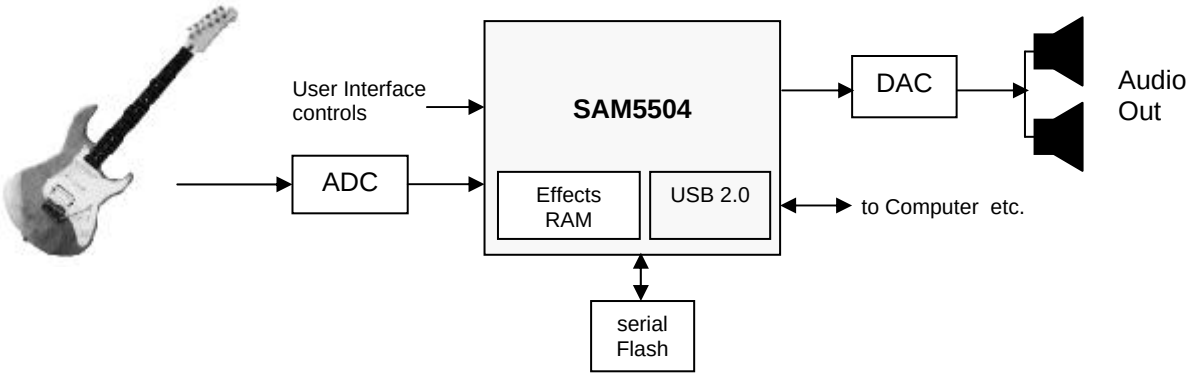
5504GTFX

Guitar Multi-Effect Module with USB
Firmware for SAM5504

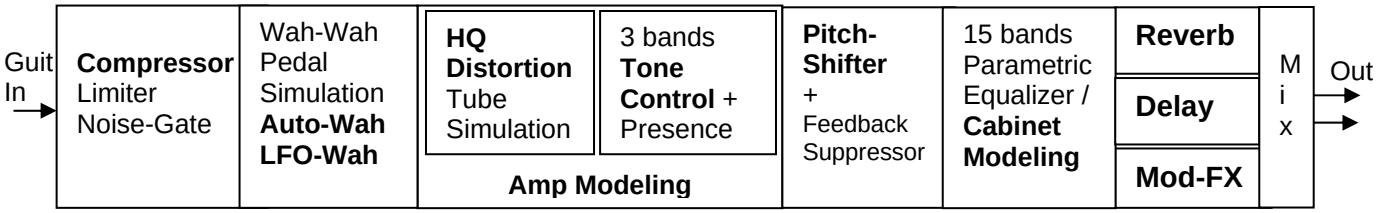
1. Overview

The SAM5504, driven by the firmware 5504GTFX-USB described in here, is a fully USB-MIDI controllable high quality Multi-Effect Device, especially made for Guitar FX applications. The SAM5504 includes a Microcontroller and **four 24-bit DSP** engines, up to **40Kx24 embedded RAM** and **secure eFuses for code protection**. It provides digital interfaces for serial data input and output, a **built-in USB** device controller, **built-in 10-bit ADC** for analog inputs like potentiometers and sliders, and plenty of general IO pins for direct connection of user interface controls (switches, LEDs, Graphic-Display etc.).



1.1 Signal Processing Synoptic

All Effect modules shown in the signal processing synoptic below are processed by SAM5504 and can be used at same time:



1.2 Features

- Multi-Effects module, different configurations (fully user configurable):
  - stereo HQ-Reverb, mono or Ping-Pong Delay
  - Mod-FX: stereo Chorus, Flanging, Phaser, Tremolo, Vibrato, Panning
  - Amp Modeling with 4-stage HQ Distortion algorithm and parametric Equalizer
  - 15 bands Parametric Equalizer on outputs, can be used for Cabinet Modeling and for adaptation to frequency response of Guitar Amp loudspeakers
- USB Audio Class compliant interface (USB MIDI device) for control of all effect parameters

Reference Design 5504FX-EK and 5504GTFX_Control.exe software for Effect customization available.

2. Multi Effect Presets

A Multi Effect is a combination of Effect Presets of the different blocks (see chapter 3) and Front Panel Knob settings.
Presets are selected through MIDI NPRN 377Fh nn (nn: preset number, from 0 to 32) or by Front panel hardware selector.

Nb	Name	Preset defaults values													
		Drive	Volume	Bass	Middle	Treble	RevDel Level	ModFx Level	Inp Preset	Wah Preset	Amp preset	Pitch Preset	ModFx	Rev/Del	Cabinet PEQ Preset
0	Bypass	64	64	64	64	64	0	0	0	0	0	0	0	0	0
1	Clean Chorus	31	96	79	85	95	26	33	0	0	2	0	2	9	1
2	Super Clean	21	113	91	35	58	26	33	0	0	3	0	8	6	6
3	Luxe Amp Tremolo	60	64	67	63	90	9	33	0	0	3	0	3	6	6
4	Twin Amp Reverb	65	64	102	52	64	10	33	0	0	1	0	0	2	6
5	Bass Tremolo	49	96	79	85	95	26	33	0	0	4	0	4	6	5
6	Twin Amp Small Reverb	65	64	102	52	64	10	33	9	0	1	0	0	3	6
7	Rock 80	93	99	103	80	81	13	33	0	0	6	0	0	1	4
8	Solo Amp	46	96	79	85	95	26	33	0	0	8	0	0	9	2
9	Rock Phaser	101	96	79	85	95	16	9	0	0	6	0	5	6	2
10	Ang Rod	104	96	79	83	88	14	9	0	0	7	0	0	1	7
11	Fusion Solo	104	96	118	36	86	14	9	0	0	7	0	0	9	7
12	Metal Wah	108	64	78	29	107	9	33	0	3	9	0	0	8	3
13	Metal Flanger	108	64	78	29	107	9	20	0	0	9	0	7	7	3
14	Champ 57 Clean	11	96	96	41	67	26	33	0	0	10	0	0	4	1
15	Rockabilly Amp	92	60	79	85	95	21	33	0	0	11	0	0	12	1
16	Luxe Amp flanger	86	72	36	97	87	20	33	0	0	12	0	10	2	1
17	Funky	15	96	79	85	95	26	33	0	3	10	0	0	3	5
18	Highway	31	96	79	85	95	26	33	0	0	14	0	0	7	8
19	Rock 70	31	96	79	85	95	26	33	0	0	15	0	0	7	3
20	Noise	31	96	79	85	95	26	33	0	0	16	0	0	7	3
21	Rock Vintage	13	96	79	85	95	26	68	0	0	16	0	4	5	3
22	Twin 57 Amp	27	64	36	97	87	20	33	0	0	1	0	0	2	6
23	Twin 65 Amp	27	64	36	97	87	20	33	0	0	2	0	0	2	1
24	Base Amp	27	64	36	97	87	20	33	0	0	4	0	0	2	5
25	British 80 Amp	45	64	36	97	87	20	33	0	0	6	0	0	5	8
26	Super Amp	87	64	36	97	87	20	33	0	0	7	0	0	4	7
27	Americain Amp	87	64	36	97	87	20	33	0	0	8	0	0	4	2
28	Metal Amp	87	64	38	112	94	20	33	0	0	9	0	0	4	3
29	Champ 57 Amp	22	64	38	112	94	20	33	0	0	10	0	0	4	3
30	Prince 65 Amp	14	64	38	112	94	20	33	0	0	11	0	0	4	7
31	British 60 Amp	23	64	38	112	94	11	33	0	0	14	0	0	5	8
32	Bristish 70 Amp	23	64	38	112	94	11	33	0	0	15	0	0	5	8

Note: All Multi-Effect settings can be customized by use of 5504GTFX Software Control Panel.

3. Effect Presets

Some presets have been predefined for each effects: Wah-Wah, Compressor, Amp-Model, Pitch Shift, Mod-FX (Chorus etc), Reverb, Delay and Cabinet PEQ. Presets are selected through MIDI NRPN messages.
All these Effect settings can be modified by use of 5504GTFX Software Control Panel.

3.1 Input Processing Presets

Preset is selected by using MIDI NRPN 057Fh nn
nn: preset number, from 0 to 9

Nb	Name	Gain	Noise Gate		Compressor						
			NG Release	NG Threshold	ON	Slow Attack	Threshold	Ratio	Attack	Release	Boost
0	Flat		90	0	0	0	0	0	0	64	0
1	COMPRESSOR 1: -18dB 2:1		90	0	127	0	73	64	64	0	24
2	COMPRESSOR 2: -15dB 3:1		90	0	127	0	82	84	64	0	32
3	COMPRESSOR 3: -18dB 5:1		90	0	127	0	73	100	64	0	48
4	COMPRESSOR 4: -21dB 7:1		90	0	127	0	64	110	64	0	48
5	COMPRESSOR 5: -24dB 12:1		90	0	127	0	55	117	64	0	64
6	LIMITER 1: -6dB		90	0	127	0	109	127	0	64	0
7	LIMITER 2: -12dB		90	0	127	0	91	127	0	64	0
8	LIMITER 3: -18dB		90	0	127	0	73	127	0	64	0
9	Compressor Stomp Box		0	90	100	0	127	0	41	64	64

3.2 Wah-Wah Presets

Preset is selected by using MIDI NRPN 027Fh nn
nn: preset number, from 0 to 4

Nb	Name	Preset Default values							
		Decay	Manual	Auto Wah Sens	Filter Q	LFO Amount	LFO Rate	Mode	Filter Type
0	OFF	/	/	/	/	/	/	/	
1	Auto-Wah 1	39	46	90	8	28	127	2	0
2	Auto-Wah 2	109	54	112	96	22	88	0	0
3	Wah LFO 1	109	54	112	85	28	23	3	0
4	Wah LFO 2	109	54	112	85	14	43	3	0

3.3 Amp-Model Presets

Preset is selected by using MIDI NRPN 097Fh nn
nn: preset number, from 0 to 16

Nb	Name		Preset Default Values																						
		Type	Drive Center	Level	Drive Min	Drive Max	Gain Low	Gain Low Mid	Gain High Mid	Gain High	Freq Low	Freq Low Mid	Freq High Mid	Freq High	Quality Low Mid	Quality High Mid	Gain Low Min	Gain Low Max	Gain Mid Min	Gain Mid Max	Gain High Min	Gain High Max	Lo-Cut	Hi-Cut
0	OFF	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/								
1	Twin 57 Amp	3	50	51	0	63	83	58	54	92	3	27	29	67	26	26	0	86	0	102	0	70	12	98
2	Twin 65 Amp	8	23	51	0	79	51	87	58	90	8	48	29	106	26	26	0	64	26	96	0	67	28	57
3	Luxe 57 Amp	2	74	52	0	93	64	64	82	103	4	22	29	112	26	26	37	101	0	102	53	75	8	68
4	Base Amp	4	50	51	40	127	83	54	80	64	3	51	29	81	26	26	32	101	26	91	10	107	16	46
5	Thrift 60 Amp	17	87	52	13	100	83	75	64	104	3	25	29	111	26	26	46	81	0	102	0	72	18	61
6	British 80 Amp	5	66	51	23	90	107	38	80	89	10	48	29	97	26	26	37	70	21	91	42	80	41	98
7	Super Amp	6	102	52	26	127	85	82	85	73	10	58	29	112	26	26	47	88	26	96	26	101	36	33
8	Americain Amp	9	88	51	37	127	101	39	64	47	8	37	29	127	26	26	26	75	42	80	37	86	19	46
9	Metal Amp	7	108	51	57	127	78	40	40	91	6	59	29	97	26	26	53	88	43	82	37	86	24	43

10	Champ 57 Amp	3	92	52	0	94	64	64	64	64	8	39	29	99	26	26	26	91	0	91	31	91	25	68
11	Prince 65 Amp	3	36	52	13	100	84	105	64	46	3	26	29	127	26	26	26	91	53	117	10	117	16	126
12	Luxe 65 Amp	2	59	52	13	100	36	113	64	71	11	33	29	75	26	26	37	77	47	96	26	80	24	126
13	British Watt Amp	5	87	52	28	113	90	80	64	91	7	20	29	127	26	26	10	75	0	107	10	117	20	126
14	British 60 Amp	8	87	52	41	127	90	64	64	80	11	25	29	127	26	26	0	86	0	96	26	102	32	126
15	British 70 Amp	4	127	52	13	127	104	47	64	84	22	45	29	67	26	26	37	75	31	86	31	86	51	126
16	British Color Amp	17	127	52	13	100	63	44	64	77	11	39	29	67	26	26	47	80	25	80	42	86	12	46

3.4 Cabinet-Model-PEQ Presets

Preset is selected by using MIDI NRPN 0B2Fh nn
nn: preset number, from 0 to 8

Nb	Name	InGain	Gain1	Freq1	Q1	Gain2	Freq2	Q2	Gain3	Freq3	Q3	Gain4	Freq4	Q4	Gain5	Freq5	Q5
0	OFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	65 CAB	127	64	64	64	36	6310	109	94	4927	110	106	3285	97	13	2017	115
2	4X12V CAB	127	64	64	64	56	365	96	45	492	97	40	619	97	28	734	122
3	4X12G CAB	127	64	64	64	36	63	117	42	2459	116	44	2016	117	43	1254	115
4	4X12M CAB	127	64	64	64	56	238	82	41	734	118	127	3789	14	119	6820	115
5	BSEMN CAB	127	64	64	64	127	3789	65	92	2143	101	54	1762	97	54	2358	115
6	57LX CAB	127	64	64	64	22	45	101	104	86	87	37	232	111	92	314	105
7	SUP CAB	127	64	64	64	84	149	23	72	238	23	71	365	25	70	492	26
8	2X12C CAB	127	64	64	64	103	320	62	79	492	54	79	619	55	35	1762	31

Continued for frequency points 6 till 10:

Nb	Name	Gain6	Freq6	Q6	Gain7	Freq7	Q7	Gain8	Freq8	Q8	Gain9	Freq9	Q9	Gain10	Freq10	Q10
0	OFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	65 CAB	40	1091	119	85	7311	121	53	874	77	57	748	64	44	232	102
2	4X12V CAB	35	3604	123	24	2396	119	36	1889	103	19	1254	100	80	2142	61
3	4X12G CAB	42	1657	96	65	7311	121	48	874	77	107	136	25	65	128	87
4	4X12M CAB	93	2523	58	29	6060	121	46	175	77	27	8799	106	89	5051	87
5	BSEMN CAB	81	1436	77	39	1114	116	89	619	25	116	308	64	44	238	102
6	57LX CAB	85	873	58	74	492	60	65	874	77	110	3790	4	79	619	63
7	SUP CAB	72	619	23	0	746	112	96	860	112	33	2142	27	81	5051	48
8	2X12C CAB	109	3789	33	48	200	63	75	149	65	65	748	64	65	128	87

Continued for frequency points 11 till 15:

Nb	Name	Gain11	Freq11	Q11	Gain12	Freq12	Q12	Gain13	Freq13	Q13	Gain14	Freq14	Q14	Gain15	Freq15	Q15
0	OFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	65 CAB	67	301	20	76	937	64	85	79	43	75	143	64	64	21	64
2	4X12V CAB	78	136	27	78	213	28	50	85	90	76	428	33	64	21	64
3	4X12G CAB	65	13	42	65	13	64	66	13	64	64	13	64	64	21	64
4	4X12M CAB	70	3789	42	77	10032	64	66	13	64	64	13	64	64	21	64
5	BSEMN CAB	44	149	48	65	13	64	66	13	64	64	13	64	64	21	64
6	57LX CAB	56	1762	27	78	2523	60	66	13	64	64	13	64	64	21	64
7	SUP CAB	65	13	42	65	13	64	66	13	64	64	13	64	64	21	64
8	2X12C CAB	65	13	42	65	13	64	66	13	64	64	13	64	64	21	64

3.5 Pitch Shift Presets

Preset is selected by using MIDI NRPN 067Fh nn
nn: preset number, from 0 to 5

Nb	Name	Preset Default values				
		Coarse Tune	Fine tune	Dry/Wet-Mix	Filter Frequency	Resonance
0	OFF	/	/	/	/	/
1	Light Detune	64	2	64	127	0
2	Medium Detune	64	12	64	127	0
3	Deep Detune	64	24	64	127	0
4	Octaver	52	0	64	64	0
5	Feedback Suppressor	64	15	127	127	0

3.6 Reverb/Delay Presets

Preset is selected by using MIDI NRPN 037Fh nn
nn: preset number, from 0 to 12

Nb	Name	Preset Default Values											
		Type	LevelRev	PreHP	PreDelay	TimeRev	HDamp	Tone	ToneFreq	LevelDel	PreLP	TimeDel	Feedback
0	OFF	/	/	/	/	/	/	/	/	/	/	/	/
1	Small Hall	6	64	0	60	65	64	100	64	64	0	64	0
2	Large Hall	8	64	0	39	65	64	113	83	64	0	64	0
3	Small Room	1	64	1	68	78	64	113	83	64	0	64	0
4	Large Room	4	64	1	68	89	64	113	83	64	0	64	0
5	Small Plate	10	81	1	68	68	64	113	83	64	0	64	0
6	Spring 65	12	61	1	59	68	64	113	83	64	0	64	0
7	Ping-Pong Delay	14	61	1	59	68	64	113	83	64	0	30	65
8	Tape Delay	13	61	1	59	68	64	113	83	25	48	15	65
9	Delay + Reverb	15	61	1	59	68	64	113	83	25	48	23	65
10	Stereo Delay + Reverb	16	61	1	59	68	64	113	83	25	48	37	74
11	Long Delay	13	61	1	59	68	64	113	83	64	0	68	65
12	Short Delay	13	61	1	59	68	64	113	83	64	0	6	82

3.7 Mod-FX Presets

Preset is selected by using MIDI NRPN 047Fh nn
nn: preset number, from 0 to 12

Nb	Name	Presets Defaults values								
		PreHP	Level	DelTime	Feedback	Rate	Depth	HDamp	Type	Tremolo Shape
0	OFF	/	/	/	/	/	/	/	/	/
1	Sine Chorus	11	70	127	39	39	26	0	4	0
2	Deep Chorus	45	70	41	18	65	64	44	0	0
3	Vintage Tremolo	0	127	20	69	60	90	0	5	64
4	Sine Tremolo	0	127	20	69	50	89	0	5	0
5	Phaser Slow	0	127	20	102	13	127	0	3	0
6	Step Phaser	0	127	20	117	28	113	0	6	0
7	Flanger	0	104	20	64	14	63	0	1	0
8	Vibratone	1	71	20	42	17	39	0	7	0
9	Vibratone Deep	1	71	20	42	63	26	0	7	0
10	Flanger Deep	0	104	20	64	46	116	0	1	0
11	Phaser Fast	0	127	20	64	111	64	0	3	0
12	Tremolo Fast	0	127	20	69	76	127	0	5	64

4. NRPN Controls

MIDI Non-Registered-Parameter-Number can be used to control precisely each parameter of each effect.
NRPN's are sent through 3 (or 4) midi controls:

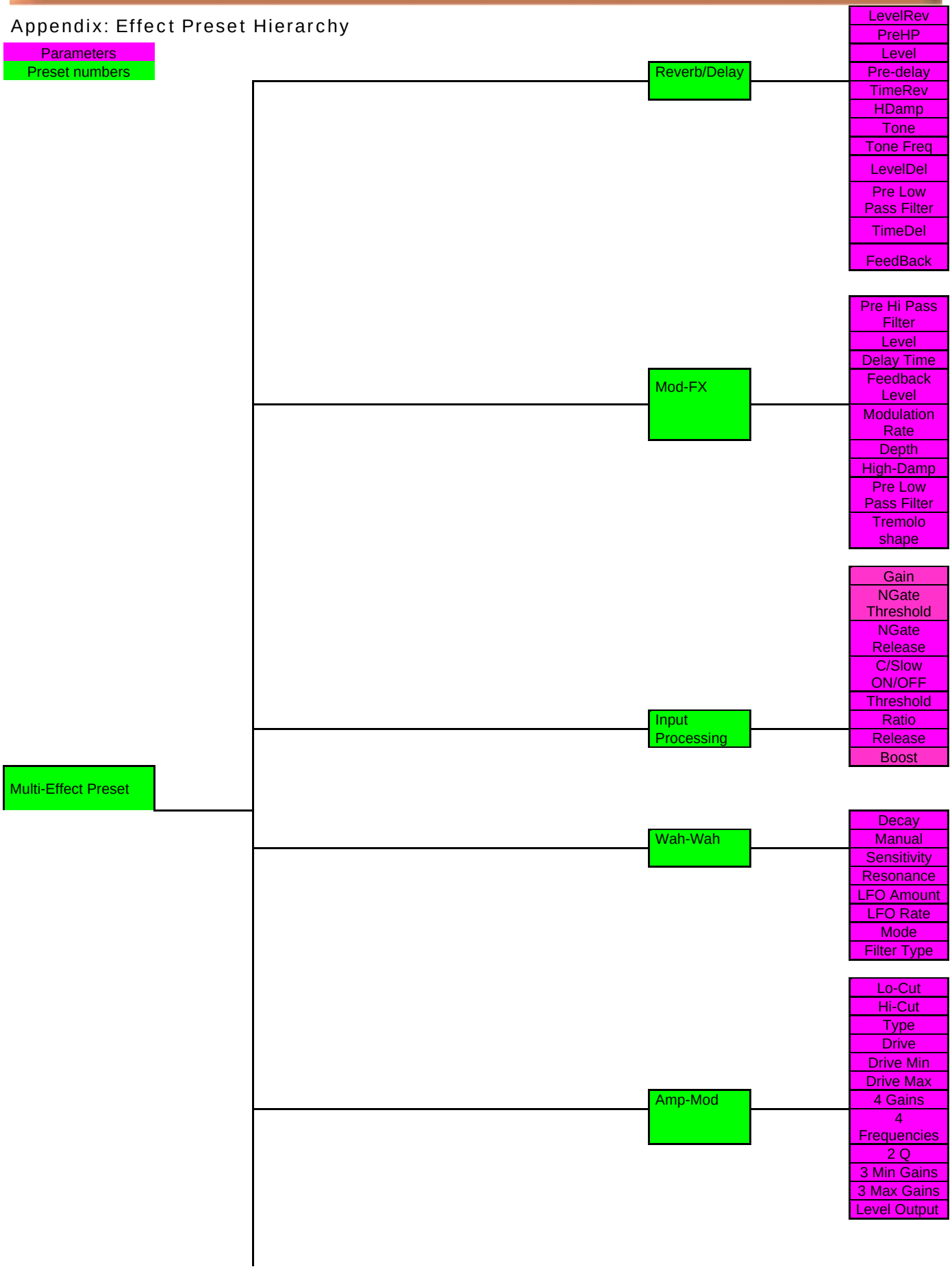
- select first NRPN MSB: MIDI control 99 (MIDI message BxH 63H nnH)
- then select NRPN LSB: MIDI control 98 (MIDI message BxH 62H nnH)
- then send NRPN Value: MIDI control 6 (MIDI message BxH 06H nnH)
- if want send parameter in high precision, the parameter LSB value can be send through MIDI control 38 (MIDI message BxH 26H nnH).

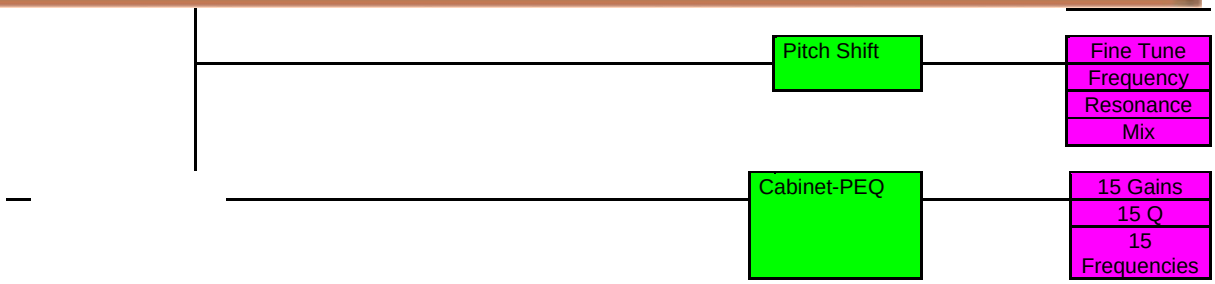
NRPN MSB	NRPN LSB	Description	
General Effect Controls (also used on Front Panel as hardware controls)			
0Ah	00h	"Drive" control: 0 = min … 64 = default … till 127 = max	
0Ah	01h	"Volume" control (post Distortion): 0 = min … 64 = default … till 127 = max	
0Ah	02h	"Bass" control: 0 = min … 64 = default … till 127 = max	
0Ah	03h	"Middle" control: 0 = min … 64 = default … till 127 = max	
0Ah	05h	"Treble" control: 0 = min … 64 = default … till 127 = max	
0Ah	06h	Mod-FX Level control: 0 = min … till 127 = max	
0Ah	07h	Reverb/Delay Level control: 0 = min … till 127 = max	
Input Processing Controls			
08	04h	Input gain: 0=-inf … 90=0dB (exceeding this value may cause clipping) … 127=+6dB	
08	05h	Noise-gate Threshold: 0 = off, 0x0100 = -66dB ... 0x7F00 = -24dB. (Step = -0.33333dB)	
08	0Ah	Noise-gate Release time: 0=~10ms ... 0x7FFF=~10s	
05	00h	Compressor ON/OFF: =0 OFF, else ON	
05	01h	Attack time: 0=fast attack (0.1ms), … 60=1ms, …100=10ms, till 127=slow attack (100ms), exp. curve	
05	02h	Release time: 0=fast release (10ms), … 60=100ms, … 100=1s, till 127=slow release (~5s), exp. curve	
05	03h	Threshold: 0=-42.3, 1=-42dB, 2=-41.66dB, 7Eh=-0.33dB, 7Fh=0dB	
05	04h	Ratio: 127=1:128, 126=2:128 (1:64), 125=3:128, … 64=64:128 (1:2), … 0=1:1	
05	05h	Boost (applied on signal after compression): 127= x8 … 64=x4 … 32=x2 … 0 = x1	
05	06h	Knee: 0=Hard Knee, else Soft Knee	
Wah-Wah Controls			
02	00h	Wah-Wah ON/OFF: =0 OFF, else ON	
02	01h	Mode: 0=UP, 1=DOWN, 2=UP-EX, 3=LFO-MOD	
02	02h	Filter resonance: 0 = no resonance, till 127 = max resonance	
02	03h	Filter type: 0 = low pass filter, 1 = band pass filter	
02	04h	LFO Rate:	
02	05h	Auto-Wah Sensitivity: (0=OFF, till 127=100%)	
02	06h	LFO Amount: (0=min, till 127=max)	
02	07h	Manual / Pedal Position: 0 = closed 0Hz , till 127 = open 8kHz	
02	08h	Decay : 0=fast release (10ms), … 60=100ms, … 100=1s, till 127=slow release (~5s), exp. curve	
Amp Model Controls			
08	02h	Lo-cut filter frequency: (0 = ~20Hz, till 7FFFh = ~300Hz)	
08	03h	Hi-cut filter frequency: (0 = ~1.5KHz,...100=~6KHz, till 7FFFh = OFF)	
07	15h	Distortion Type	
07	04h	Drive "default" point for Drive control: 0= 0% till 127 = 100%	
07	24h	Drive "min" point for Drive control: 0= 0% till 127 = 100%	
07	25h	Drive "max" point for Drive control: 0= 0% till 127 = 100%	
09	04h	EQ Low band gain"default" point for "Bass control": 0=-12dB, 64=0dB, 127=+12dB	
09	0Fh	EQ Low band gain "min" point for "Bass control": 0=-12dB, 64=0dB, 127=+12dB	
09	10h	Low band gain max: 0=-12dB, 64=0dB, 127=+12dB	
09	05h	Low-Mid band gain: 0=-12dB, 64=0dB, 127=+12dB	
09	11h	Low-Mid band gain min: 0=-12dB, 64=0dB, 127=+12dB	
09	12h	Low-Mid band gain max: 0=-12dB, 64=0dB, 127=+12dB	
09	06h	High-Mid band gain: 0=-12dB, 64=0dB, 127=+12dB	
09	07h	High band gain: 0=-12dB, 64=0dB, 127=+12dB	
09	13h	High band gain: 0=-12dB, 64=0dB, 127=+12dB	
09	14h	High band gain: 0=-12dB, 64=0dB, 127=+12dB	
09	08h	Low band frequency: 0=40Hz, till 127=1.5KHz	

09	09h	Low-Mid band frequency: 0=40Hz, till 127=2,5KHz	
09	0Ah	High-Mid band frequency: 0=40Hz, till 127=10KHz	
09	0Bh	High band frequency: 0=500Hz, til127=2KHz	
09	0Dh	Low-Mid band Q: 0=1.0 ... 64=2.0... 127=20.0	
09	0Eh	High-Mid band Q: 0=1.0 ... 64=2.0... 127=20.0	
07	06h	Level output 0= 0% till 127= 100%	
Pitch-Shift Controls			
06	00h	Pitch shift tune Coarse tune (data entry control 6): 52= -12 half tones, 53= -11 half tones, …, 63=-1 half tone, 64=0, 65=+1 half tone, 66=+2 half tones, …, 76=+12 half tones	
06	01h	Fine tune (data entry control 38): 0= no detune … 127= +1 half tone	
06	03h	Pitch shift Filter frequency: 0 = closed, till 127 = open (0 to 8kHz)	
06	04h	Pitch shift Filter resonance: 0 = no resonance, till 127 = max resonance	
06	05h	Pitch shifted / direct signal balance: 0=only direct signal, till 127=only pitched signal	
06	06h	Pitch Shifter ON/OFF: =0 OFF, else ON	
Reverb Controls			
03	0Ah	Reverb ON\OFF	
03	09h	Reverb Type	
03	00h	Reverb Level	
03	01h	Reverb Pre-Delay time: 0 = 0ms, till 127 = 127ms	
03	02h	Reverb Time	
03	03h	Reverb Tone control gain: 0 = -12dB, till 127 = +6dB, default is 64 = 0dB	
03	04h	Reverb High Pass Filter on input: 0 = no filter to 1.2 kHz	
03	05h	Reverb HDAMP: high frequency filter on reverb decay / echo feedback 0 to 100 %	
03	06h	Reverb Tone Frequency	
Delay Controls			
03	10h	Delay Level	
03	11h	Delay Time	
03	12h	Delay Feedback	
03	13h	Pre Low Pass Filter: 0 = no filter to 1.2 kHz	
Mod-FX Controls			
04	00h	Effect level	
04	01h	Chorus/Flanging delay time: 0 = 0.66ms, till 127 = 20ms	
04	02h	Chorus/Flanging delay feedback	
04	04h	Chorus/Flanging high pass filter on input: 0 = no filter to 1.2 kHz	
04	05h	HDAMP: high frequency filter on delay feedback 0 to 100 %	
04	08h	Modulation rate: 0 = ~0,023 Hz, …64=~0,89Hz, till 127 = ~5,8 Hz (~1Hz to ~20Hz for Tremolo)	
04	09h	Modulation depth	
04	0Ah	Tremolo modulation shape: 0 = triangle, till 127 = square	
04	0Bh	Mod-FX mode: 0=Chorus, 1=Flanger, 2=Phaser, 3=Tremolo, 4=SineChorus,…	
04	0Ch	Mod-FX ON/OFF : 0=OFF, else ON	
Cabinet PEQ			
0Bh	30h	PEQ Input Gain	
0Bh	31h	PEQ ON/OFF: 0 = OFF, else ON	
0Bh	00 to 0Eh	PEQ band (1 to 15) Gain 0= -12db ... 64=0dB ... 127 = 12db	
0Bh	10h to 1Eh	PEQ band (1 to 15) Frequency 0= 13 Hz till 127 = 12 kHz	
0Bh	20h to 2Eh	PEQ band (1 to 15) Quality 0= 1 till 127 = 20	

When receiving input peak level request (NRPN 8030h), SAM5504 returns current input peak level through following NRPN message: 0xB0, 0x63, 0x08, 0x62, 0x7F, 0x06, vv
"vv" is the input level in dB, range from 0h till 46h as follow:
0h=no level, 1h=-63dB, 2h=-62dB, 10h=-48db, 20h=-32dB, 30h=-16dB … 3Fh=-1dB,
40h= 0dB, 41h= +1dB, 42h=+2dB, …, 45h=+5dB, 46h>=+6dB
Peak level correspond to maximum level detected between 2 consecutives "peak level request" NRPN's.
Recommended time between 2 consecutives "peak level request" NRPN's is about 100ms. This time should **never be lower than 20ms** to avoid MIDI data input buffer overrun.

Appendix: Effect Preset Hierarchy





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