DMPro Midi Sysex Specification

v. 1.00 01/25/99

This document contains the system exclusive documentation for the DMPro

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SYSTEM EXCLUSIVE FORMAT

The DMPro MIDI System Exclusive message format is as follows:

F0	System exclusive status
00 00 0E	Alesis manufacturer id#
19	DMPro family id#
cc	Opcode
dd	Data
:	:
:	:
F7	End-Of-Exclusive

OPCODE SUMMARY:

00h	User Drum Program Dump
01h	User Drum Program Dump Request
02h	Edit Program Dump
03h	Edit Program Dump Request
04h	unused
05h	unused
06h	Effects Dump
07h	Effects Dump Request
08h	Trigger Data Dump
09h	Trigger Data Dump Request
0Ah	Global Data Dump
0Bh	Global Data Dump Request
0Ch	All Dump Request
0Dh	unused
0Eh	Drumkit Dump
0Fh	Drumkit Dump Request
10h	Single Parameter Editing
11h	Sector Erase Command
12h	Sector Write Command
13h	Sector Request Command
14h	FLASH Command ACK Response
15h	FLASH Command NACK Response
16h	unused
17h	unused
19h	Sysex Note Chase

OPCODES:

00h - MIDI User Drum Program Dump

F0 00 00 0E 19 00 <program#> <data> F7

<program#>= 0..127 selects individual user programs

<data> is in a packed format in order to optimize data transfer. Eight MIDI bytes are used to transmit each block of 7 DMPro data bytes. If the 7 data bytes are looked at as one 56-bit word, the format for transmission is eight 7-bit words beginning with the most significant bit of the first byte, as follows:

SEVEN DMPro BYTES:

0: A7 A6 A5 A4 A3 A2 A1 A0
1: B7 B6 B5 B4 B3 B2 B1 B0
2: C7 C6 C5 C4 C3 C2 C1 C0
3: D7 D6 D5 D4 D3 D2 D1 D0
4: E7 E6 E5 E4 E3 E2 E1 E0
5: F7 F6 F5 F4 F3 F2 F1 F0
6: G7 G6 G5 G4 G3 G2 G1 G0

TRANSMITTED AS:

0: 0 A6 A5 A4 A3 A2 A1 A0
1: 0 B5 B4 B3 B2 B1 B0 A7
2: 0 C4 C3 C2 C1 C0 B7 B6
3: 0 D3 D2 D1 D0 C7 C6 C5
4: 0 E2 E1 E0 D7 D6 D5 D4
5: 0 F1 F0 E7 E6 E5 E4 E3
6: 0 G0 F7 F6 F5 F4 F3 F2
7: 0 G7 G6 G5 G4 G3 G2 G1

There are 190 data bytes sent for a single program dump, which corresponds to 166 bytes of program data. With the header, the total number of bytes transmitted with a program dump is 198. The location of each parameter within a program dump is shown in the next section.

01h - MIDI User Drum Program Dump Request

F0 00 00 0E 19 01 <prog#> F7

<program#>= 0..127 selects individual user programs

When received, the DMPro will respond to this message with a MIDI user program dump (00) of the program number selected.

02h - MIDI Edit Program Dump

F0 00 00 0E 19 02 <edit#> <data> F7

<edit#> = 0-63 = Drum number

<data> is in the same format as described in 00.

03h - MIDI Edit Program Dump Request

F0 00 00 0E 19 03 <edit#> F7

<edit#> = 0-63 = Drum number

When received, the DMPro will respond to this message with a MIDI edit program dump (02) of the edit program selected.

06h - MIDI Effects Dump

F0 00 00 0E 19 06 <effect#> <data> F7

<effect#> = 0..63 selects individual user effects, 64 = Effect Edit Buffer

<data> is in the same format as described in 00, but with a different number of bytes due to the difference in the effects parameters. The total number of data bytes sent for a single effects dump is 28, which corresponds to 24 bytes of effects data. With the header, the total number of bytes transmitted with a program dump is 36. Although a Drumkit is stored along with its Effects, they are dealt with independently via MIDI.

07h - MIDI Effects Dump Request

F0 00 00 0E 19 07 <effect#> F7

<effect#> = 0..63 selects individual user effects, 64 = Effect Edit Buffer

When received, the DMPro will respond to this message with a MIDI user effects dump (06h) of the user effect selected.

08h - MIDI Trigger Data Dump

F0 00 00 0E 19 08 <data> F7

<data> is in the same format as described in 00, but with a different number of bytes due to the difference in the global parameter size. The total number of data bytes sent for a Trigger data dump is 375, which corresponds to 328 bytes of Trigger data. With the header, the total number of bytes transmitted with a Trigger dump is 382.

09h - MIDI Trigger Data Dump Request

F0 00 00 0E 19 09 F7

When received, the DMPro will respond to this message with a MIDI Trigger data dump (08h).

0Ah - MIDI Global Data Dump

F0 00 00 0E 19 0A <data> F7

<data> is in the same format as described in 00, but with a different number of bytes due to the difference in the global parameter size. The total number of data bytes sent for a global data dump is 16, which corresponds to 14 bytes of global data. With the header, the total number of bytes transmitted with a Global dump is 23.

0Bh - MIDI Global Data Dump Request

F0 00 00 0E 19 0B F7

When received, the DMPro will respond to this message with a MIDI global data dump (0Ah).

0Ch - MIDI All Dump Request

F0 00 00 0E 19 0C F7

When received, the DMPro will respond to this message with a 128 MIDI User Drum Program dumps (00), 64 MIDI Effects dumps (06), 64 MIDI Drumkit dumps (0E), a Global data dump (0A), and a Triggers data dump (08) for a total of 68,821 MIDI bytes. With sysex headers, the total number of bytes transmitted is 69525.
A delay of 4.25 milliseconds will be placed between each dump. When receiving a complete dump, the DMPro does not require any delay between dumps.

0Dh - unused

0Eh - MIDI Drumkit Dump

F0 00 00 0E 19 0E <kit#> <data> F7

<kit#> = 0..63 selects individual user drumkits; 64=drumkit edit buffer

<data> is in the same format as described in 00, but with a different number of bytes due to the difference in the drumkit parameters. The total number of data bytes sent for a single drumkit dump is 640, which corresponds to 560 bytes of drumkit data. With the header, the total number of bytes transmitted with a drumkit dump is 648. When loading a drumkit into the drumkit edit buffer, none of the 64 drum program edit buffers or the effect buffer will be changed, even if the new drumkit buffer contains drum program numbers different than what is currently selected.

0Fh - MIDI Drumkit Dump Request

F0 00 00 0E 19 0F <kit#> F7

<kit#> = 0..63 selects individual user drumkits; 64=Drumkit edit buffer

When received, the DMPro will respond to this message with a MIDI Drumkit dump (0E) of the drumkit selected.

10h - MIDI Editing

F0 00 00 0E 19 10 <0mmmffff><0kssppp><0ccccccv><0vvvvvvv>F7

<mmm> = 0=Global, 1=Drumkit, 2=Drum Program, 3=Effects, 4=Triggers
<k ffff> = Function number 0 through 20, depending on mode
!!NOTE!! The MSbit is bit <6> of the <0kssppp> byte!!
<ss> = Sound 1-4 (0-3) when <mmm>=2
<pppp> = Page 0 through 9, depending on mode and function
<cccccc> = Drum 1 through 64 (0-63) if <mmm> = 1 or 2
<vvvvvvvv>= Parameter value, 8 bit 2's complement

All parameters to be edited must be sent in this format (11 MIDI bytes), regardless of the number of bits required to transmit the value of the parameter. When the DMPro receives this message, it will edit the specified parameter to the new value and display it. If the function and page selected does not exist in the current configuration, the command will cause the nearest legal function, page, and parameter to be selected, but no edit will occur. If a program edit command is received, it will place the DMPro in Edit mode. If the value received is out of range for the parameter selected, the range will be limited to the nearest legal value. The function and page numbers for each parameter are shown in the next section.

11h - Sector Erase Command

F0 00 00 0E 19 11 <sector#> F7

<sector#>= 0..63 selects 128K byte sector number to be erased in FLASH PCMCIA card

The erase command sets all bytes of a sector to FFH. There can be up to 64 sectors of 128K bytes in a FLASH card, which allows for up to 8 megabytes of FLASH memory. Additional commands should not be sent until receiving an ACK or NACK (described below) from the DMPro. As much as 10 seconds must be allowed before aborting if no ACK or NACK is received.

12h - Sector Write Command

F0 00 00 0E 19 12 <sector#> <block#> <data> <sum> F7

<sector#>= 0..63 selects 128K byte sector number to be written in FLASH PCMCIA card
<block#>= 0..127 selects 1024 byte block of data to be written in FLASH PCMCIA card
<sum>= 0..127 seven bit checksum of previous 1173 bytes.

<data> is in a packed format in order to optimize data transfer. Eight MIDI bytes are used to transmit each block of 7 FLASH card data bytes. Like with program dumps, if the 7 data bytes are looked at as one 56-bit word, the format for transmission is eight 7-bit words beginning with the most significant bit of the first byte, as follows:

SEVEN FLASH CARD BYTES:
0: A7 A6 A5 A4 A3 A2 A1 A0
1: B7 B6 B5 B4 B3 B2 B1 B0
2: C7 C6 C5 C4 C3 C2 C1 C0
3: D7 D6 D5 D4 D3 D2 D1 D0
4: E7 E6 E5 E4 E3 E2 E1 E0
5: F7 F6 F5 F4 F3 F2 F1 F0
6: G7 G6 G5 G4 G3 G2 G1 G0

TRANSMITTED AS:
0: 0 A6 A5 A4 A3 A2 A1 A0
1: 0 B5 B4 B3 B2 B1 B0 A7
2: 0 C4 C3 C2 C1 C0 B7 B6
3: 0 D3 D2 D1 D0 C7 C6 C5
4: 0 E2 E1 E0 D7 D6 D5 D4
5: 0 F1 F0 E7 E6 E5 E4 E3
6: 0 G0 F7 F6 F5 F4 F3 F2
7: 0 G7 G6 G5 G4 G3 G2 G1

There are 1171 data bytes sent for a single block of a FLASH card sector, which corresponds to 1024 bytes of FLASH card data. With the header, the total number of bytes transmitted with a program dump is 1181. This will take a minimum of 377.92 milliseconds to transmit. Additional commands should not be sent until receiving an ACK or NACK (described below) from the DMPro. Writes should only be performed on sector blocks known to contain all FFH data. This can be verified by reading the block first (with the next command), or sending an erase command first.

13h - Sector Request Command

F0 00 00 0E 19 13 <sector#> <block#> F7

<sector#>= 0..63 selects 128K byte sector number to be written in FLASH PCMCIA card
<block#>= 0..127 selects 1024 byte block of data to be written in FLASH PCMCIA card

This command will cause the DMPro to respond with an opcode 12H (sector write command), with the contents of the sector block that was requested. If there is no card present, the DMPro will respond with an opcode 15H.

14h - FLASH Command ACK Response

F0 00 00 0E 19 14 F7

This command is ignored if received by the DMPro. It is sent out by the DMPro after completing an erase command, or receiving a complete sector block write command.

15h - FLASH Command NACK Response

F0 00 00 0E 19 15 <error> F7

<error>= 0..4 as follows:
0 = No card present / Not a FLASH card
1 = Card write protected
2 = Erase failed (FLASH chip timeout error)
3 = Checksum didn't match
4 = Programming failed (usually because block was not erased first)

This command is ignored if received by the DMPro. It is sent out by the DMPro after receiving an erase command that could not be completed, or receiving a complete sector block write command that could not be programmed or whose checksum was invalid. In the case of invalid checksum, the sending device is expected to resend the data at least once before aborting.

18h - Sysex Note Chase Command

F0 00 00 0E 19 18 <note#> F7

When this command is received by the DMPro, it will cause the display to jump in the same way the Note Chase function operates. It works regardless of whether the DMPro's Note Chase function is on or not.

<note#> = 0..127, only notes 33..96 actually do anything since the DMPro only has notes from 33..96.

NOTES ON FLASH CARDS:

- Best case programming time for each megabyte in a FLASH card will be 7 minutes, 45 seconds, assuming a typical FLASH programming time of 65 milliseconds per sector block, and a typical erase time of 1.5 seconds per sector. This results in a transfer rate of approximately 43 times slower than real time, assuming the samples are at 48KHz.

- The burden is placed on the sending device to avoid possible errors that can occur if a sector above the total memory of a card is erased or written to (due to possible address aliasing). It is not possible for the DMPro to determine the amount of memory in the card.

- The FLASH card must be a 5 volt only card (no 12 volt required for programming), must have 64K byte sectors, must have 150 nanosecond or better chip enable read access time, and must be compatible with the programming commands and Manufacturer's ID codes of an Am29F040 4-Megabit FLASH memory from AMD.

DEVICE INQUIRY

The DMPro responds to the Universal Device Inquiry message < F0 7E 7F 06 01 F7 >
Upon receiving this message the DMPro will respond with the following:

F0 7E 7F 06 02	Universal Device Reply
00 00 0E	Alesis Manufacturer ID
19 00	DMPro Family ID, LSB first
00 00	DMPro Family Member, LSB first
xx xx xx xx	Software revision, ASCI (ex. 30 31 30 30 = '0100' = 1.00)
F7	End-Of-Exclusive

PARAMETER FORMAT

The following specific parameter information shows the locations in which each parameter resides after unpacking the data from its 7 bit MIDI format into the 8 bit format as described in opcode 00, program data dump.

GLOBAL DATA FORMAT

The Global parameters are comprised of 14 bytes of data. Unlike the Program, Mix, and Effects parameters, the Global parameters are not packed into each available bit, so that each parameter occupies its own byte. This results in unused bits for most of the parameter's bytes. These bits must remain at 0. In addition, the signed parameters are kept in 2's complement format, so no offset adjustment is necessary. For direct parameter editing (sysex command 10H), the function and page number are shown. The Mode should be set to 0 (=Global), and the Sound and Channel parameters are ignored.

#	Parameter name	Func	Page	LoLim	HiLim	bits	bit address
0.	Basic MIDI Channel	3	0	0	15	4	0:3-0:0
1.	Controller A number	3	3	0	120	7	1:6-1:0
2.	Controller B number	3	4	0	120	7	2:6-2:0
3.	Controller C number	3	5	0	120	7	3:6-3:0
4.	Controller D number	3	6	0	120	7	4:6-4:0
5.	Receive MIDI Program Change	3	1	0	1	1	5:0-5:0
6.	Transmit MIDI Program Change	3	2	0	1	1	6:0-6:0
7.	Trigger Setup Number	5	7	0	3	2	7:1-7:0
8.	Aux Pedal Controller #	3	7	0	120	7	8:6-8:0
9.	Aux Pedal MIDI Channel	3	8	0	16	5	9:4-9:0
10.	Hat Pedal Controller #	3	9	0	120	7	10:6-10:0
11.	Hat Pedal MIDI Channel	3	10	0	16	5	11:4-11:0
12.	MIDI Local On/Off	3	11	0	1	1	12:0-12:0
13.	MIDI Start Enable On/Off	3	12	0	1	1	13:7-13:0

DRUMKIT DATA FORMAT

Drumkits contain 560 bytes of packed parameter data. The bit addresses shown are from most significant bit to least significant bit for each parameter, with the byte number first, followed by a colon (:), followed by the bit number. Each parameter should never exceed the limit shown in the table. For bipolar parameters, the limits shown are offset binary, since this is the format that the parameters are stored in. To view the parameters as two's complement numbers, add the value shown in the Offset column.

For direct parameter editing (sysex command 10H), the function and page number are shown. The Edit type <mmm> should be set to 1 (=Kit) for all parameters except Trig 1-16 Note#, MIDI Song, Card Seq #, and Aux Pedal where the edit type <mmm> should be set to 4 (Trigger). The Sound parameter is ignored. The Channel parameter should be set to 0 through 63, for Drums 1 through 64, respectively. If the edit type is Trigger, the Channel parameter is ignored. Signed parameters should be sent in 2's complement format.

#	Parameter name	Func	Page	Offset	Limit	bits	bit address
0.	Spare					5	0:4-0:0
1.	Kit name digit 0	4	0	0	95	7	1:3-0:5
2.	Kit name digit 1	4	1	0	95	7	2:2-1:4
3.	Kit name digit 2	4	2	0	95	7	3:1-2:3
4.	Kit name digit 3	4	3	0	95	7	4:0-3:2
5.	Kit name digit 4	4	4	0	95	7	4:7-4:1
6.	Kit name digit 5	4	5	0	95	7	5:6-5:0
7.	Kit name digit 6	4	6	0	95	7	6:5-5:7
8.	Kit name digit 7	4	7	0	95	7	7:4-6:6
9.	Kit name digit 8	4	8	0	95	7	8:3-7:5
10.	Kit name digit 9	4	9	0	95	7	9:2-8:4
11.	Trig 1 Note #	5	0	0	64	7	10:1-9:3
12.	Trig 2 Note #	6	0	0	64	7	11:0-10:2
13.	Trig 3 Note #	7	0	0	64	7	11:7-11:1
14.	Trig 4 Note #	8	0	0	64	7	12:6-12:0
15.	Trig 5 Note #	9	0	0	64	7	13:5-12:7
16.	Trig 6 Note #	10	0	0	64	7	14:4-13:6
17.	Trig 7 Note #	11	0	0	64	7	15:3-14:5
18.	Trig 8 Note #	12	0	0	64	7	16:2-15:4
19.	Trig 9 Note #	13	0	0	64	7	17:1-16:3
20.	Trig 10 Note #	14	0	0	64	7	18:0-17:2
21.	Trig 11 Note #	15	0	0	64	7	18:7-18:1
22.	Trig 12 Note #	16	0	0	64	7	19:6-19:0
23.	Trig 13 Note Down #	17	0	0	64	7	20:5-19:7
24.	Trig 14 Note Down #	18	0	0	64	7	21:4-20:6
25.	Trig 15 Note #	19	0	0	64	7	22:3-21:5
26.	Trig 16 Note #	20	0	0	64	7	23:2-22:4
27.	Trig 13 Note Up #	17	1	0	64	7	24:1-23:3

28.	Trig 14 Note Up #	18	1	0	64	7	25:0-24:2
29.	Trig 1 MIDI Song	5	8	0	7	3	25:3-25:1
30.	Trig 2 MIDI Song	6	8	0	7	3	25:6-25:4
31.	Trig 3 MIDI Song	7	8	0	7	3	26:1-25:7
32.	Trig 4 MIDI Song	8	8	0	7	3	26:4-26:2
33.	Trig 5 MIDI Song	9	8	0	7	3	26:7-26:5
34.	Trig 6 MIDI Song	10	8	0	7	3	27:2-27:0
35.	Trig 7 MIDI Song	11	8	0	7	3	27:5-27:3
36.	Trig 8 MIDI Song	12	8	0	7	3	28:0-27:6
37.	Trig 9 MIDI Song	13	8	0	7	3	28:3-28:1
38.	Trig 10 MIDI Song	14	8	0	7	3	28:6-28:4
39.	Trig 11 MIDI Song	15	8	0	7	3	29:1-28:7
40.	Trig 12 MIDI Song	16	8	0	7	3	29:4-29:2
41.	Trig 13 MIDI Song	17	9	0	7	3	29:7-29:5
42.	Trig 14 MIDI Song	18	9	0	7	3	30:2-30:0
43.	Trig 15 MIDI Song	19	8	0	7	3	30:5-30:3
44.	Trig 16 MIDI Song	20	7	0	7	3	31:0-30:6
45.	Trig 1 Card Seq Num	5	9	0	49	6	31:6-31:1
46.	Trig 2 Card Seq Num	6	9	0	49	6	32:4-31:7
47.	Trig 3 Card Seq Num	7	9	0	49	6	33:2-32:5
48.	Trig 4 Card Seq Num	8	9	0	49	6	34:0-33:3
49.	Trig 5 Card Seq Num	9	9	0	49	6	34:6-34:1
50.	Trig 6 Card Seq Num	10	9	0	49	6	35:4-34:7
51.	Trig 7 Card Seq Num	11	9	0	49	6	36:2-35:5
52.	Trig 8 Card Seq Num	12	9	0	49	6	37:0-36:3
53.	Trig 9 Card Seq Num	13	9	0	49	6	37:6-37:1
54.	Trig 10 Card Seq Num	14	9	0	49	6	38:4-37:7
55.	Trig 11 Card Seq Num	15	9	0	49	6	39:2-38:5
56.	Trig 12 Card Seq Num	16	9	0	49	6	40:0-39:3
57.	Trig 13 Card Seq Num	17	10	0	49	6	40:6-40:1
58.	Trig 14 Card Seq Num	18	10	0	49	6	41:4-40:7
59.	Trig 15 Card Seq Num	19	9	0	49	6	42:2-41:5
60.	Trig 16 Card Seq Num	20	8	0	49	6	43:0-42:3
61.	AUX Pedal Note Num	20	10	0	64	7	43:7-43:1

62.	Drum 1 Program Number	0	1	0	127	7	44:6-44:0
63.	Drum 1 Program Type	0	0	0	31	5	45:3-44:7
64.	Drum 1 enable	2	7	0	1	1	45:4
65.	Drum 1 volume	2	0	0	99	7	46:3-45:5
66.	Drum 1 pan	2	1	0	7	3	46:6-46:4
67.	Drum 1 output	2	2	0	4	3	47:1-46:7
68.	Drum 1 effect level	2	3	0	99	7	48:0-47:2
69.	Drum 1 effect bus	2	4	0	1	1	48:1
70.	Drum 1 Pitch	1	0	-96	192	8	49:1-48:2
71.	Drum 1 Mute Group	2	5	0	4	3	49:4-49:2
72.	Drum 1 midi in on/off	3	14	0	1	1	49:5
73.	Drum 1 midi out on/off	3	15	0	1	1	49:6
74.	Drum 1 MIDI Channel	3	13	0	16	5	50:3-49:7
75.	Drum 1 Drum Link	2	6	0	64	7	51:2-50:4
76.	Drum 1 Spare						51:7-51:3

77-91.	Drum 2 parameters	(see above)	59:7-52:0
92-106.	Drum 3 parameters	(see above)	67:7-60:0
107-121.	Drum 4 parameters	(see above)	75:7-68:0
122-136.	Drum 5 parameters	(see above)	83:7-76:0
137-151.	Drum 6 parameters	(see above)	91:7-84:0
152-166.	Drum 7 parameters	(see above)	99:7-92:0
167-181.	Drum 8 parameters	(see above)	107:7-100:0
182-196.	Drum 9 parameters	(see above)	115:7-108:0
197-211.	Drum 10 parameters	(see above)	123:7-116:0
212-226.	Drum 11 parameters	(see above)	131:7-124:0
227-241.	Drum 12 parameters	(see above)	139:7-129:0
242-256.	Drum 13 parameters	(see above)	147:7-140:0
257-271.	Drum 14 parameters	(see above)	155:7-148:0
272-286.	Drum 15 parameters	(see above)	163:7-156:0
287-301.	Drum 16 parameters	(see above)	171:7-164:0
302-316.	Drum 17 parameters	(see above)	179:7-172:0
317-331.	Drum 18 parameters	(see above)	187:7-180:0
332-346.	Drum 19 parameters	(see above)	195:7-188:0
347-361.	Drum 20 parameters	(see above)	203:7-196:0
362-376.	Drum 21 parameters	(see above)	211:7-204:0
377-391.	Drum 22 parameters	(see above)	219:7-212:0
392-406.	Drum 23 parameters	(see above)	227:7-220:0
407-421.	Drum 24 parameters	(see above)	235:7-228:0
422-436.	Drum 25 parameters	(see above)	243:7-236:0
437-451.	Drum 26 parameters	(see above)	251:7-244:0
452-466.	Drum 27 parameters	(see above)	259:7-252:0
467-481.	Drum 28 parameters	(see above)	267:7-260:0
482-496.	Drum 29 parameters	(see above)	275:7-268:0
497-511.	Drum 30 parameters	(see above)	283:7-276:0

512-526. Drum 31 parameters	(see above)	291:7-284:0
527-541. Drum 32 parameters	(see above)	299:7-292:0
542-556. Drum 33 parameters	(see above)	307:7-300:0
557-571. Drum 34 parameters	(see above)	315:7-308:0
572-586. Drum 35 parameters	(see above)	323:7-316:0
587-601. Drum 36 parameters	(see above)	331:7-324:0
602-616. Drum 37 parameters	(see above)	339:7-332:0
617-631. Drum 38 parameters	(see above)	347:7-340:0
632-646. Drum 39 parameters	(see above)	355:7-348:0
647-661. Drum 40 parameters	(see above)	363:7-356:0
662-676. Drum 41 parameters	(see above)	371:7-364:0
677-691. Drum 42 parameters	(see above)	379:7-372:0
692-706. Drum 43 parameters	(see above)	387:7-380:0
707-721. Drum 44 parameters	(see above)	395:7-388:0
722-736. Drum 45 parameters	(see above)	403:7-396:0
737-751. Drum 46 parameters	(see above)	411:7-404:0
752-766. Drum 47 parameters	(see above)	419:7-412:0
767-781. Drum 48 parameters	(see above)	427:7-420:0
782-796. Drum 49 parameters	(see above)	435:7-428:0
797-811. Drum 50 parameters	(see above)	443:7-436:0
812-826. Drum 51 parameters	(see above)	451:7-444:0
827-841. Drum 52 parameters	(see above)	459:7-452:0
842-856. Drum 53 parameters	(see above)	467:7-460:0
857-871. Drum 54 parameters	(see above)	475:7-468:0
872-886. Drum 55 parameters	(see above)	483:7-476:0
887-901. Drum 56 parameters	(see above)	491:7-484:0
902-916. Drum 57 parameters	(see above)	499:7-492:0
917-931. Drum 58 parameters	(see above)	507:7-500:0
932-946. Drum 59 parameters	(see above)	515:7-508:0
947-961. Drum 60 parameters	(see above)	523:7-516:0
962-976. Drum 61 parameters	(see above)	531:7-524:0
977-991. Drum 62 parameters	(see above)	539:7-532:0
992-1006. Drum 63 parameters	(see above)	547:7-540:0
1007-1021. Drum 64 parameters	(see above)	555:7-548:0
Drumkit Spare		559:7-556:0

DRUM PROGRAM DATA FORMAT

Drum Programs contain 166 bytes of packed parameter data. The first 9 bytes are common parameters for all four sounds. The next four sets of 39 bytes contain each of the four sound's parameters. The bit addresses must have the correct offset added to them in order to address the correct sound relative to the beginning of the program. Sound 1's address begins at 9, Sound 2 at 48, Sound 3 at 87, and Sound 4 at 126. This is followed by 1 spare byte The bit addresses shown are from most significant bit to least significant bit for each parameter, with the byte number first, followed by a colon (:), followed by the bit number. Each parameter should never exceed the limit shown in the table. For bipolar parameters, the limits shown are offset binary, since this is the format that the parameters are stored in. To view them as two's complement numbers, add the value shown in the Offset column. For direct parameter editing (sysex command 10H), the function and page number are shown. The Edit Type <mmm> should be set to 2 (=Drum Program), the Sound parameter set to 0 through 3 for sounds 1 through 4, respectively, and the Channel parameter should be set to 0 through 63, for channels 1 through 64, respectively. Signed parameters should be sent in 2's complement format.

#	Parameter name	Func	Page	Offset	Limit	bits	bit address
0.	Program name digit 0	10	0	0	95	7	0:6-0:0
1.	Program name digit 1	10	1	0	95	7	1:5-0:7
2.	Program name digit 2	10	2	0	95	7	2:4-1:6
3.	Program name digit 3	10	3	0	95	7	3:3-2:5
4.	Program name digit 4	10	4	0	95	7	4:2-3:4
5.	Program name digit 5	10	5	0	95	7	5:1-4:3
6.	Program name digit 6	10	6	0	95	7	6:0-5:2
7.	Program name digit 7	10	7	0	95	7	6:7-6:1
	Program Spare						8:7-7:0

#	Parameter name	Func	Page	Offset	Limit	bits	bit address
0.	Sample group*	0	1	0	23	6	0:5-0:0
1.	Sample number	0	2	0	127	7	1:4-0:6
2.	Sound volume	1	0	0	99	7	2:3-1:5
3.	Sound pan	1	1	0	6	3	2:6-2:4
4.	Sound pitch semitone	2	0	-24	48	6	3:4-2:7
5.	Sound pitch detune	2	1	-99	198	8	4:4-3:5
6.	Sound pitch wheel mod	2	2	0	12	4	5:0-4:5
7.	Sound pitch env mod	2	3	-99	198	8	6:0-5:1
8.	Sound filter frequency	3	0	0	99	7	6:7-6:1
9.	Sound filter velocity mod	3	1	-99	198	8	7:7-7:0
10.	Sound filter mod wheel mod	3	2	-99	198	8	8:7-8:0
11.	Sound filter env mod	3	3	-99	198	8	9:7-9:0
12.	Sound amp velocity curve	4	0	0	12	4	10:3-10:0
13.	Sound overlap	4	1	0	99	7	11:2-10:4

14.	Sound mod 1 source	8	0	0	15	5	11:7-11:3
15.	Sound mod 1 destination	8	1	0	20	5	12:4-12:0
16.	Sound mod 1 amplitude	8	2	-99	198	8	13:4-12:5
17.	Sound mod 2 source	9	0	0	15	5	14:1-13:5
18.	Sound mod 2 destination	9	1	0	20	5	14:6-14:2
19.	Sound mod 2 amplitude	9	2	-99	198	8	15:6-14:7
20.	Sound pitch env attack	5	1	0	99	7	16:5-15:7
21.	Sound pitch env decay	5	2	0	99	7	17:4-16:6
22.	Sound pitch env sustain	5	3	0	99	7	18:3-17:5
23.	Sound pitch env release	5	5	0	99	7	19:2-18:4
24.	Sound pitch env delay	5	0	0	100	7	20:1-19:3
25.	Sound pitch env sustain decay	5	4	0	99	7	21:0-20:2
26.	Sound pitch env trig type	5	7	0	3	2	21:2-21:1
27.	Sound pitch env sustain pedal	5	8	0	1	1	21:3
28.	Sound pitch env level	5	6	0	99	7	22:2-21:4
29.	Sound pitch env velocity mod	5	9	-99	198	8	23:2-22:3
30.	Sound filter env attack	6	1	0	99	7	24:1-23:3
31.	Sound filter env decay	6	2	0	99	7	25:0-24:2
32.	Sound filter env sustain	6	3	0	99	7	25:7-25:1
33.	Sound filter env release	6	5	0	99	7	26:6-26:0
34.	Sound filter env delay	6	0	0	100	7	27:5-26:7
35.	Sound filter env sustain decay	6	4	0	99	7	28:4-27:6
36.	Sound filter env trig type	6	7	0	3	2	28:6-28:5
37.	Sound filter env sustain pedal	6	8	0	1	1	28:7
38.	Sound filter env level	6	6	0	99	7	29:6-29:0
39.	Sound filter env velocity mod	6	9	-99	198	8	30:6-29:7
40.	Sound amp env attack	7	2	0	99	7	31:5-30:7
41.	Sound amp env decay	7	3	0	99	7	32:4-31:6
42.	Sound amp env sustain	7	4	0	99	7	33:3-32:5
43.	Sound amp env release	7	6	0	99	7	34:2-33:4
44.	Sound amp env delay	7	1	0	100	7	35:1-34:3
45.	Sound amp env sustain decay	7	5	0	99	7	36:0-35:2
46.	Sound amp env trig type	7	8	0	3	2	36:2-36:1
47.	Sound amp env sustain pedal	7	9	0	1	1	36:3
48.	Sound amp env level	7	7	0	99	7	37:2-36:4
49.	Sound Enable	0	0	0	1	1	37:3
50.	Sound amp env Gate Time	7	0	0	100	7	38:2-37:4
	Sound Spare						38:7-38:3

Sample Group range is 0…23
0 …12 = Internal Sound Groups
13…15 = Unused
16…23 = Card Groups 1-8

EFFECT DATA FORMAT

Effects contain 24 bytes of packed parameter data. The bit addresses shown are from most significant bit to least significant bit for each parameter, with the byte number first, followed by a colon (:), followed by the bit number. Each parameter should never exceed the limit shown in the table. For bipolar parameters, the limits shown are offset binary, since this is the format that the parameters are stored in. To view them as two's complement numbers, add the value shown in the Offset column. For direct parameter editing (sysex command 10H), the function and page numbers are shown. The Edit type <mmm> should be set to 3 (=Effects), and the Channel parameter is not used. Signed parameters should be sent in 2's complement format.

#	Parameter name	Func	Page	Offset	Limit	bits	bit address
R E V E R B							
For Reverb Type = 0-3							
0.	Reverb Level	0	0	0	99	7	0:6-0:0
1.	Reverb Type	0	1	0	6	3	1:1-0:7
2.	Reverb Predelay 10ms	0	2	0	29	5	1:6-1:2
3.	Reverb Predelay 1ms	0	3	0	9	4	2:2-1:7
4.	Reverb Input Premix	0	4	-99	198	8	3:2-2:3
5.	Reverb Input Filter	0	5	0	99	7	4:1-3:3
6.	Reverb decay	0	6	0	99	7	5:0-4:2
7.	Reverb low decay	0	7	0	99	7	5:7-5:1
8.	Reverb high decay	0	8	0	99	7	6:6-6:0
9.	Reverb density	0	9	0	99	7	7:5-6:7
For Reverb Type = 4 (Large)							
0.	Reverb Level	0	0	0	99	7	0:6-0:0
1.	Reverb Type	0	1	0	6	3	1:1-0:7
2.	Reverb Predelay 10ms	0	2	0	29	5	1:6-1:2
3.	Reverb Predelay 1ms	0	3	0	9	4	2:2-1:7
4.	Reverb Input Premix	0	4	-99	198	8	3:2-2:3
5.	Reverb Input Filter	0	5	0	99	7	4:1-3:3
6.	Reverb decay	0	6	0	99	7	5:0-4:2
7.	Reverb low decay	0	7	0	99	7	5:7-5:1
8.	Reverb high decay	0	8	0	99	7	6:6-6:0
9.	Reverb density	UNUSED					7:5-6:7
For Reverb Type = 5-6 (Gate and Reverse)							
0.	Reverb Level	0	0	0	99	7	0:6-0:0
1.	Reverb Type	0	1	0	6	3	1:1-0:7
2.	Reverb Predelay 10ms	0	2	0	29	5	1:6-1:2
3.	Reverb Predelay 1ms	0	3	0	9	4	2:2-1:7
4.	Reverb Input Premix	0	4	-99	198	8	3:2-2:3
5.	Reverb Input Filter	0	5	0	99	7	4:1-3:3
6.	Reverb decay	0	6	0	99	7	5:0-4:2

7.	Reverb low decay	UNUSED					5:7-5:1
8.	Reverb high decay	0	7	0	99	7	6:6-6:0
9.	Reverb density	0	8	0	99	7	7:5-6:7

O V E R D R I V E

10.	Overdrive Threshold	1	0	0	99	7	8:4-7:6
11.	Overdrive Brightness	1	1	0	99	7	9:3-8:5

D E L A Y

12.	Delay Level	2	0	0	99	7	10:2-9:4
13.	Delay Input Balance	2	1	-99	198	8	11:2-10:3
14.	Delay Time 10ms	2	2	0	79	7	12:1-11:3
15.	Delay Time 1ms	2	3	0	9	4	12:5-12:2
16.	Delay Feedback	2	4	0	99	7	13:4-12:6
17.	Delay Output to Reverb	2	5	0	99	7	14:3-13:5

P I T C H

For Pitch Type = 0-3 (Mono & Stereo Chorus and Flange)

18.	Pitch Level	3	0	0	99	7	15:2-14:4
19.	Pitch Input Balance	3	1	-99	198	8	16:2-15:3
20.	Pitch Type	3	2	0	4	3	16:5-16:3
21.	Pitch Waveform	3	4	0	1	1	16:6
22.	Pitch Speed	3	3	0	99	7	17:5-16:7
23.	Pitch Depth	3	5	0	99	7	18:4-17:6
24.	Pitch Feedback	3	6	0	99	7	19:3-18:5
25.	Pitch Output to Reverb	3	7	0	99	7	20:2-19:4

For Pitch Type = 4 (Resonator)

18.	Pitch Level	3	0	0	99	7	15:2-14:4
19.	Pitch Input Balance	3	1	-99	198	8	16:2-15:3
20.	Pitch Type	3	2	0	4	3	16:5-16:3
21.	Pitch Waveform	UNUSED				1	16:6
22.	Resonator Tuning	3	3	0	60	7	17:5-16:7
23.	Resonator Decay	3	4	0	99	7	18:4-17:6
24.	Pitch Feedback	UNUSED				7	19:3-18:5
25.	Pitch Output to Reverb	3	5	0	99	7	20:2-19:4

E Q

26.	EQ High Frequency	4	0	0	5	3	20:5-20:3
27.	EQ High Boost	4	1	0	9	4	21:1-20:6
28.	EQ Low Frequency	4	2	0	7	3	21:4-21:2
29.	EQ Low Boost	4	3	0	12	4	22:0-21:5
	FX Spare						23:7..22:1

TRIGGER DATA FORMAT

The Trigger parameters are comprised of 328 bytes of data which contain 4 setups at 82 bytes each. Like the Global parameters, the Trigger parameters are not packed into each available bit, so that each parameter occupies its own byte. This results in unused bits for most of the parameter's bytes. These bits must remain at 0. The Trigger parameters are stored in 2's complement. Add the Offset amount to the parameter value to obtain the value displayed. For direct parameter editing (SysEx command 10H), the function and page numbers are shown. The Mode should be set to 4 (=Trigger), the Channel parameter should be set to the trigger 0-15, and the Sound # parameter is ignored.

NOTE: Direct parameter editing only modifies the trigger parameters for the current Trigger Setup. The current Trigger Setup (0~3) is part of the Global parameters. The parameters for direct editing the current Trigger Setup are shown here. Bit Addresses are shown for Trigger Setup 1.

#	Parameter name	Func	Page	Offset	LoLim	HiLim	bits	bit address
0.	Trigger 1 Gain	5	1	0	0	99	7	0:6-0:0
1.	Trigger 1 VCurve	5	2	0	0	14	4	1:3-1:0
2.	Trigger 1 Threshold	5	3	-80	0	80	7	2:6-2:0
3.	Trigger 1 Crosstalk	5	5	-60	0	60	6	3:5-3:0
4.	Trigger 1 Retrigger	5	4	+100	-100	100	8	4:7-4:0
5.	Trigger 2 Gain	6	1	0	0	99	7	5:6-5:0
6.	Trigger 2 VCurve	6	2	0	0	14	4	6:3-6:0
7.	Trigger 2 Threshold	6	3	-80	0	80	7	7:6-7:0
8.	Trigger 2 Crosstalk	6	5	-60	0	60	6	8:5-8:0
9.	Trigger 2 Retrigger	6	4	+100	-100	100	8	9:7-9:0
10.	Trigger 3 Gain	7	1	0	0	99	7	10:6-10:0
11.	Trigger 3 VCurve	7	2	0	0	14	4	11:3-11:0
12.	Trigger 3 Threshold	7	3	-80	0	80	7	12:6-12:0
13.	Trigger 3 Crosstalk	7	5	-60	0	60	6	13:5-13:0
14.	Trigger 3 Retrigger	7	4	+100	-100	100	8	14:7-14:0
15.	Trigger 4 Gain	8	1	0	0	99	7	15:6-15:0
16.	Trigger 4 VCurve	8	2	0	0	14	4	16:3-16:0
17.	Trigger 4 Threshold	8	3	-80	0	80	7	17:6-17:0
18.	Trigger 4 Crosstalk	8	5	-60	0	60	6	18:5-18:0
19.	Trigger 4 Retrigger	8	4	+100	-100	100	8	19:7-19:0
20.	Trigger 5 Gain	9	1	0	0	99	7	20:6-20:0
21.	Trigger 5 VCurve	9	2	0	0	14	4	21:3-21:0
22.	Trigger 5 Threshold	9	3	-80	0	80	7	22:6-22:0
23.	Trigger 5 Crosstalk	9	5	-60	0	60	6	23:5-23:0
24.	Trigger 5 Retrigger	9	4	+100	-100	100	8	24:7-24:0
25.	Trigger 6 Gain	10	1	0	0	99	7	25:6-25:0
26.	Trigger 6 VCurve	10	2	0	0	14	4	26:3-26:0
27.	Trigger 6 Threshold	10	3	-80	0	80	7	27:6-27:0

28.	Trigger 6 Crosstalk	10	5	-60	0	60	6	28:5-28:0
29.	Trigger 6 Retrigger	10	4	+100	-100	100	8	29:7-29:0
30.	Trigger 7 Gain	11	1	0	0	99	7	30:6-30:0
31.	Trigger 7 VCurve	11	2	0	0	14	4	31:3-31:0
32.	Trigger 7 Threshold	11	3	-80	0	80	7	32:6-32:0
33.	Trigger 7 Crosstalk	11	5	-60	0	60	6	33:5-33:0
34.	Trigger 7 Retrigger	11	4	+100	-100	100	8	34:7-34:0
35.	Trigger 8 Gain	12	1	0	0	99	7	35:6-35:0
36.	Trigger 8 VCurve	12	2	0	0	14	4	36:3-36:0
37.	Trigger 8 Threshold	12	3	-80	0	80	7	37:6-37:0
38.	Trigger 8 Crosstalk	12	5	-60	0	60	6	38:5-38:0
39.	Trigger 8 Retrigger	12	4	+100	-100	100	8	39:7-39:0
40.	Trigger 9 Gain	13	1	0	0	99	7	40:6-40:0
41.	Trigger 9 VCurve	13	2	0	0	14	4	41:3-41:0
42.	Trigger 9 Threshold	13	3	-80	0	80	7	42:6-42:0
43.	Trigger 9 Crosstalk	13	5	-60	0	60	6	43:5-43:0
44.	Trigger 9 Retrigger	13	4	+100	-100	100	8	44:7-44:0
45.	Trigger 10 Gain	14	1	0	0	99	7	45:6-45:0
46.	Trigger 10 VCurve	14	2	0	0	14	4	46:3-46:0
47.	Trigger 10 Threshold	14	3	-80	0	80	7	47:6-47:0
48.	Trigger 10 Crosstalk	14	5	-60	0	60	6	48:5-48:0
49.	Trigger 10 Retrigger	14	4	+100	-100	100	8	49:7-49:0
50.	Trigger 11 Gain	15	1	0	0	99	7	50:6-50:0
51.	Trigger 11 VCurve	15	2	0	0	14	4	51:3-51:0
52.	Trigger 11 Threshold	15	3	-80	0	80	7	52:6-52:0
53.	Trigger 11 Crosstalk	15	5	-60	0	60	6	53:5-53:0
54.	Trigger 11 Retrigger	15	4	+100	-100	100	8	54:7-54:0
55.	Trigger 12 Gain	16	1	0	0	99	7	55:6-55:0
56.	Trigger 12 VCurve	16	2	0	0	14	4	56:3-56:0
57.	Trigger 12 Threshold	16	3	-80	0	80	7	57:6-57:0
58.	Trigger 12 Crosstalk	16	5	-60	0	60	6	58:5-58:0
59.	Trigger 12 Retrgger	16	4	+100	-100	100	8	59:7-59:0
60.	Trigger 13 Gain	17	2	0	0	99	7	60:6-60:0
61.	Trigger 13 VCurve	17	3	0	0	14	4	61:3-61:0
62.	Trigger 13 Threshold	17	4	-80	0	80	7	62:6-62:0
63.	Trigger 13 Crosstalk	17	6	-60	0	60	6	63:5-63:0
64.	Trigger 13 Retrigger	17	5	+100	-100	100	8	64:7-64:0
65.	Trigger 14 Gain	18	2	0	0	99	7	65:6-65:0
66.	Trigger 14 VCurve	18	3	0	0	14	4	66:3-66:0
67.	Trigger 14 Threshold	18	4	-80	0	80	7	67:6-67:0
68.	Trigger 14 Crosstalk	18	6	-60	0	60	6	68:5-68:0
69.	Trigger 14 Retrigger	18	5	+100	-100	100	8	69:7-69:0
70.	Trigger 15 Gain	19	1	0	0	99	7	70:6-70:0
71.	Trigger 15 VCurve	19	2	0	0	14	4	71:3-71:0
72.	Trigger 15 Hat Threshold	19	3	-80	0	80	7	72:6-72:0

73.	Hat Pedal Type	19	5	0	0	1	1	73:0
74.	Trigger 15 Retrigger	19	4	+100	-100	100	8	74:7-74:0
75.	Trigger 16 Gain	20	1	0	0	99	7	75:6-75:0
76.	Trigger 16 VCurve	20	2	0	0	14	4	76:3-76:0
77.	AUX Pedal Type	20	9	0	0	1	1	77:0
78.	AUX Pedal Gain	20	11	0	0	99	7	78:6-78:0
79.	Trigger 16 Retrigger	20	4	+100	-100	100	8	79:7-79:0
80.	Noise Suppression	5	6	-60	0	60	6	80:5-80:0
81.	Spare							81:7-81:0

80-159. Trigger Setup 2 Trigger 1-16 Parameters	163:7-82:0
160-239. Trigger Setup 3 Trigger 1-16 Parameters	245:7-164:0
319-240. Trigger Setup 4 Trigger 1-16 Parameters	327:7-246:0