

Charts and Tables for
SID-WIZARD

(1.2)

WAVEFORM-ARPEGGIO-DETUNE TABLE

(DOCUMENT VERSION 1.0)

WF-COLUMN

- \$00..\$0F** Repeat only arpeggio/detune-columns for 1..16 frames (no Waveform-change).
- \$10..\$FD** Simple WAVEFORM/CONTROL register value setting.
- \$FE** Jump to a table-position (position in 2nd (ARP) column, if $\geq \$40$, it jumps to itself).
- \$FF** End of the table, table execution ends here. This value can't be typed, it's show as END at end of table.

WAVEFORM / CONTROL FIRST NIBBLE

The first nibble of this value sets the waveform (or combination of waveforms). To combine waveforms, you add the value for one waveform to the other, so to combine Sawtooth and Pulse, the value would be $\$2 + \$4 = \$6$. Remember that that noise waveform can't be combined with other waveforms. The values for the waveforms are:

- \$1** TRIANGLE
- \$2** SAWTOOTH
- \$4** PULSE
- For the pulse waveform to be audible you need to insert at least one row in the PULSE table to set the pulse width.
- \$8** NOISE

WAVEFORM / CONTROL SECOND NIBBLE

The second nibble (control register) sets different options for the waveform. These values can again be combined by adding the ones you want together, so to put gate on (like you would normally do) and enable ring modulation, the result would be $\$1 + \$4 = \$5$.

- \$1** GATE ON
- The gate need to be on for the waveform to be heard.
- \$2** SYNC

To produce "Hard Sync" effects, explained in the introduction.

\$4

RING MODULATION

This is explained in the introduction.

\$8

TEST

This resets and lock the oscillator at zero until this value is cleared.

ARP-COLUMN

- \$00** Zero pitch-shifting (prime, '0' interval) - regain original note-pitch
- \$01..\$5F** Relative pitch-shift upwards in halftones (positive interval)
- \$7F** Jump to default or pattern-FX set Chord.
- Depending on the chord, the execution of the waveform table may continue after the chord. With this command you can also override the default chord speed by setting the speed value in the (WF) column (values can be $\$00..\$0F$). If you do this, you should leave the default chord speed setting to $\$00$.
- \$80** No process (useful when don't want to touch pitch and detune, just waveform).
- \$81..\$DF** Set absolute pitch (frequencies are identical to C-1..A-8 notes, see table in the end of this manual).
- \$E0..\$FF** Relative pitch-shift downwards in negative direction (negative interval).

DT-COLUMN (DETUNE)

- \$00..\$FE** Set fine-detuning amount. The higher the value the sharper the pitch will be.
- \$FF** No process in detune-table (the previously set detune-value is retained).

PULSE WIDTH AND FILTER TABLES

PULSE WIDTH TABLE

\$8x..\$Fx xx set pulse-waveform's pulse width hi-nibble and low-byte. A value of \$000 or \$FFF will produce a constant DC output (silent), a value of \$800 will produce a square wave. The value of the first nibble doesn't affect the pulse width, but it has to be \$8..\$F.

\$00..\$7F xx Adds / subtracts signed xx (0...\$7F / \$80...\$ff) to the pulse width 0-127 (\$00-7F) times, in other words, this will animate the pulse width. Use '=' key to negate a positive value or see the conversion table in the end of this manual for signed decimal values (-128 - 127).

\$FE Jump to a position in the table (position in 2nd column, can jump to itself)

\$FF End of the table, table execution ends here. This value can't be typed, it's show as END at end of table.

FILTER TABLE

\$8r..\$Fr xx The first nibble sets the filter band, the possible values are \$8 => filter deactivated, \$9 => low-pass, \$B => low-pass + band pass, \$C => high-pass, \$D => low-pass + high pass, \$E => band-pass + high-pass, \$F => all modes together.

The second nibble (r) sets the resonance, this can be any value from \$0 to \$F, \$F giving the strongest resonance of course. If band is set to \$F (all modes together) then r can't be set to \$F (this is due to the reserved end of table value \$FF).

The third and fourth nibbles (xx) sets the cutoff frequency. Valid values are \$00 - \$FF. The approximate cutoff frequency ranges between 30Hz and 10KHz.

\$00..\$7F xx Adds / subtracts signed xx (0...\$7F / \$80...\$ff) to the cutoff frequency 0-127 (\$00-7F) times, in other words, this will generate a filter sweep. Use '=' key to negate a positive value or see the conversion table in the end of this manual for signed decimal values (-128 - 127).

\$FE Jump to a position in the table (position in 2nd column, can jump to itself)

\$FF End of the table, table execution ends here. This value can't be typed, it's show as END at end of table.

PATTERN EDITOR

NOTE-COLUMN EFFECTS

| | |
|----------------------------|---|
| Note | 2 3 5 6 7 9 0 Q W E R T Y U I O P (Upper octave) |
| | S D G H J L Z X C V B N M , . (Lower octave) |
| Note OFF | RETURN |
| Ring Modulation ON | SHIFT + R |
| Ring Modulation OFF | C= + R (CTRL + R) |
| Auto-portamento | SHIFT + P |
| Sync ON | SHIFT + S |
| Sync OFF | C= + S (CTRL + S) |

INSTRUMENT-COLUMN EFFECTS

| | |
|-------------------|---|
| \$01..\$3E | Select an instrument for the actual note, which stays selected until another instrument is selected with this command. This also resets the tables which restart was switched off with C=+P (CTRL+P) or C=+F (CTRL+F). |
| \$3F | Tied note (true legato, the instrument doesn't restart just note-pitch changes) |
| \$40..\$4F | Waveform (reg.4) nibble adjusting - any subsequent WF-table waveform change overrides it. |
| \$50..\$5F | Sustain nibble adjusting of ADSR (Small-FX) |
| \$60..\$6F | Release (reg.6) nibble adjusting of ADSR (Small-FX) |
| \$70..\$7F | Select Chord (overriding the default) for the instrument. (No need to create an instrument for every chord. Instead, create an instrument, call chord-table with \$7F from ARP-table, then select the chord with this pattern-FX.) |

EFFECT-COLUMN SMALL EFFECTS

The Small effects' 1st nibble is their type of operation, the 2nd nibble is the corresponding effect-value / amount. Unless you are using the 'extra' player version, only one Small-FX ADSR setting is allowed per note.

| | |
|-------------------|--|
| \$20..\$2F | Attack nibble adjusting of ADSR (Small-FX) |
| \$30..\$3F | Decay nibble adjusting of ADSR (Small-FX) |
| \$40..\$4F | Waveform (reg.4) nibble adjusting - any subsequent WF-table waveform change overrides it. |
| \$50..\$5F | Sustain nibble adjusting of ADSR (Small-FX) |
| \$60..\$6F | Release (SID reg.6) nibble adjusting of ADSR (Small-FX) |
| \$70..\$7F | Select Chord (overriding the default) for the instrument. (No need to create an instrument for every chord. Instead, create an instrument, call a chord with \$7f from ARP-table, then select chord.) |
| \$80..\$8F | Vibrato Amplitude adjustment - The frequency stays intact. |
| \$90..\$9F | Vibrato Frequency adjustment - Amplitude stays intact. |
| \$A0..\$AF | Adjust Main volume (low nibble of \$d418) |
| \$B0..\$BF | Filter Band (LOW/MID/HI/3OFF) (Filter band can be overwritten with filter-table execution) |
| \$C0..\$CF | Chord-speed adjustment (arpeggio-speed in case of explicit arpeggio) |
| \$D0..\$DF | Detune actual note with given amount |
| \$E0..\$EF | Enable/disable Test-bit/Ring-bit/Sync-bit/Gate-bit (Waveform-table can override) |
| \$F0..\$FF | Filter Resonance (strength) nibble setting (Subsequent filter-table command can override it.) |

PATTERN EDITOR (CONTINUED)

EFFECT-COLUMN BIG EFFECTS

The Big effects has their effect-type in effect-column and their 1 byte (\$0..\$FF or -\$7f..+\$80) value is in the last column of a pattern. (\$4...\$7 effects are identical to Small effect-types of the same range to aid human memorization.)

- \$01** **Pitch Slide UP** (same FX-number as Goattracker's)
- \$02** **Pitch Slide DOWN** (same FX-number as Goattracker's)
- \$03** **Tone-portamento** (with given speed) (same FX-number as Goattracker's)
- \$04** **Waveform-Control** (\$d404, etc.) register setting (or above \$f0: goes to WF-ARP table-position)
- \$05** **ATTACK/DECAY** (SID-register 5) byte adjustment
- \$06** **SUSTAIN/RELEASE** (SID-register 6) byte adjustment
- \$07** Select **Chord** (overriding the default) for the instrument.
- \$08** **Vibrato amplitude and frequency** adjustment (overrides instrument's default vibrato)
- \$09** Select **vibrato-type** (possible values: \$00, \$10, \$20, \$30)
- \$0A** Adjust **Pulse width program table-index** for current instrument (go to table-position)
- \$0B** Branch to **Filter-program table-index** for the actual instrument
- \$0C** **Chord-speed** adjustment (arpeggio-speed in case of explicit arpeggio)
- \$0D** **Detune** actual note with given amount
- \$0E** **Simple pulse width** setting for pulse-waveform (instr.PW-table changes can override it)
- \$0F** **Filter-cutoff frequency** hi-byte shift (added to filter frequency). Now notes don't reset it!

- \$10** Set **Main** (subtune's basic) **single-tempo**
- \$11** Set **Main** (subtune's) **funktempo**. 1st (even rows) and 2nd (odd rows) tempo, in left/right nibbles.
- \$12** Set **Main tempo-program** for whole subtune (any speeds can be given for each rows)
- \$13** Set **track's** individual **single-tempo**
- \$14** Set the **track's funktempo** (even and odd rows' in left/right nibbles)
- \$15** Set the **track's** individual **tempo-program**
- \$16..\$1C** Kept for later expansions....
- \$1D** **Delay track** by \$00..\$ff (20ms) frames
- \$1E** **Delay** only the actual **note** by \$00..\$ff frames.
- \$1F** *Extra: 'Filt external source' bit on/off in SID ('off' by default, 'on' can reduce noise)

GENERAL PURPOSE AND GLOBALLY USABLE KEYS

| Keys on C64 | US int. Keys in VICE emulator | Category | Functions of the pressed keys |
|------------------------------------|------------------------------------|-------------------|--|
| F5 | F5 | Navigation | Go to Pattern-editor window. |
| Shift+F5 | F6 | Navigation | Go to Orderlist . |
| F7 | F7 | Navigation | Go to Instrument-editor panel. |
| C= + F5 | CTRL + F5 or F6 | Navigation | Go to Chord-table . |
| C= + F7 | CTRL+F7 | Navigation | Go to Tempoprogram-table . |
| Shift+F7 | F8 | Navigation | Go to Main Menu . |
| CURSOR-down/right and Shift | Cursor up/down/left/right | Navigation | Move cursor step-by-step up/down/left/right where possible. |
| CONTROL or Shift+CONTROL | TAB or Shift+TAB | Navigation | Cycle through tracks or instrument-tables. |
| / or Shift+/, UP-arrow* or RESTORE | / or Shift+ / , Page-Down*/Page-Up | Navigation | Move cursor in 4 or 8 steps up/down /left/right depending on window (pattern/orderlist/etc.) |
| HOME | Home | Navigation | Move cursor to start-position on screen, then absolute start-position in table/pattern. |
| RETURN | Enter | Navigation | Car return to beginning of row, or go to pattern(s) or instrument under cursor. |
| F1 or C= + F1 | F1 or CTRL+F1 | Playback | Play the tune from start / follow-play tune from start. |
| Shift+F1 or C= + Shift + F1 | F2 or CTRL+F2 | Playback | Play the tune from marker position(s) / follow-play tune from marker position(s). |
| F3 or C= + F3 | F3 or CTRL+F3 | Playback | Play the selected patterns / follow-play the selected patterns. |
| Shift + F3 or STOP | F4 or ESC | Playback | Toggle pause/continue the playback of tune/patterns. |
| Shift + SPACE | Shift + SPACE | Playback | Play the selected patterns from cursor-position . |
| Left-Arrow | ` (above TAB) | Playback | Fast-forward play (4x the speed of normal) |
| Shift + Left-Arrow C= + Left-Arrow | Shift + ` (above TAB) Control + ` | Playback, Setting | Toggle follow-play mode / normal playback . Set follow-play mode as default on/off. |
| Shift+ 1 / 2 / 3 | Shift + 1 / 2 / 3 | Play./Setting | Toggle Mute / Solo on channels 1..3 |
| Shift + A/Z | Shift + A/Z | Setting | Increase/Decrease auto-advance (stepping) amount after typing notes. |
| Shift + I | Shift + I | Setting | Toggle instrument auto-typing with notes. |
| Shift + D | Shift + D | Setting | Toggle monophonic+legato or polyphonic+dovetailing jamming mode. |
| Shift + F/G | Shift + F/G | Setting | Decrease/increase framespeed (1x singlespeed...8x multispeed). |
| Shift + H/J | Shift+H/J | Setting | Decrease/increase step-highlighting aid frequency in pattern-editor window. |
| C= + B | CTRL + B | Setting | Toggle pattern/ track-binding on/off . Patterns can be scrolled together/independently. |
| C= + T | CTRL + T | Setting | Toggle global normal tempo / funktempo mode for subtune. |
| Shift + colon/dot , Shift + ; or ; | Shift + colon/dot , Shift + ; or ' | Setting | Increase/decrease global normal tempo / 2nd funktempo for subtune. |
| C= + colon / dot | CTRL + colon / dot | Selection | Select subtune (Orderlist). Patterns are shared between subtunes. |
| C= + 1..8 | CTRL + 1..8 | Selection | Select octave 1..8 to edit or jam musical notes. (In 'DMC' mode no need for C=) |
| Shift+PLUS or Shift+MINUS | Shift+PLUS or Shift+MINUS | Selection | Select instrument for jamming / editing. |
| Shift + T/Y | Shift + T/Y | Selection | Select (decrease/increase number of) tempo-program . |
| Shift + K/L | Shift + K/L | Selection | Select (decrease/increase number of) Chord to edit. |
| SPACE | SPACE | Editing | Toggle Keyboard note-jamming or note-editing in pattern-editor window. |
| Shift + N | Shift + N | Editing | Rename selected instrument . Max. 8 characters, Esc/Stop aborts the renaming. |
| DEL/Pound or Shift+DEL | Delete/Backspace or Insert | Editing | Delete/insert in cursor position or increase/decrease pattern/table size in end-positions. |

*In Linux the VICE build seems to have up-arrow key associated to Page-Down, while the default would be 'Del'-key (which is good, because therefore in Linux the Page-Down (up-arrow) is in correct place, below Page-Up, which is associated to Restore C64 key.) In Linux the 'Del'-key works as Backspace which is better selection IMO.

*Note that in follow-play modes the pattern-editor keys are inactive to prevent accidental editing while playing the tune.

PATTERN EDITOR RELATED KEYS

| Keys on C64 | US int. Keys in VICE emulator | Category | Functions of pressed keys |
|---|---|------------|---|
| CONTROL or Shift+CONTROL | TAB or Shift+TAB | Navigation | Cycle through tracks forward/backward. |
| RETURN or Shift+RETURN | Enter or Shift+Enter | Navigation | Go to next row, place Note-on/off , or select instrument/chord under cursor. |
| Z X C V B N M , . (A...L in DMC mode) | Z X C V B N M , . (A...L in DMC mode) | Edit/Jam | Lower octave white piano-keys (C major diatonic whole-tones). Legato jamming possible. |
| Q,W,E,R,T,Y,U,I,O,P (not in DMC mode) | Q,W,E,R,T,Y,U,I,O,P (not in DMC mode) | Edit/Jam | Upper octave white piano-keys (C major diatonic scale whole-tones). |
| S,D, G,H,J, L , 2,3, 5,6,7, 9,0 (non-DMC) | S,D, G,H,J, L , 2,3, 5,6,7, 9,0 (non-DMC) | Edit/Jam | Lower and upper octave black piano keys (halftones). In DMC-mode it's in QWERTY row! |
| C= + 1...8 (1...8 in DMC-mode) | CTRL + 1...8 (1...8 in DMC-mode) | Edit/Jam | Select octave 1...8 where editing or jamming musical notes happens. |
| A, 1, C+=Del (Q in 'DMC' mode) | A, 1, Cotrol+Del (Q in 'DMC' mode) | Editing | Empty-note (Delete note in note-column pattern-position without moving the rest.) |
| 1...9, A...F hexa keys | 1...9, A...F hexa keys | Editing | In instrument/effect columns type value , in note-column set note or vibrato-amplitude . |
| DEL/Pound or Shift+DEL | Delete/Backspace or Insert | Editing | Delete/insert in cursor position or increase/decrease pattern-size in pattern-end position. |
| C= + DEL | CTRL + Delete/Backspace | Editing | Delete note or instrument+effect columns in actual pattern-row, depending on cursor-position. |
| C= + Shift + DEL | CTRL + Shift + Del./Backspace | Editing | Delete the entire pattern-row (note and instrument and effect) in the actual track. |
| Shift + Q/W | Shift + Q/W | Editing | Transpose notes up/down by half-notes in actual pattern after cursor-position. |
| C= + Q/W | CTRL + Q/W | Editing | Transpose notes up/down by octaves in actual pattern after cursor-position. |
| Shift + R or C= + R | Shift + R or CTRL + R | Editing | Place ring-modulation effect on/off into note column at actual cursor position. |
| Shift + P | Shift + P | Editing | Place auto-portamento effect into note column at actual cursor position. |
| Shift + S or C= + S | Shift + S or CTRL + S | Editing | Place sync-bit on/off effect into note column at actual cursor position. |
| Shift + V | Shift + V | Editing | Place vibrato -effect into note column at actual cursor position. Amplitude editable. |
| C= + X | CTRL + X | Editing | Cut/delete pattern content from cursor position to end of pattern and copy to pattern-buffer/clipboard. |
| C= + C | CTRL + C | Editing | Copy pattern content from cursor position to end of pattern to pattern-buffer/clipboard. |
| Shift + C | Shift + C | Editing | Limit the range of data copied (or cut) into buffer to cursor position. Define end of buffer. |
| C= + V | CTRL + V | Editing | Paste pattern-buffer content from cursor position till end of pattern. |

ORDERLIST RELATED KEYS

| Keys on C64 | US int. Keys in VICE emulator | Category | Functions of pressed keys |
|------------------------|-------------------------------|------------|---|
| RETURN or Shift+RETURN | Enter or Shift+Enter | Navigation | Selects the pattern(s) under the cursor position in Orderlist and jumps to actual track in Pattern-editor. |
| C= + RETURN | CTRL + Enter | Navigation | Selects the patterns that are currently played and jumps to actual track in the Pattern-editor. |
| Shift+SPACE | Shift + Space | Playback | Sets Orderlist playstart-marker (for F2-playing) to cursor-position for all tracks. Position number gets inverted. |
| C= + SPACE | CTRL + SPACE | Playback | Sets Orderlist playstart-markers to individual played position for all tracks. Position number of 1st track gets inverted. |
| 1...9, A...F hexa keys | 1...9, A...F hexa keys | Editing | To type hexa pattern-numbers and effect/jump numbers into Orderlist sequences of tracks. |
| DEL/Pound or Shift+DEL | Delete/Backspace or Insert | Editing | Delete/insert in cursor position or increase/decrease Orderlist sequence-size if cursor is in sequence-end/loop position. |
| C= + C | CTRL + C | Editing | Copy orderlist-sequence from cursor to buffer. |
| Shift + C | Shift + C | Editing | Set the end of copied data in buffer. (limit buffer) |
| C= + V | CTRL + V | Editing | Paste buffer to cursor-pos ., appends existing data |
| C= + E | CTRL + E | Editing | Type and the first Empty (unused) pattern number . Increased if pressed more times, works on endsignal. |

INSTRUMENT EDITOR RELATED KEYS

| Keys on C64 | US int. Keys in VICE emulator | Category | Functions of pressed keys |
|---------------------------------|-------------------------------|------------|--|
| CONTROL or Shift+CONTROL | TAB or Shift+TAB | Navigation | Cycle through main instrument-setting panel and instrument-tables. |
| RETURN or Shift+RETURN | Enter or Shift+Enter | Navigation | Car return' to beginning of next row in tables (or toggle/cycle some main instrument-parameters.) |
| + / - | + / - | Selection | Select instrument. The same in pattern/orderlist/instrument windows, while Shift is needed in Chord/Tempo tables. |
| RETURN | Enter | Selection | Toggle/cycle some of the instrument's main parameters like HR-type, Vibrato-type, octave-shift sign.. Or goes to default-chord if it's number is under the cursor. |
| 1...9, A...F hexa keys and F..Z | 1...9, A...F hexa keys | Editing | To type hexa values into instrument-data fields, or type the name of the instrument (some signals allowed too.) |
| = | = | Editing | Negate value (e.g. \$40 will be \$C0 = -\$40) |
| Shift + N | Shift + N | Editing | Rename selected instrument . Max. 8 characters, Esc/Stop aborts the renaming. |
| DEL/Pound or Shift+DEL | Delete/Backspace or Insert | Editing | Delete/insert in cursor position. Increases/decreases table-size. |
| Shift + Space | Shift+Space | Editing | Set/clear gate-off index to current table-row under the cursor |
| C= + C | CTRL + C | Editing | Copy the entire selected instrument to instrument-buffer. |
| C= + V | CTRL + V | Editing | Paste instrument -clipboard content to the selected instrument. The entire instrument will be overwritten. |
| C= + P or C= + F | CTRL + P / F | Editing | Toggle pulsewidth-/filter-table reset on note-start. (Selecting instrument resets it.) |

CHORD TABLE / TEMPO TABLE RELATED KEYS

| Keys on C64 | US int. Keys in VICE emulator | Category | Functions of pressed keys |
|---------------------------|-------------------------------|------------|---|
| CONTROL or Shift+CONTROL | TAB or Shift+TAB | Navigation | Go to pattern editor or go to instrument-editor. |
| RETURN or Shift+RETURN | Enter or Shift+Enter | Navigation | Car return' to beginning of next row in tables (or toggle/cycle some main instrument-parameters.) |
| + / - | + / - | Selection | Select chord / tempo-program. Shift+K/L or Shift+T/Y is needed in other windows. |
| Shift+PLUS or Shift+MINUS | Shift+PLUS or Shift+MINUS | Selection | Select instrument for jamming / editing. |
| 1...9, A...F hexa keys | 1...9, A...F hexa keys | Editing | To type hexa values and chord loop/return numbers into chordtable/tempoprogram-table. |
| = | = | Editing | Negate value (e.g. \$04 will be \$fb -4 2s' compl.) |
| DEL/Pound or Shift+DEL | Delete/Backspace or Insert | Editing | Delete/insert in cursor position. Increases/decreases table-size. |

DECIMAL TO HEXADECIMAL CONVERSION TABLE (Next Page) ...

DECIMAL TO HEXADECIMAL CONVERSION TABLE

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 (<http://www.witchmastercreations.com>)

| UNSIG. | SIG. | HEX |
|--------|------|-----|
| 0 | 0 | 00 |
| 1 | 1 | 01 |
| 2 | 2 | 02 |
| 3 | 3 | 03 |
| 4 | 4 | 04 |
| 5 | 5 | 05 |
| 6 | 6 | 06 |
| 7 | 7 | 07 |
| 8 | 8 | 08 |
| 9 | 9 | 09 |
| 10 | 10 | 0A |
| 11 | 11 | 0B |
| 12 | 12 | 0C |
| 13 | 13 | 0D |
| 14 | 14 | 0E |
| 15 | 15 | 0F |
| 16 | 16 | 10 |
| 17 | 17 | 11 |
| 18 | 18 | 12 |
| 19 | 19 | 13 |
| 20 | 20 | 14 |
| 21 | 21 | 15 |
| 22 | 22 | 16 |
| 23 | 23 | 17 |
| 24 | 24 | 18 |
| 25 | 25 | 19 |
| 26 | 26 | 1A |
| 27 | 27 | 1B |
| 28 | 28 | 1C |
| 29 | 29 | 1D |
| 30 | 30 | 1E |
| 31 | 31 | 1F |
| 32 | 32 | 20 |
| 33 | 33 | 21 |
| 34 | 34 | 22 |
| 35 | 35 | 23 |
| 36 | 36 | 24 |
| 37 | 37 | 25 |
| 38 | 38 | 26 |
| 39 | 39 | 27 |
| 40 | 40 | 28 |
| 41 | 41 | 29 |
| 42 | 42 | 2A |
| 43 | 43 | 2B |
| 44 | 44 | 2C |
| 45 | 45 | 2D |
| 46 | 46 | 2E |
| 47 | 47 | 2F |
| 48 | 48 | 30 |
| 49 | 49 | 31 |
| 50 | 50 | 32 |
| 51 | 51 | 33 |
| 52 | 52 | 34 |
| 53 | 53 | 35 |
| 54 | 54 | 36 |
| 55 | 55 | 37 |
| 56 | 56 | 38 |
| 57 | 57 | 39 |
| 58 | 58 | 3A |
| 59 | 59 | 3B |
| 60 | 60 | 3C |
| 61 | 61 | 3D |
| 62 | 62 | 3E |
| 63 | 63 | 3F |

| UNSIG. | SIG. | HEX |
|--------|------|-----|
| 64 | 64 | 40 |
| 65 | 65 | 41 |
| 66 | 66 | 42 |
| 67 | 67 | 43 |
| 68 | 68 | 44 |
| 69 | 69 | 45 |
| 70 | 70 | 46 |
| 71 | 71 | 47 |
| 72 | 72 | 48 |
| 73 | 73 | 49 |
| 74 | 74 | 4A |
| 75 | 75 | 4B |
| 76 | 76 | 4C |
| 77 | 77 | 4D |
| 78 | 78 | 4E |
| 79 | 79 | 4F |
| 80 | 80 | 50 |
| 81 | 81 | 51 |
| 82 | 82 | 52 |
| 83 | 83 | 53 |
| 84 | 84 | 54 |
| 85 | 85 | 55 |
| 86 | 86 | 56 |
| 87 | 87 | 57 |
| 88 | 88 | 58 |
| 89 | 89 | 59 |
| 90 | 90 | 5A |
| 91 | 91 | 5B |
| 92 | 92 | 5C |
| 93 | 93 | 5D |
| 94 | 94 | 5E |
| 95 | 95 | 5F |
| 96 | 96 | 60 |
| 97 | 97 | 61 |
| 98 | 98 | 62 |
| 99 | 99 | 63 |
| 100 | 100 | 64 |
| 101 | 101 | 65 |
| 102 | 102 | 66 |
| 103 | 103 | 67 |
| 104 | 104 | 68 |
| 105 | 105 | 69 |
| 106 | 106 | 6A |
| 107 | 107 | 6B |
| 108 | 108 | 6C |
| 109 | 109 | 6D |
| 110 | 110 | 6E |
| 111 | 111 | 6F |
| 112 | 112 | 70 |
| 113 | 113 | 71 |
| 114 | 114 | 72 |
| 115 | 115 | 73 |
| 116 | 116 | 74 |
| 117 | 117 | 75 |
| 118 | 118 | 76 |
| 119 | 119 | 77 |
| 120 | 120 | 78 |
| 121 | 121 | 79 |
| 122 | 122 | 7A |
| 123 | 123 | 7B |
| 124 | 124 | 7C |
| 125 | 125 | 7D |
| 126 | 126 | 7E |
| 127 | 127 | 7F |

| UNSIG. | SIG. | HEX |
|--------|------|-----|
| 128 | -128 | 80 |
| 129 | -127 | 81 |
| 130 | -126 | 82 |
| 131 | -125 | 83 |
| 132 | -124 | 84 |
| 133 | -123 | 85 |
| 134 | -122 | 86 |
| 135 | -121 | 87 |
| 136 | -120 | 88 |
| 137 | -119 | 89 |
| 138 | -118 | 8A |
| 139 | -117 | 8B |
| 140 | -116 | 8C |
| 141 | -115 | 8D |
| 142 | -114 | 8E |
| 143 | -113 | 8F |
| 144 | -112 | 90 |
| 145 | -111 | 91 |
| 146 | -110 | 92 |
| 147 | -109 | 93 |
| 148 | -108 | 94 |
| 149 | -107 | 95 |
| 150 | -106 | 96 |
| 151 | -105 | 97 |
| 152 | -104 | 98 |
| 153 | -103 | 99 |
| 154 | -102 | 9A |
| 155 | -101 | 9B |
| 156 | -100 | 9C |
| 157 | -99 | 9D |
| 158 | -98 | 9E |
| 159 | -97 | 9F |
| 160 | -96 | A0 |
| 161 | -95 | A1 |
| 162 | -94 | A2 |
| 163 | -93 | A3 |
| 164 | -92 | A4 |
| 165 | -91 | A5 |
| 166 | -90 | A6 |
| 167 | -89 | A7 |
| 168 | -88 | A8 |
| 169 | -87 | A9 |
| 170 | -86 | AA |
| 171 | -85 | AB |
| 172 | -84 | AC |
| 173 | -83 | AD |
| 174 | -82 | AE |
| 175 | -81 | AF |
| 176 | -80 | B0 |
| 177 | -79 | B1 |
| 178 | -78 | B2 |
| 179 | -77 | B3 |
| 180 | -76 | B4 |
| 181 | -75 | B5 |
| 182 | -74 | B6 |
| 183 | -73 | B7 |
| 184 | -72 | B8 |
| 185 | -71 | B9 |
| 186 | -70 | BA |
| 187 | -69 | BB |
| 188 | -68 | BC |
| 189 | -67 | BD |
| 190 | -66 | BE |
| 191 | -65 | BF |

| UNSIG. | SIG. | HEX |
|--------|------|-----|
| 192 | -64 | C0 |
| 193 | -63 | C1 |
| 194 | -62 | C2 |
| 195 | -61 | C3 |
| 196 | -60 | C4 |
| 197 | -59 | C5 |
| 198 | -58 | C6 |
| 199 | -57 | C7 |
| 200 | -56 | C8 |
| 201 | -55 | C9 |
| 202 | -54 | CA |
| 203 | -53 | CB |
| 204 | -52 | CC |
| 205 | -51 | CD |
| 206 | -50 | CE |
| 207 | -49 | CF |
| 208 | -48 | D0 |
| 209 | -47 | D1 |
| 210 | -46 | D2 |
| 211 | -45 | D3 |
| 212 | -44 | D4 |
| 213 | -43 | D5 |
| 214 | -42 | D6 |
| 215 | -41 | D7 |
| 216 | -40 | D8 |
| 217 | -39 | D9 |
| 218 | -38 | DA |
| 219 | -37 | DB |
| 220 | -36 | DC |
| 221 | -35 | DD |
| 222 | -34 | DE |
| 223 | -33 | DF |
| 224 | -32 | E0 |
| 225 | -31 | E1 |
| 226 | -30 | E2 |
| 227 | -29 | E3 |
| 228 | -28 | E4 |
| 229 | -27 | E5 |
| 230 | -26 | E6 |
| 231 | -25 | E7 |
| 232 | -24 | E8 |
| 233 | -23 | E9 |
| 234 | -22 | EA |
| 235 | -21 | EB |
| 236 | -20 | EC |
| 237 | -19 | ED |
| 238 | -18 | EE |
| 239 | -17 | EF |
| 240 | -16 | F0 |
| 241 | -15 | F1 |
| 242 | -14 | F2 |
| 243 | -13 | F3 |
| 244 | -12 | F4 |
| 245 | -11 | F5 |
| 246 | -10 | F6 |
| 247 | -9 | F7 |
| 248 | -8 | F8 |
| 249 | -7 | F9 |
| 250 | -6 | FA |
| 251 | -5 | FB |
| 252 | -4 | FC |
| 253 | -3 | FD |
| 254 | -2 | FE |
| 255 | -1 | FF |

EXACT NOTES FOR ARP-COLUMN

| Value | Note | Value | Note | Value | Note | Value | Note |
|-------|------------|-------|------------|-------|------------|-------|------------|
| 81 | C-1 | 99 | C-3 | B1 | C-5 | C9 | C-7 |
| 82 | C# | 9A | C# | B2 | C# | CA | C# |
| 83 | D | 9B | D | B3 | D | CB | D |
| 84 | Eb | 9C | Eb | B4 | Eb | CC | Eb |
| 85 | E | 9D | E | B5 | E | CD | E |
| 86 | F | 9E | F | B6 | F | CE | F |
| 87 | F# | 9F | F# | B7 | F# | CF | F# |
| 88 | G | A0 | G | B8 | G | D0 | G |
| 89 | G# | A1 | G# | B9 | G# | D1 | G# |
| 8A | A | A2 | A | BA | A | D2 | A |
| 8B | Bb | A3 | Bb | BB | Bb | D3 | Bb |
| 8C | B | A4 | B | BC | B | D4 | B |
| 8D | C-2 | A5 | C-4 | BD | C-6 | D5 | C-8 |
| 8E | C# | A6 | C# | BE | C# | D6 | C# |
| 8F | D | A7 | D | BF | D | D7 | D |
| 90 | Eb | A8 | Eb | C0 | Eb | D8 | Eb |
| 91 | E | A9 | E | C1 | E | D9 | E |
| 92 | F | AA | F | C2 | F | DA | F |
| 93 | F# | AB | F# | C3 | F# | DB | F# |
| 94 | G | AC | G | C4 | G | DC | G |
| 95 | G# | AD | G# | C5 | G# | DD | G# |
| 96 | A | AE | A | C6 | A | DE | A |
| 97 | Bb | AF | Bb | C7 | Bb | DF | Bb |
| 98 | B | B0 | B | C8 | B | | |

ATTACK / DECAY / RELEASE TIMINGS

| HEX | Attack Rate | Decay / Release Rate |
|-----|-------------|----------------------|
| 0 | 2 ms | 6 ms |
| 1 | 8 ms | 24 ms |
| 2 | 16 ms | 48 ms |
| 3 | 24 ms | 72 ms |
| 4 | 38 ms | 114 ms |
| 5 | 56 ms | 168 ms |
| 6 | 68 ms | 204 ms |
| 7 | 80 ms | 240 ms |
| 8 | 100 ms | 300 ms |
| 9 | 250 ms | 750 ms |
| A | 500 ms | 1.5 s |
| B | 800 ms | 2.4 s |
| C | 1 s | 3 s |
| D | 3 s | 9 s |
| E | 5 s | 15 s |
| F | 8 s | 24 s |