, aaH, bbH, ccH,	F7H
	ddH, ssH, ttH, uuH, vvH, sum	

Byte	Remarks
F0H	Exclusive status
41H	ID number (Roland)
dev	device ID (dev: 10H–1FH, 7FH)
00H	model ID #1 (JD-XA)
00H	model ID #2 (JD-XA)
00H	model ID #3 (JD-XA)
0FH	model ID #4 (JD-XA)
11H	command ID (RQ1)
aaH	address MSB
bbH	address
ccH	address
ddH	address LSB
ssH	size MSB
ttH	size
uuH	size
vvH	size LSB
sum	checksum
F7H	EOX (End Of Exclusive)

* The size of data that can be transmitted at one time is fixed for each type of data. And data requests must be made with a fixed starting address and size. Refer to the address and size given in Parameter Address Map (p. 8).
* For the checksum, refer to p. 20.
* Not received when the Rx Exclusive parameter (SYSTEM:MIDI RX) is OFF.

○ **Data set 1 (DT1)**

Status	Data byte	Status
F0H	41H, dev, 00H, 00H, 00H, 0FH, 12H, aaH, bbH,	F7H
	ccH, ddH, eeH, ... ffH, sum	

Byte	Explanation	
F0H	Exclusive status	
41H	ID number (Roland)	
dev	Device ID (dev: 10H–1FH, 7FH)	
00H	Model ID #1 (JD-XA)	
00H	Model ID #2 (JD-XA)	
00H	Model ID #3 (JD-XA)	
0FH	Model ID #4 (JD-XA)	
12H	Command ID (DT1)	
aaH	Address MSB:	upper byte of the starting address of the data to be sent
bbH	Address:	upper middle byte of the starting address of the data to be sent
ccH	Address:	lower middle byte of the starting address of the data to be sent
ddH	Address LSB:	lower byte of the starting address of the data to be sent.
eeH	Data:	the actual data to be sent. Multiple bytes of data are transmitted in order starting from the address.
:	:	
ffH	Data	
sum	Checksum	
F7H	EOX (End Of Exclusive)	

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

2. Data Transmission (Sound Source Section)

■ 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

* By selecting a controller number that corresponds to the setting of parameters of controllers (wheels, etc.), this instrument can transmit any control change message.

○ 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 transmitted when Tx Bank Sel parameter (SYSTEM:MIDI TX) is OFF.

The Programs corresponding to each Bank Select are as follows.

```
BANK SELECT   | PROGRAM   | GROUP                         | NUMBER
MSB | LSB     | NUMBER    |                               |
----+---------+-----------+-------------------------------+------------
 085| 000 - 001| 001 - 128 | Internal Program             | INT:A01 - P16
    | 032 - 033| 001 - 128 | USB Memory Program           | USB:A01 - P16
```

○ 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)

○ 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

○ 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)

○ 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

* When Cont Hold parameter (SYSTEM:HOLD PEDAL) is OFF, just only 00H (OFF) and 7FH (ON) can be send as the control value.

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

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

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

<<< NRPN >>>
The NRPN (Non Registerd Parameter Number) message allows an extended range of control changes to be used. On this unit, NRPN messages can be used to modify sound parameters etc.

To use these messages, you must first use NRPN messages (Controller number 98 and 99, their order does not matter) to specify the parameter to be controlled, and then use Data Entry messages to specify the value of the specified parameter. Once an NRPN parameters has been specified, all Data Entry messages received on that channel will modify the value of that parameter. To prevent accidents, it is recomended that you set RPN Null (RPN Number = 7FH/7FH) when you have finished setting the value of the desired parameter.

* For more about the NRPN that JD-XA transmit, refer to Parameter Guide "CC Assignments."

● 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 Program is selected. But not transmitted when Tx Prog Chg parameter (SYSTEM:MIDI TX) 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)

■ System Realtime Messages

● Active Sensing

Status
FEH

* This message is transmitted at intervals of approximately 250 msec.
* Not transmitted when Tx Actv Sens parameter (SYSTEM:MIDI TX) 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 JD-XA

● Universal Non-realtime System Exclusive Message

○ Identity Reply Message (JD-XA)

Receiving Identity Request Message (p. 4), the JD-XA send this
message.

Status	Data byte	Status
F0H	7EH, dev, 06H, 02H, 41H, 0FH, 03H,	F7H
	00H, 00H, 00H, 03H, 00H, 00H	

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)
0FH 03H	Device family code
00H 00H	Device family number code
00H 03H 00H 00H	Software revision level
F7H	EOX (End of Exclusive)

● Data Transmission

○ Data set 1 (DT1)

Status	Data byte	Status
F0H	41H, dev, 00H, 00H, 00H, 0FH, 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 (JD-XA)	
00H	Model ID #2 (JD-XA)	
00H	Model ID #3 (JD-XA)	
0FH	Model ID #4 (JD-XA)	
12H	Command ID (DT1)	
aaH	Address MSB:	upper byte of the starting address of the data to be sent
bbH	Address:	upper middle byte of the starting address of the data to be sent
ccH	Address:	lower middle byte of the starting address of the data to be sent
ddH	Address LSB:	lower byte of the starting address of the data to be sent.
eeH	Data:	the actual data to be sent. Multiple bytes of data are transmitted in order starting from the address.
:	:	
ffH	Data	
sum	Checksum	
F7H	EOX (End Of Exclusive)	

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

3. Data Reception (Sequencer Section)

3.1 Messages recorded during recording

■ Channel Voice Messages

● Note off

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

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

● 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

Status	2nd byte	3rd byte
BnH	01H	vvH

n=MIDI channel number: 0H—FH (ch.1—ch.16)
kk=Control number: 00H—78H (0—120)
vv=value: 00H—7FH (0—127)

* kk = 00H and kk = 20H are not recorded.

● Channel Aftertouch

Status	2nd byte
DnH	vvH

n = MIDI channel number: 0H—FH (ch.1—16)
vv=Channel Aftertouch: 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

● All Sounds Off (Controller number 120)

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

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

* The same processing will be done as when an All Note Off message is
  received.

● **Reset All Controllers (Controller number 121)**

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

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

● **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 done as when an All Note Off message 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 done as when an All Note Off message is
   received.

● **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 done as when an All Note Off message is
   received.

● **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 done as when an All Note Off message is
   received.

■ System Exclusive Messages

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

F0H: System Exclusive message status
ii=ID number: This is the ID number (manufacturer ID) that
                   specifies the manufacturer whose exclusive message
                   this is. Roland's manufacturer ID is 41H. ID
                   numbers 7EH and 7FH are defined in an expansion
                   of the MIDI standard as Universal Non-real-time
                   messages (7EH) and Universal Realtime Messages
                   (7FH).
dd,..., ee = data: 00H—7FH (0—127)
F7H: EOX (End of System Exclusive)

 * MIDI Machine Control and MIDI Time code is not recorded.

3.2 Messages not recorded during recording

■ Channel mode messages

● **Local On/Off (Controller number 122)**

Status	2nd byte	3rd byte
BnH	7AH	vvH

n=MIDI channel number: 0H—FH (ch.1—ch.16)
vv=Value: 00H, 7FH (Local Off, Local On)

● **All notes off (Controller number 123)**

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

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

 * When an All Note Off message is received, all notes of the
   corresponding channel that are on will be sent Note Off's, and the
   resulting Note Off messages will be recorded.

3.3 Messages acknowledged for synchronization

■ System Realtime Messages

● **Timing Clock**

Status
F8H

 * Received when Sync Mode parameter (SYSTEM:SYNC/TEMPO) is set to
   SLAVE.

● **Start**

Status
FAH

 * Received when Sync Mode parameter (SYSTEM:SYNC/TEMPO) is set to
   SLAVE or REMOTE.

● **Continue**

Status
FBH

 * The same processing will be done as when a Start message is
   received.
 * Received when Sync Mode parameter (SYSTEM:SYNC/TEMPO) is set to
   SLAVE or REMOTE.

● **Stop**

Status
FCH

 * Received when Sync Mode parameter (SYSTEM:SYNC/TEMPO) is set to
   SLAVE or REMOTE.

4. Data transmission (Sequencer Section)

4.1 Messages transmitted during playing

Recorded messages are transmitted during playback.

4.2 Messages that are generated and transmitted

Messages are generated and transmitted to synchronize with other devices.

■ System Realtime Messages

* Sent when Sync Output parameter (SYSTEM:SYNC/TEMPO) is set to ON.

● Timing Clock

Status
F8H

● Start

Status
FAH

● Stop

Status
FCH

5. Parameter Address Map

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

JD-XA (ModelID = 00H 00H 00H 0FH)

```
+-------------+-------------------------------------------------------+
| Start       |                                                       |
|    Address  |                 Description                           |
|-------------+-------------------------------------------------------|
| 01 00 00 00 | Setup                                                 |
|-------------+-------------------------------------------------------|
| 02 00 00 00 | System                                                |
|-------------+-------------------------------------------------------|
| 18 00 00 00 | Temporary Program                                     |
| 19 00 00 00 | Temporary Tone (Analog Part 1)                        |
| 19 20 00 00 | Temporary Tone (Analog Part 2)                        |
| 19 40 00 00 | Temporary Tone (Analog Part 3)                        |
| 19 60 00 00 | Temporary Tone (Analog Part 4)                        |
| 1A 00 00 00 | Temporary Tone (Digital Part 1)                       |
| 1A 20 00 00 | Temporary Tone (Digital Part 2)                       |
| 1A 40 00 00 | Temporary Tone (Digital Part 3)                       |
| 1A 60 00 00 | Temporary Tone (Digital Part 4)                       |
+-------------+-------------------------------------------------------+
```

* System

```
+-------------+-------------------------------------------------------+
| Offset      |                                                       |
|    Address  |                 Description                           |
|-------------+-------------------------------------------------------|
|    00 00 00 | System Common                                         |
|    00 01 00 | System Master EQ                                      |
|    00 02 00 | System Mic EFX                                        |
|    00 03 00 | System Controller                                     |
+-------------+-------------------------------------------------------+
```

* Temporary Tone

```
+-------------+-------------------------------------------------------+
| Offset      |                                                       |
|    Address  |                 Description                           |
|-------------+-------------------------------------------------------|
|    01 00 00 | Temporary SuperNATURAL Synth Tone                     |
|    02 00 00 | Temporary Analog Synth Tone                           |
+-------------+-------------------------------------------------------+
```

* Program

```
+-------------+-------------------------------------------------------+
| Offset      |                                                       |
|    Address  |                 Description                           |
|-------------+-------------------------------------------------------|
|    00 00 00 | Program Common                                        |
|    00 02 00 | Program Reverb                                        |
|    00 03 00 | Program Delay                                         |
```

```
|    00 04 00 | Program Vocoder                                       |
|    00 05 00 | Program TFX (1)                                       |
|    00 06 00 | Program TFX (2)                                       |
|    00 20 00 | Program Part (Analog Part1)                           |
|    00 21 00 | Program Part (Analog Part2)                           |
|    00 22 00 | Program Part (Analog Part3)                           |
|    00 23 00 | Program Part (Analog Part4)                           |
|    00 24 00 | Program Part (Digital Part1)                          |
|    00 25 00 | Program Part (Digital Part2)                          |
|    00 26 00 | Program Part (Digital Part3)                          |
|    00 27 00 | Program Part (Digital Part4)                          |
|    00 28 00 | Program Part (MIDI Control Part1)                     |
|    00 29 00 | Program Part (MIDI Control Part2)                     |
|    00 2A 00 | Program Part (MIDI Control Part3)                     |
|    00 2B 00 | Program Part (MIDI Control Part4)                     |
|    00 2C 00 | Program Part (MIDI Control Part5)                     |
|    00 2D 00 | Program Part (MIDI Control Part6)                     |
|    00 2E 00 | Program Part (MIDI Control Part7)                     |
|    00 2F 00 | Program Part (MIDI Control Part8)                     |
|    00 30 00 | Program Part EQ (Analog Part1)                        |
|    00 31 00 | Program Part EQ (Analog Part2)                        |
|    00 32 00 | Program Part EQ (Analog Part3)                        |
|    00 33 00 | Program Part EQ (Analog Part4)                        |
|    00 34 00 | Program Part EQ (Digital Part1)                       |
|    00 35 00 | Program Part EQ (Digital Part2)                       |
|    00 36 00 | Program Part EQ (Digital Part3)                       |
|    00 37 00 | Program Part EQ (Digital Part4)                       |
|    00 40 00 | Program Zone (Analog Part1)                           |
|    00 41 00 | Program Zone (Analog Part2)                           |
|    00 42 00 | Program Zone (Analog Part3)                           |
|    00 43 00 | Program Zone (Analog Part4)                           |
|    00 44 00 | Program Zone (Digital Part1)                          |
|    00 45 00 | Program Zone (Digital Part2)                          |
|    00 46 00 | Program Zone (Digital Part3)                          |
|    00 47 00 | Program Zone (Digital Part4)                          |
|    00 48 00 | Program Zone (MIDI Control Part1)                     |
|    00 49 00 | Program Zone (MIDI Control Part2)                     |
|    00 4A 00 | Program Zone (MIDI Control Part3)                     |
|    00 4B 00 | Program Zone (MIDI Control Part4)                     |
|    00 4C 00 | Program Zone (MIDI Control Part5)                     |
|    00 4D 00 | Program Zone (MIDI Control Part6)                     |
|    00 4E 00 | Program Zone (MIDI Control Part7)                     |
|    00 4F 00 | Program Zone (MIDI Control Part8)                     |
|    00 50 00 | Program Controller                                    |
|    00 60 00 | Program Arpeggio Common                               |
|    00 61 00 | Program Arpeggio Pattern (Note 1)                     |
|    00 62 00 | Program Arpeggio Pattern (Note 2)                     |
|         :   |                                                       |
|    00 70 00 | Program Arpeggio Pattern (Note 16)                    |
|    00 71 00 | Program MIDI Controller (1)                           |
|    00 71 10 | Program MIDI Controller (2)                           |
|         :   |                                                       |
|    00 77 10 | Program MIDI Controller (50)                          |
|    00 78 00 | Program Trigger (1)                                   |
|    00 78 10 | Program Trigger (2)                                   |
|         :   |                                                       |
|    00 79 70 | Program Trigger (16)                                  |
+-------------+-------------------------------------------------------+
```

* SuperNATURAL Synth Tone

```
+-------------+-------------------------------------------------------+
| Offset      |                                                       |
|    Address  |                 Description                           |
|-------------+-------------------------------------------------------|
|    00 00 00 | SuperNATURAL Synth Tone Common                        |
|    00 02 00 | SuperNATURAL Synth Tone MFX                           |
|    00 20 00 | SuperNATURAL Synth Tone Partial (1)                   |
|    00 21 00 | SuperNATURAL Synth Tone Partial (2)                   |
|    00 22 00 | SuperNATURAL Synth Tone Partial (3)                   |
|    00 50 00 | SuperNATURAL Synth Tone Modify                        |
+-------------+-------------------------------------------------------+
```

* Analog Synth Tone

```
+-------------+-------------------------------------------------------+
| Offset      |                                                       |
|    Address  |                 Description                           |
|-------------+-------------------------------------------------------|
|    00 00 00 | Analog Synth Tone Common                              |
|    00 01 00 | Analog Synth Tone Partial                             |
|    00 02 00 | Analog Synth Tone MFX                                 |
+-------------+-------------------------------------------------------+
```

* Setup

```
+-----------+-----------+-------------------------------------------+
| Offset    |           |                                           |
|   Address |           |         Description                       |
|-----------+-----------+-------------------------------------------|
|    00 00  | 0000 000a | (reserve) <*>                             |
|    00 01  | 0aaa aaaa | (reserve) <*>                             |
|        :  |           |                                           |
|    00 03  | 0aaa aaaa | (reserve) <*>                             |
|-----------+-----------+-------------------------------------------|
|    00 04  | 0aaa aaaa | Program BS MSB (CC# 0)          (0 - 127) |
|    00 05  | 0aaa aaaa | Program BS LSB (CC# 32)         (0 - 127) |
|    00 06  | 0aaa aaaa | Program PC (PC)                 (0 - 127) |
|-----------+-----------+-------------------------------------------|
|    00 07  | 0aaa aaaa | (reserve) <*>                             |
|    00 08  | 0aaa aaaa | (reserve) <*>                             |
|        :  |           |                                           |
|    00 0B  | 0aaa aaaa | (reserve) <*>                             |
|-----------+-----------+-------------------------------------------|
|    00 0C  | 0000 aaaa | Transpose Value               (59 - 70)  |
|           |           |                               -5 - +6    |
|    00 0D  | 0000 0aaa | Octave Shift                  (61 - 67)  |
|           |           |                               -3 - +3    |
|-----------+-----------+-------------------------------------------|
|    00 0E  | 0000 aaaa | (reserve) <*>                             |
|-----------+-----------+-------------------------------------------|
| 00 00 00 0F | 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 | (reserve) <*>                            |
| 00 07     | 0000 000a | (reserve) <*>                            |
|   :       |           |                                          |
| 00 10     | 000a aaaa | (reserve) <*>                            |
+-----------+-----------+------------------------------------------+
| 00 11     | 000a aaaa | Program Control Channel    (0 - 15)      |
|           |           |                        1 - 16            |
+-----------+-----------+------------------------------------------+
| 00 12     | 0aaa aaaa | (reserve) <*>                            |
| 00 13     | 0aaa aaaa | (reserve) <*>                            |
|   :       |           |                                          |
| 00 1F     | 0aaa aaaa | (reserve) <*>                            |
+-----------+-----------+------------------------------------------+
| 00 20     | 0aaa aaaa | System Control 1 Source    (0 - 97)      |
|           |           |   OFF, CC01 - CC31, OFF, CC33 - CC95,    |
|           |           |                        BEND, AFT         |
| 00 21     | 0aaa aaaa | System Control 2 Source    (0 - 97)      |
|           |           |   OFF, CC01 - CC31, OFF, CC33 - CC95,    |
|           |           |                        BEND, AFT         |
| 00 22     | 0aaa aaaa | System Control 3 Source    (0 - 97)      |
|           |           |   OFF, CC01 - CC31, OFF, CC33 - CC95,    |
|           |           |                        BEND, AFT         |
| 00 23     | 0aaa aaaa | System Control 4 Source    (0 - 97)      |
|           |           |   OFF, CC01 - CC31, OFF, CC33 - CC95,    |
|           |           |                        BEND, AFT         |
+-----------+-----------+------------------------------------------+
| 00 24     | 0000 000a | Control Source             (0 - 1)       |
|           |           |                   SYSTEM, PROGRAM        |
+-----------+-----------+------------------------------------------+
| 00 25     | 0000 000a | Tempo Assign Source        (0 - 1)       |
|           |           |                   SYSTEM, PROGRAM        |
+-----------+-----------+------------------------------------------+
| 00 26     | 0000 000a | Receive Program Change     (0 - 1)       |
|           |           |                        OFF, ON           |
| 00 27     | 0000 000a | Receive Bank Select        (0 - 1)       |
|           |           |                        OFF, ON           |
+-----------+-----------+------------------------------------------+
| 00 28     | 0000 000a | (reserve) <*>                            |
| 00 29     | 0000 0aaa | (reserve) <*>                            |
| 00 2A     | 0000 0aaa | (reserve) <*>                            |
+-----------+-----------+------------------------------------------+
| 00 2B     | 0000 000a | CV/Gate 1 Assign Source    (0 - 1)       |
|           |           |                   SYSTEM, PROGRAM        |
| 00 2C     | 0aaa aaaa | (reserve) <*>                            |
| 00 2D     | 000a aaaa | CV/Gate 1 Control Channel  (0 - 16)      |
|           |           |                        1 - 16, OFF       |
| 00 2E     | 0000 0aaa | CV 1 Reference Note        (0 - 4)       |
|           |           |                   C0, C1, C2, C3, C4     |
| 00 2F     | 0aaa aaaa | CV 1 Scale                 (1 - 127)     |
|           |           |                        -63 - +63         |
| 00 30     | 0aaa aaaa | CV 1 Fine Tune for 0V      (14 - 114)    |
|           |           |                        -63 - +63         |
| 00 31     | 0000 000a | (reserve) <*>                            |
| 00 32     | 0000 000a | (reserve) <*>                            |
| 00 33     | 000a aaaa | CV/Gate 2 Control Channel  (0 - 16)      |
|           |           |                        1 - 16, OFF       |
| 00 34     | 0000 0aaa | CV 2 Reference Note        (0 - 4)       |
|           |           |                   C0, C1, C2, C3, C4     |
| 00 35     | 0aaa aaaa | CV 2 Scale                 (1 - 127)     |
|           |           |                        -63 - +63         |
| 00 36     | 0aaa aaaa | CV 2 Fine Tune for 0V      (14 - 114)    |
|           |           |                        -63 - +63         |
| 00 37     | 0000 000a | (reserve) <*>                            |
| 00 38     | 0000 000a | CV/Gate 2 Assign Source    (0 - 1)       |
|           |           |                   SYSTEM, PROGRAM        |
+-----------+-----------+------------------------------------------+
| 00 39     | 00aa aaaa | (reserve) <*>                            |
| 00 3A     | 0aaa aaaa | (reserve) <*>                            |
|   :       |           |                                          |
| 00 3C     | 0aaa aaaa | (reserve) <*>                            |
+-----------+-----------+------------------------------------------+
| 00 00 00 3D | Total Size                                         |
+------------------------------------------------------------------+
```

* System Master EQ

```
+------------------------------------------------------------------+
| Offset    |           |                                          |
|  Address  |           |         Description                      |
+-----------+-----------+------------------------------------------+
| 00 00     | 0000 000a | EQ Switch                  (0 - 1)       |
|           |           |                        OFF, ON           |
| 00 01     | 000a aaaa | EQ Input Gain             (0 - 30)       |
|           |           |                        -15 - +15[dB]     |
| 00 02     | 000a aaaa | EQ Low Freq               (0 - 17)       |
|           |           |                   16,20,25,31,40,        |
|           |           |                   50,63,80,100,125,      |
|           |           |                   160,200,250,315,400,   |
|           |           |                   500,630,800 [Hz]       |
| 00 03     | 000a aaaa | EQ Low Gain               (0 - 30)       |
|           |           |                        -15 - +15 [dB]    |
| 00 04     | 000a aaaa | EQ Mid1 Freq              (0 - 30)       |
|           |           |                   16,20,25,31,40,        |
|           |           |                   50,63,80,100,125,      |
|           |           |                   160,200,250,315,400,   |
|           |           |                   500,630,800,1000,1250, |
|           |           |                   1600,2000,2500,3150,4000,|
|           |           |                   5000,6300,8000,10000,12500,|
```

```
+------------------------------------------------------------------+
|           |           |                   16000,[Hz]            |
| 00 05     | 000a aaaa | EQ Mid1 Gain              (0 - 30)       |
|           |           |                        -15 - +15 [dB]    |
| 00 06     | 0000 0aaa | EQ Mid1 Q                  (0 - 4)       |
|           |           |                   0.5, 1.0, 2.0, 4.0, 8.0|
| 00 07     | 000a aaaa | EQ Mid2 Freq              (0 - 30)       |
|           |           |                   16,20,25,31,40,        |
|           |           |                   50,63,80,100,125,      |
|           |           |                   160,200,250,315,400,   |
|           |           |                   500,630,800,1000,1250, |
|           |           |                   1600,2000,2500,3150,4000,|
|           |           |                   5000,6300,8000,10000,12500,|
|           |           |                   16000,[Hz]            |
| 00 08     | 000a aaaa | EQ Mid2 Gain              (0 - 30)       |
|           |           |                        -15 - +15 [dB]    |
| 00 09     | 0000 0aaa | EQ Mid2 Q                  (0 - 4)       |
|           |           |                   0.5, 1.0, 2.0, 4.0, 8.0|
| 00 0A     | 000a aaaa | EQ Mid3 Freq              (0 - 30)       |
|           |           |                   16,20,25,31,40,        |
|           |           |                   50,63,80,100,125,      |
|           |           |                   160,200,250,315,400,   |
|           |           |                   500,630,800,1000,1250, |
|           |           |                   1600,2000,2500,3150,4000,|
|           |           |                   5000,6300,8000,10000,12500,|
|           |           |                   16000,[Hz]            |
| 00 0B     | 000a aaaa | EQ Mid3 Gain              (0 - 30)       |
|           |           |                        -15 - +15 [dB]    |
| 00 0C     | 0000 0aaa | EQ Mid3 Q                  (0 - 4)       |
|           |           |                   0.5, 1.0, 2.0, 4.0, 8.0|
| 00 0D     | 0000 aaaa | EQ High Freq               (0 - 14)      |
|           |           |                   630,800,1000,1250,1600,|
|           |           |                   2000,2500,3150,4000,5000,|
|           |           |                   6300,8000,10000,12500,16000,[Hz]|
| 00 0E     | 000a aaaa | EQ High Gain              (0 - 30)       |
|           |           |                        -15 - +15 [dB]    |
+-----------+-----------+------------------------------------------+
| 00 00 00 0F | Total Size                                         |
+------------------------------------------------------------------+
```

* System Mic EFX

```
+------------------------------------------------------------------+
| Offset    |           |                                          |
|  Address  |           |         Description                      |
+-----------+-----------+------------------------------------------+
| 00 00     | 0000 000a | Reverb Switch              (0 - 1)       |
|           |           |                        OFF, ON           |
| 00 01     | 0000 0aaa | Reverb Type                (0 - 7)       |
|           |           |   ROOM1, ROOM2, STAGE1, STAGE2,          |
|           |           |   HALL1, HALL2, DELAY, PAN-DLY           |
| 00 02     | 0aaa aaaa | Reverb Time               (0 - 127)      |
| 00 03     | 0aaa aaaa | Reverb Level              (0 - 127)      |
+-----------+-----------+------------------------------------------+
| 00 04     | 0000 000a | NS Switch                  (0 - 1)       |
|           |           |                        OFF, ON           |
| 00 05     | 0aaa aaaa | NS Threshold              (0 - 127)      |
| 00 06     | 0aaa aaaa | NS Release                (0 - 127)      |
+-----------+-----------+------------------------------------------+
| 00 07     | 0aaa aaaa | (reserve) <*>                            |
| 00 08     | 0aaa aaaa | (reserve) <*>                            |
|   :       |           |                                          |
| 00 0A     | 0aaa aaaa | (reserve) <*>                            |
+-----------+-----------+------------------------------------------+
| 00 00 00 0B | Total Size                                         |
+------------------------------------------------------------------+
```

* System Controller

```
+------------------------------------------------------------------+
| Offset    |           |                                          |
|  Address  |           |         Description                      |
+-----------+-----------+------------------------------------------+
| 00 00     | 0000 000a | Transmit Program Change    (0 - 1)       |
|           |           |                        OFF, ON           |
| 00 01     | 0000 000a | Transmit Bank Select       (0 - 1)       |
|           |           |                        OFF, ON           |
| 00 02     | 0aaa aaaa | Keyboard Velocity         (0 - 127)      |
|           |           |                        REAL, 1 - 127     |
| 00 03     | 0000 00aa | Keyboard Velocity Curve    (1 - 3)       |
|           |           |                   LIGHT, MEDIUM, HEAVY   |
| 00 04     | 000a aaaa | Keyboard Velocity Curve Offset (54 - 73) |
|           |           |                        -10 - +9          |
| 00 05     | 0aaa aaaa | Aftertouch Sens           (0 - 100)      |
+-----------+-----------+------------------------------------------+
| 00 06     | 0000 0aaa | Hold Pedal Polarity        (0 - 1)       |
|           |           |                   STANDARD, REVERSE      |
| 00 07     | 0000 000a | Continuous Hold Pedal      (0 - 1)       |
|           |           |                        OFF, ON           |
+-----------+-----------+------------------------------------------+
| 00 08     | 0aaa aaaa | Pedal 1 Assign             (0 - 124)     |
|           |           |   OFF, CC01 - CC31, OFF, CC33 - CC95,    |
|           |           |                   CC102 - CC119,         |
|           |           |   BEND-DOWN, BEND-UP, AFT,               |
|           |           |   START/STOP, TAP-TEMPO,                 |
|           |           |   PROG-DOWN, PROG-UP,                    |
|           |           |   FAV-DOWN, FAV-UP,                      |
|           |           |   PANEL-DEC, PANEL-INC                   |
| 00 09     | 0000 0aaa | Pedal 1 Destination        (0 - 1)       |
|           |           |                   PART-Select, PART-On   |
| 00 0A     | 0000 0aaa | Pedal 1 Polarity           (0 - 1)       |
|           |           |                   STANDARD, REVERSE      |
| 00 0B     | 0aaa aaaa | Pedal 2 Assign             (0 - 124)     |
|           |           |   OFF, CC01 - CC31, OFF, CC33 - CC95,    |
|           |           |                   CC102 - CC119,         |
|           |           |   BEND-DOWN, BEND-UP, AFT,               |
|           |           |   START/STOP, TAP-TEMPO,                 |
|           |           |   PROG-DOWN, PROG-UP,                    |
|           |           |   FAV-DOWN, FAV-UP,                      |
|           |           |   PANEL-DEC, PANEL-INC                   |
| 00 0C     | 0000 0aaa | Pedal 2 Destination        (0 - 1)       |
|           |           |                   PART-Select, PART-On   |
| 00 0D     | 0000 0aaa | Pedal 2 Polarity           (0 - 1)       |
|           |           |                   STANDARD, REVERSE      |
```

```
----------+-----------+-------------------------------------------------       ----------+-----------+-------------------------------------------------
|   00 0E  | 0aaa aaaa | Wheel 1 Assign                       (0 - 117)    |     |     00 57 | 0000 0aaa | Poly Stack Part                       (0 - 3)    |
|          |           |          OFF, CC01 - CC31, OFF, CC33 - CC95,       |     |           |           |                                        1 - 4     |
|          |           |                            CC102 - CC119,          |     |     00 58 | 0000 000a | (reserve) <*>                                     |
|          |           |          BEND, BEND-DOWN, BEND-UP, AFT             |     |     00 59 | 00aa aaaa | (reserve) <*>                                     |
|   00 0F  | 0000 0aaa | Wheel 1 Destination                   (0 - 1)      |     |     00 5A | 0aaa aaaa | (reserve) <*>                                     |
|          |           |                   PART-Select, PART-On             |     ----------+-----------+-------------------------------------------------
|   00 10  | 0aaa aaaa | Wheel 2 Assign                       (0 - 117)     |     |     00 5B | 0aaa aaaa | (reserve) <*>                                     |
|          |           |          OFF, CC01 - CC31, OFF, CC33 - CC95,       |     |     00 5C | 000a aaaa | CV/Gate 1 Control Channel             (0 - 16)   |
|          |           |                            CC102 - CC119,          |     |           |           |                                   1 - 16, OFF    |
|          |           |          BEND, BEND-DOWN, BEND-UP, AFT             |     |     00 5D | 0aaa aaaa | (reserve) <*>                                     |
|   00 11  | 0000 0aaa | Wheel 2 Destination                   (0 - 1)      |     |     00 5E | 000a aaaa | CV/Gate 2 Control Channel             (0 - 16)   |
|          |           |                   PART-Select, PART-On             |     |           |           |                                   1 - 16, OFF    |
----------+-----------+-------------------------------------------------       ----------+-----------+-------------------------------------------------
|   00 12  | 0000 000a | Pedal 1 Assign Source                 (0 - 1)      |     |     00 5F | 0aaa aaaa | (reserve) <*>                                     |
|          |           |                       SYSTEM, PROGRAM              |     |     00 60 | 0aaa aaaa | (reserve) <*>                                     |
|   00 13  | 0000 000a | Wheel 1 Assign Source                 (0 - 1)      |     |        :  |           |                                                   |
|          |           |                       SYSTEM, PROGRAM              |     |     00 66 | 0aaa aaaa | (reserve) <*>                                     |
|   00 14  | 0000 000a | Knob Mode                             (0 - 1)      |     ----------+-----------+-------------------------------------------------
|          |           |                        DIRECT, CATCH               |   # |     00 67 | 0000 aaaa |                                                   |
|   00 15  | 0000 000a | (reserve) <*>                                      |     |           | 0000 bbbb |                                                   |
----------+-----------+-------------------------------------------------       |           | 0000 cccc |                                                   |
|   00 16  | 0000 000a | Pedal 2 Assign Source                 (0 - 1)      |     |           | 0000 dddd | Program Tempo                    (500 - 30000)   |
|          |           |                       SYSTEM, PROGRAM              |     |           |           |                                   5.00 - 300.00  |
|   00 17  | 0000 000a | Wheel 2 Assign Source                 (0 - 1)      |     ----------+-----------+-------------------------------------------------
|          |           |                       SYSTEM, PROGRAM              |     | 00 00 00 6B | Total Size                                        |
----------+-----------+-------------------------------------------------       +-------------+-----------------------------------------------------+
|   00 18  | 0000 aaaa | (reserve) <*>                                      |
|   00 19  | 0aaa aaaa | (reserve) <*>                                      |     * Program Reverb
|     :    |           |                                                    |
|   00 1F  | 0aaa aaaa | (reserve) <*>                                      |     +-----------+-------------------------------------------------------+
----------+-----------+-------------------------------------------------       | Offset    |                                                       |
| 00 00 00 20 | Total Size                                         |              |   Address |                     Description                       |
+-------------+----------------------------------------------------+              ----------+-----------+-------------------------------------------------
                                                                                  |   00 00  | 0000 000a | Reverb Switch                         (0 - 1)      |
* Program Common                                                                  |          |           |                                   OFF, ON         |
                                                                                  |   00 01  | 0000 aaaa | Reverb Type                           (0 - 6)      |
+-----------+---------------------------------------------------------+          |   00 02  | 0aaa aaaa | Reverb Level                          (0 - 127)    |
| Offset    |                                                         |          |   00 03  | 0000 00aa | (reserve) <*>                                     |
|   Address |                     Description                         |          ----------+-----------+-------------------------------------------------
----------+-----------+-----------------------------------------------        # |   00 04  | 0000 aaaa |                                                   |
|   00 00  | 0aaa aaaa | Program Name 1                     (32 - 127)    |          |          | 0000 bbbb |                                                   |
|          |           |                        32 - 127 [ASCII]         |          |          | 0000 cccc |                                                   |
|   00 01  | 0aaa aaaa | Program Name 2                     (32 - 127)    |          |          | 0000 dddd | Reverb Parameter 1            (12768 - 52768)     |
|          |           |                        32 - 127 [ASCII]         |          |          |           |                               -20000 - +20000     |
|   00 02  | 0aaa aaaa | Program Name 3                     (32 - 127)    |        # |   00 08  | 0000 aaaa |                                                   |
|          |           |                        32 - 127 [ASCII]         |          |          | 0000 bbbb |                                                   |
|   00 03  | 0aaa aaaa | Program Name 4                     (32 - 127)    |          |          | 0000 cccc |                                                   |
|          |           |                        32 - 127 [ASCII]         |          |          | 0000 dddd | Reverb Parameter 2            (12768 - 52768)     |
|   00 04  | 0aaa aaaa | Program Name 5                     (32 - 127)    |          |          |           |                               -20000 - +20000     |
|          |           |                        32 - 127 [ASCII]         |        # |   00 0C  | 0000 aaaa |                                                   |
|   00 05  | 0aaa aaaa | Program Name 6                     (32 - 127)    |          |          | 0000 bbbb |                                                   |
|          |           |                        32 - 127 [ASCII]         |          |          | 0000 cccc |                                                   |
|   00 06  | 0aaa aaaa | Program Name 7                     (32 - 127)    |          |          | 0000 dddd | Reverb Parameter 3            (12768 - 52768)     |
|          |           |                        32 - 127 [ASCII]         |          |          |           |                               -20000 - +20000     |
|   00 07  | 0aaa aaaa | Program Name 8                     (32 - 127)    |        # |   00 10  | 0000 aaaa |                                                   |
|          |           |                        32 - 127 [ASCII]         |          |          | 0000 bbbb |                                                   |
|   00 08  | 0aaa aaaa | Program Name 9                     (32 - 127)    |          |          | 0000 cccc |                                                   |
|          |           |                        32 - 127 [ASCII]         |          |          | 0000 dddd | Reverb Parameter 4            (12768 - 52768)     |
|   00 09  | 0aaa aaaa | Program Name 10                    (32 - 127)    |          |          |           |                               -20000 - +20000     |
|          |           |                        32 - 127 [ASCII]         |        # |   00 14  | 0000 aaaa |                                                   |
|   00 0A  | 0aaa aaaa | Program Name 11                    (32 - 127)    |          |          | 0000 bbbb |                                                   |
|          |           |                        32 - 127 [ASCII]         |          |          | 0000 cccc |                                                   |
|   00 0B  | 0aaa aaaa | Program Name 12                    (32 - 127)    |          |          | 0000 dddd | Reverb Parameter 5            (12768 - 52768)     |
|          |           |                        32 - 127 [ASCII]         |          |          |           |                               -20000 - +20000     |
----------+-----------+-----------------------------------------------        # |   00 18  | 0000 aaaa |                                                   |
|   00 0C  | 0aaa aaaa | Program Level                      (0 - 127)     |          |          | 0000 bbbb |                                                   |
----------+-----------+-----------------------------------------------          |          | 0000 cccc |                                                   |
|   00 0D  | 00aa aaaa | (reserve) <*>                                   |          |          | 0000 dddd | Reverb Parameter 6            (12768 - 52768)     |
|   00 0E  | 00aa aaaa | (reserve) <*>                                   |          |          |           |                               -20000 - +20000     |
|     :    |           |                                                 |        # |   00 1C  | 0000 aaaa |                                                   |
|   00 31  | 0000 000a | (reserve) <*>                                   |          |          | 0000 bbbb |                                                   |
----------+-----------+-----------------------------------------------          |          | 0000 cccc |                                                   |
|   00 32  | 0aaa aaaa | Tone Control 1 Source              (0 - 97)      |          |          | 0000 dddd | Reverb Parameter 7            (12768 - 52768)     |
|          |           |          OFF, CC01 - CC31, OFF, CC33 - CC95,     |          |          |           |                               -20000 - +20000     |
|          |           |                            BEND, AFT            |        # |   00 20  | 0000 aaaa |                                                   |
|   00 33  | 0aaa aaaa | Tone Control 2 Source              (0 - 97)      |          |          | 0000 bbbb |                                                   |
|          |           |          OFF, CC01 - CC31, OFF, CC33 - CC95,     |          |          | 0000 cccc |                                                   |
|          |           |                            BEND, AFT            |          |          | 0000 dddd | Reverb Parameter 8            (12768 - 52768)     |
|   00 34  | 0aaa aaaa | Tone Control 3 Source              (0 - 97)      |          |          |           |                               -20000 - +20000     |
|          |           |          OFF, CC01 - CC31, OFF, CC33 - CC95,     |        # |   00 24  | 0000 aaaa |                                                   |
|          |           |                            BEND, AFT            |          |          | 0000 bbbb |                                                   |
|   00 35  | 0aaa aaaa | Tone Control 4 Source              (0 - 97)      |          |          | 0000 cccc |                                                   |
|          |           |          OFF, CC01 - CC31, OFF, CC33 - CC95,     |          |          | 0000 dddd | Reverb Parameter 9            (12768 - 52768)     |
|          |           |                            BEND, AFT            |          |          |           |                               -20000 - +20000     |
----------+-----------+-----------------------------------------------        # |   00 28  | 0000 aaaa |                                                   |
|   00 36  | 000a aaaa | (reserve) <*>                                   |          |          | 0000 bbbb |                                                   |
|   00 37  | 0000 000a | (reserve) <*>                                   |          |          | 0000 cccc |                                                   |
|     :    |           |                                                 |          |          | 0000 dddd | Reverb Parameter 10           (12768 - 52768)     |
|   00 3E  | 0000 00aa | (reserve) <*>                                   |          |          |           |                               -20000 - +20000     |
|   00 3F  | 0000 000a | Efx Tempo Sync Switch              (0 - 1)      |        # |   00 2C  | 0000 aaaa |                                                   |
|          |           |                        OFF, ON                  |          |          | 0000 bbbb |                                                   |
|   00 40  | 0000 000a | (reserve) <*>                                   |          |          | 0000 cccc |                                                   |
|   00 41  | 0000 000a | (reserve) <*>                                   |          |          | 0000 dddd | Reverb Parameter 11           (12768 - 52768)     |
|     :    |           |                                                 |          |          |           |                               -20000 - +20000     |
|   00 51  | 0000 aaaa | (reserve) <*>                                   |        # |   00 30  | 0000 aaaa |                                                   |
----------+-----------+-----------------------------------------------          |          | 0000 bbbb |                                                   |
|   00 52  | 0aaa aaaa | Mic Level                          (0 - 127)     |          |          | 0000 cccc |                                                   |
|   00 53  | 0000 00aa | Mic Mode                           (0 - 3)       |          |          | 0000 dddd | Reverb Parameter 12           (12768 - 52768)     |
|          |           |          OFF, VOCODER, MOD, BYPASS               |          |          |           |                               -20000 - +20000     |
|   00 54  | 0aaa aaaa | Mic Modulation Sens                (1 - 127)     |        # |   00 34  | 0000 aaaa |                                                   |
|          |           |                        -63 - +63                |          |          | 0000 bbbb |                                                   |
|   00 55  | 0aaa aaaa | Mic Modulation Destination         (0 - 16)      |          |          | 0000 cccc |                                                   |
|          |           |          OFF, CUTOFF, RESO, AMP-LEV, X-MOD,       |          |          | 0000 dddd | Reverb Parameter 13           (12768 - 52768)     |
|          |           |                 PIT-OSC1, PIT-OSC2,              |          |          |           |                               -20000 - +20000     |
|          |           |                 PW-OSC1, PW-OSC2,                |        # |   00 38  | 0000 aaaa |                                                   |
|          |           |                 PIT-LFO1, PIT-LFO2,              |          |          | 0000 bbbb |                                                   |
|          |           |                 FLT-LFO1, FLT-LFO2,              |          |          | 0000 cccc |                                                   |
|          |           |                 AMP-LFO1, AMP-LFO2,              |          |          | 0000 dddd | Reverb Parameter 14           (12768 - 52768)     |
|          |           |                 LFO1-RATE, LFO2-RATE             |          |          |           |                               -20000 - +20000     |
|   00 56  | 0000 000a | Poly Stack Switch                  (0 - 1)       |        # |   00 3C  | 0000 aaaa |                                                   |
|          |           |                        OFF, ON                  |          |          | 0000 bbbb |                                                   |
|          |           |                                                 |          |          | 0000 cccc |                                                   |
```

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|       |       | 0000 dddd | Reverb Parameter 15 | (12768 - 52768) |
|       |       |           |                     | -20000 - +20000 |
| #     | 00 40 | 0000 aaaa |                     |                 |
|       |       | 0000 bbbb |                     |                 |
|       |       | 0000 cccc |                     |                 |
|       |       | 0000 dddd | Reverb Parameter 16 | (12768 - 52768) |
|       |       |           |                     | -20000 - +20000 |
| #     | 00 44 | 0000 aaaa |                     |                 |
|       |       | 0000 bbbb |                     |                 |
|       |       | 0000 cccc |                     |                 |
|       |       | 0000 dddd | Reverb Parameter 17 | (12768 - 52768) |
|       |       |           |                     | -20000 - +20000 |
| #     | 00 48 | 0000 aaaa |                     |                 |
|       |       | 0000 bbbb |                     |                 |
|       |       | 0000 cccc |                     |                 |
|       |       | 0000 dddd | Reverb Parameter 18 | (12768 - 52768) |
|       |       |           |                     | -20000 - +20000 |
| #     | 00 4C | 0000 aaaa |                     |                 |
|       |       | 0000 bbbb |                     |                 |
|       |       | 0000 cccc |                     |                 |
|       |       | 0000 dddd | Reverb Parameter 19 | (12768 - 52768) |
|       |       |           |                     | -20000 - +20000 |
| #     | 00 50 | 0000 aaaa |                     |                 |
|       |       | 0000 bbbb |                     |                 |
|       |       | 0000 cccc |                     |                 |
|       |       | 0000 dddd | Reverb Parameter 20 | (12768 - 52768) |
|       |       |           |                     | -20000 - +20000 |
| #     | 00 54 | 0000 aaaa |                     |                 |
|       |       | 0000 bbbb |                     |                 |
|       |       | 0000 cccc |                     |                 |
|       |       | 0000 dddd | Reverb Parameter 21 | (12768 - 52768) |
|       |       |           |                     | -20000 - +20000 |
| #     | 00 58 | 0000 aaaa |                     |                 |
|       |       | 0000 bbbb |                     |                 |
|       |       | 0000 cccc |                     |                 |
|       |       | 0000 dddd | Reverb Parameter 22 | (12768 - 52768) |
|       |       |           |                     | -20000 - +20000 |
| #     | 00 5C | 0000 aaaa |                     |                 |
|       |       | 0000 bbbb |                     |                 |
|       |       | 0000 cccc |                     |                 |
|       |       | 0000 dddd | Reverb Parameter 23 | (12768 - 52768) |
|       |       |           |                     | -20000 - +20000 |
| #     | 00 60 | 0000 aaaa |                     |                 |
|       |       | 0000 bbbb |                     |                 |
|       |       | 0000 cccc |                     |                 |
|       |       | 0000 dddd | Reverb Parameter 24 | (12768 - 52768) |
|       |       |           |                     | -20000 - +20000 |

| 00 00 00 64 | Total Size |
```

* Program Delay

```
| Offset  |           |                     |                 |
| Address |           | Description         |                 |
|---------|-----------|---------------------|-----------------|
|   00 00 | 0000 000a | Delay Switch        | (0 - 1)         |
|         |           |                     | OFF, ON         |
|   00 01 | 0000 aaaa | (reserve) <*>       |                 |
|   00 02 | 0aaa aaaa | Delay Level         | (0 - 127)       |
|   00 03 | 0000 00aa | (reserve) <*>       |                 |
```
```
| #     | 00 04 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 1  | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 08 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 2  | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 0C | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 3  | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 10 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 4  | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 14 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 5  | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 18 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 6  | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 1C | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 7  | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 20 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 8  | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 24 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 9  | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 28 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 10 | (12768 - 52768) |
```

Right column:

```
| #     | 00 2C |           |                    | -20000 - +20000 |
|       |       | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 11 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 30 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 12 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 34 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 13 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 38 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 14 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 3C | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 15 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 40 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 16 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 44 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 17 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 48 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 18 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 4C | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 19 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 50 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 20 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 54 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 21 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 58 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 22 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 5C | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 23 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 60 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 24 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 64 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 25 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 68 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 26 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 6C | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 27 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 70 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 28 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 74 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 29 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |
| #     | 00 78 | 0000 aaaa |                    |                 |
|       |       | 0000 bbbb |                    |                 |
|       |       | 0000 cccc |                    |                 |
|       |       | 0000 dddd | Delay Parameter 30 | (12768 - 52768) |
|       |       |           |                    | -20000 - +20000 |

| 00 00 00 7C | Total Size |
```

* Program Vocoder

```
| Offset  |           |                     |                 |
| Address |           | Description         |                 |
|---------|-----------|---------------------|-----------------|
|   00 00 | 0000 000a | Vocoder Switch      | (0 - 1)         |
```

```
|        | 00 01  | 0000 aaaa |                                      OFF, ON
|        | 00 02  | 0aaa aaaa | (reserve) <*>
|        | 00 03  | 0aaa aaaa | (reserve) <*>
|        | 00 04  | 0aaa aaaa | Vocoder Reverb Send Level       (0 - 127)
|        | 00 05  | 0000 00aa | (reserve) <*>
|        | 00 06  | 0000 00aa | (reserve) <*>
+--------+--------+-----------+
| #      | 00 07  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | Vocoder Parameter 1            (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 0B  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | Vocoder Parameter 2            (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 0F  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | Vocoder Parameter 3            (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 13  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | Vocoder Parameter 4            (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 17  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | Vocoder Parameter 5            (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 1B  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | Vocoder Parameter 6            (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 1F  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | Vocoder Parameter 7            (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 23  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | Vocoder Parameter 8            (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 27  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | Vocoder Parameter 9            (12768 - 52768)
|        |        |           |                                -20000 - +20000
+--------+--------+-----------+
| 00 00 00 2B | Total Size
+-------------+
```

* Program TFX

```
+--------+--------+-----------+
| Offset                      |
|   Address        |                  Description
+--------+--------+-----------+
|        | 00 00  | 0000 000a | TFX Switch                      (0 - 1)
|        |        |           |                                 OFF, ON
|        | 00 01  | 000a aaaa | TFX Type                        (0 - 29)
|        | 00 02  | 0000 0aaa | TFX Headmargin                  (0 - 6)
|        |        |           |       -18dB, -15dB, -12dB, -9dB, -6dB, -3dB, 0dB
+--------+--------+-----------+
|        | 00 03  | 0000 aaaa | (reserve) <*>
|        | 00 04  | 0aaa aaaa | (reserve) <*>
|        |  :     |           |
|        | 00 06  | 0aaa aaaa | (reserve) <*>
+--------+--------+-----------+
| #      | 00 07  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | TFX Parameter 1                (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 0B  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | TFX Parameter 2                (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 0F  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | TFX Parameter 3                (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 13  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | TFX Parameter 4                (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 17  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | TFX Parameter 5                (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 1B  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | TFX Parameter 6                (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 1F  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
|        |        | 0000 dddd | TFX Parameter 7                (12768 - 52768)
|        |        |           |                                -20000 - +20000
| #      | 00 23  | 0000 aaaa |
|        |        | 0000 bbbb |
|        |        | 0000 cccc |
```

```
|        |        | 0000 dddd | TFX Parameter 8                (12768 - 52768)
|        |        |           |                                -20000 - +20000
+-------------+
| 00 00 00 27 | Total Size
+-------------+
```

* Program Part

```
+--------+--------+-----------+
| Offset                      |
|   Address        |                  Description
+--------+--------+-----------+
|        | 00 00  | 0000 aaaa | Receive Channel                 (0 - 15)
|        |        |           |                                 1 - 16
|        | 00 01  | 0000 000a | (reserve) <*>
|        | 00 02  | 0000 000a | (reserve) <*>
|        |  :     |           |
|        | 00 08  | 0aaa aaaa | (reserve) <*>
+--------+--------+-----------+
|        | 00 09  | 0aaa aaaa | Part Level (CC# 7)              (0 - 127)
|        | 00 0A  | 0aaa aaaa | Part Pan (CC# 10)               (0 - 127)
|        |        |           |                                 L64 - 63R
|        | 00 0B  | 0aaa aaaa | Part Coarse Tune (RPN# 2)       (16 - 112)
|        |        |           |                                 -48 - +48
|        | 00 0C  | 0aaa aaaa | Part Fine Tune (RPN# 1)         (14 - 114)
|        |        |           |                                 -50 - +50
|        | 00 0D  | 0000 00aa | (reserve) <*>
|        | 00 0E  | 0000 00aa | Part Legato Switch (CC# 68)     (0 - 2)
|        |        |           |                                 OFF, ON, TONE
|        | 00 0F  | 000a aaaa | Part Pitch Bend Range (RPN# 0)  (0 - 25)
|        |        |           |                                 0 - 24, TONE
|        | 00 10  | 0000 00aa | Part Portamento Switch (CC# 65) (0 - 2)
|        |        |           |                                 OFF, ON, TONE
| #      | 00 11  | 0000 aaaa |
|        |        | 0000 bbbb | Part Portamento Time            (0 - 128)
|        |        |           |                                 0 - 127, TONE
|        | 00 13  | 0aaa aaaa | Part Cutoff Offset (CC# 74)     (0 - 127)
|        |        |           |                                 -64 - +63
|        | 00 14  | 0aaa aaaa | Part Resonance Offset (CC# 71)  (0 - 127)
|        |        |           |                                 -64 - +63
|        | 00 15  | 0aaa aaaa | Part Attack Time Offset (CC# 73)(0 - 127)
|        |        |           |                                 -64 - +63
|        | 00 16  | 0aaa aaaa | Part Decay Time Offset (CC# 75) (0 - 127)
|        |        |           |                                 -64 - +63
|        | 00 17  | 0aaa aaaa | Part Release Time Offset (CC# 72)(0 - 127)
|        |        |           |                                 -64 - +63
|        | 00 18  | 0aaa aaaa | Part Vibrato Rate (CC# 76)      (0 - 127)
|        |        |           |                                 -64 - +63
|        | 00 19  | 0aaa aaaa | Part Vibrato Depth (CC# 77)     (0 - 127)
|        |        |           |                                 -64 - +63
|        | 00 1A  | 0aaa aaaa | Part Vibrato Delay (CC# 78)     (0 - 127)
|        |        |           |                                 -64 - +63
+--------+--------+-----------+
|        | 00 1B  | 0000 0aaa | Part Octave Shift               (61 - 67)
|        |        |           |                                 -3 - +3
|        | 00 1C  | 0aaa aaaa | Part Velocity Sens Offset       (1 - 127)
|        |        |           |                                 -63 - +63
|        | 00 1D  | 0aaa aaaa | (reserve) <*>
|        | 00 1E  | 0aaa aaaa | (reserve) <*>
|        | 00 1F  | 0aaa aaaa | Keyboard Fade Width Lower
|        |        |           |                                 0 - 127
|        | 00 20  | 0aaa aaaa | Keyboard Fade Width Upper
|        |        |           |                                 0 - 127
|        | 00 21  | 0aaa aaaa | Velocity Range Lower            (1 - 127)
|        |        |           |                                 1 - UPPER
|        | 00 22  | 0aaa aaaa | Velocity Range Upper            (0 - 127)
|        |        |           |                                 LOWER - 127
|        | 00 23  | 0aaa aaaa | Velocity Fade Width Lower       (0 - 127)
|        | 00 24  | 0aaa aaaa | Velocity Fade Width Upper       (0 - 127)
|        | 00 25  | 0000 000a | Mute Switch                     (0 - 1)
|        |        |           |                                 OFF, MUTE
+--------+--------+-----------+
|        | 00 26  | 0aaa aaaa | (reserve) <*>
|        | 00 27  | 0aaa aaaa | (reserve) <*>
|        |  :     |           |
|        | 00 29  | 0000 0aaa | (reserve) <*>
+--------+--------+-----------+
|        | 00 2A  | 0000 000a | Part Select                     (0 - 1)
|        |        |           |                                 OFF, ON
|        | 00 2B  | 0000 000a | Part Vocoder Send Switch        (0 - 1)
|        |        |           |                                 OFF, ON
|        | 00 2C  | 0000 00aa | (reserve) <*>
+--------+--------+-----------+
|        | 00 2D  | 0aaa aaaa | (reserve) <*>
|        | 00 2E  | 0aaa aaaa | (reserve) <*>
|        | 00 2F  | 0aaa aaaa | Part Reverb Send Level (CC# 91) (0 - 127)
|        | 00 30  | 0000 000a | (reserve) <*>
|        | 00 31  | 0000 00aa | (reserve) <*>
+--------+--------+-----------+
|        | 00 32  | 0aaa aaaa | Part Scale Tune Type            (0 - 8)
|        |        |           |        CUSTOM, EQUAL, JUST-MAJ, JUST-MIN,
|        |        |           |        PYTHAGORE, KIRNBERGE, MEANTONE,
|        |        |           |                     WERCKMEIS, ARABIC
|        | 00 33  | 0aaa aaaa | Part Scale Tune Key             (0 - 11)
|        |        |           |        C, C#, D, D#, E, F, F#, G, G#,
|        |        |           |                             A, A#, B
|        | 00 34  | 0aaa aaaa | Part Scale Tune for C           (0 - 127)
|        |        |           |                                 -64 - +63
|        | 00 35  | 0aaa aaaa | Part Scale Tune for C#          (0 - 127)
|        |        |           |                                 -64 - +63
|        | 00 36  | 0aaa aaaa | Part Scale Tune for D           (0 - 127)
|        |        |           |                                 -64 - +63
|        | 00 37  | 0aaa aaaa | Part Scale Tune for D#          (0 - 127)
|        |        |           |                                 -64 - +63
|        | 00 38  | 0aaa aaaa | Part Scale Tune for E           (0 - 127)
|        |        |           |                                 -64 - +63
|        | 00 39  | 0aaa aaaa | Part Scale Tune for F           (0 - 127)
|        |        |           |                                 -64 - +63
|        | 00 3A  | 0aaa aaaa | Part Scale Tune for F#          (0 - 127)
|        |        |           |                                 -64 - +63
|        | 00 3B  | 0aaa aaaa | Part Scale Tune for G           (0 - 127)
|        |        |           |                                 -64 - +63
```

	Offset Address		Description	
	00 3C	0aaa aaaa	Part Scale Tune for G#	(0 - 127) -64 - +63
	00 3D	0aaa aaaa	Part Scale Tune for A	(0 - 127) -64 - +63
	00 3E	0aaa aaaa	Part Scale Tune for A#	(0 - 127) -64 - +63
	00 3F	0aaa aaaa	Part Scale Tune for B	(0 - 127) -64 - +63
	00 40	0000 000a	(reserve) <*>	
	00 41	0000 000a	(reserve) <*>	
	00 42	0000 000a	Receive Pitch Bend	(0 - 1) OFF, ON
	00 43	0000 000a	Receive Polyphonic Key Pressure	(0 - 1) OFF, ON
	00 44	0000 000a	Receive Channel Pressure	(0 - 1) OFF, ON
	00 45	0000 000a	Receive Modulation	(0 - 1) OFF, ON
	00 46	0000 000a	Receive Volume	(0 - 1) OFF, ON
	00 47	0000 000a	Receive Pan	(0 - 1) OFF, ON
	00 48	0000 000a	Receive Expression	(0 - 1) OFF, ON
	00 49	0000 000a	Receive Hold-1	(0 - 1) OFF, ON
	00 4A	0000 0aaa	(reserve) <*>	
	00 4B	0aaa aaaa	(reserve) <*>	
	:			
	00 4E	0aaa aaaa	(reserve) <*>	
00 00 00 4F	Total Size			

* Program Part EQ

Offset Address		Description	
00 00	0000 000a	EQ Switch	(0 - 1) OFF, ON
00 01	000a aaaa	EQ Low Freq	(0 - 17) 16,20,25,31,40, 50,63,80,100,125, 160,200,250,315,400, 500,630,800 [Hz]
00 02	000a aaaa	EQ Low Gain	(0 - 30) -15 - +15 [dB]
00 03	000a aaaa	EQ Mid Freq	(0 - 30) 16,20,25,31,40, 50,63,80,100,125, 160,200,250,315,400, 500,630,800,1000,1250, 1600,2000,2500,3150,4000, 5000,6300,8000,10000,12500, 16000,[Hz]
00 04	000a aaaa	EQ Mid Gain	(0 - 30) -15 - +15 [dB]
00 05	0000 0aaa	EQ Mid Q	(0 - 4) 0.5, 1.0, 2.0, 4.0, 8.0
00 06	0000 aaaa	EQ High Freq	(0 - 14) 630,800,1000,1250,1600, 2000,2500,3150,4000,5000, 6300,8000,10000,12500,16000 [Hz]
00 07	000a aaaa	EQ High Gain	(0 - 30) -15 - +15 [dB]
00 00 00 08	Total Size		

* Program Zone

	Offset Address		Description	
	00 00	0aaa aaaa	Keyboard Range Lower	(0 - 127) C-1 - UPPER
	00 01	0aaa aaaa	Keyboard Range Upper	(0 - 127) LOWER - G9
	00 02	0000 000a	Keyboard Switch	(0 - 1) OFF, ON
	00 03	0000 000a	Arpeggio Switch	(0 - 1) OFF, ON
	00 04	0000 000a	Control Bender	(0 - 1) OFF, ON
	00 05	0000 000a	Control Aftertouch	(0 - 1) OFF, ON
	00 06	0000 000a	Control Modulation	(0 - 1) OFF, ON
	00 07	0000 000a	Control Hold Pedal	(0 - 1) OFF, ON
	00 08	0000 000a	Control Pedal 1	(0 - 1) OFF, ON
	00 09	0000 000a	Control Pedal 2	(0 - 1) OFF, ON
	00 0A	0000 000a	Control Wheel 1	(0 - 1) OFF, ON
	00 0B	0000 000a	Control Wheel 2	(0 - 1) OFF, ON
#	00 0C	0000 aaaa 0000 bbbb	(reserve) <*>	
	00 0E	0aaa aaaa	(reserve) <*>	
	:			
	00 20	0aaa aaaa	(reserve) <*>	
00 00 00 21	Total Size			

* Program Controller

	Offset Address		Description	
	00 00	0aaa aaaa	Pedal 1 Assign	(0 - 116) OFF, CC01 - CC31, OFF, CC33 - CC95, CC102 - CC119, BEND-DOWN, BEND-UP, AFT
	00 01	0000 0aaa	Pedal 1 Destination	(0 - 1) PART-Select, PART-On
	00 02	0aaa aaaa	Pedal 2 Assign	(0 - 116) OFF, CC01 - CC31, OFF, CC33 - CC95, CC102 - CC119, BEND-DOWN, BEND-UP, AFT
	00 03	0000 0aaa	Pedal 2 Destination	(0 - 1) PART-Select, PART-On
	00 04	0aaa aaaa	Wheel 1 Assign	(0 - 117) OFF, CC01 - CC31, OFF, CC33 - CC95, CC102 - CC119, BEND, BEND-DOWN, BEND-UP, AFT
	00 05	0000 0aaa	Wheel 1 Destination	(0 - 1) PART-Select, PART-On
	00 06	0aaa aaaa	Wheel 2 Assign	(0 - 117) OFF, CC01 - CC31, OFF, CC33 - CC95, CC102 - CC119, BEND, BEND-DOWN, BEND-UP, AFT
	00 07	0000 0aaa	Wheel 2 Destination	(0 - 1) PART-Select, PART-On
	00 08	0000 000a	Arpeggio Switch	(0 - 1) OFF, ON
	00 09	0000 000a	Arpeggio Hold	(0 - 1) OFF, ON
	00 0A	0000 000a	(reserve) <*>	
	00 0B	0000 000a	(reserve) <*>	
	:			
	00 13	0aaa aaaa	(reserve) <*>	
00 00 00 14	Total Size			

* Program Arpeggio Common

	Offset Address		Description	
	00 00	0aaa aaaa	Arpeggio Grid	(0 - 8) 04_, 08_, 08L, 08H, 08t, 16_, 16L, 16H, 16t
	00 01	0aaa aaaa	Arpeggio Duration	(0 - 9) 30, 40, 50, 60, 70, 80, 90, 100, 120, FUL
	00 02	0aaa aaaa	Arpeggio Motif	(0 - 11) UP/L, UP/L&H, UP/_, DOWN/L, DOWN/L&H, DOWN/_, UP&DOWN/L, UP&DOWN/L&H, UP&DOWN/_, RANDOM/L, RANDOM/_, PHRASE
	00 03	0000 0aaa	Arpeggio Octave Range	(61 - 67) -3 - +3
	00 04	0aaa aaaa	Arpeggio Accent Rate	(0 - 100)
	00 05	0aaa aaaa	Arpeggio Velocity	(0 - 127) REAL, 1 - 127
#	00 06	0000 aaaa 0000 bbbb	End Step	(1 - 32)
00 00 00 08	Total Size			

* Program Arpeggio Pattern

	Offset Address		Description	
#	00 00	0000 aaaa 0000 bbbb	Original Note	(0 - 128)
#	00 02	0000 aaaa 0000 bbbb	Step1 Data	(0 - 128)
#	00 04	0000 aaaa 0000 bbbb	Step2 Data	(0 - 128)
#	00 06	0000 aaaa 0000 bbbb	Step3 Data	(0 - 128)
#	00 08	0000 aaaa 0000 bbbb	Step4 Data	(0 - 128)
#	00 0A	0000 aaaa 0000 bbbb	Step5 Data	(0 - 128)
#	00 0C	0000 aaaa 0000 bbbb	Step6 Data	(0 - 128)
#	00 0E	0000 aaaa 0000 bbbb	Step7 Data	(0 - 128)
#	00 10	0000 aaaa 0000 bbbb	Step8 Data	(0 - 128)
#	00 12	0000 aaaa 0000 bbbb	Step9 Data	(0 - 128)
#	00 14	0000 aaaa 0000 bbbb	Step10 Data	(0 - 128)
#	00 16	0000 aaaa 0000 bbbb	Step11 Data	(0 - 128)
#	00 18	0000 aaaa 0000 bbbb	Step12 Data	(0 - 128)
#	00 1A	0000 aaaa 0000 bbbb	Step13 Data	(0 - 128)
#	00 1C	0000 aaaa 0000 bbbb	Step14 Data	(0 - 128)
#	00 1E	0000 aaaa 0000 bbbb	Step15 Data	(0 - 128)

```
+------+-------+-----------+------------------------------------------+
| #    | 00 20 | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step16 Data                    (0 - 128) |
| #    | 00 22 | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step17 Data                    (0 - 128) |
| #    | 00 24 | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step18 Data                    (0 - 128) |
| #    | 00 26 | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step19 Data                    (0 - 128) |
| #    | 00 28 | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step20 Data                    (0 - 128) |
| #    | 00 2A | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step21 Data                    (0 - 128) |
| #    | 00 2C | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step22 Data                    (0 - 128) |
| #    | 00 2E | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step23 Data                    (0 - 128) |
| #    | 00 30 | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step24 Data                    (0 - 128) |
| #    | 00 32 | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step25 Data                    (0 - 128) |
| #    | 00 34 | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step26 Data                    (0 - 128) |
| #    | 00 36 | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step27 Data                    (0 - 128) |
| #    | 00 38 | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step28 Data                    (0 - 128) |
| #    | 00 3A | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step29 Data                    (0 - 128) |
| #    | 00 3C | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step30 Data                    (0 - 128) |
| #    | 00 3E | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step31 Data                    (0 - 128) |
| #    | 00 40 | 0000 aaaa |                                          |
|      |       | 0000 bbbb | Step32 Data                    (0 - 128) |
+------+-------+-----------+------------------------------------------+
| 00 00 00 42 | Total Size                                           |
+-------------+----------------------------------------------------+
```

* Program MIDI Controller

```
+-----------------------------------------------------------------+
| Offset                                                          |
|   Address  |            Description                             |
|------------+----------------------------------------------------|
|   00 00    | 0aaa aaaa | Knob Assign                 (0 - 127)  |
|            |           |          CC01 - CC31, CC33 - CC127     |
|   00 01    | 0aaa aaaa | (reserve) <*>                          |
|   00 02    | 0aaa aaaa | (reserve) <*>                          |
|     :      |           |                                        |
|   00 04    | 0aaa aaaa | (reserve) <*>                          |
|------------+----------------------------------------------------|
| 00 00 00 05 | Total Size                                        |
+-----------------------------------------------------------------+
```

* Program Trigger

```
+-----------------------------------------------------------------+
| Offset                                                          |
|   Address  |            Description                             |
|------------+----------------------------------------------------|
|   00 00    | 0000 aaaa | Assign                        (0 - 5)  |
|            |           | NOTE, CC, BEND-DOWN, BEND-UP, AFT, PC+BS |
|   00 01    | 0000 000a | Trigger Type                  (0 - 1)  |
|            |           |                    MOMENTARY, LATCH    |
|   00 02    | 0000 000a | (reserve) <*>                          |
| # 00 03    | 0000 aaaa |                                        |
|            | 0000 bbbb | Bank Select MSB (CC# 0)     (0 - 128)  |
|            |           |                       0 - 127, OFF     |
|   00 05    | 0aaa aaaa | Bank Select LSB (CC# 32)    (0 - 127)  |
|   00 06    | 0aaa aaaa | Program Number (PC)         (0 - 127)  |
|   00 07    | 0aaa aaaa | Note Number                 (0 - 127)  |
|   00 08    | 0aaa aaaa | Note Velocity               (1 - 127)  |
|   00 09    | 0aaa aaaa | CC Number                   (0 - 125)  |
|            |           |       CC01 - CC31, CC33 - CC127,       |
|   00 0A    | 0aaa aaaa | On Value                    (0 - 127)  |
|   00 0B    | 0aaa aaaa | Off Value                   (0 - 127)  |
|------------+----------------------------------------------------|
|   00 0C    | 0aaa aaaa | (reserve) <*>                          |
|   00 0D    | 0aaa aaaa | (reserve) <*>                          |
|     :      |           |                                        |
|   00 0F    | 0aaa aaaa | (reserve) <*>                          |
|------------+----------------------------------------------------|
| 00 00 00 10 | Total Size                                        |
+-----------------------------------------------------------------+
```

* SuperNATURAL Synth Tone Common

```
+-----------------------------------------------------------------+
| Offset                                                          |
|   Address  |            Description                             |
|------------+----------------------------------------------------|
|   00 00    | 0aaa aaaa | Tone Name 1                 (32 - 127) |
|            |           |                       32 - 127 [ASCII] |
|   00 01    | 0aaa aaaa | Tone Name 2                 (32 - 127) |
|            |           |                       32 - 127 [ASCII] |
|   00 02    | 0aaa aaaa | Tone Name 3                 (32 - 127) |
|            |           |                       32 - 127 [ASCII] |
|   00 03    | 0aaa aaaa | Tone Name 4                 (32 - 127) |
|            |           |                       32 - 127 [ASCII] |
|   00 04    | 0aaa aaaa | Tone Name 5                 (32 - 127) |
|            |           |                       32 - 127 [ASCII] |
|   00 05    | 0aaa aaaa | Tone Name 6                 (32 - 127) |
|            |           |                       32 - 127 [ASCII] |
|   00 06    | 0aaa aaaa | Tone Name 7                 (32 - 127) |
|            |           |                       32 - 127 [ASCII] |
|   00 07    | 0aaa aaaa | Tone Name 8                 (32 - 127) |
|            |           |                       32 - 127 [ASCII] |
|   00 08    | 0aaa aaaa | Tone Name 9                 (32 - 127) |
|            |           |                       32 - 127 [ASCII] |
|   00 09    | 0aaa aaaa | Tone Name 10                (32 - 127) |
|            |           |                       32 - 127 [ASCII] |
|   00 0A    | 0aaa aaaa | Tone Name 11                (32 - 127) |
|            |           |                       32 - 127 [ASCII] |
+-----------------------------------------------------------------+
```

```
+-----------------------------------------------------------------+
|   00 0B    | 0aaa aaaa | Tone Name 12                (32 - 127) |
|            |           |                       32 - 127 [ASCII] |
|------------+----------------------------------------------------|
|   00 0C    | 0aaa aaaa | Tone Level                   (0 - 127) |
|------------+----------------------------------------------------|
| # 00 0D    | 0000 aaaa |                                        |
|            | 0000 bbbb |                                        |
|            | 0000 cccc | (reserve) <*>                          |
|   00 10    | 0000 000a | (reserve) <*>                          |
|   00 11    | 0000 000a | (reserve) <*>                          |
|------------+----------------------------------------------------|
|   00 12    | 0000 000a | Portamento Switch              (0 - 1) |
|            |           |                             OFF, ON    |
|   00 13    | 0aaa aaaa | Portamento Time (CC# 5)      (0 - 127) |
|   00 14    | 0000 00aa | Mono Switch                    (0 - 1) |
|            |           |                             OFF, ON    |
|   00 15    | 0000 0aaa | Octave Shift                (61 - 67)  |
|            |           |                             -3 - +3    |
|   00 16    | 000a aaaa | Pitch Bend Range Up         (0 - 24)   |
|   00 17    | 000a aaaa | Pitch Bend Range Down       (0 - 24)   |
|   00 18    | 0000 0aaa | Bend Mode                      (0 - 1) |
|            |           |              NORMAL, CATCH+LAST        |
|------------+----------------------------------------------------|
|   00 19    | 0000 000a | Partial1 Switch                (0 - 1) |
|            |           |                             OFF, ON    |
|   00 1A    | 0000 000a | Partial1 Select                (0 - 1) |
|            |           |                             OFF, ON    |
|   00 1B    | 0000 000a | Partial2 Switch                (0 - 1) |
|            |           |                             OFF, ON    |
|   00 1C    | 0000 000a | Partial2 Select                (0 - 1) |
|            |           |                             OFF, ON    |
|   00 1D    | 0000 000a | Partial3 Switch                (0 - 1) |
|            |           |                             OFF, ON    |
|   00 1E    | 0000 000a | Partial3 Select                (0 - 1) |
|            |           |                             OFF, ON    |
|------------+----------------------------------------------------|
|   00 1F    | 0000 00aa | RING Switch                    (0 - 2) |
|            |           |                        OFF, ---, ON    |
|------------+----------------------------------------------------|
|   00 20    | 0000 000a | Tone MFX Switch                (0 - 1) |
|            |           |                             OFF, ON    |
|   00 21    | 0000 00aa | (reserve) <*>                          |
|   00 22    | 0000 000a | (reserve) <*>                          |
|     :      |           |                                        |
|   00 2D    | 0000 000a | (reserve) <*>                          |
|------------+----------------------------------------------------|
|   00 2E    | 0000 000a | Unison Switch                  (0 - 1) |
|            |           |                             OFF, ON    |
|   00 2F    | 0000 000a | (reserve) <*>                          |
|   00 30    | 0000 000a | (reserve) <*>                          |
|   00 31    | 0000 000a | Portamento Mode                (0 - 1) |
|            |           |                      NORMAL, LEGATO    |
|   00 32    | 0000 000a | Legato Switch                  (0 - 1) |
|            |           |                             OFF, ON    |
|   00 33    | 0000 000a | (reserve) <*>                          |
|   00 34    | 0aaa aaaa | Analog Feel                  (0 - 127) |
|   00 35    | 0aaa aaaa | Wave Shape                   (0 - 127) |
|   00 36    | 0aaa aaaa | Tone Category                (0 - 127) |
| # 00 37    | 0000 aaaa |                                        |
|            | 0000 bbbb |                                        |
|            | 0000 cccc |                                        |
|            | 0000 dddd | (reserve) <*>                          |
|   00 3B    | 0000 0aaa | (reserve) <*>                          |
|   00 3C    | 0000 00aa | Unison Size                    (0 - 3) |
|            |           |                         2, 4, 6, 8     |
|   00 3D    | 0aaa aaaa | (reserve) <*>                          |
|   00 3E    | 0aaa aaaa | (reserve) <*>                          |
|   00 3F    | 0aaa aaaa | (reserve) <*>                          |
|------------+----------------------------------------------------|
| 00 00 00 40 | Total Size                                        |
+-----------------------------------------------------------------+
```

* SuperNATURAL Synth Tone Common MFX

```
+-----------------------------------------------------------------+
| Offset                                                          |
|   Address  |            Description                             |
|------------+----------------------------------------------------|
|   00 00    | 0aaa aaaa | MFX Type                    (0 - 67)   |
|   00 01    | 0aaa aaaa | (reserve) <*>                          |
|   00 02    | 0aaa aaaa | (reserve) <*>                          |
|     :      |           |                                        |
|   00 04    | 0000 00aa | (reserve) <*>                          |
|------------+----------------------------------------------------|
|   00 05    | 0aaa aaaa | MFX Control 1 Source        (0 - 101)  |
|            |           |      OFF, CC01 - CC31, OFF, CC33 - CC95,|
|            |           |            BEND, AFT, SYS1 - SYS4      |
|   00 06    | 0aaa aaaa | MFX Control 1 Sens          (1 - 127)  |
|            |           |                            -63 - +63   |
|   00 07    | 0aaa aaaa | MFX Control 2 Source        (0 - 101)  |
|            |           |      OFF, CC01 - CC31, OFF, CC33 - CC95,|
|            |           |            BEND, AFT, SYS1 - SYS4      |
|   00 08    | 0aaa aaaa | MFX Control 2 Sens          (1 - 127)  |
|            |           |                            -63 - +63   |
|   00 09    | 0aaa aaaa | MFX Control 3 Source        (0 - 101)  |
|            |           |      OFF, CC01 - CC31, OFF, CC33 - CC95,|
|            |           |            BEND, AFT, SYS1 - SYS4      |
|   00 0A    | 0aaa aaaa | MFX Control 3 Sens          (1 - 127)  |
|            |           |                            -63 - +63   |
|   00 0B    | 0aaa aaaa | MFX Control 4 Source        (0 - 101)  |
|            |           |      OFF, CC01 - CC31, OFF, CC33 - CC95,|
|            |           |            BEND, AFT, SYS1 - SYS4      |
|   00 0C    | 0aaa aaaa | MFX Control 4 Sens          (1 - 127)  |
|            |           |                            -63 - +63   |
|------------+----------------------------------------------------|
|   00 0D    | 000a aaaa | MFX Control Assign 1        (0 - 16)   |
|            |           |                          OFF, 1 - 16   |
|   00 0E    | 000a aaaa | MFX Control Assign 2        (0 - 16)   |
|            |           |                          OFF, 1 - 16   |
|   00 0F    | 000a aaaa | MFX Control Assign 3        (0 - 16)   |
|            |           |                          OFF, 1 - 16   |
|   00 10    | 000a aaaa | MFX Control Assign 4        (0 - 16)   |
+-----------------------------------------------------------------+
```

```
# | 00 11 | 0000 aaaa |                                          OFF, 1 - 16
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 1               (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 15 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 2               (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 19 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 3               (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 1D | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 4               (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 21 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 5               (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 25 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 6               (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 29 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 7               (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 2D | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 8               (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 31 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 9               (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 35 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 10              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 39 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 11              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 3D | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 12              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 41 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 13              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 45 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 14              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 49 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 15              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 4D | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 16              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 51 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 17              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 55 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 18              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 59 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 19              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 5D | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 20              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 61 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 21              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 65 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 22              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 69 | 0000 aaaa |
```

```
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 23              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 6D | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 24              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 71 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 25              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 75 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 26              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 79 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 27              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 00 7D | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 28              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 01 01 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 29              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 01 05 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 30              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 01 09 | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 31              (12768 - 52768)
  |       |           |                               -20000 - +20000
# | 01 0D | 0000 aaaa |
  |       | 0000 bbbb |
  |       | 0000 cccc |
  |       | 0000 dddd | MFX Parameter 32              (12768 - 52768)
  |       |           |                               -20000 - +20000
+------------+----------+
| 00 00 01 11 | Total Size
+-------------+---------------------------------------------------+
```

* SuperNATURAL Synth Tone Modify

```
+-----------+----------+---------------------------------------------------+
| Offset    |          |                                                   |
|   Address |          |          Description                              |
+-----------+----------+---------------------------------------------------+
|   00 00   | 0aaa aaaa | (reserve) <*>                                    |
+-----------+----------+---------------------------------------------------+
|   00 01   | 0aaa aaaa | Attack Time Interval Sens            (0 - 127)   |
|   00 02   | 0aaa aaaa | Release Time Interval Sens           (0 - 127)   |
|   00 03   | 0aaa aaaa | Portamento Time Interval Sens        (0 - 127)   |
|   00 04   | 0000 00aa | Envelope Loop Mode                   (0 - 2)     |
|           |           |             OFF, FREE-RUN, TEMPO-SYNC            |
|   00 05   | 000a aaaa | Envelope Loop Sync Note              (0 - 19)    |
|           |           |          16, 12, 8, 4, 2, 1, 3/4, 2/3, 1/2,     |
|           |           |          3/8, 1/3, 1/4, 3/16, 1/6, 1/8, 3/32,   |
|           |           |                  1/12, 1/16, 1/24, 1/32         |
|   00 06   | 0000 000a | Chromatic Portamento                 (0 - 1)     |
|           |           |                                  OFF, ON        |
|   00 07   | 0aaa aaaa | (reserve) <*>                                    |
|   00 08   | 0aaa aaaa | (reserve) <*>                                    |
|     :     |           |                                                  |
|   00 24   | 0aaa aaaa | (reserve) <*>                                    |
+-----------+----------+---------------------------------------------------+
| 00 00 00 25 | Total Size                                               |
+-------------+-------------------------------------------------------------+
```

* SuperNATURAL Synth Tone Partial

```
+-----------+----------+---------------------------------------------------+
| Offset    |          |                                                   |
|   Address |          |          Description                              |
+-----------+----------+---------------------------------------------------+
|   00 00   | 0000 0aaa | OSC Wave                             (0 - 7)     |
|           |           |       SAW, SQR, PW-SQR, TRI, SINE,               |
|           |           |       NOISE, SUPER-SAW, PCM                      |
|   00 01   | 00aa aaaa | OSC Wave Variation                   (0 - 2)     |
|           |           |                                  A, B, C        |
|   00 02   | 0000 00aa | (reserve) <*>                                    |
|   00 03   | 00aa aaaa | OSC Pitch                            (40 - 88)   |
|           |           |                                  -24 - +24      |
|   00 04   | 0aaa aaaa | OSC Detune                           (14 - 114)  |
|           |           |                                  -50 - +50      |
|   00 05   | 0aaa aaaa | OSC Pulse Width Mod Depth            (0 - 127)   |
|   00 06   | 0aaa aaaa | OSC Pulse Width                      (0 - 127)   |
|   00 07   | 0aaa aaaa | OSC Pitch Env Attack Time            (0 - 127)   |
|   00 08   | 0aaa aaaa | OSC Pitch Env Decay                  (0 - 127)   |
|   00 09   | 0aaa aaaa | OSC Pitch Env Depth                  (1 - 127)   |
|           |           |                                  -63 - +63      |
+-----------+----------+---------------------------------------------------+
|   00 0A   | 0000 0aaa | FILTER Mode                          (0 - 7)     |
|           |           |       BYPASS, LPF, HPF, BPF, PKG,                |
|           |           |       LPF2, LPF3, LPF4                           |
|   00 0B   | 0000 000a | FILTER Slope                         (0 - 1)     |
|           |           |                                  -12, -24 [dB]  |
|   00 0C   | 0aaa aaaa | FILTER Cutoff                        (0 - 127)   |
|   00 0D   | 00aa aaaa | FILTER Cutoff Keyfollow               (54 - 74)  |
|           |           |                                  -100 - +100    |
|   00 0E   | 0aaa aaaa | FILTER Env Velocity Sens             (1 - 127)   |
|           |           |                                  -63 - +63      |
```

15

```
|       |           |                                      32 - 127 [ASCII] |
|-------+-----------+-----------------------------------------------------------|
| 00 0F | 0aaa aaaa | FILTER Resonance                         (0 - 127) |
| 00 10 | 0aaa aaaa | FILTER Env Attack Time                   (0 - 127) |
| 00 11 | 0aaa aaaa | FILTER Env Decay Time                    (0 - 127) |
| 00 12 | 0aaa aaaa | FILTER Env Sustain Level                 (0 - 127) |
| 00 13 | 0aaa aaaa | FILTER Env Release Time                  (0 - 127) |
| 00 14 | 0aaa aaaa | FILTER Env Depth                         (1 - 127) |
|       |           |                                          -63 - +63 |
|-------+-----------+-----------------------------------------------------------|
| 00 15 | 0aaa aaaa | AMP Level                                (0 - 127) |
| 00 16 | 0aaa aaaa | AMP Level Velocity Sens                  (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 17 | 0aaa aaaa | AMP Env Attack Time                      (0 - 127) |
| 00 18 | 0aaa aaaa | AMP Env Decay Time                       (0 - 127) |
| 00 19 | 0aaa aaaa | AMP Env Sustain Level                    (0 - 127) |
| 00 1A | 0aaa aaaa | AMP Env Release Time                     (0 - 127) |
| 00 1B | 0aaa aaaa | AMP Pan                                  (0 - 127) |
|       |           |                                          L64 - 63R |
|-------+-----------+-----------------------------------------------------------|
| 00 1C | 0000 0aaa | LFO Shape                                (0 - 5) |
|       |           |                         TRI, SIN, SAW, SQR, S&H, RND |
| 00 1D | 0aaa aaaa | LFO Rate                                 (0 - 127) |
| 00 1E | 0000 000a | LFO Tempo Sync Switch                    (0 - 1) |
|       |           |                                          OFF, ON |
| 00 1F | 000a aaaa | LFO Tempo Sync Note                      (0 - 19) |
|       |           |            16, 12, 8, 4, 2, 1, 3/4, 2/3, 1/2, |
|       |           |            3/8, 1/3, 1/4, 3/16, 1/6, 1/8, 3/32, |
|       |           |                            1/12, 1/16, 1/24, 1/32 |
| 00 20 | 0aaa aaaa | LFO Fade Time                            (0 - 127) |
| 00 21 | 0000 000a | LFO Key Trigger                          (0 - 1) |
|       |           |                                          OFF, ON |
| 00 22 | 0aaa aaaa | LFO Pitch Depth                          (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 23 | 0aaa aaaa | LFO Filter Depth                         (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 24 | 0aaa aaaa | LFO Amp Depth                            (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 25 | 0aaa aaaa | LFO Pan Depth                            (1 - 127) |
|       |           |                                          -63 - +63 |
|-------+-----------+-----------------------------------------------------------|
| 00 26 | 0000 0aaa | Modulation LFO Shape                     (0 - 5) |
|       |           |                         TRI, SIN, SAW, SQR, S&H, RND |
| 00 27 | 0aaa aaaa | Modulation LFO Rate                      (0 - 127) |
| 00 28 | 0000 000a | Modulation LFO Tempo Sync Switch         (0 - 1) |
|       |           |                                          OFF, ON |
| 00 29 | 000a aaaa | Modulation LFO Tempo Sync Note           (0 - 19) |
|       |           |            16, 12, 8, 4, 2, 1, 3/4, 2/3, 1/2, |
|       |           |            3/8, 1/3, 1/4, 3/16, 1/6, 1/8, 3/32, |
|       |           |                            1/12, 1/16, 1/24, 1/32 |
| 00 2A | 0aaa aaaa | OSC Pulse Width Shift                    (0 - 127) |
| 00 2B | 0000 000a | (reserve) <*>                                      |
| 00 2C | 0aaa aaaa | Modulation LFO Pitch Depth               (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 2D | 0aaa aaaa | Modulation LFO Filter Depth              (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 2E | 0aaa aaaa | Modulation LFO Amp Depth                 (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 2F | 0aaa aaaa | Modulation LFO Pan Depth                 (1 - 127) |
|       |           |                                          -63 - +63 |
|-------+-----------+-----------------------------------------------------------|
| 00 30 | 0aaa aaaa | Cutoff Aftertouch Sens                   (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 31 | 0aaa aaaa | Level Aftertouch Sens                    (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 32 | 0aaa aaaa | (reserve) <*>                                      |
| 00 33 | 0aaa aaaa | (reserve) <*>                                      |
|-------+-----------+-----------------------------------------------------------|
| 00 34 | 0000 00aa | Wave Gain                                (0 - 3) |
|       |           |                               -6, 0, +6, +12 [dB] |
| 00 35 | 0000 aaaa |                                                    |
|       |   0000 bbbb |                                                  |
|       |   0000 cccc |                                                  |
|       |   0000 dddd | Wave Number                           (0 - 16384) |
|       |           |                                      OFF, 1 - 16384 |
| 00 39 | 0aaa aaaa | HPF Cutoff                               (0 - 127) |
| 00 3A | 0aaa aaaa | Super Saw Detune                         (0 - 127) |
| 00 3B | 0aaa aaaa | Modulation LFO Rate Control              (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 3C | 000a aaaa | AMP Level Keyfollow                      (54 - 74) |
|       |           |                                          -100 - +100 |
|-------+-----------+-----------------------------------------------------------|
| 00 00 00 3D | Total Size |                                            |
+-------------+------------+--------------------------------------------+
```

* Analog Synth Tone Common

```
+----------------------------------------------------------------------+
| Offset  |                                                            |
|  Address |           Description                                     |
|----------+-----------------------------------------------------------|
| 00 00 | 0aaa aaaa | Tone Name 1                             (32 - 127) |
|       |           |                                   32 - 127 [ASCII] |
| 00 01 | 0aaa aaaa | Tone Name 2                             (32 - 127) |
|       |           |                                   32 - 127 [ASCII] |
| 00 02 | 0aaa aaaa | Tone Name 3                             (32 - 127) |
|       |           |                                   32 - 127 [ASCII] |
| 00 03 | 0aaa aaaa | Tone Name 4                             (32 - 127) |
|       |           |                                   32 - 127 [ASCII] |
| 00 04 | 0aaa aaaa | Tone Name 5                             (32 - 127) |
|       |           |                                   32 - 127 [ASCII] |
| 00 05 | 0aaa aaaa | Tone Name 6                             (32 - 127) |
|       |           |                                   32 - 127 [ASCII] |
| 00 06 | 0aaa aaaa | Tone Name 7                             (32 - 127) |
|       |           |                                   32 - 127 [ASCII] |
| 00 07 | 0aaa aaaa | Tone Name 8                             (32 - 127) |
|       |           |                                   32 - 127 [ASCII] |
| 00 08 | 0aaa aaaa | Tone Name 9                             (32 - 127) |
|       |           |                                   32 - 127 [ASCII] |
| 00 09 | 0aaa aaaa | Tone Name 10                            (32 - 127) |
|       |           |                                   32 - 127 [ASCII] |
| 00 0A | 0aaa aaaa | Tone Name 11                            (32 - 127) |
|       |           |                                   32 - 127 [ASCII] |
| 00 0B | 0aaa aaaa | Tone Name 12                            (32 - 127) |
```

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|       |           |                                   32 - 127 [ASCII] |
|-------+-----------+-----------------------------------------------------------|
| 00 0C | 0aaa aaaa | (reserve) <*>                                      |
| 00 0D | 0aaa aaaa | (reserve) <*>                                      |
| 00 0E | 0000 000a | Tone MFX Switch                          (0 - 1) |
|       |           |                                          OFF, ON |
| 00 0F | 0000 000a | Portamento Switch                        (0 - 1) |
|       |           |                                          OFF, ON |
| 00 10 | 0aaa aaaa | Portamento Time (CC# 5)                  (0 - 127) |
| 00 11 | 0000 000a |                                          (0 - 1) |
| 00 12 | 0000 00aa | (reserve) <*>                                      |
| 00 13 | 0000 000a | Unison Switch                            (0 - 1) |
|       |           |                                          OFF, ON |
| 00 14 | 0000 00aa |                                          (0 - 2) |
| 00 15 | 0000 000a | Legato Switch                            (0 - 1) |
|       |           |                                          OFF, ON |
| 00 16 | 0000 000a |                                          (0 - 1) |
| 00 17 | 0000 0aaa | Octave Shift                             (61 - 67) |
|       |           |                                          -3 - +3 |
| 00 18 | 000a aaaa | Pitch Bend Range Up                      (0 - 24) |
| 00 19 | 000a aaaa | Pitch Bend Range Down                    (0 - 24) |
| 00 1A | 0000 000a | Bend Mode                                (0 - 1) |
|       |           |                                   NORMAL, CATCH+LAST |
|-------+-----------+-----------------------------------------------------------|
| 00 1B | 0000 aaaa |                                                    |
|       |   0000 bbbb |                                                  |
|       |   0000 cccc | (reserve) <*>                                    |
| 00 1E | 0000 000a | (reserve) <*>                                      |
|   :   |           |                                                    |
| 00 29 | 0aaa aaaa | (reserve) <*>                                      |
|-------+-----------+-----------------------------------------------------------|
| 00 2A | 0aaa aaaa | Matrix Control 1 Source                  (0 - 100) |
|       |           |                    OFF, CC01 - CC31, CC33 - CC95, |
|       |           |                    BEND, AFT, SYS1 - SYS4, VELOCITY, |
|       |           |                              KEYFOLLOW, TEMPO |
| 00 2B | 0aaa aaaa | Matrix Control 1 Destination 1           (0 - 16) |
|       |           |               OFF, CUTOFF, RESO, AMP-LEV, X-MOD, |
|       |           |                         PIT-OSC1, PIT-OSC2, |
|       |           |                         PW-OSC1, PW-OSC2, |
|       |           |                         PIT-LFO1, PIT-LFO2, |
|       |           |                         FLT-LFO1, FLT-LFO2, |
|       |           |                         AMP-LFO1, AMP-LFO2, |
|       |           |                         LFO1-RATE, LFO2-RATE |
| 00 2C | 0aaa aaaa | Matrix Control 1 Sens 1                  (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 2D | 0aaa aaaa | Matrix Control 1 Destination 2           (0 - 16) |
|       |           |               OFF, CUTOFF, RESO, AMP-LEV, X-MOD, |
|       |           |                         PIT-OSC1, PIT-OSC2, |
|       |           |                         PW-OSC1, PW-OSC2, |
|       |           |                         PIT-LFO1, PIT-LFO2, |
|       |           |                         FLT-LFO1, FLT-LFO2, |
|       |           |                         AMP-LFO1, AMP-LFO2, |
|       |           |                         LFO1-RATE, LFO2-RATE |
| 00 2E | 0aaa aaaa | Matrix Control 1 Sens 2                  (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 2F | 0aaa aaaa | Matrix Control 1 Destination 3           (0 - 16) |
|       |           |               OFF, CUTOFF, RESO, AMP-LEV, X-MOD, |
|       |           |                         PIT-OSC1, PIT-OSC2, |
|       |           |                         PW-OSC1, PW-OSC2, |
|       |           |                         PIT-LFO1, PIT-LFO2, |
|       |           |                         FLT-LFO1, FLT-LFO2, |
|       |           |                         AMP-LFO1, AMP-LFO2, |
|       |           |                         LFO1-RATE, LFO2-RATE |
| 00 30 | 0aaa aaaa | Matrix Control 1 Sens 3                  (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 31 | 0aaa aaaa | Matrix Control 1 Destination 4           (0 - 16) |
|       |           |               OFF, CUTOFF, RESO, AMP-LEV, X-MOD, |
|       |           |                         PIT-OSC1, PIT-OSC2, |
|       |           |                         PW-OSC1, PW-OSC2, |
|       |           |                         PIT-LFO1, PIT-LFO2, |
|       |           |                         FLT-LFO1, FLT-LFO2, |
|       |           |                         AMP-LFO1, AMP-LFO2, |
|       |           |                         LFO1-RATE, LFO2-RATE |
| 00 32 | 0aaa aaaa | Matrix Control 1 Sens 4                  (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 33 | 0aaa aaaa | Matrix Control 2 Source                  (0 - 100) |
|       |           |                    OFF, CC01 - CC31, CC33 - CC95, |
|       |           |                    BEND, AFT, SYS1 - SYS4, VELOCITY, |
|       |           |                              KEYFOLLOW, TEMPO |
| 00 34 | 0aaa aaaa | Matrix Control 2 Destination 1           (0 - 16) |
|       |           |               OFF, CUTOFF, RESO, AMP-LEV, X-MOD, |
|       |           |                         PIT-OSC1, PIT-OSC2, |
|       |           |                         PW-OSC1, PW-OSC2, |
|       |           |                         PIT-LFO1, PIT-LFO2, |
|       |           |                         FLT-LFO1, FLT-LFO2, |
|       |           |                         AMP-LFO1, AMP-LFO2, |
|       |           |                         LFO1-RATE, LFO2-RATE |
| 00 35 | 0aaa aaaa | Matrix Control 2 Sens 1                  (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 36 | 0aaa aaaa | Matrix Control 2 Destination 2           (0 - 16) |
|       |           |               OFF, CUTOFF, RESO, AMP-LEV, X-MOD, |
|       |           |                         PIT-OSC1, PIT-OSC2, |
|       |           |                         PW-OSC1, PW-OSC2, |
|       |           |                         PIT-LFO1, PIT-LFO2, |
|       |           |                         FLT-LFO1, FLT-LFO2, |
|       |           |                         AMP-LFO1, AMP-LFO2, |
|       |           |                         LFO1-RATE, LFO2-RATE |
| 00 37 | 0aaa aaaa | Matrix Control 2 Sens 2                  (1 - 127) |
|       |           |                                          -63 - +63 |
| 00 38 | 0aaa aaaa | Matrix Control 2 Destination 3           (0 - 16) |
|       |           |               OFF, CUTOFF, RESO, AMP-LEV, X-MOD, |
|       |           |                         PIT-OSC1, PIT-OSC2, |
|       |           |                         PW-OSC1, PW-OSC2, |
|       |           |                         PIT-LFO1, PIT-LFO2, |
|       |           |                         FLT-LFO1, FLT-LFO2, |
|       |           |                         AMP-LFO1, AMP-LFO2, |
|       |           |                         LFO1-RATE, LFO2-RATE |
| 00 39 | 0aaa aaaa | Matrix Control 2 Sens 3                  (1 - 127) |
|       |           |                                          -63 - +63 |
```

Left column

Offset Address	Data	Description	Value
00 3A	0aaa aaaa	Matrix Control 2 Destination 4	(0 - 16)
		OFF, CUTOFF, RESO, AMP-LEV, X-MOD, PIT-OSC1, PIT-OSC2, PW-OSC1, PW-OSC2, PIT-LFO1, PIT-LFO2, FLT-LFO1, FLT-LFO2, AMP-LFO1, AMP-LFO2, LFO1-RATE, LFO2-RATE	
00 3B	0aaa aaaa	Matrix Control 2 Sens 4	(1 - 127) -63 - +63
00 3C	0aaa aaaa	Matrix Control 3 Source	(0 - 100)
		OFF, CC01 - CC31, CC33 - CC95, BEND, AFT, SYS1 - SYS4, VELOCITY, KEYFOLLOW, TEMPO	
00 3D	0aaa aaaa	Matrix Control 3 Destination 1	(0 - 16)
		OFF, CUTOFF, RESO, AMP-LEV, X-MOD, PIT-OSC1, PIT-OSC2, PW-OSC1, PW-OSC2, PIT-LFO1, PIT-LFO2, FLT-LFO1, FLT-LFO2, AMP-LFO1, AMP-LFO2, LFO1-RATE, LFO2-RATE	
00 3E	0aaa aaaa	Matrix Control 3 Sens 1	(1 - 127) -63 - +63
00 3F	0aaa aaaa	Matrix Control 3 Destination 2	(0 - 16)
		OFF, CUTOFF, RESO, AMP-LEV, X-MOD, PIT-OSC1, PIT-OSC2, PW-OSC1, PW-OSC2, PIT-LFO1, PIT-LFO2, FLT-LFO1, FLT-LFO2, AMP-LFO1, AMP-LFO2, LFO1-RATE, LFO2-RATE	
00 40	0aaa aaaa	Matrix Control 3 Sens 2	(1 - 127) -63 - +63
00 41	0aaa aaaa	Matrix Control 3 Destination 3	(0 - 16)
		OFF, CUTOFF, RESO, AMP-LEV, X-MOD, PIT-OSC1, PIT-OSC2, PW-OSC1, PW-OSC2, PIT-LFO1, PIT-LFO2, FLT-LFO1, FLT-LFO2, AMP-LFO1, AMP-LFO2, LFO1-RATE, LFO2-RATE	
00 42	0aaa aaaa	Matrix Control 3 Sens 3	(1 - 127) -63 - +63
00 43	0aaa aaaa	Matrix Control 3 Destination 4	(0 - 16)
		OFF, CUTOFF, RESO, AMP-LEV, X-MOD, PIT-OSC1, PIT-OSC2, PW-OSC1, PW-OSC2, PIT-LFO1, PIT-LFO2, FLT-LFO1, FLT-LFO2, AMP-LFO1, AMP-LFO2, LFO1-RATE, LFO2-RATE	
00 44	0aaa aaaa	Matrix Control 3 Sens 4	(1 - 127) -63 - +63
00 45	0aaa aaaa	Matrix Control 4 Source	(0 - 100)
		OFF, CC01 - CC31, CC33 - CC95, BEND, AFT, SYS1 - SYS4, VELOCITY, KEYFOLLOW, TEMPO	
00 46	0aaa aaaa	Matrix Control 4 Destination 1	(0 - 16)
		OFF, CUTOFF, RESO, AMP-LEV, X-MOD, PIT-OSC1, PIT-OSC2, PW-OSC1, PW-OSC2, PIT-LFO1, PIT-LFO2, FLT-LFO1, FLT-LFO2, AMP-LFO1, AMP-LFO2, LFO1-RATE, LFO2-RATE	
00 47	0aaa aaaa	Matrix Control 4 Sens 1	(1 - 127) -63 - +63
00 48	0aaa aaaa	Matrix Control 4 Destination 2	(0 - 16)
		OFF, CUTOFF, RESO, AMP-LEV, X-MOD, PIT-OSC1, PIT-OSC2, PW-OSC1, PW-OSC2, PIT-LFO1, PIT-LFO2, FLT-LFO1, FLT-LFO2, AMP-LFO1, AMP-LFO2, LFO1-RATE, LFO2-RATE	
00 49	0aaa aaaa	Matrix Control 4 Sens 2	(1 - 127) -63 - +63
00 4A	0aaa aaaa	Matrix Control 4 Destination 3	(0 - 16)
		OFF, CUTOFF, RESO, AMP-LEV, X-MOD, PIT-OSC1, PIT-OSC2, PW-OSC1, PW-OSC2, PIT-LFO1, PIT-LFO2, FLT-LFO1, FLT-LFO2, AMP-LFO1, AMP-LFO2, LFO1-RATE, LFO2-RATE	
00 4B	0aaa aaaa	Matrix Control 4 Sens 3	(1 - 127) -63 - +63
00 4C	0aaa aaaa	Matrix Control 4 Destination 4	(0 - 16)
		OFF, CUTOFF, RESO, AMP-LEV, X-MOD, PIT-OSC1, PIT-OSC2, PW-OSC1, PW-OSC2, PIT-LFO1, PIT-LFO2, FLT-LFO1, FLT-LFO2, AMP-LFO1, AMP-LFO2, LFO1-RATE, LFO2-RATE	
00 4D	0aaa aaaa	Matrix Control 4 Sens 4	(1 - 127) -63 - +63
00 00 00 4E		Total Size	

* Analog Synth Tone Partial

Offset Address	Data	Description	Value
00 00	0000 0aaa	LFO1 Shape	(0 - 5)
		TRI, SIN, SAW, SQR, S&H, RND	
00 01	0aaa aaaa	LFO1 Rate	(0 - 127)
00 02	0aaa aaaa	LFO1 Fade Time	(0 - 127)

Right column

Offset Address	Data	Description	Value
00 03	0000 000a	LFO1 Tempo Sync Switch	(0 - 1) OFF, ON
00 04	000a aaaa	LFO1 Tempo Sync Note	(0 - 19)
		16, 12, 8, 4, 2, 1, 3/4, 2/3, 1/2, 3/8, 1/3, 1/4, 3/16, 1/6, 1/8, 3/32, 1/12, 1/16, 1/24, 1/32	
00 05	0000 00aa	LFO1 Pitch Destination	(0 - 2) OSC1+2, OSC1, OSC2
00 06	0aaa aaaa	LFO1 Pitch Depth	(1 - 127) -63 - +63
00 07	0aaa aaaa	LFO1 Filter Depth	(1 - 127) -63 - +63
00 08	0aaa aaaa	LFO1 Amp Depth	(1 - 127) -63 - +63
00 09	0000 000a	LFO1 Pulse Width Destination	(0 - 3) OSC1+2, OSC1, OSC2, OFF
00 0A	000a aaaa		(0 - 31)
00 0B	0000 000a	LFO1 Key Trigger	(0 - 1) OFF, ON
00 0C	0000 0aaa	LFO2 Shape	(0 - 5) TRI, SIN, SAW, SQR, S&H, RND
00 0D	0aaa aaaa	LFO2 Rate	(0 - 127)
00 0E	0aaa aaaa	LFO2 Fade Time	(0 - 127)
00 0F	0000 000a	LFO2 Tempo Sync Switch	(0 - 1) OFF, ON
00 10	000a aaaa	LFO2 Tempo Sync Note	(0 - 19)
		16, 12, 8, 4, 2, 1, 3/4, 2/3, 1/2, 3/8, 1/3, 1/4, 3/16, 1/6, 1/8, 3/32, 1/12, 1/16, 1/24, 1/32	
00 11	0000 00aa	LFO2 Pitch Destination	(0 - 2) OSC1+2, OSC1, OSC2
00 12	0aaa aaaa	LFO2 Pitch Depth	(1 - 127) -63 - +63
00 13	0aaa aaaa	LFO2 Filter Depth	(1 - 127) -63 - +63
00 14	0aaa aaaa	LFO2 Amp Depth	(1 - 127) -63 - +63
00 15	0000 00aa	LFO2 Pulse Width Destination	(0 - 3) OSC1+2, OSC1, OSC2, OFF
00 16	000a aaaa		(0 - 31)
00 17	0000 000a	LFO2 Key Trigger	(0 - 1) OFF, ON
00 18	0000 0aaa	MOD-LFO Shape	(0 - 5) TRI, SIN, SAW, SQR, S&H, RND
00 19	0aaa aaaa	MOD-LFO Rate	(0 - 127)
00 1A	0aaa aaaa	MOD-LFO Fade Time	(0 - 127)
00 1B	0000 000a	MOD-LFO Tempo Sync Switch	(0 - 1) OFF, ON
00 1C	000a aaaa	MOD-LFO Tempo Sync Note	(0 - 19)
		16, 12, 8, 4, 2, 1, 3/4, 2/3, 1/2, 3/8, 1/3, 1/4, 3/16, 1/6, 1/8, 3/32, 1/12, 1/16, 1/24, 1/32	
00 1D	0000 00aa	MOD-LFO Pitch Destination	(0 - 2) OSC1+2, OSC1, OSC2
00 1E	0aaa aaaa	MOD-LFO Pitch Depth	(1 - 127) -63 - +63
00 1F	0aaa aaaa	MOD-LFO Filter Depth	(1 - 127) -63 - +63
00 20	0aaa aaaa	MOD-LFO Amp Depth	(1 - 127) -63 - +63
00 21	0000 00aa	MOD-LFO Pulse Width Destination	(0 - 3) OSC1+2, OSC1, OSC2, OFF
00 22	000a aaaa	(reserve) <*>	
00 23	0000 000a	MOD-LFO Key Trigger	(0 - 1) OFF, ON
00 24	0000 000a	LFO Select	(0 - 1) LFO1, LFO2
00 25	0000 000a	OSC Sync Switch	(0 - 1) OFF, ON
00 26	0000 000a	OSC Ring Switch	(0 - 1) OFF, ON
00 27	0aaa aaaa	OSC Cross Modulation Depth	(0 - 127)
00 28	0000 000a	OSC Modulation Source	(0 - 1) OSC2, AUX
00 29	0000 000a	OSC Phase Sync	(0 - 1) OFF, ON
00 2A	0000 0aaa	OSC1 Waveform	(0 - 4) SAW, SQR, PW-SQR, TRI, SIN
00 2B	00aa aaaa	OSC1 Pitch Range	(0 - 4) 0 - 4 [oct]
00 2C	0aaa aaaa	OSC1 Pitch Coarse	(16 - 112) -48 - +48
00 2D	0aaa aaaa	OSC1 Pitch Fine	(14 - 114) -50 - +50
00 2E	0aaa aaaa	OSC1 Pulse Width	(0 - 127)
00 2F	0aaa aaaa	OSC1 Pulse Width Mod Depth	(0 - 127)
00 30	0000 000a	(reserve) <*>	
00 31	0aaa aaaa	OSC1 Level	(0 - 127)
00 32	0aaa aaaa	OSC1 Pitch Env Velocity Sens	(1 - 127) -63 - +63
00 33	0aaa aaaa	OSC1 Pitch Env Attack Time	(0 - 127)
00 34	0aaa aaaa	OSC1 Pitch Env Decay	(0 - 127)
00 35	0aaa aaaa	OSC1 Pitch Env Depth	(1 - 127) -63 - +63
00 36	0000 0aaa	OSC2 Waveform	(0 - 4) SAW, SQR, PW-SQR, TRI, SIN
00 37	00aa aaaa	OSC2 Pitch Range	(0 - 4) 0 - 4 [oct]
00 38	0aaa aaaa	OSC2 Pitch Coarse	(16 - 112) -48 - +48
00 39	0aaa aaaa	OSC2 Pitch Fine	(14 - 114) -50 - +50
00 3A	0aaa aaaa	OSC2 Pulse Width	(0 - 127)
00 3B	0aaa aaaa	OSC2 Pulse Width Mod Depth	(0 - 127)
00 3C	0000 000a	(reserve) <*>	
00 3D	0aaa aaaa	OSC2 Level	(0 - 127)
00 3E	0aaa aaaa	OSC2 Pitch Env Velocity Sens	(1 - 127) -63 - +63

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|   00 3F | 0aaa aaaa | OSC2 Pitch Env Attack Time        (0 - 127) |
|   00 40 | 0aaa aaaa | OSC2 Pitch Env Decay              (0 - 127) |
|   00 41 | 0aaa aaaa | OSC2 Pitch Env Depth              (1 - 127) |
|         |           |                                  -63 - +63 |
|   00 42 | 0000 00aa | OSC Pitch Env Select                (0 - 2) |
|         |           |                      OSC1+2, OSC1, OSC2    |
|---------+-----------+--------------------------------------------|
|   00 43 | 0aaa aaaa | AUX Level                         (0 - 127) |
|   00 44 | 0aaa aaaa | AUX Source                          (0 - 3) |
|         |           |              WHITE, PINK, DIGITAL, MIC     |
|   00 45 | 0000 0aaa | (reserve) <*>                               |
|---------+-----------+--------------------------------------------|
|   00 46 | 0000 0aaa | Filter Type                         (0 - 5) |
|         |           |       BYPASS, LPF1, LPF2, LPF3, HPF, BPF    |
|   00 47 | 0aaa aaaa | Filter Cutoff                     (0 - 127) |
|   00 48 | 0aaa aaaa | Filter Cutoff Fine               (14 - 114) |
|         |           |                                   -50 - +50 |
|   00 49 | 000a aaaa | Filter Cutoff Keyfollow          (54 - 74) |
|         |           |                                  -100 - +100 |
|   00 4A | 0aaa aaaa | Filter Cutoff Keyfollow Fine     (14 - 114) |
|         |           |                                   -50 - +50 |
|   00 4B | 0aaa aaaa | Filter Resonance                  (0 - 127) |
|   00 4C | 0aaa aaaa | Filter Env Velocity Sens          (1 - 127) |
|         |           |                                   -63 - +63 |
|   00 4D | 0aaa aaaa | Filter Env Attack Time            (0 - 127) |
|   00 4E | 0aaa aaaa | Filter Env Decay Time             (0 - 127) |
|   00 4F | 0aaa aaaa | Filter Env Sustain Level          (0 - 127) |
|   00 50 | 0aaa aaaa | Filter Env Release Time           (0 - 127) |
|   00 51 | 0aaa aaaa | Filter Env Depth                  (1 - 127) |
|         |           |                                   -63 - +63 |
|   00 52 | 0aaa aaaa | Filter HPF Cutoff                 (0 - 127) |
|   00 53 | 0aaa aaaa |                                  (14 - 114) |
|         |           |                                             |
|   00 54 | 0aaa aaaa | Filter Drive                      (0 - 127) |
|---------+-----------+--------------------------------------------|
|   00 55 | 0aaa aaaa | AMP Level                         (0 - 127) |
|   00 56 | 000a aaaa | AMP Level Keyfollow              (54 - 74) |
|         |           |                                  -100 - +100 |
|   00 57 | 0aaa aaaa | AMP Level Velocity Sens           (1 - 127) |
|         |           |                                   -63 - +63 |
|   00 58 | 0aaa aaaa | AMP Env Attack Time               (0 - 127) |
|   00 59 | 0aaa aaaa | AMP Env Decay Time                (0 - 127) |
|   00 5A | 0aaa aaaa | AMP Env Sustain Level             (0 - 127) |
|   00 5B | 0aaa aaaa | AMP Env Release Time              (0 - 127) |
|---------+-----------+--------------------------------------------|
|   00 5C | 0000 aaaa | (reserve) <*>                               |
|   00 5D | 0000 0aaa | (reserve) <*>                               |
|     :   |           |                                             |
|   00 64 | 0aaa aaaa | (reserve) <*>                               |
|---------+-----------+--------------------------------------------|
| 00 00 00 65 | Total Size                                         |
+-------------------------------------------------------------------+
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* Analog Synth Tone MFX

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+-------------------------------------------------------------------+
| Offset  |           |                                             |
|  Address |          |             Description                     |
|---------+-----------+--------------------------------------------|
|   00 00 | 0aaa aaaa | MFX Type                           (0 - 67) |
|   00 01 | 0aaa aaaa | (reserve) <*>                               |
|   00 02 | 0aaa aaaa | (reserve) <*>                               |
|     :   |           |                                             |
|   00 04 | 0000 00aa | (reserve) <*>                               |
|---------+-----------+--------------------------------------------|
|   00 05 | 0aaa aaaa | MFX Control 1 Source              (0 - 101) |
|         |           |        OFF, CC01 - CC31, OFF, CC33 - CC95,  |
|         |           |                   BEND, AFT, SYS1 - SYS4    |
|   00 06 | 0aaa aaaa | MFX Control 1 Sens                (1 - 127) |
|         |           |                                   -63 - +63 |
|   00 07 | 0aaa aaaa | MFX Control 2 Source              (0 - 101) |
|         |           |        OFF, CC01 - CC31, OFF, CC33 - CC95,  |
|         |           |                   BEND, AFT, SYS1 - SYS4    |
|   00 08 | 0aaa aaaa | MFX Control 2 Sens                (1 - 127) |
|         |           |                                   -63 - +63 |
|   00 09 | 0aaa aaaa | MFX Control 3 Source              (0 - 101) |
|         |           |        OFF, CC01 - CC31, OFF, CC33 - CC95,  |
|         |           |                   BEND, AFT, SYS1 - SYS4    |
|   00 0A | 0aaa aaaa | MFX Control 3 Sens                (1 - 127) |
|         |           |                                   -63 - +63 |
|   00 0B | 0aaa aaaa | MFX Control 4 Source              (0 - 101) |
|         |           |        OFF, CC01 - CC31, OFF, CC33 - CC95,  |
|         |           |                   BEND, AFT, SYS1 - SYS4    |
|   00 0C | 0aaa aaaa | MFX Control 4 Sens                (1 - 127) |
|         |           |                                   -63 - +63 |
|---------+-----------+--------------------------------------------|
|   00 0D | 000a aaaa | MFX Control Assign 1               (0 - 16) |
|         |           |                                   OFF, 1 - 16 |
|   00 0E | 000a aaaa | MFX Control Assign 2               (0 - 16) |
|         |           |                                   OFF, 1 - 16 |
|   00 0F | 000a aaaa | MFX Control Assign 3               (0 - 16) |
|         |           |                                   OFF, 1 - 16 |
|   00 10 | 000a aaaa | MFX Control Assign 4               (0 - 16) |
|         |           |                                   OFF, 1 - 16 |
| #   00 11 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 1            (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 15 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 2            (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 19 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 3            (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 1D | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
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|         | 0000 dddd | MFX Parameter 4            (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 21 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 5            (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 25 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 6            (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 29 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 7            (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 2D | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 8            (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 31 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 9            (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 35 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 10           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 39 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 11           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 3D | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 12           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 41 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 13           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 45 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 14           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 49 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 15           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 4D | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 16           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 51 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 17           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 55 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 18           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 59 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 19           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 5D | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 20           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 61 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 21           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 65 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 22           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 69 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 23           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 6D | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 24           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 71 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 25           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
| #   00 75 | 0000 aaaa |                                           |
|         | 0000 bbbb |                                             |
|         | 0000 cccc |                                             |
|         | 0000 dddd | MFX Parameter 26           (12768 - 52768) |
|         |           |                          -20000 - +20000   |
```

```
|#    00 79  | 0000 aaaa |                                          |
|            | 0000 bbbb |                                          |
|            | 0000 cccc |                                          |
|            | 0000 dddd | MFX Parameter 27       (12768 - 52768)    |
|                                                 -20000 - +20000   |
|#    00 7D  | 0000 aaaa |                                          |
|            | 0000 bbbb |                                          |
|            | 0000 cccc |                                          |
|            | 0000 dddd | MFX Parameter 28       (12768 - 52768)    |
|                                                 -20000 - +20000   |
|#    01 01  | 0000 aaaa |                                          |
|            | 0000 bbbb |                                          |
|            | 0000 cccc |                                          |
|            | 0000 dddd | MFX Parameter 29       (12768 - 52768)    |
|                                                 -20000 - +20000   |
|#    01 05  | 0000 aaaa |                                          |
|            | 0000 bbbb |                                          |
|            | 0000 cccc |                                          |
|            | 0000 dddd | MFX Parameter 30       (12768 - 52768)    |
|                                                 -20000 - +20000   |
|#    01 09  | 0000 aaaa |                                          |
|            | 0000 bbbb |                                          |
|            | 0000 cccc |                                          |
|            | 0000 dddd | MFX Parameter 31       (12768 - 52768)    |
|                                                 -20000 - +20000   |
|#    01 0D  | 0000 aaaa |                                          |
|            | 0000 bbbb |                                          |
|            | 0000 cccc |                                          |
|            | 0000 dddd | MFX Parameter 32       (12768 - 52768)    |
|                                                 -20000 - +20000   |
+-----------+-----------------------------------------------------+
| 00 00 01 11 | Total Size                                        |
+---------------------------------------------------------------+
```

6. 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 this 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 aabbccddH and the data or size is eeffH.

```
aa + bb + cc + dd + ee + ff = sum
sum / 128 = quotient ... remainder
128 – remainder = checksum
```

<Example> Setting Reverb Type of Program to Room 2 (DT1)
According to the Parameter Address Map (p. 8), the start address of Temporary Program is 18 00 00 00H, the offset address of Reverb at Program is 02 00H, and the address of Reverb Type is 00 00H. Therefore the address of Reverb Type is;

```
    18 00 00 00H
          02 00H
+)        00 00H
    18 00 02 00H
```

Room 2 has the value of 02H.
So the system exclusive message should be sent is;

```
F0    41    10    00 00 00 0F    12 18 00 02 00 02    ??            F7
(1)   (2)   (3)   (4)       (5)       address  data checksum        (6)
```

(1) Exclusive Status   (2) ID (Roland)   (3) Device ID (17)
(4) Model ID (JD–XA)   (5) Command ID (DT1)
(6) End of Exclusive

Then calculate the checksum.

```
18H + 00H + 02H + 00H + 02H = 24 + 0 + 2 + 0 + 2 = 28 (sum)
28 (sum) / 128 = 0 (quotient) ... 28 (remainder)
checksum = 128 – 28 (remainder) = 100 = 64H
```

This means that F0 41 10 00 00 00 0F 12 18 00 02 00 02 64 F7 is the message should be sent.

ASCII Code Table
Program 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.

Function...		Transmitted		Recognized		Remarks	
Basic	Default	1-16		1-16			
Channel	Changed	1-16		1-16		Memorized	
	Default	Mode 3		Mode 3			
Mode	Messages	x		Mode 3, 4 (M=1)			*2
	Altered	**************					
Note		0-126		0-127			
Number :	: True Voice	**************		0-127			
Velocity	Note On	o		o			
	Note Off	o		o			
After	Key's	x		o	*1		
Touch	Channel's	o		o	*1		
Pitch Bend		o		o	*1		
	0,32	o		o	*1	Bank select	
	1	o		o	*1	Modulation	
	5	o		o		Portamento time	
	6,38	o		o		Data entry	
	7	x		o	*1	Volume	
	10	x		o	*1	Panpot	
	11	o		o	*1	Expression	
	12-31	o		o			*4
	64	o		o	*1	Hold 1	
	65	x		o		Portamento	
	71	x		o		Resonance	
Control	72	x		o		Release time	
Change	73	x		o		Attack time	
	74	x		o		Cutoff	
	75	x		o		Decay time	
	76	x		o		Vibrate rate	
	77	x		o		Vibrate depth	
	78	x		o		Vibrate delay	
	80-83	o		o			*4
	90,91	o		o			*4
	98,99	o		o		NRPN LSB,MSB	*4
	100,101	x		o		RPN LSB,MSB	
	102-119	o		o			*4
	1-31,33-127	o		–		MIDI CONTROL	
	1-31,33-95,102-119	o		–		Pedal, Wheel	
Program		o	*1	o	*1		
Change	: True Number	**************		0-127		Program No.1-128	
System Exclusive		o	*3	o	*1		
System	: Song Position	x		x			
Common	: Song Select	x		x			
	: Tune Request	x		x			
System	:Clock	x		o			
Real Time	:Commands	x		x			
	:All Sound Off	x		o (120,126,127)			
	:Reset All Controllers	x		o			
Aux	:Local On/Off	x		x			
Messages	:All Notes Off	x		o (123,127)			
	:Active Sensing	o	*1	o			
	:System Reset	x		x			
Notes	*1 o x is selectable.						
	*2 Recognized as M=1 even if M1.						
	*3 Transmitted only when "Transmitted Edit Data" is ON or RQ1 is received						
	*4 Refer to Parameter Guide "CC Assignments" about function of each controller number.						

Mode 1 : OMNI ON, POLY   Mode 2 : OMNI ON, MONO   O : Yes
Mode 3 : OMNI OFF, POLY   Mode 4 : OMNI OFF, MONO   X : No

MIDI Implementation Chart

Function...		Transmitted	Recognized	Remarks
Basic	Default	All channel	All channel	There is not specific basic channel
Channel	Changed	x	1-16	
Mode	Default	x	x	
	Messages	x	x	
	Altered	**************		
Note		0-127	0-127	
Number :	: True Voice	**************	0-127	
Velocity	Note On	o	o	
	Note Off	o	o	
After	Key's	x	x	
Touch	Channel's	o	o	
Pitch Bend		o	o	
Control				
Change	0-119	o	o	
Program		x	x	
Change	: True Number	**************		
System Exclusive		o	o	
System	: Song Position	x	x	
Common	: Song Select	x	x	
	: Tune Request	x	x	
System	:Clock	o *1	o *1	
Real Time	:Commands	o *1	o *1	
	:All Sound Off	o	o *2	
	:Reset All Controllers	o	o	
	:Local On/Off	x	x	
	:All Notes Off	x	x *3	
Aux	:Omni Mode Off	o	o *2	
Messages	:Omni Mode On	o	o *2	
	:Mono Mode On	o	o *2	
	:Poly Mode On	o	o *2	
	:Active Sensing	o	o	
	:System Reset	x	x	
Notes	*1 o x is selectable.			
	*2 First, a note-off message is recorded for each note that is currently on; then this message itself is recorded			
	*3 The All Notes Off message itself is not recorded; a note-off message is recorded for each note that is currently on			

Mode 1 : OMNI ON, POLY	Mode 2 : OMNI ON, MONO	O : Yes
Mode 3 : OMNI OFF, POLY	Mode 4 : OMNI OFF, MONO	X : No