Remote Preset Editing via MIDI SysEx
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SPECIFICATION:

Focus: What's it all about.

General Info: Device Inquiry messages

Dumps: Sample Dump Standard like protocol

Format: The technical specifics.

Parameters: A List of ID's and their meanings.

Commands: A List of Commands and Examples.

Focus:

    The main focus is to provide an easy to use, easy to implement, elegant
protocol for the specific function of editing E4 presets from a remote
system. Typically this would be a computer, with the potential for a
large, colorful, graphical interface, superior to the standard E4 front
panel display.
    The protocol consists of a data format usable over MIDI, as well as
any other transfer media. The data format is simple, flexible, and easy
to expand while maintaining backwards compatibility.

    There are a few basic necessary functions that make up a Remote
Preset Editor/Librarian package.

    - the ability to select the Preset to edit.

    - the ability to select the Voice or Group of Voices to edit.

    - the ability to send a new individual parameter value to the E4.

    - the ability to request from the E4 the value of an individual parameter.

    - the ability to send a Dump of parameters to the E4.

    - the ability to request from the E4 a Dump of parameters.

    - the ability to Name a Preset.

    - the ability to request the Name of a Preset/Sample.

- the ability to Catalogue the Folders/Banks/Presets/Samples of a disk.

General Information:

    The E4 line of products support the Non-Real Time System Exclusive
General Information Device Inquiry messages (sub-ID#1 = 06).

Format: {F0h,7Eh,<device ID>,06h,01h,F7}

        {F0h,7Eh,<device ID>} = Universal System Exclusive Non-real time header.
                        06h = General Information (sub-ID#1)
                        01h = Identity Request (sub-ID#2)
                        F7h = EOX

Response: {F0h,7Eh,<device ID>,06h,02h,mm,ff,ff,dd,dd,ss,ss,ss,ss,F7}

        {F0h,7Eh,<device ID>} = Universal System Exclusive Non-real time header.
                <device ID> = ID the hunk of metal and plastic is set to.
                               0 - 126 are Unique ID's, 127 is an All Broadcast ID.
                        06h = General Information (sub-ID#1)
                        02h = Identity Reply (sub-ID#2)
                         mm = 18h (Manufacturers System Exclusive id code)
                      ff ff = 01h,04h (Device family code, 14 bits, LSB first)
                      dd dd = Device family member code, 14 bits, LSB first
                               00h,05h = E4
                               01h,05h = E64
                               02h,05h = E4k
                               03h,05h = E64FX
                               04h,05h = E4XT
                               05h,05h = E4X
                               06h,05h = E6400
                               07h,05h = E4XT ULTRA
                               08h,05h = E6400 ULTRA

              ss ss ss ss = Software revision level, 4 ASCII characters.
        example: 4 . 0 0 = version 4.00

                      F7h = EOX

E4 Specific Data Format:

    The transfer of Data is organized in the following ways.

Format: <Header>,<Command>,<Count*>,<Packet1>,<Packet2>,...,<Checksum*>,<EOX>.

    <Header>

```
      F0h = sysex message
      18h = EMU ID
      21h = E4 ID
      xxh = Device ID
            00h - 7Eh are Unique
            7Fh is an All Broadcast

      55h = Special Editor designator byte

   <Command> determines what function to perform, such as:

      Parameter Edit/Request
      Preset/Sample Name/Request
      Dump/Request


   <Count> Gives the number of bytes in a message, such as
           Parameter Edits of multiple parameters.  *Only used
           in variable sized messages.



- Packets take several forms, depending on the command.  Some commands may
  not require a packet at all.

   <Packet> = <2 Byte ID>,<2 Byte Data>.
              The main packet has 2 parts;  An ID portion and the Data
              portion.  This is used for editing a parameter.  The ID
              chooses the parameter, and the Data is the new value.

              Every Parameter has a unique ID.  This way, parameters can be
              individually manipulated.  However, these Parameter ID's operate
              on a specific Voice/Group/Sample, as well as Global parameters.

              The ID Byte is the Parameter ID, a 14-bit unsigned number split
              into 2 MIDI bytes, and sent LSB first.

              The Data is a 14 bit signed or unsigned number split into 2
              7-bit MIDI bytes, and sent LSB first.

   <Packet> = <2 Byte ID>
              The request packet requires only the Parameter ID, or Preset/
              Sample number.  Typically used in a request for data from a
              particular Parameter.

   <Packet> = <Preset/Sample #>,<ASCII string>
              The Name packet contains the Preset or Sample number, followed
              by the name as a string of ASCII characters.

   <Packet> = <Preset #>
              Selecting another Preset.


   <Checksum> = 1 Byte XOR(1's compliment) of the sum of the DATA bytes in the message.
                *Only used in certain messages.  A checksum value of 7Fh means "ignore
                checksum".
```

```
        <EOX> = F7h end of SYSEX.



The following is a list of editable parameters and their ID's:

  - Values recieved that are outside the min/max range will be clipped
    to within that range.

  - Preset and Sample Number Ranges may vary if Preset Flash, Sample ROM or
    Sample Flash are present.  Preset and Sample information for ROM/Flash
    locations may be requested, but cannot be changed.


GLOBAL:
                                 (LSB,MSB)
 E4_PRESET_TRANSPOSE,       id = 0 (00h,00h)      min = -24;  max = +24  (semitones)
 E4_PRESET_VOLUME,          id = 1 (01h,00h)      min = -96;  max = +10  (dB)
 E4_PRESET_CTRL_A,          id = 2 (02h,00h)      min = -1;   max = 127  (-1 = off)
 E4_PRESET_CTRL_B,          id = 3 (03h,00h)      min = -1;   max = 127  (-1 = off)
 E4_PRESET_CTRL_C,          id = 4 (04h,00h)      min = -1;   max = 127  (-1 = off)
 E4_PRESET_CTRL_D,          id = 5 (05h,00h)      min = -1;   max = 127  (-1 = off)

 E4_PRESET_FX_A_ALGORITHM,  id = 6 (06h,00h)      min = 0;  max =  44 (see below)
 E4_PRESET_FX_A_PARM_0,     id = 7 (07h,00h)      min = 0;  max =  90
 E4_PRESET_FX_A_PARM_1,     id = 8 (08h,00h)      min = 0;  max = 127
 E4_PRESET_FX_A_PARM_2,     id = 9 (09h,00h)      min = 0;  max = 127
 E4_PRESET_FX_A_AMT_0,      id = 10 (0Ah,00h)     min = 0;  max = 100
 E4_PRESET_FX_A_AMT_1,      id = 11 (0Bh,00h)     min = 0;  max = 100
 E4_PRESET_FX_A_AMT_2,      id = 12 (0Ch,00h)     min = 0;  max = 100
 E4_PRESET_FX_A_AMT_3,      id = 13 (0Dh,00h)     min = 0;  max = 100

 E4_PRESET_FX_B_ALGORITHM,  id = 14 (0Eh,00h)     min = 0;  max =  27 (see below)
 E4_PRESET_FX_B_PARM_0,     id = 15 (0Fh,00h)     min = 0;  max = 127
 E4_PRESET_FX_B_PARM_1,     id = 16 (10h,00h)     min = 0;  max = 127
 E4_PRESET_FX_B_PARM_2,     id = 17 (11h,00h)     min = 0;  max = 127
 E4_PRESET_FX_B_AMT_0,      id = 18 (12h,00h)     min = 0;  max = 100
 E4_PRESET_FX_B_AMT_1,      id = 19 (13h,00h)     min = 0;  max = 100
 E4_PRESET_FX_B_AMT_2,      id = 20 (14h,00h)     min = 0;  max = 100
 E4_PRESET_FX_B_AMT_3,      id = 21 (15h,00h)     min = 0;  max = 100


*** id 22 not used ***

LINKS:

 E4_LINK_PRESET,            id = 23 (17h,00h)     min =   0;  max = 999(1255)
 E4_LINK_VOLUME,            id = 24 (18h,00h)     min = -96;  max = +10
 E4_LINK_PAN,               id = 25 (19h,00h)     min = -64;  max = +63
 E4_LINK_TRANSPOSE,         id = 26 (1Ah,00h)     min = -24;  max = +24
 E4_LINK_FINE_TUNE,         id = 27 (1Bh,00h)     min = -64;  max = +64

 E4_LINK_KEY_LOW,           id = 28 (1Ch,00h)     min = 0;  max = 127  (C-2 -> G8)
 E4_LINK_KEY_LOWFADE,       id = 29 (1Dh,00h)     min = 0;  max = 127
 E4_LINK_KEY_HIGH,          id = 30 (1Eh,00h)     min = 0;  max = 127  (C-2 -> G8)
 E4_LINK_KEY_HIGHFADE,      id = 31 (1Fh,00h)     min = 0;  max = 127
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```
E4_LINK_VEL_LOW,          id = 32 (20h,00h)      min = 0;  max = 127
E4_LINK_VEL_LOWFADE,      id = 33 (21h,00h)      min = 0;  max = 127
E4_LINK_VEL_HIGH,         id = 34 (22h,00h)      min = 0;  max = 127
E4_LINK_VEL_HIGHFADE,     id = 35 (23h,00h)      min = 0;  max = 127


*** id 36 not used ***

VOICES:

 E4_GEN_GROUP_NUM,        id = 37 (25h,00h)      min =   1;  max =   32
 E4_GEN_SAMPLE,           id = 38 (26h,00h)      min =   0;  max = 999(2999)

 E4_GEN_VOLUME,           id = 39 (27h,00h)      min = -96;  max = +10
 E4_GEN_PAN,              id = 40 (28h,00h)      min = -64;  max = +63
 E4_GEN_CTUNE,            id = 41 (29h,00h)      min = -72;  max = +24  (Voice only)
 E4_GEN_FTUNE,            id = 42 (2Ah,00h)      min = -64;  max = +64
 E4_GEN_XPOSE,            id = 43 (2Bh,00h)      min = -24;  max = +24  (Voice only)
 E4_GEN_ORIG_KEY,         id = 44 (2Ch,00h)      min =   0;  max = 127  (60 = C3, Sample only)

 E4_GEN_KEY_LOW,          id = 45 (2Dh,00h)      min = 0;  max = 127  (C-2 -> G8)
 E4_GEN_KEY_LOWFADE,      id = 46 (2Eh,00h)      min = 0;  max = 127
 E4_GEN_KEY_HIGH,         id = 47 (2Fh,00h)      min = 0;  max = 127  (C-2 -> G8)
 E4_GEN_KEY_HIGHFADE,     id = 48 (30h,00h)      min = 0;  max = 127

 E4_GEN_VEL_LOW,          id = 49 (31h,00h)      min = 0;  max = 127
 E4_GEN_VEL_LOWFADE,      id = 50 (32h,00h)      min = 0;  max = 127
 E4_GEN_VEL_HIGH,         id = 51 (33h,00h)      min = 0;  max = 127
 E4_GEN_VEL_HIGHFADE,     id = 52 (34h,00h)      min = 0;  max = 127

 E4_GEN_RT_LOW,           id = 53 (35h,00h)      min = 0;  max = 127  (Voice only)
 E4_GEN_RT_LOWFADE,       id = 54 (36h,00h)      min = 0;  max = 127  (Voice only)
 E4_GEN_RT_HIGH,          id = 55 (37h,00h)      min = 0;  max = 127  (Voice only)
 E4_GEN_RT_HIGHFADE,      id = 56 (38h,00h)      min = 0;  max = 127  (Voice only)


Tuning:

 E4_VOICE_NON_TRANSPOSE,  id = 57 (39h,00h)      min = 0;  max = 1

    0 = off
    1 = on

 E4_VOICE_CHORUS_AMOUNT,  id = 58 (3Ah,00h)      min =    0;  max = 100 (%)
 E4_VOICE_CHORUS_WIDTH,   id = 59 (3Bh,00h)      min = -128;  max =   0

  Displayed Value:
    int pct = ((val + 128) * 100) / 128;
    sprintf(buf,"%3d%%", pct);

 E4_VOICE_CHORUS_X,       id = 60 (3Ch,00h)      min =  -32;  max = +32 (ms)

    Chorus initial ITD(Inter-Aural Time Delay):
        Adjusts the delay of the left and right sounds.
        Positive numbers delay the left channel more.
        Negative numbers delay the right channel more.
```

```
     (+ or -)     (+ or -)
    0.000ms   =   0
    0.045ms   =   1
    0.090ms   =   2
    0.136ms   =   3
    0.181ms   =   4
    0.226ms   =   5
    0.272ms   =   6
    0.317ms   =   7
    0.362ms   =   8
    0.408ms   =   9
    0.453ms   =   10
    0.498ms   =   11
    0.544ms   =   12
    0.589ms   =   13
    0.634ms   =   14
    0.680ms   =   15
    0.725ms   =   16
    0.770ms   =   17
    0.816ms   =   18
    0.861ms   =   19
    0.907ms   =   20
    0.952ms   =   21
    0.997ms   =   22
    1.043ms   =   23
    1.088ms   =   24
    1.133ms   =   25
    1.179ms   =   26
    1.224ms   =   27
    1.269ms   =   28
    1.315ms   =   29
    1.360ms   =   30
    1.405ms   =   31
    1.451ms   =   32
```

```
 E4_VOICE_DELAY,              id = 61 (3Dh,00h)     min = 0;  max = 10000   (ms)
 E4_VOICE_START_OFFSET,       id = 62 (3Eh,00h)     min = 0;  max =    127

 E4_VOICE_GLIDE_RATE,         id = 63 (3Fh,00h)     min = 0;  max = 127 (sec/oct)
      (Portamento)
```

Here are the function and tables for the displayed values:

This is for E4_VOICE_GLIDE_RATE only.

```
LOCAL Void cnv_glide_rate(Long val, Char *buf)
{
   int msec = (envunits1[val] * 1000 + envunits2[val] * 10) / 5;
   sprintf(buf, "%2d.%03dsec/oct", msec / 1000, msec % 1000);
}


const unsigned char          envunits1[] =
{
    0, 0, 0, 0, 0, 0, 0, 0,
    0, 0, 0, 0, 0, 0, 0, 0,
    0, 0, 0, 0, 0, 0, 0, 0,
    0, 0, 0, 0, 0, 0, 0, 0,
    0, 0, 0, 0, 0, 0, 0, 0,
```

```
    0, 0, 0, 0, 0, 0, 0, 0,
    1, 1, 1, 1, 1, 1, 1, 1,
    1, 1, 1, 1, 2, 2, 2, 2,
    2, 2, 2, 3, 3, 3, 3, 3,
    4, 4, 4, 4, 5, 5, 5, 5,
    6, 6, 7, 7, 7, 8, 8, 9,
    9, 10, 11, 11, 12, 13, 13, 14,
    15, 16, 17, 18, 19, 20, 22, 23,
    24, 26, 28, 30, 32, 34, 36, 38,
    41, 44, 47, 51, 55, 59, 64, 70,
    76, 83, 91, 100, 112, 125, 142, 163,
};

const unsigned char           envunits2[] =
{
    00, 01, 02, 03, 04, 05, 06, 07,
    8, 9, 10, 11, 12, 13, 14, 15,
    16, 17, 18, 19, 20, 21, 22, 23,
    25, 26, 28, 29, 32, 34, 36, 38,
    41, 43, 46, 49, 52, 55, 58, 62,
    65, 70, 74, 79, 83, 88, 93, 98,
    04, 10, 17, 24, 31, 39, 47, 56,
    65, 74, 84, 95, 06, 18, 31, 44,
    59, 73, 89, 06, 23, 42, 62, 82,
    04, 28, 52, 78, 05, 34, 64, 97,
    32, 67, 06, 46, 90, 35, 83, 34,
    87, 45, 06, 70, 38, 11, 88, 70,
    56, 49, 48, 53, 65, 85, 13, 50,
    97, 54, 24, 06, 02, 15, 44, 93,
    64, 60, 84, 41, 34, 70, 56, 03,
    22, 28, 40, 87, 9, 65, 36, 69,
};


    0.000sec/oct to 0.046sec/oct by 2's

    0.050
    0.052
    0.056
    0.058
    0.064
    0.068
    0.072
    0.076
    0.082
    0.086
    0.092
    0.098
    0.104
    0.110
    0.116
    0.124
    0.130
    0.140
    0.148
    0.158
    0.166
```

```
0.176
0.186
0.196
0.208
0.220
0.234
0.248
0.262
0.278
0.294
0.312
0.330
0.348
0.368
0.390
0.412
0.436
0.462
0.488
0.518
0.546
0.578
0.612
0.646
0.684
0.724
0.764
0.808
0.856
0.904
0.956
1.010
1.068
1.128
1.194
1.264
1.334
1.412
1.492
1.580
1.670
1.766
1.868
1.974
2.090
2.212
2.340
2.476
2.622
2.776
2.940
3.112
3.298
3.496
3.706
3.930
4.170
```

```
4.426
4.700
4.994
5.308
5.648
6.012
6.404
6.830
7.288
7.786
8.328
8.920
9.568
10.282
11.068
11.940
12.912
14.006
15.244
16.656
18.280
20.174
22.148
25.130
28.472
32.738
```

```
E4_VOICE_GLIDE_CURVE,       id = 64 (40h,00h)     min = 0;  max = 8
    linear -> exponential;  0 = linear, 8 = most exponential curve


E4_VOICE_SOLO,              id = 65 (41h,00h)     min = 0;  max = 8
   "Monophonic" mode.

   0 = Off
   1 = Multiple Trigger
   2 = Melody (last)
   3 = Melody (low)
   4 = Melody (high)
   5 = Synth (last)
   6 = Synth (low)
   7 = Synth (high)
   8 = Fingered Glide

E4_VOICE_ASSIGN_GROUP,      id = 66 (42h,00h)     min = 0;  max = 23

   0   =   Poly All
   1   =   Poly16 A
   2   =   Poly16 B
   3   =   Poly 8 A
   4   =   Poly 8 B
   5   =   Poly 8 C
   6   =   Poly 8 D
   7   =   Poly 4 A
```

```
    8   =   Poly 4 B
    9   =   Poly 4 C
   10   =   Poly 4 D
   11   =   Poly 2 A
   12   =   Poly 2 B
   13   =   Poly 2 C
   14   =   Poly 2 D
   15   =   Mono A
   16   =   Mono B
   17   =   Mono C
   18   =   Mono D
   19   =   Mono E
   20   =   Mono F
   21   =   Mono G
   22   =   Mono H
   23   =   Mono I


 E4_VOICE_LATCHMODE,         id = 67 (43h,00h)     min =    0;  max =    1

    0 = off
    1 = on




Amplifier:


 E4_VOICE_VOLENV_DEPTH,      id = 68 (44h,00h)     min = 0;  max = 16
    Amp Env Depth:    -96dB to -48dB by 3's

 E4_VOICE_SUBMIX,            id = 69 (45h,00h)     min = -1;  max =   3

Submix: -1 = voice
        0 = main
        1 = sub1
        2 = sub2
        3 = sub3
    (if has Octopus card)
        4 = sub4
        5 = sub5
        6 = sub6
        7 = sub7


 E4_VOICE_VENV_SEG0_RATE,   id = 70 (46h,00h)    min = 0;  max = 127 (Atk1 Rate)
 E4_VOICE_VENV_SEG0_TGTLVL, id = 71 (47h,00h)    min = 0;  max = 100 (Atk1 Level%)
 E4_VOICE_VENV_SEG1_RATE,   id = 72 (48h,00h)    min = 0;  max = 127 (Dcy1 Rate)
 E4_VOICE_VENV_SEG1_TGTLVL, id = 73 (49h,00h)    min = 0;  max = 100 (Dcy1 Level%)
 E4_VOICE_VENV_SEG2_RATE,   id = 74 (4Ah,00h)    min = 0;  max = 127 (Rls1 Rate)
 E4_VOICE_VENV_SEG2_TGTLVL, id = 75 (4Bh,00h)    min = 0;  max = 100 (Rls1 Level%)
 E4_VOICE_VENV_SEG3_RATE,   id = 76 (4Ch,00h)    min = 0;  max = 127 (Atk2 Rate)
 E4_VOICE_VENV_SEG3_TGTLVL, id = 77 (4Dh,00h)    min = 0;  max = 100 (Atk2 Level%)
 E4_VOICE_VENV_SEG4_RATE,   id = 78 (4Eh,00h)    min = 0;  max = 127 (Dcy2 Rate)
 E4_VOICE_VENV_SEG4_TGTLVL, id = 79 (4Fh,00h)    min = 0;  max = 100 (Dcy2 Level%)
 E4_VOICE_VENV_SEG5_RATE,   id = 80 (50h,00h)    min = 0;  max = 127 (Rls2 Rate)
```

```
 E4_VOICE_VENV_SEG5_TGTLVL, id = 81 (51h,00h)      min = 0;  max = 100 (Rls2 Level%)


/*
 * Filter Parameters:   See Filter section below for filter types.
 */

 E4_VOICE_FTYPE,            id = 82 (52h,00h)      min = 0;  max = variable
 E4_VOICE_FMORPH,           id = 83 (53h,00h)      min = 0;  max = 255
 E4_VOICE_FKEY_XFORM,       id = 84 (54h,00h)      min = 0;  max = 127

 E4_VOICE_FILT_GEN_PARM1,   id = 85 (55h,00h)      min = 0;  max = 255 (reserved for future
expansion)
 E4_VOICE_FILT_GEN_PARM2,   id = 86 (56h,00h)      min = 0;  max = 255 (reserved for future
expansion)
 E4_VOICE_FILT_GEN_PARM3,   id = 87 (57h,00h)      min = 0;  max = 255
 E4_VOICE_FILT_GEN_PARM4,   id = 88 (58h,00h)      min = 0;  max = 255
 E4_VOICE_FILT_GEN_PARM5,   id = 89 (59h,00h)      min = 0;  max = 255
 E4_VOICE_FILT_GEN_PARM6,   id = 90 (5Ah,00h)      min = 0;  max = 255
 E4_VOICE_FILT_GEN_PARM7,   id = 91 (5Bh,00h)      min = 0;  max = 255
 E4_VOICE_FILT_GEN_PARM8,   id = 92 (5Ch,00h)      min = 0;  max = 255


 E4_VOICE_FENV_SEG0_RATE,   id = 93 (5Dh,00h)      min = 0;  max = 127 (Atk1 Rate)
 E4_VOICE_FENV_SEG0_TGTLVL, id = 94 (5Eh,00h)      min = 0;  max = 100 (Atk1 Level%)
 E4_VOICE_FENV_SEG1_RATE,   id = 95 (5Fh,00h)      min = 0;  max = 127 (Dcy1 Rate)
 E4_VOICE_FENV_SEG1_TGTLVL, id = 96 (60h,00h)      min = 0;  max = 100 (Dcy1 Level%)
 E4_VOICE_FENV_SEG2_RATE,   id = 97 (61h,00h)      min = 0;  max = 127 (Rls1 Rate)
 E4_VOICE_FENV_SEG2_TGTLVL, id = 98 (62h,00h)      min = 0;  max = 100 (Rls1 Level%)
 E4_VOICE_FENV_SEG3_RATE,   id = 99 (63h,00h)      min = 0;  max = 127 (Atk2 Rate)
 E4_VOICE_FENV_SEG3_TGTLVL, id = 100 (64h,00h)     min = 0;  max = 100 (Atk2 Level%)
 E4_VOICE_FENV_SEG4_RATE,   id = 101 (65h,00h)     min = 0;  max = 127 (Dcy2 Rate)
 E4_VOICE_FENV_SEG4_TGTLVL, id = 102 (66h,00h)     min = 0;  max = 100 (Dcy2 Level%)
 E4_VOICE_FENV_SEG5_RATE,   id = 103 (67h,00h)     min = 0;  max = 127 (Rls2 Rate)
 E4_VOICE_FENV_SEG5_TGTLVL, id = 104 (68h,00h)     min = 0;  max = 100 (Rls2 Level%)




 E4_VOICE_LFO_RATE,         id = 105 (69h,00h)    min = 0;  max = 127

Conversions for displayed values:

Void cnv_lfo_rate(Long val, Char *buf)
{
   sprintf (buf, "%2d.%02d", lfounits1[val], lfounits2[val]);
}

const unsigned char          lfounits1[] =
{
    0, 0, 0, 0, 0, 0, 0, 0,
    0, 0, 0, 0, 0, 0, 0, 0,
    0, 0, 0, 0, 0, 0, 0, 0,
    1, 1, 1, 1, 1, 1, 1, 1,
    1, 1, 1, 1, 1, 1, 1, 1,
```

```
    2, 2, 2, 2, 2, 2, 2, 2,
    2, 2, 2, 2, 2, 3, 3, 3,
    3, 3, 3, 3, 3, 3, 3, 4,
    4, 4, 4, 4, 4, 4, 4, 4,
    5, 5, 5, 5, 5, 5, 5, 6,
    6, 6, 6, 6, 6, 7, 7, 7,
    7, 7, 7, 8, 8, 8, 8, 8,
    9, 9, 9, 9, 10, 10, 10, 10,
    10, 11, 11, 11, 11, 12, 12, 12,
    13, 13, 13, 13, 14, 14, 14, 15,
    15, 15, 16, 16, 17, 17, 17, 18,
};

const unsigned char         lfounits2[] =
{
    8, 11, 15, 18, 21, 25, 28, 32,
    35, 39, 42, 46, 50, 54, 58, 63,
    67, 71, 76, 80, 85, 90, 94, 99,
    04, 10, 15, 20, 25, 31, 37, 42,
    48, 54, 60, 67, 73, 79, 86, 93,
    00, 07, 14, 21, 29, 36, 44, 52,
    60, 68, 77, 85, 94, 03, 12, 21,
    31, 40, 50, 60, 70, 81, 91, 02,
    13, 25, 36, 48, 60, 72, 84, 97,
    10, 23, 37, 51, 65, 79, 94, 8,
    24, 39, 55, 71, 88, 04, 21, 39,
    57, 75, 93, 12, 32, 51, 71, 92,
    13, 34, 56, 78, 00, 23, 47, 71,
    95, 20, 46, 71, 98, 25, 52, 80,
    9, 38, 68, 99, 30, 61, 93, 26,
    60, 94, 29, 65, 01, 38, 76, 14,
};
```

```
 E4_VOICE_LFO_SHAPE,        id = 106 (6Ah,00h)    min = 0;  max =    7

   Shape: 0 = triangle
          1 = sine
          2 = sawtooth
          3 = square
          4 = 0,1,0,-1
          5 = C,E,G,C
          6 = C,D,F,G
          7 = 8st Pent

 E4_VOICE_LFO_DELAY,        id = 107 (6Bh,00h)    min = 0;  max = 127
 E4_VOICE_LFO_VAR,          id = 108 (6Ch,00h)    min = 0;  max = 100 (%)
 E4_VOICE_LFO_SYNC,         id = 109 (6Dh,00h)    min = 0;  max =    1

   Sync:  0 = key sync
          1 = free run

 E4_VOICE_LFO2_RATE,        id = 110 (6Eh,00h)    min = 0;  max = 127 (as above)
 E4_VOICE_LFO2_SHAPE,       id = 111 (6Fh,00h)    min = 0;  max =    7 (as above)
 E4_VOICE_LFO2_DELAY,       id = 112 (70h,00h)    min = 0;  max = 127
 E4_VOICE_LFO2_VAR,         id = 113 (71h,00h)    min = 0;  max = 100 (%)
 E4_VOICE_LFO2_SYNC,        id = 114 (72h,00h)    min = 0;  max =    1 (as above)
```

```
E4_VOICE_LFO2_OP0_PARM,      id = 115 (73h,00h)    min = 0;  max = 10  (Lag 0: )
E4_VOICE_LFO2_OP1_PARM,      id = 116 (74h,00h)    min = 0;  max = 10  (Lag 1: )

E4_VOICE_AENV_SEG0_RATE,     id = 117 (75h,00h)    min = 0;  max = 127 (Atk1 Rate)
E4_VOICE_AENV_SEG0_TGTLVL,   id = 118 (76h,00h)    min = 0;  max = 100 (Atk1 Level%)
E4_VOICE_AENV_SEG1_RATE,     id = 119 (77h,00h)    min = 0;  max = 127 (Dcy1 Rate)
E4_VOICE_AENV_SEG1_TGTLVL,   id = 120 (78h,00h)    min = 0;  max = 100 (Dcy1 Level%)
E4_VOICE_AENV_SEG2_RATE,     id = 121 (79h,00h)    min = 0;  max = 127 (Rls1 Rate)
E4_VOICE_AENV_SEG2_TGTLVL,   id = 122 (7Ah,00h)    min = 0;  max = 100 (Rls1 Level%)
E4_VOICE_AENV_SEG3_RATE,     id = 123 (7Bh,00h)    min = 0;  max = 127 (Atk2 Rate)
E4_VOICE_AENV_SEG3_TGTLVL,   id = 124 (7Ch,00h)    min = 0;  max = 100 (Atk2 Level%)
E4_VOICE_AENV_SEG4_RATE,     id = 125 (7Dh,00h)    min = 0;  max = 127 (Dcy2 Rate)
E4_VOICE_AENV_SEG4_TGTLVL,   id = 126 (7Eh,00h)    min = 0;  max = 100 (Dcy2 Level%)
E4_VOICE_AENV_SEG5_RATE,     id = 127 (7Fh,00h)    min = 0;  max = 127 (Rls2 Rate)
E4_VOICE_AENV_SEG5_TGTLVL,   id = 128 (00h,01h)    min = 0;  max = 100 (Rls2 Level%)


Cords:


E4_VOICE_CORD0_SRC,          id = 129 (01h,01h)    min =    0;  max =  255
E4_VOICE_CORD0_DST,          id = 130 (02h,01h)    min =    0;  max =  255
E4_VOICE_CORD0_AMT,          id = 131 (03h,01h)    min = -100;  max = +100
E4_VOICE_CORD1_SRC,          id = 132 (04h,01h)    min =    0;  max =  255
E4_VOICE_CORD1_DST,          id = 133 (05h,01h)    min =    0;  max =  255
E4_VOICE_CORD1_AMT,          id = 134 (06h,01h)    min = -100;  max = +100
E4_VOICE_CORD2_SRC,          id = 135 (07h,01h)    min =    0;  max =  255
E4_VOICE_CORD2_DST,          id = 136 (08h,01h)    min =    0;  max =  255
E4_VOICE_CORD2_AMT,          id = 137 (09h,01h)    min = -100;  max = +100
E4_VOICE_CORD3_SRC,          id = 138 (0Ah,01h)    min =    0;  max =  255
E4_VOICE_CORD3_DST,          id = 139 (0Bh,01h)    min =    0;  max =  255
E4_VOICE_CORD3_AMT,          id = 140 (0Ch,01h)    min = -100;  max = +100
E4_VOICE_CORD4_SRC,          id = 141 (0Dh,01h)    min =    0;  max =  255
E4_VOICE_CORD4_DST,          id = 142 (0Eh,01h)    min =    0;  max =  255
E4_VOICE_CORD4_AMT,          id = 143 (0Fh,01h)    min = -100;  max = +100
E4_VOICE_CORD5_SRC,          id = 144 (10h,01h)    min =    0;  max =  255
E4_VOICE_CORD5_DST,          id = 145 (11h,01h)    min =    0;  max =  255
E4_VOICE_CORD5_AMT,          id = 146 (12h,01h)    min = -100;  max = +100
E4_VOICE_CORD6_SRC,          id = 147 (13h,01h)    min =    0;  max =  255
E4_VOICE_CORD6_DST,          id = 148 (14h,01h)    min =    0;  max =  255
E4_VOICE_CORD6_AMT,          id = 149 (15h,01h)    min = -100;  max = +100
E4_VOICE_CORD7_SRC,          id = 150 (16h,01h)    min =    0;  max =  255
E4_VOICE_CORD7_DST,          id = 151 (17h,01h)    min =    0;  max =  255
E4_VOICE_CORD7_AMT,          id = 152 (18h,01h)    min = -100;  max = +100
E4_VOICE_CORD8_SRC,          id = 153 (19h,01h)    min =    0;  max =  255
E4_VOICE_CORD8_DST,          id = 154 (1Ah,01h)    min =    0;  max =  255
E4_VOICE_CORD8_AMT,          id = 155 (1Bh,01h)    min = -100;  max = +100
E4_VOICE_CORD9_SRC,          id = 156 (1Ch,01h)    min =    0;  max =  255
E4_VOICE_CORD9_DST,          id = 157 (1Dh,01h)    min =    0;  max =  255
E4_VOICE_CORD9_AMT,          id = 158 (1Eh,01h)    min = -100;  max = +100
E4_VOICE_CORD10_SRC,         id = 159 (1Fh,01h)    min =    0;  max =  255
E4_VOICE_CORD10_DST,         id = 160 (20h,01h)    min =    0;  max =  255
E4_VOICE_CORD10_AMT,         id = 161 (21h,01h)    min = -100;  max = +100
E4_VOICE_CORD11_SRC,         id = 162 (22h,01h)    min =    0;  max =  255
E4_VOICE_CORD11_DST,         id = 163 (23h,01h)    min =    0;  max =  255
```

```
E4_VOICE_CORD11_AMT,      id = 164 (24h,01h)    min = -100;   max = +100
E4_VOICE_CORD12_SRC,      id = 165 (25h,01h)    min =    0;   max =  255
E4_VOICE_CORD12_DST,      id = 166 (26h,01h)    min =    0;   max =  255
E4_VOICE_CORD12_AMT,      id = 167 (27h,01h)    min = -100;   max = +100
E4_VOICE_CORD13_SRC,      id = 168 (28h,01h)    min =    0;   max =  255
E4_VOICE_CORD13_DST,      id = 169 (29h,01h)    min =    0;   max =  255
E4_VOICE_CORD13_AMT,      id = 170 (2Ah,01h)    min = -100;   max = +100
E4_VOICE_CORD14_SRC,      id = 171 (2Bh,01h)    min =    0;   max =  255
E4_VOICE_CORD14_DST,      id = 172 (2Ch,01h)    min =    0;   max =  255
E4_VOICE_CORD14_AMT,      id = 173 (2Dh,01h)    min = -100;   max = +100
E4_VOICE_CORD15_SRC,      id = 174 (2Eh,01h)    min =    0;   max =  255
E4_VOICE_CORD15_DST,      id = 175 (2Fh,01h)    min =    0;   max =  255
E4_VOICE_CORD15_AMT,      id = 176 (30h,01h)    min = -100;   max = +100
E4_VOICE_CORD16_SRC,      id = 177 (31h,01h)    min =    0;   max =  255
E4_VOICE_CORD16_DST,      id = 178 (32h,01h)    min =    0;   max =  255
E4_VOICE_CORD16_AMT,      id = 179 (33h,01h)    min = -100;   max = +100
E4_VOICE_CORD17_SRC,      id = 180 (34h,01h)    min =    0;   max =  255
E4_VOICE_CORD17_DST,      id = 181 (35h,01h)    min =    0;   max =  255
E4_VOICE_CORD17_AMT,      id = 182 (36h,01h)    min = -100;   max = +100
```

There are a maximum of 256 Source and Destination settings(including Off).
They are grouped, and not numbered in a linear fashion. Additions
may be included in the future.

Source

```
 0  =  Off

 4  =  XfdRnd    (Crossfade Random)

 8  =  Key+      (Key 0...127)
 9  =  Key~      (Key -64...+63)
10  =  Vel+      (Velocity 0...127)
11  =  Vel~      (Velocity -64...+63)
12  =  Vel<      (Velocity -127...0)
13  =  RlsVel    (Release Velocity)
14  =  Gate

16  =  PitWl     (Pitch Wheel)
17  =  ModWl     (Mod Wheel)
18  =  Press     (Pressure)
19  =  Pedal     (Pedal)
20  =  MidiA
21  =  MidiB
22  =  FtSw1     (Foot Switch 1)
23  =  FtSw2     (Foot Switch 2)

24  =  Ft1FF     (Flip-Flop Foot Switch 1)
25  =  Ft2FF     (Flip-Flop Foot Switch 2)
26  =  MidiVl    (Midi Volume controller 7)
27  =  MidPn     (Midi Pan controller 10)

32  =  MidiC
33  =  MidiD
34  =  MidiE
```

```
35 =  MidiF
36 =  MidiG
37 =  MidiH
38 =  Thumb
39 =  ThmFF


48 =  KeyGld    (Key Glide)


72 =  VEnv+     (Volume Envelope 0...127)
73 =  VEnv~     (Volume Envelope -64...+63)
74 =  VEnv<     (Volume Envelope -127...0)


80 =  FEnv+     (Filter Envelope 0...127)
81 =  FEnv~     (Filter Envelope -64...+63)
82 =  FEnv<     (Filter Envelope -127...0)


88 =  AEnv+     (Aux Envelope 0...127)
89 =  AEnv~     (Aux Envelope -64...+63)
90 =  AEnv<     (Aux Envelope -127...0)


96  =  Lfo1~
97  =  Lfo1+
98  =  White     (White Noise)
99  =  Pink      (Pink Noise)
100 =  kRand1    (kRandom 1)
101 =  kRand2    (kRandom 2)


104 =  Lfo2~
105 =  Lfo2+
106 =  Lag0in    (summing amp out)
107 =  Lag0
108 =  Lag1in    (summing amp out)
109 =  Lag1


144 =  CkDwhl    (Clock Double Whole Note)
145 =  CkWhle    (Clock Whole Note)
146 =  CkHalf    (Clock Half Note)
147 =  CkQtr     (Clock Quarter Note)
148 =  Ck8th     (Clock Eighth Note)
149 =  Ck16th    (Clock Sixteenth Note)


160 =  DC        (DC Offset)
161 =  Sum       (Summing Amp)
162 =  Switch
163 =  Abs       (Absolute Value)
164 =  Diode
165 =  FlipFlop
166 =  Quantiz   (Quantizer)
167 =  Gain4X



   Destination

0 =   Off

8 =   KeySust
```

```
47 =   FinePtch

48 =   Pitch
49 =   Glide
50 =   ChrsAmt   (Chorus Amount)
51 =   'ChrsITD  (Chorus Position ITD)
52 =   'SStart   (Sample Start)
53 =   SLoop     (Sample Loop)
54 =   SRetrig   (Sample Retrigger)

56 =   FilFreq   (Filter Frequency)
57 =   'FilRes   (Filter Resonance)

64 =   AmpVol    (Amplifier Volume)
65 =   AmpPan    (Amplifier Pan)
66 =   AmpXfd    (Amplifier Crossfade)

72 =   VEnvRts   (Volume Envelope Rates)
73 =   VEnvAtk   (Volume Envelope Attack)
74 =   VEnvDcy   (Volume Envelope Decay)
75 =   VEnvRls   (Volume Envelope Release)

80 =   FEnvRts   (Filter Envelope Rates)
81 =   FEnvAtk   (Filter Envelope Attack)
82 =   FEnvDcy   (Filter Envelope Decay)
83 =   FEnvRls   (Filter Envelope Release)

86 =   FEnvTrig (Filter Envelope Trigger/Retrigger)

88 =   AEnvRts   (Aux Envelope Rates)
89 =   AEnvAtk   (Aux Envelope Attack)
90 =   AEnvDcy   (Aux Envelope Decay)
91 =   AEnvRls   (Aux Envelope Release)

94 =   AEnvTrig (Aux Envelope Trigger/Retrigger)

96 =   Lfo1Rt    (Lfo 1 Rate)
97 =   Lfo1Trig (Lfo 1 Trigger/Retrigger)

104 =  Lfo2Rt    (Lfo 2 Rate)
105 =  Lfo2Trig (Lfo 2 Trigger/Retrigger)
106 =  Lag0in
108 =  Lag1in

161 =  Sum       (Summing Amp)
162 =  Switch
163 =  Abs       (Absolute Value)
164 =  Diode
165 =  FlipFlop
166 =  Quantize
167 =  Gain4X

168 =  C00Amt    (Cord Amount)
169 =  C01Amt
170 =  C02Amt
171 =  C03Amt
```

```
172 =   C04Amt
173 =   C05Amt
174 =   C06Amt
175 =   C07Amt

176 =   C08Amt
177 =   C09Amt
178 =   C10Amt
179 =   C11Amt
180 =   C12Amt
181 =   C13Amt
182 =   C14Amt
183 =   C15Amt

184 =   C16Amt
185 =   C17Amt
```

Master Mode Global Parms

Master Setup Tuning:
```
 MASTER_TUNING_OFFSET,            id = 183 (37h,01h)    min = -64;  max = +64

    display = +/-0.0
                  1.2
                  3.5
                  4.7
                  6.0
                  7.2
                  9.5
                 10.7
                 12.0
                 14.2
                 15.5
                 17.7
                 18.0
                 20.2
                 21.5
                 23.7
                 25.0
                 26.2
                 28.5
                 29.7
                 31.0
                 32.2
                 34.5
                 35.7
                 37.0
                 39.2
                 40.5
                 42.7
                 43.0
                 45.2
                 46.5
                 48.7
                 50.0
```

```
                51.2
                53.5
                54.7
                56.0
                57.2
                59.5
                60.7
                62.0
                64.2
                65.5
                67.7
                68.0
                70.2
                71.5
                73.7
                75.0
                76.2
                78.5
                79.7
                81.0
                82.2
                84.5
                85.7
                87.0
                89.2
                90.5
                92.7
                93.0
                95.2
                96.5
                98.7
               100.0
```

MASTER_TRANSPOSE,   id = 184 (38h,01h)   min = -12; max = +12

    display:
                    C   =   -12
                    C# =   -11
                    D   =   -10
                    D# =   -9
                    E   =   -8
                    F   =   -7
                    F# =   -6
                    G   =   -5
                    G# =   -4
                    A   =   -3
                    A# =   -2
                    B   =   -1
            off (C) =   0
                    C# =   +1
                    D   =   +2
                    D# =   +3
                    E   =   +4
                    F   =   +5
                    F# =   +6

```
               G   =    +7
               G#  =    +8
               A   =    +9
               A#  =    +10
               B   =    +11
               C   =    +12


Master Setup Output:
 MASTER_HEADROOM,              id = 185 (39h,01h)    min = 0;  max = 15
 MASTER_HCHIP_BOOST,           id = 186 (3Ah,01h)    min = 0;  max = 1

   Output Boost:  0 = +0dB
                  1 = +12dB


 MASTER_OUTPUT_FORMAT,         id = 187 (3Bh,01h)    min = 0;  max = 2

   Output Format:  0 = analog
                   1 = AES pro
                   2 = S/PDIF

 MASTER_OUTPUT_CLOCK,          id = 188 (3Ch,01h)    min = 0;  max = 1

   Output Clock:  0 = 44.1kHz
                  1 = 48kHz

 MASTER_AES_BOOST,             id = 189 (3Dh,01h)    min = 0;  max = 1

   AES Boost: 0 = off
              1 = on


Master Setup Misc:
 MASTER_SCSI_ID,               id = 190 (3Eh,01h)    min = 0;  max = 7
    (SCSI ID)

 MASTER_SCSI_TERM,             id = 191 (3Fh,01h)    min = 0;  max = 1

   SCSI termination: 0 = on
                     1 = off




 MASTER_USING_MAC,             id = 192 (40h,01h)    min = -1;  max = 7

   Avoid Host on SCSI ID: -1 = none
                           0 = ID 0
                           1 = ID 1
                           2 = ID 2
                           3 = ID 3
                           4 = ID 4
                           5 = ID 5
                           6 = ID 6
                           7 = ID 7(Mac)
```

```
Master Setup Import:
 MASTER_COMBINE_LR,              id = 193 (41h,01h)    min = 0;  max = 1

    Combine L/R into stereo:  0 = on
                              1 = off

 MASTER_AKAI_LOOP_ADJ,          id = 194 (42h,01h)    min = 0;  max = 1

    Adjust Akai fractional loops:  0 = off
                                   1 = on

 MASTER_AKAI_SAMPLER_ID,        id = 195 (43h,01h)    min = -1;  max = 7

    Foreign sampler SCSI ID:    -1 = none
                                0-7 = 0-7


***id's 196,197 not used.***



Master MIDI Mode:
 MIDIGLO_BASIC_CHANNEL,         id = 198 (46h,01h)    min = 0;  max = 15(31 if has MIDI expansion
card)

    Basic Channel: 0-15(31) = 1-16(32)

 MIDIGLO_MIDI_MODE,             id = 199 (47h,01h)    min = 0;  max = 2

    MIDI mode: 0 = omni
               1 = poly
               2 = multi


***id 200 not used.***



Master MIDI Cntrls1:
 MIDIGLO_PITCH_CONTROL,         id = 201 (49h,01h)    min = -1;  max = 33
 MIDIGLO_MOD_CONTROL,           id = 202 (4Ah,01h)    min = -1;  max = 33
 MIDIGLO_PRESSURE_CONTROL,      id = 203 (4Bh,01h)    min = -1;  max = 33
 MIDIGLO_PEDAL_CONTROL,         id = 204 (4Ch,01h)    min = -1;  max = 33

    Display for these 4 parameters:   -1 = off
                                      0-31 = 0-31
                                        32 = ptwheel
                                        33 = chnpres

 MIDIGLO_SWITCH_1_CONTROL,      id = 205 (4Dh,01h)    min = -1;  max = 33
 MIDIGLO_SWITCH_2_CONTROL,      id = 206 (4Eh,01h)    min = -1;  max = 33
 MIDIGLO_THUMB_CONTROL,         id = 207 (4Fh,01h)    min = -1;  max = 33

    Display for these 3 parameters:   -1 = off
                                      0-33 = 64-97

Master MIDI cntrls2:
```

```
    MIDIGLO_MIDI_A_CONTROL,        id = 208 (50h,01h)    min = -1;  max = 33
    MIDIGLO_MIDI_B_CONTROL,        id = 209 (51h,01h)    min = -1;  max = 33
    MIDIGLO_MIDI_C_CONTROL,        id = 210 (52h,01h)    min = -1;  max = 33
    MIDIGLO_MIDI_D_CONTROL,        id = 211 (53h,01h)    min = -1;  max = 33
    MIDIGLO_MIDI_E_CONTROL,        id = 212 (54h,01h)    min = -1;  max = 33
    MIDIGLO_MIDI_F_CONTROL,        id = 213 (55h,01h)    min = -1;  max = 33
    MIDIGLO_MIDI_G_CONTROL,        id = 214 (56h,01h)    min = -1;  max = 33
    MIDIGLO_MIDI_H_CONTROL,        id = 215 (57h,01h)    min = -1;  max = 33

        Display for these 8 parameters:   -1 = off
                                        0-31 = 0-31
                                          32 = ptwheel
                                          33 = chnpres


Master MIDI Prefs1:
    MIDIGLO_VEL_CURVE,             id = 216 (58h,01h)    min = 0;  max = 13

        Velocity Curve:    0 = linear
                        1-13 = 1-13

    MIDIGLO_VOLUME_SENSITIVITY,    id = 217 (59h,01h)    min = 0;  max = 31
    MIDIGLO_CTRL7_CURVE,           id = 218 (5Ah,01h)    min = 0;  max = 2

        Ctrl#7 Curve:  0 = linear
                       1 = squared
                       2 = logarithmic

    MIDIGLO_PEDAL_OVERRIDE,        id = 219 (5Bh,01h)    min = 0;  max = 1

        Global pedal override:  0 = off
                                1 = on

Master MIDI Prefs2:
    MIDIGLO_RCV_PROGRAM_CHANGE,    id = 220 (5Ch,01h)    min = 0;  max = 1

        Rcv Program Change:  0 = off
                             1 = on

    MIDIGLO_SEND_PROGRAM_CHANGE,   id = 221 (5Dh,01h)    min = 0;  max = 1

        Send Program Change:  0 = off
                              1 = on

    MIDIGLO_MAGIC_PRESET,          id = 222 (5Eh,01h)    min = 0;  max = 128

        Magic load preset:     0 = off
                           1-128 = Presets 000 - 127


    PRESET_SELECT,                 id = 223 (5Fh,01h)    min = 000;  max = 999
    LINK_SELECT,                   id = 224 (60h,01h)    min =   0;  max = (255 - Num of Voices)
    VOICE_SELECT,                  id = 225 (61h,01h)    min =   0;  max = (255 - Num of links)
    SAMPLE_ZONE_SELECT,            id = 226 (62h,01h)    min =   0;  max = 255
    GROUP_SELECT,                  id = 227 (63h,01h)    min =   0;  max = 31
```

These Selection Parameters are independant of what is selected from the front
pannel of the E4. Once you select something remotely, the only way to change
the selection is remotely, with a couple of exceptions. Any regular front panel
editing can be done without affecting what was selected for remote editing.

A Preset Selection will always remain until you change it.

A Link Selection will remain until you select another Link, or if you select
another Preset, in which case no Links are selected.

Similar with a Voice Selection.

A Sample Zone selection will get reset if you select a new Voice or a new Preset.

Master Effects Parameter Section(similar to Preset Effects Parameters):

```
 MASTER_FX_A_ALGORITHM,       id = 228 (64h,01h)   min = 0;   max =  44;   default = 14;
 MASTER_FX_A_PARM_0,          id = 229 (65h,01h)   min = 0;   max =  90;   default = 54;
 MASTER_FX_A_PARM_1,          id = 230 (66h,01h)   min = 0;   max = 127;   default = 64;
 MASTER_FX_A_PARM_2,          id = 231 (67h,01h)   min = 0;   max = 127;   default = 0;
 MASTER_FX_A_AMT_0,           id = 232 (68h,01h)   min = 0;   max = 100;   default = 10;
 MASTER_FX_A_AMT_1,           id = 233 (69h,01h)   min = 0;   max = 100;   default = 20;
 MASTER_FX_A_AMT_2,           id = 234 (6Ah,01h)   min = 0;   max = 100;   default = 30;
 MASTER_FX_A_AMT_3,           id = 235 (6Bh,01h)   min = 0;   max = 100;   default = 40;

 MASTER_FX_B_ALGORITHM,       id = 236 (6Ch,01h)   min = 0;   max =  27;   default = 1;
 MASTER_FX_B_PARM_0,          id = 237 (6Dh,01h)   min = 0;   max = 127;   default = 0;
 MASTER_FX_B_PARM_1,          id = 238 (6Eh,01h)   min = 0;   max = 127;   default = 3;
 MASTER_FX_B_PARM_2,          id = 239 (6Fh,01h)   min = 0;   max = 127;   default = 0;
 MASTER_FX_B_AMT_0,           id = 240 (70h,01h)   min = 0;   max = 100;   default = 10;
 MASTER_FX_B_AMT_1,           id = 241 (71h,01h)   min = 0;   max = 100;   default = 15;
 MASTER_FX_B_AMT_2,           id = 242 (72h,01h)   min = 0;   max = 100;   default = 30;
 MASTER_FX_B_AMT_3,           id = 243 (73h,01h)   min = 0;   max = 100;   default = 0;

 MASTER_FX_BYPASS,            id = 244 (74h,01h)   min =  0;  max =  1;   default =  0;
 MASTER_FX_MM_CTRL_CHANNEL,   id = 245 (75h,01h)   min = -1;  max = 15;   default = -1;


 MULTIMODE_CHANNEL,           id = 246 (76h,01h)   min =   1;  max = 16(32);      default =   1;
 MULTIMODE_PRESET,            id = 247 (77h,01h)   min =  -1;  max = 999(1255);   default =  -1;
 MULTIMODE_VOLUME,            id = 248 (78h,01h)   min =   0;  max =  127;        default = 127;
 MULTIMODE_PAN   ,            id = 249 (79h,01h)   min = -64;  max =  +63;        default =   0;
 MULTIMODE_SUBMIX,            id = 250 (7Ah,01h)   min =  -1;  max = 3(7);        default =  -1;
```

Midi Expansion Card yields 32 total Channels.
Output Expansion Card yields Submix 4 - 7.


```
 E4_LINK_INTERNAL_EXTERNAL, id = 251 (7Bh,01h)   min = 0;   max =  16;  default = 0;
 E4_LINK_FILTER_PITCH,      id = 252 (7Ch,01h)   min = 0;   max =   1;  default = 0;
 E4_LINK_FILTER_MOD,        id = 253 (7Dh,01h)   min = 0;   max =   1;  default = 0;
 E4_LINK_FILTER_PRESSURE,   id = 254 (7Eh,01h)   min = 0;   max =   1;  default = 0;
 E4_LINK_FILTER_PEDAL,      id = 255 (7Fh,01h)   min = 0;   max =   1;  default = 0;
 E4_LINK_FILTER_CTRL_A,     id = 256 (00h,02h)   min = 0;   max =   1;  default = 0;
 E4_LINK_FILTER_CTRL_B,     id = 257 (01h,02h)   min = 0;   max =   1;  default = 0;
 E4_LINK_FILTER_CTRL_C,     id = 258 (02h,02h)   min = 0;   max =   1;  default = 0;
```

```
   E4_LINK_FILTER_CTRL_D,      id = 259 (03h,02h)   min = 0;  max =    1;  default = 0;
   E4_LINK_FILTER_CTRL_E,      id = 260 (04h,02h)   min = 0;  max =    1;  default = 0;
   E4_LINK_FILTER_CTRL_F,      id = 261 (05h,02h)   min = 0;  max =    1;  default = 0;
   E4_LINK_FILTER_CTRL_G,      id = 262 (06h,02h)   min = 0;  max =    1;  default = 0;
   E4_LINK_FILTER_CTRL_H,      id = 263 (07h,02h)   min = 0;  max =    1;  default = 0;
   E4_LINK_FILTER_SWITCH_1,    id = 264 (08h,02h)   min = 0;  max =    1;  default = 0;
   E4_LINK_FILTER_SWITCH_2,    id = 265 (09h,02h)   min = 0;  max =    1;  default = 0;
   E4_LINK_FILTER_THUMB,       id = 266 (0Ah,02h)   min = 0;  max =    1;  default = 0;

      0 = filter off
      1 = filter on


/** ULTRA ONLY PARAMETERS **********************************************/

 MASTER_WORD_CLOCK_IN,           id = 267 (0Bh,02h)    min = 0;  max = 4

    Word Clock In:  0 = Internal
                    1 = BNC
                    2 = AES
                    3 = ADAT
                    4 = (future expansion)

 MASTER_WORD_CLOCK_PHASE_IN,    id = 268 (0Ch,02h)    min = 0;  max = 511
 MASTER_WORD_CLOCK_PHASE_OUT,   id = 269 (0Dh,02h)    min = 0;  max = 511

            0.00 - 359.30 degrees in 512 increments.

 MASTER_OUTPUT_DITHER,          id = 270 (0Eh,02h)    min = 0;  max = 1

    0 = off
    1 = on

/** END ULTRA ONLY PARAMETERS *********************************************/


 MASTER_AUDITION_KEY,           id = 271 (0Fh,02h)    min = 0;  max = 127



Effects Algorithms:

Preset Effect A:
(44 algorithms)


 Master Effect A  (Global Effects Edit)
 Room 1-3
 Hall 1-2
 Plate
 Delay
 Panning Delay
 Multitap 1
 Multitap Pan
 3 Tap
 3 Tap Pan
```

```
 Soft Room
 Warm Room
 Perfect Room
 Tiled Room
 Hard Plate
 Warm Hall
 Spacious Hall
 Bright Hall
 Brt Hall Pan
 Bright Plate
 BBall Court
 Gymnasium
 Cavern
 Concert 9
 Concert 10 Pan
 Reverse Gate
 Gate 2
 Gate Pan
 Concert 11
 MediumConcert
 Large Concert
 Lg Concert Pan
 Canyon
 DelayVerb 1-3
 DelayVerb4Pan
 DelayVerb5Pan
 DelayVerb 6-9


Parameters:

 E4_PRESET_FX_A_PARM_0 -> Decay Time: 0 - 90
 E4_PRESET_FX_A_PARM_1 -> HF Damping: 0 - 127
 E4_PRESET_FX_A_PARM_2 -> FxB==>FxA : 0 - 127

 E4_PRESET_FX_A_AMT_0 ->  Main FX A Send: 0 - 100%
 E4_PRESET_FX_A_AMT_1 ->  Sub1 FX A Send: 0 - 100%
 E4_PRESET_FX_A_AMT_2 ->  Sub2 FX A Send: 0 - 100%
 E4_PRESET_FX_A_AMT_3 ->  Sub3 FX A Send: 0 - 100%




Preset Effect B:
(27 algorithms)


 Master Effect B (Global Effects Edit)
 Chorus 1-5
 Doubling
 Slapback
 Flange 1-7
 Big Chorus
 Symphonic
 Ensemble
```

```
Delay
Delay Stereo
Delay Stereo 2
Panning Delay
Delay Chorus
Pan Dly Chrs 1-2
DualTap 1/3
DualTap 1/4
Vibrato
Distortion 1-2
DistortedFlange
DistortedChorus
DistortedDouble
```

Parameters:

```
E4_PRESET_FX_B_PARM_0 -> Feedback: 0 - 127
E4_PRESET_FX_B_PARM_1 -> LFO Rate: 0 - 127
E4_PRESET_FX_B_PARM_2 -> Delay Time: 0 - 127 (0 - 635ms in 5ms increments)

E4_PRESET_FX_B_AMT_0 ->  Main FX A Send: 0 - 100%
E4_PRESET_FX_B_AMT_1 ->  Sub1 FX A Send: 0 - 100%
E4_PRESET_FX_B_AMT_2 ->  Sub2 FX A Send: 0 - 100%
E4_PRESET_FX_B_AMT_3 ->  Sub3 FX A Send: 0 - 100%
```

For many filter parameters, I will need to supply tables to convert to
displayed values(Hz,dB). I will include this information in a future document.

Filter Types:

```
  2 Pole Low-pass:
  4 Pole Low-pass:
  6 Pole Low-pass:

    E4_VOICE_FMORPH,           id = 83      min = 0;  max = 255
       Frequency: 57Hz to 20000Hz (see Filter Table 1)

    E4_VOICE_FKEY_XFORM,       id = 84      min = 0;  max = 127
       Q: 0 to 127


  2nd Order High-pass:
  4th Order High-pass:

    E4_VOICE_FMORPH,           id = 83      min = 0;  max = 255
       Frequency: 69Hz to 18000Hz (see Filter Table 2)

    E4_VOICE_FKEY_XFORM,       id = 84      min = 0;  max = 127
       Q: 0 to 127


  2nd Order Band-pass:
  4th Order Band-pass:
```

```
Contrary Band-pass:

   E4_VOICE_FMORPH,           id = 83      min = 0;  max = 255
      Frequency: 57Hz to 10000Hz (see Filter Table 3)

   E4_VOICE_FKEY_XFORM,       id = 84      min = 0;  max = 127
      Q: 0 to 127

Swept EQ 1 octave:
Swept EQ 2->1 oct:
Swept EQ 3->1 oct:

   E4_VOICE_FMORPH,           id = 83      min = 0;  max = 255
      Frequency: 83Hz to 10000Hz (see Filter Table 3)

   E4_VOICE_FKEY_XFORM,       id = 84      min = 0;  max = 127
      Gain: -24.0 dB  to  +23.6 dB (see Filter Table 4)



Phaser 1:
Phaser 2:
Bat-Phaser:
Flanger Lite:

   E4_VOICE_FMORPH,           id = 83      min = 0;  max = 255
      Frequency: 0 to 255

   E4_VOICE_FKEY_XFORM,       id = 84      min = 0;  max = 127
      Resonance: 0 to 127


Vocal Ah-Ay-Ee:
Vocal Oo-Ah:

   E4_VOICE_FMORPH,           id = 83      min = 0;  max = 255
      Morph: 0 to 255

   E4_VOICE_FKEY_XFORM,       id = 84      min = 0;  max = 127
      Body Size: 0 to 127


Dual EQ Morph:

   E4_VOICE_FMORPH,           id = 83      min = 0;  max = 255
      Morph: 0 to 255

   E4_VOICE_FKEY_XFORM,       id = 84      min = 0;  max = 127
      Gain: -24.0dB to +23.6dB (see Filter Table 4)

   E4_VOICE_FILT_GEN_PARM3,   id = 87      min = 0;  max = 127
      EQ 1 Low: 83Hz to 9824Hz (see Filter Table 5)

   E4_VOICE_FILT_GEN_PARM4,   id = 88      min = 0;  max = 127
      EQ 1 High: 83Hz to 9824Hz (see Filter Table 5)

   E4_VOICE_FILT_GEN_PARM5,   id = 89      min = 0;  max = 127
```

```
       EQ 1 Gain: -24.0dB to +23.6dB (see Filter Table 4)

   E4_VOICE_FILT_GEN_PARM6,    id = 90       min = 0;  max = 127
       EQ 2 Low: 83Hz to 9824Hz (see Filter Table 5)

   E4_VOICE_FILT_GEN_PARM7,    id = 91       min = 0;  max = 127
       EQ 2 High: 83Hz to 9824Hz (see Filter Table 5)

   E4_VOICE_FILT_GEN_PARM8,    id = 92       min = 0;  max = 127
       EQ 2 Gain: -24.0dB to +23.6dB (see Filter Table 4)




2EQ+Lowpass Morph:

   E4_VOICE_FMORPH,            id = 83       min = 0;  max = 255
       Fc/Morph: 0 to 255

   E4_VOICE_FKEY_XFORM,        id = 84       min = 0;  max = 127
       LPF Q: 0 to 127

   E4_VOICE_FILT_GEN_PARM3,    id = 87       min = 0;  max = 127
       EQ 1 Low: 83Hz to 9824Hz (see Filter Table 5)

   E4_VOICE_FILT_GEN_PARM4,    id = 88       min = 0;  max = 127
       EQ 1 High: 83Hz to 9824Hz (see Filter Table 5)

   E4_VOICE_FILT_GEN_PARM5,    id = 89       min = 0;  max = 127
       EQ 1 Gain: -24.0dB to +23.6dB (see Filter Table 4)

   E4_VOICE_FILT_GEN_PARM6,    id = 90       min = 0;  max = 127
       EQ 2 Low: 83Hz to 9824Hz (see Filter Table 5)

   E4_VOICE_FILT_GEN_PARM7,    id = 91       min = 0;  max = 127
       EQ 2 High: 83Hz to 9824Hz (see Filter Table 5)

   E4_VOICE_FILT_GEN_PARM8,    id = 92       min = 0;  max = 127
       EQ 2 Gain: -24.0dB to +23.6dB (see Filter Table 4)


2EQMorph+Exprssn:

   E4_VOICE_FMORPH,            id = 83       min = 0;  max = 255
       Morph: 0 to 255

   E4_VOICE_FKEY_XFORM,        id = 84       min = 0;  max = 127
       Expression: 0 to 127

   E4_VOICE_FILT_GEN_PARM3,    id = 87       min = 0;  max = 127
       EQ 1 Low: 83Hz to 9824Hz (see Filter Table 5)

   E4_VOICE_FILT_GEN_PARM4,    id = 88       min = 0;  max = 127
       EQ 1 High: 83Hz to 9824Hz (see Filter Table 5)

   E4_VOICE_FILT_GEN_PARM5,    id = 89       min = 0;  max = 127
       EQ 1 Gain: -24.0dB to +23.6dB (see Filter Table 4)
```

```
        E4_VOICE_FILT_GEN_PARM6,   id = 90      min = 0;  max = 127
            EQ 2 Low: 83Hz to 9824Hz (see Filter Table 5)

        E4_VOICE_FILT_GEN_PARM7,   id = 91      min = 0;  max = 127
            EQ 2 High: 83Hz to 9824Hz (see Filter Table 5)

        E4_VOICE_FILT_GEN_PARM8,   id = 92      min = 0;  max = 127
            EQ 2 Gain: -24.0dB to +23.6dB (see Filter Table 4)



  Peak/Shelf Morph:

        E4_VOICE_FMORPH,           id = 83      min = 0;  max = 255
            Morph: 0 to 255

        E4_VOICE_FKEY_XFORM,       id = 84      min = 0;  max = 127
            Peak: -24.0dB to +23.6dB (see Filter Table 4)

        E4_VOICE_FILT_GEN_PARM3,   id = 87      min = 0;  max = 127
            low morph frame Freq: 83Hz to 9824Hz (see Filter Table 5)

        E4_VOICE_FILT_GEN_PARM4,   id = 88      min = 0;  max = 127
            low morph frame Shelf: -64 to 63

        E4_VOICE_FILT_GEN_PARM5,   id = 89      min = 0;  max = 127
            low morph frame Peak: -24.0dB to +23.6dB (see Filter Table 4)

        E4_VOICE_FILT_GEN_PARM6,   id = 90      min = 0;  max = 127
            high morph frame Freq: 83Hz to 9824Hz (see Filter Table 5)

        E4_VOICE_FILT_GEN_PARM7,   id = 91      min = 0;  max = 127
            high morph frame Shelf: -64 to 63

        E4_VOICE_FILT_GEN_PARM8,   id = 92      min = 0;  max = 127
            high morph frame Peak: -24.0dB to +23.6dB (see Filter Table 4)


FILTER Hz and dB DISPLAY TABLE CALCULATIONS:

/*
 *
 * example fil_freq (100, 20000, 1002)
 * in=0..255
 */
int fil_freq (int input, int maxfreq, int mul)
{
    int f = maxfreq;
    input = 255 - input;
    while (input-- > 0)
            f *= mul, f /= 1024;
    return f;
}

/*in=0..255*/
void cnv_morph_freq (int input, char *buf)
```

```c
{
    sprintf (buf, "%dHz", fil_freq (input, 10000, 1006)); /*1009*/
}

/* in=0..127 out=-24..+24   (32in ==> 12out) */
void cnv_morph_gain (int input, char *buf)
{
    int gain10x = -240 + ((input * 120) / 32);
    int gain_i  = gain10x / 10;
    int gain_f  = abs (gain10x % 10);
    sprintf (buf, "%s%d.%1ddB",
             gain10x >= 0 ? "+" : "-",
             abs (gain_i),
             gain_f);
}
```

Filter Table 1:   sprintf (value, "%dHz", fil_freq (input, 20000, 1002)); /* input=0..255 */

Filter Table 2:   sprintf (value, "%dHz", fil_freq (input, 18000, 1003)); /* input=0..255 */

Filter Table 3:   sprintf (value, "%dHz", fil_freq (input, 10000, 1006)); /*1009; input=0..255
*/

Filter Table 4:   cnv_morph_gain (input, value); /* input=0..127 */

Filter Table 5:   cnv_morph_freq (2*input, value); /* input=0..127 */

/
****
*****/
/
****
*****/

Commands:

    00h   Reserved. If received, the following 2 MIDI bytes form a
                 14 bit command.

    01h   Parameter Edit
    02h   Parameter Value Request

    03h   Parameter min/max/default Request
    04h   Parameter min/max/default Response

    05h   Preset Name
    06h   Preset Name Request
    07h   Preset Name Character Update
    08h   Preset Name Character Request

    09h   Sample Name
    0Ah   Sample Name Request
    0Bh   Sample Name Character Update
    0Ch   Sample Name Character Request
```

```
    0Dh          Preset Dump/NEW Preset Dump/NEW Preset Dump Request
    0Eh          Preset Dump Request

Configuration Utils:
    10h          Preset Memory Request
    11h          Preset Memory Response
    12h          Sample Memory Request
    13h          Sample Memory Response
    14h          Configuration Request (Hardware options installed, amount of RAM etc.)
    15h          Configuration Response

    16h          Preset Number of Voices Request
    17h          Preset Number of Voices Response
    18h          Preset Number of Links Request
    19h          Preset Number of Links Response
    1Ah          Preset Number of SZones Request
    1Bh          Preset Number of SZones Response
    1Ch          Voice Number of SZones Request
    1Dh          Voice Number of SZones Response
    1Eh          Extended Configuration Request (Hardware options installed, amount of RAM etc.)
    1Fh          Extended Configuration Response

Voice Utils:
    20h          New Voice
    21h          Delete Voice
    22h          Copy Voice

SZone Utils:
    30h          New Sample Zone
    31h          Get Multisample
    32h          Delete Sample Zone
    33h          Combine
    34h          Expand

Link Utils:
    40h          New Link
    41h          Delete Link
    42h          Copy Link

Sample Utils:
    50h          Sample Erase
    52h          Sample Memory Defrag

Misc Utils:
    70h          Copy Preset
    71h          Delete Preset
    72h          Multimode Map Dump
    73h          Multimode Map Dump Request
    74h          Erase RAM Bank
    75h          Erase All RAM Presets
    76h          Erase All RAM Samples

Dump/Handshaking:
    79h          NEW Dump Nak
    7Ah          NEW Dump Ack
    7Bh          EOF
    7Ch          Wait
```

```
     7Dh          Cancel
     7Eh          Nak
     7Fh          Ack
```

Parameter Value Edit:

EXAMPLE:> {F0h,18h,21h,ddh,55h,01h,02h,<xxh,xxh,yyh,yyh>,<Checksum>,F7h}

```
     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     01h = Command::Parameter Value Edit

     02h = Byte count(number of Byte pairs)

     {xxh,xxh} = Parameter ID (LSB first)
     {yyh,yyh} = Parameter Data

     <Checksum> = 1 Byte = XOR(1's compliment) of sum of {<xxh,xxh,yyh,yyh>}
                = 7Fh is ignore checksum flag.

     F7h = EOX
     This message contains only 1 packet.
```

Do not send messages containing more than 256 Data Bytes, or 42 Parameter Edits, at a time.

Parameter Value Request:

EXAMPLE:> {F0h,18h,21h,ddh,55h,02h,01h,xxh,xxh,<Checksum>,F7h}

```
     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     02h = Command::Parameter Value Request

     01h = Byte count(number of Byte pairs)

     {xxh,xxh} = Parameter ID (LSB first)

     <Checksum> = 1 Byte = XOR(1's compliment) of sum of {xxh,xxh}

     F7h = EOX
     This message contains only 1 request packet.
```

  The response a complete Parameter Value Edit SYSEX message for each parameter.

Do not send messages containing more than 256 Data Bytes, or 64 Parameter IDs, at a time.

Parameter Min/Max/Default Value Request:

   This is a Read Only system.

EXAMPLE:> {F0h,18h,21h,ddh,55h,03h,xxh,xxh,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     03h = Command::Parameter Min/Max/Default Value Request

     xxh,xxh = The Parameter ID

     F7h = EOX

RESPONSE:> {F0h,18h,21h,ddh,55h,04h,xxh,xxh,yyh,yyh,zzh,zzh,qqh,qqh,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     04h = Command::Parameter Min/Max/Default

     xxh,xxh = the Parameter ID

     yyh,yyh = Parameter minimum value
     zzh,zzh = Parameter maximum value
     qqh,qqh = Parameter default value

     F7h = EOX

Preset Name:

EXAMPLE:> {F0h,18h,21h,ddh,55h,05h,xxh,xxh,<STRING 1>,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     05h = Command::ASCII Preset Name

```
    xxh,xxh = Preset number 0-999

    <STRING x> = <CHAR 1>,<CHAR 2>,...,<CHAR 16> = Preset Name

    F7h = EOX



Preset Name Request:

EXAMPLE:> {F0h,18h,21h,ddh,55h,06h,xxh,xxh,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    06h = Command::ASCII Preset Name Request

    xxh,xxh = Preset number 0-999

    F7h = EOX

  The response is the ASCII Preset Name SYSEX message.



Preset Name Character Update:

EXAMPLE:> {F0h,18h,21h,ddh,55h,07h,xxh,xxh,yyh,zzh,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    07h = Command::Preset Name Character Update

    <xxh,xxh> = Preset number, LSB first

    yyh = Character number (0-15)

    zzh = ASCII character

    F7h = EOX



Preset Name Character Request:

EXAMPLE:> {F0h,18h,21h,ddh,55h,08h,xxh,xxh,yyh,F7h}

    F0h = sysex message
```

```
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    08h = Command::Preset Name Character Request

    <xxh,xxh> = Preset number, LSB first

    yyh = Character number (0-15)

    F7h = EOX

  response is the Preset Name Character Update message.




Sample Name:

EXAMPLE:> {F0h,18h,21h,ddh,55h,09h,xxh,xxh,<STRING 1>,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    09h = Command::ASCII Sample Name

    xxh,xxh = Sample number 000-999

    <STRING x> = <CHAR 1>,<CHAR 2>,...,<CHAR 16> = Sample Name

    F7h = EOX




Sample Name Request:

EXAMPLE:> {F0h,18h,21h,ddh,55h,0Ah,xxh,xxh,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    0Ah = Command::ASCII Sample Name Request

    xxh,xxh = Sample number 000-999(2999)

    F7h = EOX

  The response is the ASCII Sample Name SYSEX message.
```

```
Sample Name Character Update:

EXAMPLE:> {F0h,18h,21h,ddh,55h,0Bh,xxh,xxh,yyh,zzh,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    0Bh = Command::Sample Name Character Update

    <xxh,xxh> = Sample number, LSB first

    yyh = Character number (0-15)

    zzh = ASCII character

    F7h = EOX



Sample Name Character Request:

EXAMPLE:> {F0h,18h,21h,ddh,55h,0Ch,xxh,xxh,yyh,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    0Ch = Command::Sample Name Character Request

    <xxh,xxh> = Sample number, LSB first

    yyh = Character number (0-15)

    F7h = EOX

  response is the Sample Name Character Update message.




Dump Format:

    The transfer of large messages shall follow a method similar to the
MIDI Sample Dump Standard.


Generic Handshaking Messages:
```

```
ACK:
 EXAMPLE:> {F0h,18h,21h,ddh,55h,7Fh,pph,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     7Fh = Command::Acknowledge; The last packet was received correctly.

     pph = Packet number

     F7h = EOX


NAK:
 EXAMPLE:> {F0h,18h,21h,ddh,55h,7Eh,pph,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     7Eh = Command::Negative Acknowledge; The last packet was received
                                          incorrectly, resend.
     pph = Packet number

     F7h = EOX


CANCEL:
 EXAMPLE:> {F0h,18h,21h,ddh,55h,7Dh,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     7Dh = Command::Cancel; Abort the Dump.

     F7h = EOX


WAIT:
 EXAMPLE:> {F0h,18h,21h,ddh,55h,7Ch,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     7Ch = Command::Wait; Stop sending packets until an ACK is received.
```

```
     F7h = EOX


EOF:
 EXAMPLE:> {F0h,18h,21h,ddh,55h,7Bh,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     7Bh = Command::End Of File; No more packets follow, no response required.
                                 Must be sent at end of transfer.
     F7h = EOX




When a Dump is requested or initiated, the first element of the Dump
sent is the Dump Header.  This contains information on what kind of
Dump it is, and how many Bytes are included in the Data.  What follows
are 266 Byte messages that each contain 256 Bytes of actual Data.  The
last message contains 256 Bytes, or LESS, depending on how much Data is left.
The total number of these messages, and the number of Bytes (256 or less)
of Data contained in the final message can be derived from the total
number of Bytes in this Header.  Generic handshaking messages
will be used to negotiate the transfer.  After all the Data messages
have been sent, and End Of File will be sent, closing the transfer.

Examples of the Dump Header, and the different types of data within
the Data messages.




DUMP HEADER:
 EXAMPLE:> {F0h,18h,21h,ddh,55h,0Dh,01h,00h,kkh,kkh,kkh,kkh,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     0Dh = Command::Preset Dump;

     01h = subCommand::Dump Header;

     00h = Packet Number (first packet)

     kkh,kkh,kkh,kkh = Number of bytes, LSB first.

     F7h = EOX




DATA MESSAGE:
 EXAMPLE:> {F0h,18h,21h,ddh,55h,0Dh,02h,kkh,<256 Data Bytes>,<Checksum>,F7h}
```

```
    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    0Dh = Command::Preset Dump

    02h = subCommand::Dump Message;

    kkh = Running Packet count(low 7 bits in long dumps)

    <256 Data Bytes> (except for last message)

    <Checksum> = 1 Byte = 1's compliment of the sum of {<256 Data Bytes>}

    F7h = EOX
```

Dump Data Formats:

/* short form */

```
 PresetDump          :== PresetNumber Name GlobalParms NoOfLinks { Link }*NoOfLinks
                                         NoOfVoices { Voice }*NoOfVoices.
 PresetNumber        :== 0 .. 999.
 Name                :== 16 * ASCIIChar.
 GlobalParms         :== E4_PRESET_TRANSPOSE ... E4_PRESET_FX_B_AMT_3.
 NoOfLinks           :== MAX(0 - 255, 255-NoOfVoices).
 Link                :== E4_LINK_PRESET ... E4_LINK_VEL_HIGHFADE.
 NoOfVoices          :== MAX(1 - 255, 255-NoOfLinks).
 Voice               :== E4_GEN_GROUP_NUM SingleSampleVoice | MultiSampleVoice.
 SingleSampleVoice   :== E4_GEN_SAMPLE VoiceParams 1.
 MultiSampleVoice    :== 3FFFh VoiceParams NoOfZones { Zone }*NoOfZones.
 VoiceParams         :== E4_GEN_VOLUME ... E4_VOICE_CORD17_AMT.
 NoOfZones           :== 0 .. 255.
 Zone                :== E4_GEN_SAMPLE E4_GEN_VOLUME E4_GEN_PAN E4_GEN_FTUNE E4_GEN_ORIG_KEY
                         E4_GEN_KEY_LOW ... E4_GEN_VEL_HIGHFADE.
```

/* long form */

```
Preset Dump:
    <256 Data Bytes> x <? messages> = {<NUMBER>,<NAME>,<DATA 1>,<DATA 2>,...,}
        (last message may contain less than 256 Data Bytes)
    <NUMBER> = Preset number
    <NAME> = Preset Name, 16 ASCII characters
    <DATA 1>,<DATA 2>,..., = (see below)
```

The Data is organized in the following way, and then broken into 256 Byte chunks.

```
{<NUMBER>,<NAME>,<Global Parms>,<Links>,<Voices>}


<NUMBER>:

Preset number (000 - 999)

<NAME>:

16 ASCII characters.


<Global Parms>:

Always starts with the first 6 parms.  All parms are 2 Bytes.

 E4_PRESET_TRANSPOSE,        id = 0       min = -24;  max = +24  (semitones)
 E4_PRESET_VOLUME,           id = 1       min = -96;  max = +10  (dB)
 E4_PRESET_CTRL_A,           id = 2       min = -1;   max = 127  (-1 = off)
 E4_PRESET_CTRL_B,           id = 3       min = -1;   max = 127  (-1 = off)
 E4_PRESET_CTRL_C,           id = 4       min = -1;   max = 127  (-1 = off)
 E4_PRESET_CTRL_D,           id = 5       min = -1;   max = 127  (-1 = off)

Then effects A and effects B.  If the effects A or B Algorithm is 0, then the
effects parameters are the values of Master Effects A or B.  After the effects,
the next word is the beginning of the LINKS section of Data.



<Links>:

The first word is the number of Links in the Preset.
The max number of Links + the max number of Voices = 256.
Each Link has 13 parameters, so the number of Bytes remaining
in this section is (13 words * 2 Bytes/word * number of Links).
These 13 word blocks are delivered in order of Link number,
starting with 1.  If there are no Links in the Preset then
no Link data follows the Link count word.



<Voices>:

The first word is the number of Voices in the Preset.
The max number of Voices + the max number of Links = 256.

66 Bytes of Preset so far if no Links.

The next group of words applies to the first Voice.

The first word is the Group number associated with
the Voice.

What follows are the Voice Parameters.  If the Sample
Number is 3FFFh, then it is a "multisample" voice.
The first word following the Voice Parameters is the number
of Sample Zones.  If the number of Sample Zones is 1, the
```

Voice is not a "multisample", and the next word is the
beginning of the next Voice(the Group number). If the number
of Sample Zones is greater than 1, then Sample Zone Parameters
corresponding to the number of Sample Zones follows, and
after the last Sample Zone of the Voice, the next set of Voice
parameters follow, assuming another Voice exists. If
no more Voices exist after the last Sample Zone parameter
of the current voice, then the Preset is complete.

The Voice Parameters consist of all the General Parameters(20),
Tuning(11), Amp/Filt(37), Lfo/Aux(24), and Cords(54) groups
of parameters. There are 146 total base(single Sample Voice)
parameters per Voice. Additional Samples require additional
parameters. This number along with the number of Samples word
= 147 words, or 294 Bytes.

The Sample Parameters consist of a subset of the General
Parameters. Each additional Sample requires a block of
information containing the Sample number, and the 12 Sample
parameters. There can be 255 of these additional Sample zones
per Voice.


```
 E4_GEN_SAMPLE,             id = 38      min =   0;  max = 999(2999)
 E4_GEN_VOLUME,             id = 39      min = -96;  max = +10
 E4_GEN_PAN,                id = 40      min = -64;  max = +63

 E4_GEN_FTUNE,              id = 42      min = -64;  max = +64

 E4_GEN_ORIG_KEY,           id = 44      min =   0;  max = 127   (60 = C3)

 E4_GEN_KEY_LOW,            id = 45      min = 0;  max = 127   (C-2 -> G8)
 E4_GEN_KEY_LOWFADE,        id = 46      min = 0;  max = 127
 E4_GEN_KEY_HIGH,           id = 47      min = 0;  max = 127   (C-2 -> G8)
 E4_GEN_KEY_HIGHFADE,       id = 48      min = 0;  max = 127

 E4_GEN_VEL_LOW,            id = 49      min = 0;  max = 127
 E4_GEN_VEL_LOWFADE,        id = 50      min = 0;  max = 127
 E4_GEN_VEL_HIGH,           id = 51      min = 0;  max = 127
 E4_GEN_VEL_HIGHFADE,       id = 52      min = 0;  max = 127
```


The total Max number of words per Voice becomes 146 + (255*13) = 3461.
Each parameter is 2 bytes, for a total of 6922 Bytes. Each preset can
have a maximum of 256 Voices(assuming no Links). The first word is
the number of Voices, and only occurs once, so the total Bytes in a
maximum sized Preset = 6920 * 256 = 1,771,520 Bytes. This is just to
give you an idea of the Theoretical limits, however it is advisable
to keep the Presets to 64k or less.

Preset Dump Request:

EXAMPLE:> {F0h,18h,21h,ddh,55h,0Eh,xxh,xxh,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    0Eh = Command::Preset Parameter Dump Request

    <xxh,xxh> = Preset number

    F7h = EOX

  The response is the Preset Dump SYSEX message.

*If a non-existant Preset is requested, the response is a CANCEL message.

*WARNING! Only 1 Preset may be Dumped to or from the E4 at a time!

==
NEW and IMPROVED Dump Format:

    The transfer of large messages shall follow a method similar to the
MIDI Sample Dump Standard.

Preset Dumps of the Old format may still be Requested from and Dumped to the E4.

Generic Handshaking Messages:

NEW ACK:
 EXAMPLE:> {F0h,18h,21h,ddh,55h,7Ah,<pph,pph>,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    7Ah = Command::Acknowledge; The last packet was received correctly.

    <pph,pph> = Packet number

    F7h = EOX

NEW NAK:
 EXAMPLE:> {F0h,18h,21h,ddh,55h,79h,<pph,pph>,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

```
    79h = Command::Negative Acknowledge; The last packet was received
                                          incorrectly, resend.
    <pph,pph> = Packet number

    F7h = EOX


CANCEL:
 EXAMPLE:> {F0h,18h,21h,ddh,55h,7Dh,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    7Dh = Command::Cancel; Abort the Dump.

    F7h = EOX


WAIT:
 EXAMPLE:> {F0h,18h,21h,ddh,55h,7Ch,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    7Ch = Command::Wait; Stop sending packets until an ACK is received.

    F7h = EOX


EOF:
 EXAMPLE:> {F0h,18h,21h,ddh,55h,7Bh,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    7Bh = Command::End Of File; No more packets follow, no response required.
                                Must be sent at end of transfer.
    F7h = EOX
```

When a Dump is requested or initiated, the first element of the Dump
sent is the Dump Header. This contains information on the type of Dump
(old or new), The Preset Number of the Dump, how many Bytes are included
in the Data, and the number of Parameters in each section, which may
depend on the version of EOS the Dump may have come from. As parameters
are added to newer version of EOS, the dump format can expand with that.

The Dump Engine within older EOS versions is smart enough to ignore
Parameters it does not understand if a newer dump is transmitted to that
old EOS Software.

What follows the Header message are 255-Byte messages that each contain
244 Bytes of actual Data. The last message may contain LESS than 255
Bytes, depending on how much Data is left. Generic handshaking messages
will be used to negotiate the transfer. After all the Data messages
have been sent, an End Of File message will be sent, closing the transfer.

Examples of the NEW Dump Header, and the different types of data within
the NEW Data messages, follow.

NEW DUMP HEADER:
 EXAMPLE:>
{F0h,18h,21h,ddh,55h,0Dh,03h,nnh,nnh,kkh,kkh,kkh,kkh,ggh,ggh,llh,llh,vvh,vvh,zzh,zzh,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    0Dh = Command::Preset Dump;

    03h = subCommand::NEW Dump Header;

    <nnh,nnh> = Preset Number.
    <kkh,kkh,kkh,kkh> = Number of Data bytes in the Dump, LSB first.
    <ggh,ggh> = Number of Global Parameters, LSB first.
    <llh,llh> = Number of Link Parameters per Link, LSB first.
    <vvh,vvh> = Number of Voice Parameters per Voice, LSB first.
    <zzh,zzh> = Number of Sample Zone Parameters per Sample Zone, LSB first.

    F7h = EOX

NEW DATA MESSAGE:
 EXAMPLE:> {F0h,18h,21h,ddh,55h,0Dh,04h,kkh,kkh,<244 Data Bytes>,<Checksum>,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    0Dh = Command::Preset Dump

    04h = subCommand::NEW Dump Message;

    <kkh,kkh> = Running Packet count, LSB first, begins at 1

    <244 Data Bytes> (except for last message)

```
     <Checksum> = 1 Byte = 1's compliment of the sum of {<244 Data Bytes>}

     F7h = EOX




NEW Dump Data Formats:


/* short form */

 PresetDump          :== Name GlobalParms NoOfLinks { Link }*NoOfLinks
                                         NoOfVoices { Voice }*NoOfVoices.
 Name                :== 16 * ASCIIChar.
 GlobalParms         :== E4_PRESET_TRANSPOSE ... (end of Global Parameters).
 NoOfLinks           :== MAX(0 - 255, 255-NoOfVoices).
 Link                :== E4_LINK_PRESET ... (end of Link Parameters).
 NoOfVoices          :== MAX(1 - 255, 255-NoOfLinks).
 Voice               :== E4_GEN_GROUP_NUM SingleSampleVoice | MultiSampleVoice.
 SingleSampleVoice   :== E4_GEN_SAMPLE VoiceParams 1.
 MultiSampleVoice    :== 3FFFh VoiceParams NoOfZones { Zone }*NoOfZones.
 VoiceParams         :== E4_GEN_VOLUME ... (end of Voice Parameters).
 NoOfZones           :== 0 .. 255.
 Zone                :== E4_GEN_SAMPLE E4_GEN_VOLUME E4_GEN_PAN E4_GEN_FTUNE E4_GEN_ORIG_KEY
                         E4_GEN_KEY_LOW ... (end of Sample Zone Parameters).


/* long form */

Preset Dump:
     <244 Data Bytes> x <? messages> = {<NAME>,<DATA 1>,<DATA 2>,...,}
         (last message may contain less than 244 Data Bytes)
     <NAME> = Preset Name, 16 ASCII characters
     <DATA 1>,<DATA 2>,..., = (see below)

The Data is organized in the following way, and then broken into 244 Byte chunks.


Preset Name:          16 Bytes
Global Parms:         44 Bytes
Number of Links:       2 Bytes
    Link Parms:       (58 Bytes * Number of Links)
Number of Voices:      2 Bytes
    Voice Parms:     (292 Bytes * Number of Voices)
    Number of SZones  (2 Bytes * Number of Voices)
       SZone Parms   (26 Bytes * Number of SZones per Voice)

1 Voice, no Links, no SZones: 358 Data Bytes




{<NAME>,<Global Parms>,<Links>,<Voices>}


<NAME>:
```

16 ASCII characters, 16 Bytes.

<Global Parms>:

There are currently 22 Global Parameters, for a total of 44 Bytes.

Always starts with the first 6 parms. All parms are 2 Bytes.

```
 E4_PRESET_TRANSPOSE,        id = 0        min = -24;  max = +24  (semitones)
 E4_PRESET_VOLUME,           id = 1        min = -96;  max = +10  (dB)
 E4_PRESET_CTRL_A,           id = 2        min = -1;   max = 127  (-1 = off)
 E4_PRESET_CTRL_B,           id = 3        min = -1;   max = 127  (-1 = off)
 E4_PRESET_CTRL_C,           id = 4        min = -1;   max = 127  (-1 = off)
 E4_PRESET_CTRL_D,           id = 5        min = -1;   max = 127  (-1 = off)
```

Then effects A and effects B. If the effects A or B Algorithm is 0, then the
effects parameters are the values of Master Effects A or B. After the effects,
the next word is the beginning of the LINKS section of Data. More Global
Parameters may be added to future versions of EOS, in which case they would
follow these Global Effects parameters, but before the LINK parameters. The
number of Global Parameters is contained in the Header message.

<Links>:

There are currently 29 LINK parameters, or 58 Bytes per LINK.

The first word(2 Bytes, LSB first) is the number of Links in the Preset.
The max number of Links + the max number of Voices = 256.
Each Link currently has 29 parameters, so the number of Bytes
remaining in this section is (29 words * 2 Bytes/word * number of Links).
These 28 word blocks are delivered in order of Link number,
starting with 1. If there are no Links in the Preset then
no Link data follows the 0 Link count word.

<Voices>:

62 Bytes of Preset so far if no Links.

The first word is the number of Voices in the Preset.
The max number of Voices + the max number of Links = 256.

The next group of words applies to the first Voice.

The first word is the Group number associated with
the Voice.

What follows are the Voice Parameters.

The first word following the Voice Parameters is the number
of Sample Zones.

- If the Sample Number is 3FFFh, then it is a "multisample" voice.

    - If the number of Sample Zones is 1, the Voice is not a "multisample",
      and the next word is the beginning of the next Voice(the Group number).

    - If the number of Sample Zones is greater than 1, then Sample Zone
      Parameters corresponding to the number of Sample Zones follows, and
      after the last Sample Zone of the Voice, the next set of Voice
      parameters follow, assuming another Voice exists.

If no more Voices exist after the last Sample Zone parameter
of the current voice, then the Preset is complete.

The Voice Parameters currently consist of:

    - General Parameters(20 if single Sample Zone, 19 if a MultiSample Voice),
    - Tuning(11)
    - Amp/Filt(37)
    - Lfo/Aux(24)
    - Cords(54)

There are 146 total base(single Sample Voice) parameters per Voice.
This number along with the Number Of Samples word = 147 words, or 294 Bytes
for a Single Sample Zone Voice.

Additional Sample Zones require an additional 13 parameters per Zone, but
1 less parameter in the Voice(The Sample Original Key Parameter).

The Sample Parameters consist of a subset of the General
Parameters. Each additional Sample requires a block of
information containing the Sample number, and the 13 current Sample
parameters. There can be 255 of these additional Sample zones
per Voice.


```
 E4_GEN_SAMPLE,              id = 38      min =   0;  max = 999(2999)
 E4_GEN_VOLUME,              id = 39      min = -96;  max = +10
 E4_GEN_PAN,                 id = 40      min = -64;  max = +63

 E4_GEN_FTUNE,               id = 42      min = -64;  max = +64

 E4_GEN_ORIG_KEY,            id = 44      min =   0;  max = 127   (60 = C3)

 E4_GEN_KEY_LOW,             id = 45      min = 0;  max = 127   (C-2 -> G8)
 E4_GEN_KEY_LOWFADE,         id = 46      min = 0;  max = 127
 E4_GEN_KEY_HIGH,            id = 47      min = 0;  max = 127   (C-2 -> G8)
 E4_GEN_KEY_HIGHFADE,        id = 48      min = 0;  max = 127

 E4_GEN_VEL_LOW,             id = 49      min = 0;  max = 127
 E4_GEN_VEL_LOWFADE,         id = 50      min = 0;  max = 127
 E4_GEN_VEL_HIGH,            id = 51      min = 0;  max = 127
 E4_GEN_VEL_HIGHFADE,        id = 52      min = 0;  max = 127
```

The total Max number of words per Voice becomes 147 + (255*13) = 3462.
Each parameter is 2 bytes, for a total of 6924 Bytes. Each preset can
have a maximum of 256 Voices(assuming no Links). So 256*6924 = 1772544 Bytes.
Add 62 Bytes for the Name, Globals, Number of Links, and Number of
Voices and the total comes to 1,772,606 Bytes! This is just to
give you an idea of the Theoretical limits, however it is advisable
to keep the Presets to 64k or less.

Preset Dump Request:

EXAMPLE:> {F0h,18h,21h,ddh,55h,0Dh,05h,xxh,xxh,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    0Dh = Command::Preset Dump

    05h = subCommand::NEW Preset Dump Request;

    <xxh,xxh> = Preset number

    F7h = EOX

  The response is the Preset Dump SYSEX message.

*If a non-existant Preset is requested, the response is a CANCEL message.

*WARNING! Only 1 Preset may be Dumped to or from the E4 at a time!

==

Configuration Utilities:

Preset Memory Request:

  This is a Read Only system.

EXAMPLE:> {F0h,18h,21h,ddh,55h,10h,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    10h = Command::Preset Memory Request

    F7h = EOX

```
RESPONSE:> {F0h,18h,21h,ddh,55h,11h,xxh,xxh,yyh,yyh,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     11h = Command::Preset Memory Response

     <xxh,xxh> = Total Preset Memory (in kBytes) LSB first

     <yyh,yyh> = Total Preset Memory Free (in kBytes) LSB first

     F7h = EOX


Sample Memory Request:

EXAMPLE:> {F0h,18h,21h,ddh,55h,12h,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     12h = Command::Sample Memory Request

     F7h = EOX

RESPONSE:> {F0h,18h,21h,ddh,55h,13h,xxh,xxh,yyh,yyh,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     13h = Command::Sample Memory Response

     <xxh,xxh> = Total Sample Memory (in MBytes) LSB first

     <yyh,yyh> = Total Sample Memory Free (in 10's of kBytes) LSB first

     F7h = EOX


Configuration Request:

   This is a Read Only system.

EXAMPLE:> {F0h,18h,21h,ddh,55h,14h,F7h}

     F0h = sysex message
```

```
      18h = EMU ID
      21h = E4 ID
      ddh = Device ID
      55h = Special Editor designator byte

      14h = Command::Configuration Request

      F7h = EOX

RESPONSE:> {F0h,18h,21h,ddh,55h,15h,<Options>,<RAM>,F7h}

      F0h = sysex message
      18h = EMU ID
      21h = E4 ID
      ddh = Device ID
      55h = Special Editor designator byte

      15h = Command::Configuration Response

      <Options> = 7 bit number, each bit representing if an option is
              present or not.

         bit 0: 0 = 64 Voices; 1 = 128 Voice
         bit 1: 0 = No FX Card; 1 = FX Card installed
         bit 2: 0 = No MIDI card; 1 = MIDI card installed
         bit 3: 0 = No Octopus card; 1 = Octopus card installed
         bit 4: 0 = No Digital I/O; 1 = Digital I/O installed
         bit 5: 0 = <undefined>
         bit 6: 0 = <undefined>

      <RAM>   = 2 Byte Sample RAM configuration(0 - 128 MB)

      F7h = EOX




Preset Number Of Voices Request:

   This is a Read Only system.

EXAMPLE:> {F0h,18h,21h,ddh,55h,16h,<xxh,xxh>,F7h}

      F0h = sysex message
      18h = EMU ID
      21h = E4 ID
      ddh = Device ID
      55h = Special Editor designator byte

      16h = Command::Preset Num Of Voices Request

      <xxh,xxh> = Preset Number (LSB first)

      F7h = EOX

RESPONSE:> {F0h,18h,21h,ddh,55h,17h,<Num_Of_Voices>,F7h}

      F0h = sysex message
```

```
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     17h = Command::Preset Num Of Voices Response

     <Num_Of_Voices> = 2 Byte number of Voices.

     F7h = EOX


Preset Number Of Links Request:

   This is a Read Only system.

EXAMPLE:> {F0h,18h,21h,ddh,55h,18h,<xxh,xxh>,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     18h = Command::Preset Num Of Links Request

     <xxh,xxh> = Preset Number (LSB first)

     F7h = EOX

RESPONSE:> {F0h,18h,21h,ddh,55h,19h,<Num_Of_Links>,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     19h = Command::Preset Num Of Links Response

     <Num_Of_Voices> = 2 Byte number of Links.

     F7h = EOX


Preset Number Of Sample Zones Request:

   This is a Read Only system.

EXAMPLE:> {F0h,18h,21h,ddh,55h,1Ah,<xxh,xxh>,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
```

```
    55h = Special Editor designator byte

    1Ah = Command::Preset Num Of SZones Request

    <xxh,xxh> = Preset Number (LSB first)

    F7h = EOX

RESPONSE:> {F0h,18h,21h,ddh,55h,1Bh,<Num_Of_SZones>,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    1Bh = Command::Preset Num Of SZones Response

    <Num_Of_SZones> = 2 Byte number of SZones.

    F7h = EOX



Voice Number Of Sample Zones Request:

  This is a Read Only system.

EXAMPLE:> {F0h,18h,21h,ddh,55h,1Ch,<xxh,xxh>,<yyh,yyh>,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    1Ch = Command::Voice Num Of SZones Request

    <xxh,xxh> = Preset Number (LSB first)
    <yyh,yyh> = Voice Number (LSB first)

    F7h = EOX

RESPONSE:> {F0h,18h,21h,ddh,55h,1Dh,<V_Num_Of_SZones>,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    1Dh = Command::Voice Num Of SZones Response

    <V_Num_Of_SZones> = 2 Byte number of SZones.

    F7h = EOX
```

```
Expanded Configuration Request:

   This is a Read Only system.

EXAMPLE:> {F0h,18h,21h,ddh,55h,1Eh,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     1Eh = Command::Configuration Request

     F7h = EOX

RESPONSE:> {F0h,18h,21h,ddh,55h,1Fh,<Options1>,<Options2>,<RAM>,<ROM>,<Flash>,<reserved>,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     1Fh = Command::Configuration Response

     <Options1> = 7 bit number, each bit representing if an option is
              present or not.

        bit 0: 0 = 64 Voices; 1 = 128 Voice
        bit 1: 0 = No FX Card; 1 = FX Card installed
        bit 2: 0 = No MIDI card; 1 = MIDI card installed
        bit 3: 0 = No Octopus card; 1 = Octopus card installed
        bit 4: 0 = No Digital I/O; 1 = Digital I/O installed
        bit 5: 0 = No Preset Flash; 1 = Preset Flash upgrade installed
        bit 6: 0 = No ADAT I/O; 1 = ADAT I/O installed

     <Options2> = 7 bit number, each bit representing if an option is
              present or not.  Reserved for future expansion.

        bit 0: 0 = <undefined>
        bit 1: 0 = <undefined>
        bit 2: 0 = <undefined>
        bit 3: 0 = <undefined>
        bit 4: 0 = <undefined>
        bit 5: 0 = <undefined>
        bit 6: 0 = <undefined>

     <RAM>   = 2 Byte Sample RAM configuration(0 - 128 MB)
     <ROM>   = 1 Byte Sample ROM configuration(0 - 128 MB) (0x7f = 128)
     <Flash> = 1 Byte Sample Flash configuration(0 - 128 MB) (0x7f = 128)

     <reserved> = 4 Bytes reserved for future expansion.
```

```
     F7h = EOX



Voice Utility Commands:


New Voice:
     Adds a new Voice to the Current Preset.

EXAMPLE:> {F0h,18h,21h,ddh,55h,20h,xxh,xxh,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     20h = Command::New Voice

     xxh,xxh = Preset Number

     F7h = EOX




Delete Voice:
     Deletes a Voice from the Current Preset.

EXAMPLE:> {F0h,18h,21h,ddh,55h,21h,xxh,xxh,yyh,yyh,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     21h = Command::Delete Voice

     xxh,xxh = Preset Number
     yyh,yyh = Voice number (0 -> 255)

     F7h = EOX




Copy Voice:
     Copy a Voice to a new Voice in the Current Preset.

EXAMPLE:> {F0h,18h,21h,ddh,55h,22h,xxh,xxh,yyh,yyh,zzh,zzh,ggh,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
```

```
    ddh = Device ID
    55h = Special Editor designator byte

    22h = Command::Copy Voice

    xxh,xxh = Source Preset (000 -> 999) LSB first
    yyh,yyh = Source Voice  (0 -> 255) LSB first
    zzh,zzh = Destination Preset (000 -> 999) LSB first
    ggh     = Group Number (0 -> 31)

    F7h = EOX
```

Sample Zone Commands:

New Sample Zone:
    Adds a new Sample Zone to the currently selected Voice in the Current Preset.

EXAMPLE:> {F0h,18h,21h,ddh,55h,30h,xxh,xxh,yyh,yyh,F7h}

```
    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    30h = Command::New Sample Zone

    xxh,xxh = Preset Number
    yyh,yyh = Voice Number

    F7h = EOX
```

Get Multisample:
    Replace Samples in currently selected Voice with Samples from any other
    Voice in the Bank.

EXAMPLE:> {F0h,18h,21h,ddh,55h,31h,xxh,xxh,yyh,yyh,zzh,zzh,qqh,qqh,F7h}

```
    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    31h = Command::Get Multisample

    xxh,xxh = Source Preset (000 -> 999)
    yyh,yyh = Source Voicenum
```

```
    zzh,zzh = Destination Preset
    qqh,qqh = Destination Voicenum

    F7h = EOX




Delete Sample Zone:
    Delete the currently selected Sample Zone in the Current Preset.

EXAMPLE:> {F0h,18h,21h,ddh,55h,32h,xxh,xxh,yyh,yyh,zzh,zzh,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    32h = Command::Delete Sample Zone

    xxh,xxh = Preset Number
    yyh,yyh = Voice Number
    zzh,zzh = Sample Number

    F7h = EOX




Combine:
    Take all the Voices in the given group and Combine them into one Voice.

EXAMPLE:> {F0h,18h,21h,ddh,55h,33h,xxh,xxh,yyh,yyh,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    33h = Command::Combine

    xxh,xxh = Preset Number

    yyh,yyh = Group number (0 -> 31)

    F7h = EOX




Expand:
    Expand all the Sample Zones in the currently selected Multisample Voice
    into separate Voices for each Sample Zone.

EXAMPLE:> {F0h,18h,21h,ddh,55h,34h,xxh,xxh,yyh,yyh,F7h}
```

```
        F0h = sysex message
        18h = EMU ID
        21h = E4 ID
        ddh = Device ID
        55h = Special Editor designator byte

        34h = Command::Expand

        xxh,xxh = Preset Number
        yyh,yyh = Voice Number

        F7h = EOX




Link Utility Commands:

New Link:
        Adds a new Link to the Current Preset.

EXAMPLE:> {F0h,18h,21h,ddh,55h,40h,xxh,xxh,F7h}

        F0h = sysex message
        18h = EMU ID
        21h = E4 ID
        ddh = Device ID
        55h = Special Editor designator byte

        40h = Command::New Link

        xxh,xxh = Preset Number

        F7h = EOX




Delete Link:
        Delete currently selected Link from the Current Preset.

EXAMPLE:> {F0h,18h,21h,ddh,55h,41h,xxh,xxh,yyh,yyh,F7h}

        F0h = sysex message
        18h = EMU ID
        21h = E4 ID
        ddh = Device ID
        55h = Special Editor designator byte

        41h = Command::Delete Link

        xxh,xxh = Preset Number
        yyh,yyh = Link Number

        F7h = EOX
```

```
Sample Defragment Memory:
EXAMPLE:> {F0h,18h,21h,ddh,55h,52h,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     52h = Command::Sample Defragment Memory

     F7h = EOX




Copy Link:
     Copy a Link from any Preset to any Preset.

EXAMPLE:> {F0h,18h,21h,ddh,55h,42h,xxh,xxh,yyh,yyh,zzh,zzh,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     42h = Command::Copy Link

     xxh,xxh = Source Preset (000 -> 999)
     yyh,yyh = Source Link (0 -> 255)
     zzh,zzh = Destination Preset (000 -> 999)

     F7h = EOX




Sample Commands

Sample Erase:
EXAMPLE:> {F0h,18h,21h,ddh,55h,50h,xxh,xxh,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     50h = Command::Sample Erase

     xxh,xxh = Sample Number to Erase
```

```
    F7h = EOX




Sample Defragment Memory:
EXAMPLE:> {F0h,18h,21h,ddh,55h,52h,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    52h = Command::Sample Defragment Memory

    F7h = EOX




Preset Copy:

EXAMPLE:> {F0h,18h,21h,ddh,55h,70h,xxh,xxh,yyh,yyh,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    70h = Command::Preset Copy

    xxh,xxh = Source Preset number 0-999(1255)
    yyh,yyh = Destination Preset number 0-999(1255)

    F7h = EOX

Preset Copy destroys whatever Preset existed in the Destination location.

If There is not enough Preset memory to copy the Preset, the copy is
aborted and a NAK message is sent as a reply.




Preset Delete:

EXAMPLE:> {F0h,18h,21h,ddh,55h,71h,xxh,xxh,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    71h = Command::Preset Delete

    xxh,xxh = Preset number 0-999(1255)
```

```
    F7h = EOX




Multimode Map Dump:

EXAMPLE:> {F0h,18h,21h,ddh,55h,72h,<multimode map>,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
    ddh = Device ID
    55h = Special Editor designator byte

    72h = Command::Multimode Map Dump

    <multimode map> = 128 Bytes for 16 MIDI Channels
                      256 Bytes for 32 MIDI Channels (if expansion card)

    F7h = EOX

The structure of a Multimode Map is like a string of Parameters without
their id's.  Each Channel has 4 parameters, or 8 Bytes.  The Channel number and Parameter
id's are assumed by the fixed order of the message.  For 16 channels this means 8 Bytes * 16,
or 128 Bytes.  For 32 Channels it is double, or 256 Bytes.  If the receiving
machine is sent a 32 Channel Multimode Map and does not have the Midi expansion
card, it will Truncate the message and only read in the first 16 channels.
If a Multimode Dump is requested from a machine with no Midi expansion card,
it will only generate a dump of the 16 Channels.

    Ch.1 Preset   (2 Bytes)
    Ch.1 Volume   (2 Bytes)
    Ch.1 Pan      (2 Bytes)
    Ch.1 Submix   (2 Bytes)

    Ch.2 Preset   (2 Bytes)
    Ch.2 Volume   (2 Bytes)
    Ch.2 Pan      (2 Bytes)
    Ch.2 Submix   (2 Bytes)

    Ch.3 Preset   (2 Bytes)
    Ch.3 Volume   (2 Bytes)
    Ch.3 Pan      (2 Bytes)
    Ch.3 Submix   (2 Bytes)

    ...



Multimode Map Dump Request:

EXAMPLE:> {F0h,18h,21h,ddh,55h,73h,F7h}

    F0h = sysex message
    18h = EMU ID
    21h = E4 ID
```

```
     ddh = Device ID
     55h = Special Editor designator byte

     73h = Command::Multimode Map Dump Request

     F7h = EOX




Erase Current RAM Bank:

EXAMPLE:> {F0h,18h,21h,ddh,55h,74h,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     74h = Command::Erase Current RAM Bank

     F7h = EOX


Erase All RAM Presets:

EXAMPLE:> {F0h,18h,21h,ddh,55h,75h,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     75h = Command::Erase All RAM Presets

     F7h = EOX


Erase All RAM Samples:

EXAMPLE:> {F0h,18h,21h,ddh,55h,76h,F7h}

     F0h = sysex message
     18h = EMU ID
     21h = E4 ID
     ddh = Device ID
     55h = Special Editor designator byte

     76h = Command::Erase All RAM Samples

     F7h = EOX
```