SoundFont NRPNs

How do I change an instrument's sound parameter in real time?

You can change an instrument's SoundFont parameters (for example, LFO depth and speed, envelope contour) through MIDI in real time via NRPN, or Non Registered Parameter Number control.

NRPN is identical to that of RPN, except that Registered Parameter Numbers are agreed upon by the MMA (MIDI Manufacturers Association) and JMSC (Japan MIDI Standards Committee), and Non Registered Parameter Number may be assigned as needed by individual manufacturers.

As NRPN and Data Entry messages are MIDI controller messages, any MIDI sequencer software that supports editing of controller messages (such as Cakewalk, MasterTracks Pro) is capable of sending them.

For SB AWE32 NRPN to be functional, NRPN MSB has to be 127, and NRPN LSB set to the desired parameter to be controlled (see Section H for a list of available NRPN LSB).

To control the AWE32's NRPNs, enter the following series of controller events:

| Controller | Parameter | Description |
|---|---|---|
| 99 | 127 | This is the NRPN MSB. It is always 127. |
| 98 | NRPN LSB # | The number of the effect as listed in Section H. |
| 6 | Data Entry MSB # | (See equations below.) |
| 38 | Data Entry LSB # | (See equations below.) |

Data Entry MSB # = (Actual Value + 8192) / 128
Data Entry LSB # = (Actual Value + 8192) % 128

Where "Actual Value" represents the desired increment in a specified range (see Section H). For example, here is a listing from Section H:

NRPN LSB 26 (Reverb Effects Send)
Realtime : No
Range : [0, 255]

In the example above, reverb may be controlled from levels 0 to 255. Select the desired reverb level, and use that number as the Actual Value in the equations above. These equations determine the parameters for controllers 6 and 38, respectively. For example, if you wanted to have a reverb value of 140, you would put 140 into the equations above, and come up with the value of 65 for Controller 6, and 12 for Controller 38.

If you need to determine the Actual Value of an NRPN already present in a MIDI file, use the formula below:

Actual value = (MSB * 128 + LSB) - 8192

A "Reset All Controllers" message (MIDI controller 121) restores the instrument's original SoundFont parameters.

Below is a table of NRPN implementation.

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SB AWE32 NRPN Implementation

NRPN LSB 0 (Delay before LFO1 starts)
Realtime : No
Range : [0, 5900]
Unit : 4 milliseconds
Delay from 0 to 22 seconds.

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NRPN LSB 1 (LFO1 Frequency)
     Realtime  : Yes
     Range     : [0, 127]
     Unit      : 0.084Hz
     LFO1 frequency from 0Hz to 10.72 Hz.

NRPN LSB 2 (Delay before LFO2 starts)
     Realtime  : No
     Range     : [0, 5900]
     Unit      : 4 milliseconds
     Delay from 0 to 22 seconds.

NRPN LSB 3 (LFO2 Frequency)
     Realtime  : Yes
     Range     : [0, 127]
     Unit      : 0.084Hz
     LFO2 frequency from 0Hz to 10.72 Hz.

NRPN LSB 4 (Envelope 1 delay time)
     Realtime  : No
     Range     : [0, 5900]
     Unit      : 4 milliseconds
     Envelope 1 Delay from 0 to 22 seconds.

NRPN LSB 5 (Envelope 1 attack time)
     Realtime  : No
     Range     : [0, 5940]
     Unit      : Milliseconds
     Envelope 1 attack time from 0 to 5.9 seconds.

NRPN LSB 6 (Envelope 1 hold time)
     Realtime  : No
     Range     : [0, 8191]
     Unit      : Milliseconds
     Envelope 1 hold time from 0 to 8 seconds.

NRPN LSB 7 (Envelope 1 decay time)
     Realtime  : No
     Range     : [0, 5940]
     Unit      : 4 Milliseconds
     Envelope 1 decay time from 0.023 to 23.7 seconds.

NRPN LSB 8 (Envelope 1 sustain level)
     Realtime  : No
     Range     : [0, 127]
     Unit      : 0.75dB
     Envelope  1 sustain level from full level down to off  (0.75
     dB step).

NRPN LSB 9 (Envelope 1 release time)
     Realtime  : No
     Range     : [0, 5940]
     Unit      : 4 milliseconds
     Envelope 1 release time from 0.023 to 23.7 seconds.

NRPN LSB 10 (Envelope 2 delay time)
     Realtime  : No
     Range     : [0, 5900]
     Unit      : 4 milliseconds
     Envelope 2 Delay from 0 to 22 seconds.

NRPN LSB 11 (Envelope 2 attack time)
     Realtime  : No
     Range     : [0, 5940]
     Unit      : Milliseconds
     Envelope 2 attack time from 0 to 5.9 seconds.

NRPN LSB 12 (Envelope 2 hold time)
     Realtime  : No
     Range     : [0, 8191]
     Unit      : Millisecond
     Envelope 2 hold time from 0 to 8 seconds.
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NRPN LSB 13 (Envelope 2 decay time)
     Realtime  : No
     Range     : [0, 5940]
     Unit      : 4 milliseconds
     Envelope 2 decay time from 0.023 to 23.7 seconds.

NRPN LSB 14 (Envelope 2 sustain level)
     Realtime  : No
     Range     : [0, 127]
     Unit      : 0.75dB
     Envelope 2 sustain level from full level down to off.

NRPN LSB 15 (Envelope 2 release time)
     Realtime  : No
     Range     : [0, 5940]
     Unit      : 4 milliseconds
     Envelope 2 release time from 0.023 to 23.7 seconds.

NRPN LSB 16 (Initial Pitch)
     Realtime  : Yes
     Range     : [-8192, 8191]
     Unit      : cents
     Pitch tuning between -8192 and 8191 cents.

NRPN LSB 17 (LFO1 to Pitch)
     Realtime  : Yes
     Range     : [-127, 127]
     Unit      : 9.375 cents
     If  data value is greater than 0, this will cause a positive
     (from 0 to maximum) 1 octave shift at LFO peak. On the other
     hand,  if  data value is smaller than 0, this will  cause  a
     negative (from 0 to minimum) 1 octave shift at LFO peak.

NRPN LSB 18 (LFO2 to Pitch)
     Realtime       : Yes
     Description    :
     Range          : [-127, 127]
     Unit           : 9.375 cents
     If  data value is greater than 0, this will cause a positive
     (from 0 to maximum) 1 octave shift at LFO peak. On the other
     hand,  if  data value is smaller than 0, this will  cause  a
     negative (from 0 to minimum) 1 octave shift at LFO peak.

NRPN LSB 19 (Envelope 1 to Pitch)
     Realtime  : No
     Range     : [-127, 127]
     Unit      : 9.375 cents
     If  data value is greater than 0, this will cause a positive
     (from 0 to maximum) 1 octave shift at envelope peak. On  the
     other hand, if data value is smaller than 0, this will cause
     a  negative  (from 0 to minimum) 1 octave shift at  envelope
     peak.

NRPN LSB 20 (LFO1 to Volume)
     Realtime  : Yes
     Range     : [0, 127]
     Unit      : 0.1875 dB
     Data values smaller than 64 causes a positive phase (from  0
     to  maximum) volume modulation via LFO1 with magnitude of 12
     dB  at LFO peak. On the other hand, data values greater than
     or  equal  to 64 causes a negative phase (from 0 to minimum)
     volume  modulation via LFO1 with magnitude of 12 dB  at  LFO
     peak.

NRPN LSB 21 (Initial Filter Cutoff)
     Realtime  : Yes
     Range     : [0, 127]
     Unit      : 62Hz
     Filter cutoff from 100Hz to 8000Hz

NRPN LSB 22 (Initial Filter Resonance Coefficient)
     Realtime  : No
     Range     : [0, 127]
     The  EMU8000  has  a  built in resonance  coefficient  table
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comprising 16 entries. Values 0-7 will select the first (0) entry, values 8-15 selects the second (1) entry and so on.

| Coeff | Low Fc(Hz) | Low Q(dB) | High Fc(kHz) | High Q(dB) | DC Attenuation(dB) |
|---|---|---|---|---|---|
| 0 | 92 | 5 | Flat | Flat | -0.0 |
| 1 | 93 | 6 | 8.5 | 0.5 | -0.5 |
| 2 | 94 | 8 | 8.3 | 1 | -1.2 |
| 3 | 95 | 10 | 8.2 | 2 | -1.8 |
| 4 | 96 | 11 | 8.1 | 3 | -2.5 |
| 5 | 97 | 13 | 8.0 | 4 | -3.3 |
| 6 | 98 | 14 | 7.9 | 5 | -4.1 |
| 7 | 99 | 16 | 7.8 | 6 | -5.5 |
| 8 | 100 | 17 | 7.7 | 7 | -6.0 |
| 9 | 100 | 19 | 7.5 | 9 | -6.6 |
| 10 | 100 | 20 | 7.4 | 10 | -7.2 |
| 11 | 100 | 22 | 7.3 | 11 | -7.9 |
| 12 | 100 | 23 | 7.2 | 13 | -8.5 |
| 13 | 100 | 25 | 7.1 | 15 | -9.3 |
| 14 | 100 | 26 | 7.1 | 16 | -10.1 |
| 15 | 100 | 28 | 7.0 | 18 | -11.0 |

NRPN LSB 23 (LFO1 to Filter Cutoff)

Realtime : Yes
Description :
Range : [-64, 63]
Unit : 56.25 cents

Data values smaller than 64 causes a positive phase (from 0 to maximum) filter modulation via LFO1 with magnitude of 3 octaves at LFO peak. On the other hand, data values greater than or equal to 64 causes a negative phase (from 0 to minimum) filter modulation via LFO1 with magnitude of 3 octaves at LFO peak.

NRPN LSB 24 (Envelope 1 to Filter Cutoff)

Realtime : No
Description :
Range : [-127, 127]
Unit : 56.25 cents

Data values greater than 0 cause a positive phase (from 0 to maximum) filter modulation via Envelope 1 with magnitude of 6 octaves at envelope peak. On the other hand, values smaller than 0 cause a negative phase (from 0 to minimum) filter modulation via Envelope 1 with magnitude of 6 octaves at envelope peak.

NRPN LSB 25 (Chorus Effects Send)

Realtime : No
Range : [0, 255]

Chorus send, with 0 being the driest (no chorus effects processing), and 255 being the wettest (full chorus effect processing).

NRPN LSB 26 (Reverb Effects Send)

Realtime : No
Range : [0, 255]

Reverb send, with 0 being the driest (no reverb effects processing), and 255 being the wettest (full reverb effect processing).

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