Tone setting guide

Beta010

12 Jun, 2017

# Introduction

FITOM handles tone data in its own format because it is compatible with multiple sound source chips.

C C # 8 9 - 90 Ya Vo i ce E d i t o r The parameters on the screen are arranged based on this unique format , so you can see the error in the register image of each sound source chip . For those who are used to Ditto , it may be a little difficult to understand .

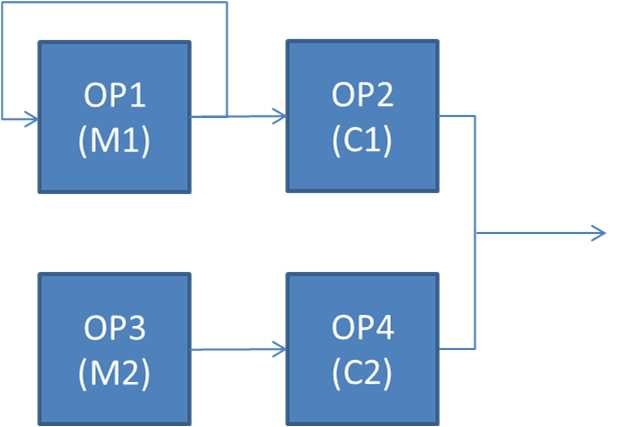
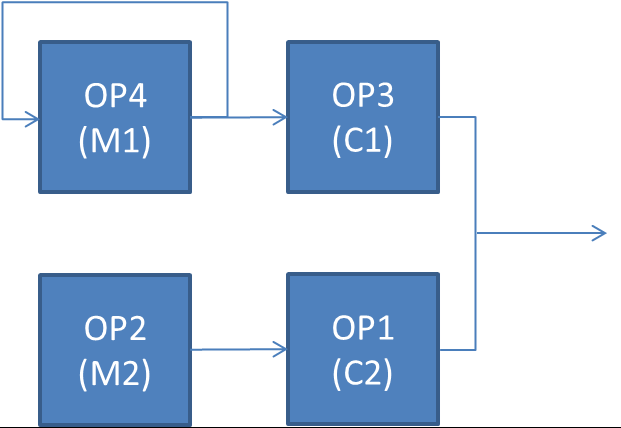
This book describes the correspondence between register images and unique formats for each sound source group , and the interpretation of parameters specific to sound source chips . , compiles the information necessary for tone editing . \_ \_ \_ \_

# Legend, basic information, etc.

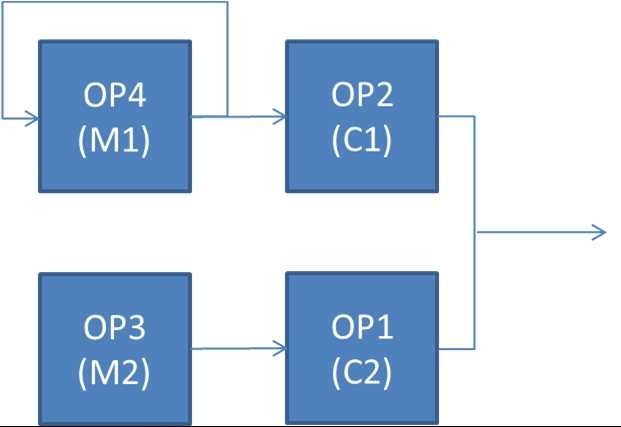
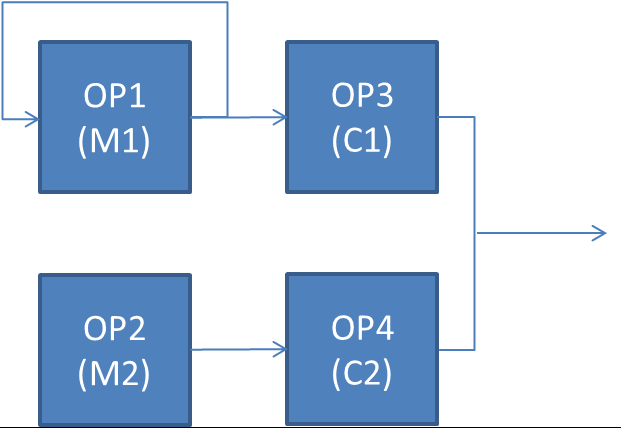
* 1. .About the operator name

FM There is a tradition of assigning a number to each operator of a sound source , but there is no unified rule for numbering , and it varies by culture and era . \_ It varies depending on which .

4- operator FM sound source, for example, on a synthesizer it is common to set the feedback operator to "4", but on a PC it is usually set to "1".

The method of assigning operator numbers can be distinguished using Algorithm 4.

|  |  |
| --- | --- |
| Yamaha TX81Z ,  DX21/DX27 etc. | Yamaha FB-01 etc.  P C These are often used in systems . \_ \_  F I T O M But I 'll adopt this . |
| I haven't seen much | Seen in some PC systems |
| It's a good style, but in this world | The style of doing. register |
| Is it there somewhere? | number in order of dress |
| Maybe. | ing. |

* 1. .About numerical expression

For synthesizers , parameters such as program numbers and channel numbers are often expressed starting from " 1 " . \_ \_ \_ \_ \_ However , internally , " 0 " is the starting point . \_ \_ \_ \_ \_ \_ \_ Also , P C In systems , it is common to write the internal representation as is . \_ F I T O M Now , unless otherwise specified , all parameters are set to the starting point of " 0 " . Ten It is expressed in decimal numbers . \_

* 1. .How to read the parameter list

**Address** : Address specified in CC#89 when editing tone parameters with CC# 89-90. **Parameter** : General name and role of parameter

**GUI notation** : Parameter symbols displayed on the Voice Editor screen

On the GUI , parameters divided into 7 bits are automatically combined and displayed as a single parameter.

(with some exceptions)

# software LFO related parameters

FITOM , LFO is applied to the output pitch and TL of each operator through software processing. You can multiply

On PSG chips, the OP1 LFO parameter applies an LFO to the volume.

With PSG (AY-3-891x)/EPSG (AY8930)/SSG (YM2149, etc. ) , you can apply an LFO to the noise frequency using the OP2 LFO parameter.

The software LFO consists of an envelope as shown below by LFO delay , LFO rate , and LFO depth , and the LFO

This is achieved by multiplying the waveforms obtained by wave and LFO freq and adding the result to the pitch of each channel or TL of each operator .

Pitch LFO and level LFO have the same parameters except for the depth range .

127

LFO rate

LFO depth

LFO delay

0

## Figure 3-1 Software LFO

Software LFOs always start in sync with note-on and end in sync with note-off. **Table 3-1 Software LFO List of parameters used in**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **アドレス** | **パラメータ** | **GUI 表記** | **範囲** | **備考** |
| **Pitch** | 24 | ピッチLFO depth (MSB) | P-LFO depth | 0-127 | 100/64 セント単位。MSB/LSB あわせて 14bit とし、符号拡張して-8192～8191 として解釈する。 |
| 25 | ピッチLFO depth (LSB) | 0-127 |
| 26 | ピッチLFO 周期 | P-LFO freq | 0-18 |  |
| 27 | ピッチLFO 波形 | P-LFO waveform | 0-6 |  |
| 29 | ピッチLFO delay | P-LFO delay | 0-127 | 80ms 単位 |
| 30 | ピッチLFO rate | P-LFO rate | 0-127 |  |
| **OP1(M1)**  **Level** | 46 | レベルLFO 周期 | TL-LFO freq | 0-18 |  |
| 47 | レベルLFO 波形 | TL-LFO waveform | 0-6 |  |
| 48 | レベルLFO depth | TL-LFO depth | 0-127 | 64～127 を-64～-1 として解釈する。 |
| 49 | レベルLFO delay | TL-LFO delay | 0-127 | 80ms 単位 |
| 50 | レベルLFO rate | TL-LFO rate | 0-127 |  |
| **OP2(C1)** | 70-74 | 同上 | | | PSG/SSG/EPSG ではノイズ周波数に対するLFO |
| **OP3(M2)** | 94-98 | 同上 | | |  |
| **OP4(C2)** | 118-122 | 同上 | | |  |

## Table 3-2 Software LFO parameter details

|  |  |  |
| --- | --- | --- |
| **parameters** | **Setting value** | **remarks** |
| **LFO delay** | 0-127 | Specifies the time until the LFO starts applying in 80ms units.  (0=no delay, 127=LFO starts after about 5 seconds) |
| **LFO rate** | 0-127 | Specifies the speed from when the LFO starts applying until it reaches its maximum depth in 20ms increments.  (0=LFO not applied, 127=maximum level immediately after delay ends) |
| **LFO depth**  **(MSB/LSB)** | -64～63  or  -8192~8191 | LFO depth. For Operator LFOs, a value between 64 and 127 will be interpreted as -64 through -1. (127=-1)  For pitch LFO, the value is (MSB x 128 + LSB) from 0 to 16383, and 8192 to 16383 is interpreted as -8192 to -1. (16383=-1) |
| **LFO freq** | 0 | Source frequency (approx. 2.08Hz) |
| 1 | Source frequency x 2 (approximately 4.16Hz) |
| 2 | Source frequency x 3 (approximately 6.25Hz) |
| 3 | Source frequency x 4 (approximately 8.33Hz) |
| Four | Source frequency x 5 (approx. 10.42Hz) |
| Five | Source frequency x 6 (approx. 12.5Hz) |
| 6 | Source frequency x 8 (approx. 16.66Hz) |
| 7 | Source frequency x 10 (approx. 20.83Hz) |
| 8 | Source frequency x 12 (approximately 25Hz) |
| 9 | Source frequency x 15 (approx. 31.26Hz) |
| Ten | Source frequency x 16 (approximately 33.33Hz) |
| 11 | Source frequency x 20 (approx. 41.66Hz) |
| 12 | Source frequency x 24 (approx. 50Hz) |
| 13 | Source frequency x 30 (approx. 62.5Hz) |
| 14 | Source frequency x 40 (approximately 83.33Hz) |
| 15 | Source frequency x 48 (approx. 100Hz) |
| 16 | Source frequency x 60 (approx. 125Hz) |
| 17 | Source frequency x 80 (approx. 166Hz) |
| 18 | Source frequency x 120 (approx. 250Hz) |
| **LFO waveform** | 0 | sawtooth wave |
| 1 | square wave |
| 2 | triangle wave |
| 3 | sample & hold |
| Four | sawtooth one shot |
| Five | triangle wave one shot |
| 6 | sine wave |

1. OPM Parameters of the system chip

C C # 3 2 OP M \_ This is the tone data layout when the system chip ( Y M 2151 /Y M 21 6 4 / Y M 24 1 4 ) is selected . Parameters without special notes represent the register values of the sound source chip as is .

## Table 4-1 List of parameters used in OPM chips

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **parameters** | **GUI notation** | **range** | **remarks** |
| **Common** | 20 | FB | Feedback | 0-7 |  |
| twenty one | AL | Algorithm | 0-15 | See **Table 4-3 OPM algorithm list .** |
| twenty two | AMS | AM sense | 0-3 |  |
| twenty three | PMS | PM sense | 0-7 |  |
| 31 | NFREQ | Noise freq | 0-31 | Specify the noise frequency when the noise generator is enabled. |
| **OP1(M1) OP2(C1) OP3(M2) OP4(C2)** | 32/56/80/104 | AR | Attack rate | 0-127 | Specify in 7bit left justified (4 times 0-31) like 0#####00. |
| 33/57/81/105 | DR | Decay rate | 0-127 | Specify in 7bit left justified (4 times 0-31) like 0#####00. |
| 34/58/82/106 | SL | Sustain level | 0-127 | Specify as 7bit left justified (8 times 0-16) like 0####000. |
| 35/59/83/107 | S.R. | Sustain rate | 0-127 | Specify in 7bit left justified (4 times 0-31) like 0#####00 |
| 36/60/84/108 | RR | Release rate | 0-127 | Specify in 7bit left justified (8 times 0-15) like 0####000. |
| 37/61/85/109 | REV | Reverberation | 0-15 | Valid only for OPZ. |
| 38/62/86/110 | T.L. | Total level | 0-127 | 0 is the maximum. |
| 40/64/88/112 | EGS | EG-Bias | 0-127 | Valid only for OPZ. |
| 41/65/89/113 | KSL | KS-Level | 0-3 |  |
| 42/66/90/114 | KSR | KS-Rate | 0-3 |  |
| 43/67/91/115 | W.S. | Wave select | 0-7 | OPZ only. See **Table 4-4 OPZ waveform selection .** |
| 44/68/92/116 | A.M. | AM enable | 0-1 |  |
| 51/75/99/123 | OSC Fix | Osc Fix | 0-1 | OPZ only. See 4.1 OPZ Fixed Frequency Mode. |
| 52/76/100/124 | M.L. | Multiple | 0-15 | If OSC Fix=1, it is interpreted as Course freq. |
| 53/77/101/125 | DT1 | Detune 1 | 0-15 | If OSC Fix=1, it is interpreted as Fix range. |
| 54/78/102/126 | DT2 | Detune 2 | 0-3 |  |
| 55/79/103/127 | DT3 | Fine freq | 0-15 | OPZ only. Equivalent to ACED's Fine freq. |

* 1. OPZ fixed frequency mode

O P Z in OS C F i x = 1 If you do this , you can create a fixed frequency mode that always oscillates the same frequency regardless of the scale for each operator . \_ \_ In this mode , D T 1 , ML , D T 3 \_ The frequency is calculated as follows by the combination of . \_ \_ \_

= Fix Range multiplier × ( Course freq × 16 + Fine freq ) ( )

## Table 4-2 Fixed frequency mode parameter settings

|  |  |  |
| --- | --- | --- |
| **Fix Range (DT1) value** | **magnification** | **Actual frequency (Hz) indicated by Course Tune (ML) × 16+Fine Tune (DT3)** |
| **0** | 1 | 8-255 (1Hz step ) |
| **1** | 2 | 16-510 (2Hz step ) |
| **2** | Four | 32-1020 (4Hz step ) |
| **3** | 8 | 64-2040 (8Hz step ) |
| **Four** | 16 | 128-4080 (16Hz step ) |
| **Five** | 32 | 256-8160 (32Hz step ) |
| **6** | 64 | 512-16320 (64Hz step ) |
| **7** | 128 | 1024-32640 (128Hz step ) |

**Table 4-3 OPM algorithm list**

|  |  |  |  |
| --- | --- | --- | --- |
| **AL value** | **algorithm shape** | **AL value** | **algorithm shape** |
| **0** | Serial 4 consecutive mode | Four | 2 serial / 2 parallel modes |
| **1** | Double modulation serial triple mode | Five | Common modulation 3 parallel mode |
| **2** | Double modulation mode 1 | 6 | 2 serial serial + 2 sign modes |
| **3** | Double modulation mode 2 | 7 | 4 parallel sign synthesis mode |
| **8-15** | 0-7 noise generator enabled (if you set this, it will always be assigned to ch.7 ) | | |

**Table 4-4 OPZ waveform selection**

|  |  |  |  |
| --- | --- | --- | --- |
| **WS value** | **Waveform** | **WS value** | **Waveform** |
| **0** |  | Four |  |
| **1** |  | Five |  |
| **2** |  | 6 |  |
| **3** |  | 7 |  |

1. OPN Parameters of the system chip

OPN chip ( YM2203/YM2608/YM2610/YM2612/YMF276/YMF288, etc.) is selected for CC#32 .

Parameters without special notes represent the register values of the sound source chip as is . **table 5-1 \_ \_ O P N List of parameters used in the system chip**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **アドレス** | **パラメータ** | **GUI 表記** | **範囲** | **備考** |
| **Common** | 20 | FB | Feedback | 0-7 |  |
| 21 | AL | Algorithm | 0-8 | **表 5-3 OPN のアルゴリズム一覧**を参照。 |
| 22 | AMS | AM sense | 0-3 |  |
| 23 | PMS | PM sense | 0-7 |  |
| **OP1(M1) OP2(C1) OP3(M2) OP4(C2)** | 32/56/80/104 | AR | Attack rate | 0-127 | 0#####00 のように、7bit 左詰（0-31 の 4 倍）で指定。 |
| 33/57/81/105 | DR | Decay rate | 0-127 | 0#####00 のように、7bit 左詰（0-31 の 4 倍）で指定。 |
| 34/58/82/106 | SL | Sustain level | 0-127 | 0####000 のように、7bit 左詰（0-16 の 8 倍）で指定。 |
| 35/59/83/107 | SR | Sustain rate | 0-127 | 0#####00 のように、7bit 左詰（0-31 の 4 倍）で指定 |
| 36/60/84/108 | RR | Release rate | 0-127 | 0####000 のように、7bit 左詰（0-15 の 8 倍）で指定。 |
| 38/62/86/110 | TL | Total level | 0-127 | 0 が最大。 |
| 39/63/87/111 | SSG-EG | SSG-EG | 0-15 | **表 5-2 SSG-EG のエンベロープ波形**を参照。 |
| 42/66/90/114 | KSR | KS-Rate | 0-3 |  |
| 44/68/92/116 | AM | AM enable | 0-1 |  |
| 52/76/100/124 | MUL | Multiple | 0-15 |  |
| 53/77/101/125 | DT1 | Detune 1 | 0-15 |  |
| 54/78/102/126 | DT2 | Pseudo Detune | 0-127 | 効果音モード(AL=8)でのみ使用。**5.1 効果音モードに**  **おける疑似デチューン**を参照。 |
| 55/79/103/127 | DT3 | 0-127 |

## Table 5-2 SSG-EG envelope waveform

|  |  |  |
| --- | --- | --- |
| **SSG-EG value** | **Waveform** | **remarks** |
| **0-7** |  | No hardware envelope |
| **8** |  | periodic waveform |
| **9** |  |  |
| **Ten** |  | periodic waveform |
| **11** |  |  |
| **12** |  | periodic waveform |
| **13** |  |  |
| **14** |  | periodic waveform |
| **15** |  |  |

**Table 5-3 OPN algorithm list**

|  |  |  |  |
| --- | --- | --- | --- |
| **AL value** | **algorithm shape** | **AL value** | **algorithm shape** |
| **0** | Serial 4 consecutive mode | Four | 2 serial / 2 parallel modes |
| **1** | Double modulation serial triple mode | Five | Common modulation 3 parallel mode |
| **2** | Double modulation mode 1 | 6 | 2 serial serial + 2 sign modes |
| **3** | Double modulation mode 2 | 7 | 4 parallel sign synthesis mode |
| **8** | Sound effect mode\* | \* If you select this algorithm , you can automatically use the physical sound effect mode even if you have not specified a physical channel . \_ channel will be assigned . \_ | |

5.1. Pseudo detune in sound effect mode

In sound effect mode (Algorithm 8 ), you can use a combination of DT2/DT3 parameters to offset the pitch of each operator. Detune units are 100/64 cents ( same as RPN#00/01 Fine Tune ) .

DT2/DT3 are each 7 bits , and are signed 14-bit integers from -8192 to 8191 as shown below .

Currently, pseudo detune values are not included in preset voice data. It is recommended to use CC#89-90 while setting the detune value. ( Although settings can be made in the GUI , they will not be saved because there is no corresponding field in the bank file.)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pseudo detune value (-8192 to 8191)** | | | | | | | | | | | | | | | |
| 15 | 14 | 13 | 12 | 11 | Ten | 9 | 8 | 7 | 6 | Five | Four | 3 | 2 | 1 | 0 |
| - | | DT3 | | | | | | | DT2 | | | | | | |

## Figure 5-1 Pseudo detune value in sound effect mode ( per operator )

1. OPL Parameters of the system chip

OPL type chip ( YM3526/YM3812/Y8950 ) is selected in CC#32 . Also, 2OP of OPL3

Also applies to modes.

Parameters without special notes represent the register values of the sound source chip as is . **table 6-1 \_ \_ OPL \_ List of parameters used in the system chip**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **アドレス** | **パラメータ** | **GUI 表記** | **範囲** | **備考** |
| **on** | 20 | FB | Feedback | 0-7 |  |
| 21 | AL | Algorithm | 0-1 | **表 6-2 OPL のアルゴリズム一覧**を参照。 |
| **OP1(M1) OP2(C1)** | 32/56 | AR | Attack rate | 0-127 | 0####000 のように、7bit 左詰（0-15 の 8 倍）で指定。 |
| 33/57 | DR | Decay rate | 0-127 | 0####000 のように、7bit 左詰（0-15 の 8 倍）で指定。 |
| 34/58 | SL | Sustain level | 0-127 | 0####000 のように、7bit 左詰（0-15 の 8 倍）で指定。 |
| 35/59 | SR | Sustain rate | 0-127 | 0####000 のように、7bit 左詰（0-15 の 8 倍）で指定 |
| 36/60 | RR | Release rate | 0-127 | 0####000 のように、7bit 左詰（0-15 の 8 倍）で指定。 |
| 38/62 | TL | Total level | 0-63 | 0 が最大。 |
| 41/65 | KSL | KS-Level | 0-3 |  |
| 42/66 | KSR | KS-Rate | 0-3 |  |
| 43/67 | WS | Wave select | 0-7 | OPL/Y8950 では無効。**表 6-3 OPL 系の波形選択**を参照。 |
| 44/68 | AM | AM enable | 0-1 |  |
| 45/69 | VIB | VIB enable | 0-1 |  |
| 52/76 | ML | Multiple | 0-15 |  |
| 53/77 | DT1 | Pseudo Detune | 0-127 | 100/64 セント単位。MSB/LSB あわせて 14bit とし、符号拡張して-8192～8191 として解釈する。 |
| 54/78 | DT2 | 0-127 |

## Table 6-2 OPL algorithm list

|  |  |  |  |
| --- | --- | --- | --- |
| **AL value** | **algorithm shape** | **AL value** | **algorithm shape** |
| **0** | Serial dual mode | 1 | 2 parallel mode |

**Table 6-3 OPL waveform selection**

|  |  |  |  |
| --- | --- | --- | --- |
| **WS value** | **Waveform** | **WS value** | **Waveform** |
| **0** |  | Four |  |
| **1** |  | Five |  |
| **2** |  | 6 |  |
| **3** |  | 7 |  |

1. OPL3 Parameters of the system chip

OPL3 ( YMF262 ) is selected in CC#32 . In addition to the 4OP native mode, which is an extended feature of OPL3 , you can also use the dual voice mode, which uses two 2OP tones combined .

Parameters without special notes represent the register values of the sound source chip as is . **table 7-1 \_ \_ O P L 3 List of parameters used in the system chip**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **アドレス** | **パラメータ** | **GUI 表記** | **範囲** | **備考** |
| **Common** | 20 | FB | Feedback | 0-63 | 4OP モードでは 0-7。**7.1 デュアルボイスモードの FB** を参照。 |
| 21 | AL | Algorithm | 0-11 | **表 7-2 OPL3 のアルゴリズム一覧**を参照。 |
| **OP1(M1) OP2(C1) OP3(M2) OP4(C2)** | 32/56/80/104 | AR | Attack rate | 0-127 | 0####000 のように、7bit 左詰（0-15 の 8 倍）で指定。 |
| 33/57/81/105 | DR | Decay rate | 0-127 | 0####000 のように、7bit 左詰（0-15 の 8 倍）で指定。 |
| 34/58/82/106 | SL | Sustain level | 0-127 | 0####000 のように、7bit 左詰（0-15 の 8 倍）で指定。 |
| 35/59/83/107 | SR | Sustain rate | 0-127 | 0####000 のように、7bit 左詰（0-15 の 8 倍）で指定 |
| 36/60/84/108 | RR | Release rate | 0-127 | 0####000 のように、7bit 左詰（0-15 の 8 倍）で指定。 |
| 38/62/86/110 | TL | Total level | 0-63 | 0 が最大。 |
| 41/65/89/113 | KSL | KS-Level | 0-3 |  |
| 42/66/90/114 | KSR | KS-Rate | 0-3 |  |
| 43/67/91/115 | WS | Wave select | 0-7 | **表 6-3 OPL 系の波形選択**を参照。 |
| 44/68/92/116 | AM | AM enable | 0-1 |  |
| 45/69/93/117 | VIB | VIB enable | 0-1 |  |
| 52/76/100/124 | ML | Multiple | 0-15 |  |
| 53/77/101/125 | DT1 | Pseudo Detune | 0-127 | 100/64 セント単位。MSB/LSB あわせて 14bit とし、符号拡張して-8192～8191 として解釈する。 |
| 54/78/102/126 | DT2 | 0-127 |

* 1. .FB in dual voice mode

Dual Voice mode is a mode in which two OPL tones are used together. In this mode, sub ch1 ( OP1/OP2 ) and

Each channel 2 ( OP3/OP4 ) constitutes an OPL tone. FB is multiplexed using the following formula.

FB = subℎ2 × 8 + subℎ1

* 1. .Pseudo detune in dual voice mode

dual voice mode (algorithms 8 to 11 ), you can use a combination of DT1/DT2 parameters to offset the pitch of each sub channel . Detune units are 100/64 cents ( same as RPN#00/01 Fine Tune ) .

DT1/DT2 are each 7 bits , and are signed 14-bit integers from -8192 to 8191 as shown below .

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pseudo detune value (-8192 to 8191)** | | | | | | | | | | | | | | | |
| 15 | 14 | 13 | 12 | 11 | Ten | 9 | 8 | 7 | 6 | Five | Four | 3 | 2 | 1 | 0 |
| - | | DT1 of OP1(OP3) | | | | | | | DT2 of OP1(OP3) | | | | | | |

## Figure 7-1 Pseudo detune value in dual 2op mode ( for each sub channel )

**Table 7-2 OPL3 algorithm list**

|  |  |  |  |
| --- | --- | --- | --- |
| **AL value** | **algorithm shape** | **AL value** | **algorithm shape** |
| **0** | Serial dual mode (sub ch.1 ) | 6 | 3 serial serial + feedback mode |
| **1** | 2 Parallel mode (sub ch.1 ) | 7 | 2 serial + 2 parallel modes  ( OPL3 native) |
| **2** | Serial dual mode (sub ch.2 ) | 8 | 2 serial / 2 parallel modes  (dual voice) |
| **3** | 2 Parallel mode (sub ch.2 ) | 9 | 2 serial + 2 parallel modes 1  (dual voice) |
| **Four** | serial 4 consecutive mode ( OPL3 native) | Ten | 2 serial + 2 parallel modes 2  (dual voice) |
| **Five** | 2 serial / 2 parallel modes  ( OPL3 native) | 11 | 4 parallel synthesis mode  (dual voice) |

1. OPLL Parameters of the system chip

C C # 3 2 De O P LL Series chips ( Y M 2413 /Y M 24 2 0 /Y M F2 8 1 / M S1 8 23 etc. ) is selected . This is the tone data layout . Parameters without special notes represent the register values of the sound source chip as is .

## Table 8-1 List of parameters used with OPLL chips

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **parameters** | **GUI notation** | **range** | **remarks** |
| **on** | 20 | FB | Feedback | 0-7 |  |
| twenty one | AL | Algorithm | 0-79 | See **8.1 OPLL-based built-in ROM tones .** |
| **OP1(M1) OP2(C1)** | 32/56 | AR | Attack rate | 0-127 | Specify in 7bit left justified (8 times 0-15) like 0####000. |
| 33/57 | DR | Decay rate | 0-127 | Specify in 7bit left justified (8 times 0-15) like 0####000. |
| 34/58 | SL | Sustain level | 0-127 | Specify in 7bit left justified (8 times 0-15) like 0####000. |
| 35/59 | S.R. | Sustain rate | 0-127 | Specify as 7bit left justified (8 times 0-15) like 0####000 |
| 36/60 | RR | Release rate | 0-127 | Specify in 7bit left justified (8 times 0-15) like 0####000. |
| 38/62 | T.L. | Total level | 0-63 | 0 is the maximum. |
| 41/65 | KSL | KS-Level | 0-3 |  |
| 42/66 | KSR | KS-Rate | 0-3 |  |
| 43/67 | W.S. | Wave select | 0-1 | See **Table 8-2 OPLL system waveform selection .** |
| 44/68 | A.M. | AM enable | 0-1 |  |
| 45/69 | VIB | VIB enable | 0-1 |  |
| 52/76 | M.L. | Multiple | 0-15 |  |

**Table 8-2 OPLL system waveform selection**

|  |  |  |  |
| --- | --- | --- | --- |
| **WS value** | **Waveform** | **WS value** | **Waveform** |
| **0** |  | 1 |  |

* 1. OPLL- based built-in ROM tone

In the OPLL series, the built-in ROM tone is AL You can select by value.

AL=65 to 79 corresponds to internal ROM tones 1 to 15 . If you select a ROM tone, all parameters other than the software LFO will be ignored.

## Table 8-3 List of built-in OPLL tones

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **AL value** | **ROM**  **No.** | **OPLL/OPLL2** | **OPLLP** | **OPLLX** |
| **0** | 0 | user tone | | |
| **65** | 1 | violin | electric strings | strings |
| **66** | 2 | guitar | Bow Wow | guitar |
| **67** | 3 | piano | Electric guitar ( same sound as OPLL No.3 ) | Electric guitar ( same sound as OPLL No.15 ) |
| **68** | Four | flute | Organ ( separate from OPLL No.8 ) | flute |
| **69** | Five | clarinet | clarinet | clarinet |
| **70** | 6 | oboe | saxophone | marimba |
| **71** | 7 | trumpet | trumpet | trumpet |
| **72** | 8 | organ | street organ | harmonica |
| **73** | 9 | horn | Synth brass (OPLL No.10) | tuba |
| **74** | Ten | synthesizer | Electric piano ( Rose style ) | Synth brass ( separate from OPLL No.10 ) |
| **75** | 11 | harpsichord | base | Synth bass ( separate from OPLL No.13 ) |
| **76** | 12 | vibraphone | vibraphone | vibraphone |
| **77** | 13 | synth bass | chime | Electric guitar ( with feedback ) |
| **78** | 14 | wood base | Tamtam II | synth bass 2 |
| **79** | 15 | Electric guitar | noise | sitar |
| **Other than those above** | - | Setting prohibited | | |

1. P.S.G. Parameters of the system chip

P.S.G. Series chips ( A Y - 3 - 891x / A Y 89 3 0 /S N 7 6 4xx / S A A1 0 99 /SC C etc. ) share the same tone data layout as the same sound source group , but the functions and performance differ greatly depending on the chip . Therefore , the same parameters can be interpreted differently depending on the chip . \_ \_

## Table 9-1 List of parameters used in PSG chips

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **parameters** | **GUI notation** | **range** | **remarks** |
| **Common** | 20 | FB | Noise freq(H) | 0-7 | 9.2 Noise frequency |
| twenty one | AL | Tone/Noise | 0-15 | 9.1 tone/noise switching |
| 31 | NFREQ | Noise freq(L) | 0-31 | 9.2 Noise frequency |
| **OP1(M1)** | 32 | AR | Attack rate | 0-127 | * 1. software envelope   2. hardware envelope |
| 33 | DR | Decay rate | 0-127 |
| 34 | SL | Sustain level | 0-127 |
| 35 | S.R. | Sustain rate | 0-127 |
| 36 | RR | Release rate | 0-127 |
| 39 | SSG-EG | SSG-EG | 0-15 | 9.5 Hardware Envelope |
| 40 | EGS | EG-Bias | 0-127 | 9.4 Software Envelope |
| 43 | W.S. | Wave select | 0-63 | 9.6 Waveform selection |
| 51 | NOM MSB | Noise OR Mask | 0-15 | 9.3 AY8930 (EPSG) noise mask |
| 53 | NAM MSB | Noise AND Mask | 0-15 |
| 54 | NAM LSB | 0-15 |
| 55 | NOM LSB | Noise OR Mask | 0-15 |

* 1. .Tone /noise switching

Switches noise output ON/OFF . For SN systems, if you specify a tone with noise ON , a noise channel will be assigned . **table 9-2 \_ \_ A Y of the system ( S S G/P S G / E P S G/ S A A ) A L Value setting list**

|  |  |  |
| --- | --- | --- |
| **AL value** | **output** | **remarks** |
| **0** | tone output |  |
| **1** | noise output |  |
| **2** | Tone + noise output |  |
| **3** | No output |  |

## table 9-3 \_ \_ S N system ( DC S G ) \_ \_ A L Value setting list

|  |  |  |
| --- | --- | --- |
| **AL value** | **output** | **remarks** |
| **0** | tone output |  |
| **1** | noise output | one note per chip . Latecomer priority. |

* 1. .Noise frequency

|  |  |  |  |
| --- | --- | --- | --- |
| **Target sound source chip** | **Parameters used** | **range** | **remarks** |
| **PSG(AY-3-891x)** | Noise freq(L) | 0-31 |  |
| **EPSG(AY8930)** | Noise freq(L) | 0-31 | The actual setting value (0-255) is determined by the following calculation formula.  (Noise freq(H)) × 32 + (Noise freq(L)) |
| Noise freq(H) | 0-7 |
| **DCSG(SN764xx)** | Noise freq(L) | 0-3 | 0: Master clock /512  1: Master clock /1024  2: Master clock /2048  3:Ch.C frequency |
| FB | 0-1 | 0:Periodic Noise 1:White Noise |
| **SAA1099** | Noise freq(L) |  |  |

9.3.AY8930 (EPSG) noise mask

AY8930 (EPSG) , you can change the characteristics of the noise generator output by applying an AND mask or OR mask to the noise generator output.

The noise mask parameter is 8 bits (0-255) , but in order to specify it with a MIDI message , it is divided into 4 bits each. The actual setting value is generated using the following calculation formula.

= (Noise OR Mask MSB) × 16 + (Noise OR Mask LSB)



= (Noise AND Mask MSB) × 16 + (Noise AND Mask LSB)



0-255 as the combined value in the Voice Editor screen and in the .bnk file can be set directly.

9.4.Software envelope

The SSG envelope internally forms a 7-bit envelope curve using 10ms cycle control. Each rate of the envelope is treated as an increment/decrement every 10ms .

AR : Increment every 10ms . When the cumulative level exceeds 127 , the game enters the decay phase.

DR : Decrement every 20ms . When the cumulative level falls below SL , it moves to the sustain phase.

SR : Decrement every 80ms . When a note-off is received, it moves to the release phase.

RR : Decrement every 40ms . Even if a note-on is received during this period, the attack phase will start from the level specified by EGS .

EGS : Initial value of attack phase. Get up from this level. Attenuates to zero when released.

SL : Threshold for transition from decay phase to sustain phase. 127 is the maximum.

127

DR

AR

EGS

SL

SR

RR

|  |  |  |  |
| --- | --- | --- | --- |
| 0 attack | decay | sustain phase | release |
| phase | phase |  | phase |

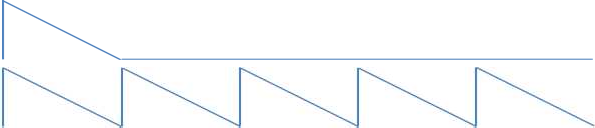
## Figure 9-1 SSG software envelope

* 1. .Hardware envelope

## Table 9-4 Envelope waveform of OPN system /SSG system (SSG/PSG/EPSG)

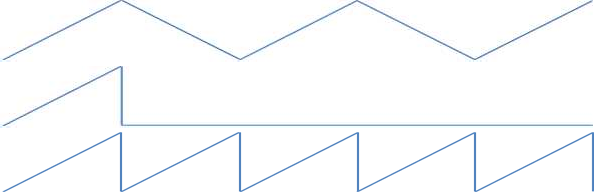
|  |  |  |
| --- | --- | --- |
| **SSG-EG value** | **Waveform** | **remarks** |
| **0-7** |  | No hardware envelope |
| **8** |  | periodic waveform |
| **9** |  |  |
| **Ten** |  | periodic waveform |
| **11** |  |  |
| **12** |  | periodic waveform |
| **13** |  |  |
| **14** |  | periodic waveform |
| **15** |  |  |

**Table 9-5 Envelope waveform of SAA1099**



|  |  |  |
| --- | --- | --- |
| **SSG-EG value** | **Waveform** | **remarks** |
| **0** |  | Silence |
| **1** |  | Maximum volume ( no envelope ) 7/8 |
| **2** |  |  |
| **3** |  |  |
| **Four** |  |  |
| **Five** |  |  |
| **6** |  |  |
| **7** |  |  |
| **8-15** | Same as 0-7 | The right channel outputs an inverted waveform. |
| **16-127** |  | Maximum volume (EG disabled ) |

* + 1. A.Y. hardware envelope period of the system



The envelope period of the AY system (PSG/SSG/EPSG) is used by combining the values of DR , SR , SL , and RR as shown below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Envelope period (0 to 65535)** | | | | | | | | | | | | | | | |
| 15 | 14 | 13 | 12 | 11 | Ten | 9 | 8 | 7 | 6 | Five | Four | 3 | 2 | 1 | 0 |
| Lower DR 4bit | | | | SR lower 4bit | | | | Lower SL 4bit | | | | Lower part of RR 4bit | | | |

## Figure 9-2 Envelope period of SSG system

* 1. .Waveform selection

Up Saw 11 Duty93.750

Sinewave 12 Duty96.875

Duty03.125 13 Harpsichord

## Table 9-6 EPSG waveform selection

3.125:96.875

6.25:93.75

12.5:87.5

25:75

50:50

75:25

87.5:12.5

93.75:12.5

96.875:3.125

|  |  |  |
| --- | --- | --- |
| **WS value** | **Waveform** | **duty ratio** |
| **0** |  |  |
| **1** |  |  |
| **2** |  |  |
| **3** |  |  |
| **Four** |  |  |
| **Five** |  |  |
| **6** |  |  |
| **7** |  |  |
| **8** |  |  |

## Table 9-7 SAA waveform selection

**形 説明**

形波 ハードウェアエンベロープを使用しない

形波 ハードウェアエンベロープを音量に使用

SG-EG で指定した波形 ハードウェアエンベロープ波形を出力波形とし

**(プリセット)**

**名称 波形 WS 値 名称 波形**

|  |  |  |
| --- | --- | --- |
| **WS value** | **wave** |  |
| **0** | rectangle |  |
| **1** | rectangle |  |
| **2** | S | use |

## Table 9-8 SCC waveform selection

Square 8 Duty25.000

Triangular 9 Duty75.000

Down Saw 10 Duty87.500

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **WS value** |  |  |  |  |  |
| **0** |  |  |  |  |  |
| **1** |  |  |  |  |  |
| **2** |  |  |  |  |  |
| **3** |  |  |  |  |  |
| **Four** |  |  |  |  |  |
| **Five** |  |  |  |  |  |
| **6** | Duty06.250 |  | 14 | Pianoforte |  |
| **7** | Duty12.500 |  | 15 | Organ |  |