Four sound channels

EVERYTHING from NR10-NR51 set to ZERO when sound is powered off

When powered on next frame sequencer WILL BE ZERO

All: length counter, panning: left, right, center, separate DAC for each

Square Wave 1: adjustable duty, frequency control, automatic frequency sweep, volume envelope

Square Wave 2: adjustable duty, frequency control, volume envelope

Wave Table: limited volume control

Noise Generator: volume envelope

(Sweep) -> Timer -> (Duty or Wave or LFSR) -> Length Counter -> (Envelope or Volume) -> Mixer

Frame Sequencer: sets frequencies for the rest, clocked at 512 Hz

Runs Sweep at 128 Hz(1/4), Length Counter at 256 Hz(1/2), and Volume Envelope at 64 Hz(1/8)

0 --- Clock ---

1 --- --- ---

2 Clock Clock ---

3 --- --- ---

4 --- Clock ---

5 --- --- ---

6 Clock Clock ---

7 --- --- Clock

SWEEP (Square Wave 1 only): periodically shifts frequency up or down, sweep timer runs at 128 Hz

if internal enable flag set:

frequency copied to shadow register,

sweep timer reloaded,

enable flag cleared if EITHER: sweep period = 0 OR sweep shift = 0,

if sweep shift is non-zero:

bit shift right shadow register by sweep shift,

make shadow register negative if negate flag set,

if frequency is GREATER than 2047: reset internal enable flag

TIMER: triggers every N input clock cycles

On overflow:

Continue

DUTY (Square Waves only): length of sound

Clocked at (2048-frequency)\*4 apparently (check this) OR sound length = (64-sound\_length)\*(1/256) seconds

Real Frequency = 131072/(2048-frequency) Hz

00 000000001 12.5%

01 100000001 25%

10 100000111 50%

11 011111110 75%

WAVE (Wave Table only): 32 entries, each 4 bits, higher nibble first

Timer period set to (2048-frequency)\*2 (check as well) OR (256-sound\_length)\*(1/256) seconds ONLY USED IF FLAG SET

When timer triggers:

Advance one nibble, looping on end,

Read value into buffer,

Shift based on volume control;

00 >> 4 0%

01 >> 0 100%

10 >> 1 50%

11 >> 2 25%

READ SOMEHOW (FIGURE THIS OUT)

LFSR (Noise Generator only): pseudo-random number generator

Bit 0 XOR Bit 1

Num >> 1

Bit 14 = XOR result

If width mode === 1:

Bit 6 = XOR result

LENGTH COUNTER: disables channels after delay, clocked at 256 Hz

Writing to values set them to max (256 for wave, 64 for others)

Decrement all counters

Reset internal enable flags of all that are zero

(volume) ENVELOPE (non-Wave only): increments or decrements volume, clocked at 64 Hz

Each channel has a period (in NRx2)

On clock trigger (period):

If new value is within 0 and 15:

Add or subtract one from volume(based on NRx2)

VOLUME (Wave only): see table under WAVE

MIXER: combines the channels

If DAC turns off, channel turns off(at internal enable flag)

ALL channels go through DAC first:

Converts input of 0 to 15 into proportional -N to +N (WHAT IS N???)

Volume = channel\*(master+1) (both in range 0-15)(ridiculous max of volume 225)

BEWARE OF VIN: reads sound data from cartridge and adds to channels

Glossary:

Square wave; a wavelength with only highs and lows

Frequency sweep; changes back and forth between two frequencies over a period of time

Volume envelope; creates specified variation in volume

Waveform generator; generates waveform (waves in general, I think)

Mixer; converts waveform into electrical sound signals

DAC; Digital to Analogue Converter; converts digital data to analogue sound