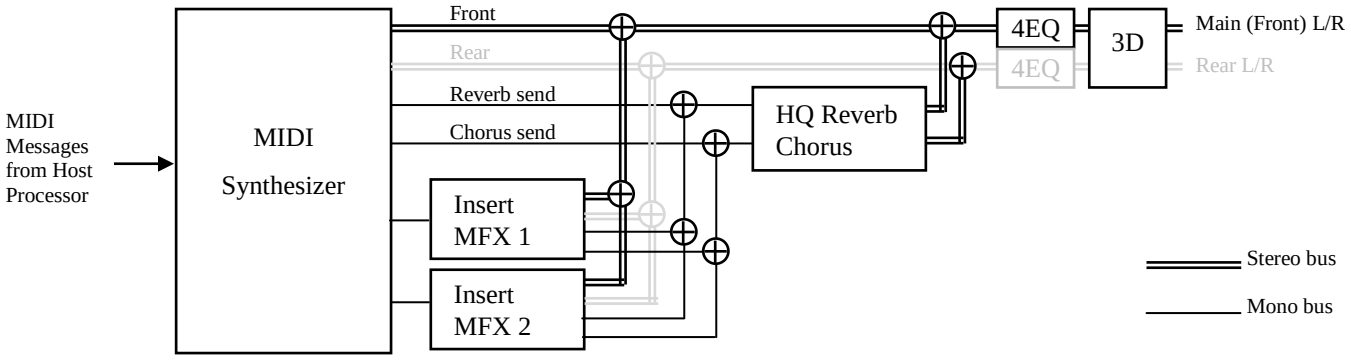
5716-FW Firmware

Signal Processing Synoptic



Features of MIDI Synthesizer

- minimum hardware configuration : SAM5716 + NAND/NOR-Flash/ROM + stereo DAC
- 48KHz or 44.1KHz sampling rate (12.288MHz or 11.2896MHz quartz)
- Full GM/GS implementation
- up to 256 voice polyphony
- 32 MIDI channels
- GS compatible Reverb, Chorus
- MFX: Insert Multi-Effects blocks (Distortion, Equalizer, Compressor, Chorus/Flanger/Phaser/Tremolo/Rotary, Delay)
- 4-bands Equalizer and Spatial 3D Surround effect on Main (Front) and Rear outputs
- 4 speaker output possible with an additional stereo DAC

Available Wave-ROM: CleanWave128® (128Mbit, 128 GM instruments + 140 variations, 9 drumsets), others on request.

Available Reference Design: 5716-EK (stand alone evaluation board)

Contact: info@dream.fr

DREAM Special NRPN Controls

NRPN sending method:
CTRL#99=high byte, CTRL#98=low byte, CTRL#6=vv

Example:
In order to set General Master Volume (NRPN 3707h) to value 64 (40h), send

- CTRL#99=56 (37h) (MIDI code: 0B0h 063h 037h)
- CTRL#98=07 (07h) (MIDI code: 0B0h 062h 007h)
- CTRL#6 =64 (40h) (MIDI code: 0B0h 006h 040h)

MIDI channel must be 0 for all these NRPNs.

NRPN # (High|Low)	Description		Power-up default
General			
3707h	Master volume	0 (mute) to 7Fh (max)	7Fh
3755h	3D Spatializer / Equalizer ON/OFF (bit 2: 3D, bit1: Front EQ, bit 0: Rear EQ)		EQ ON, 3D off
Main (Front) Output 4-bands Equalizer			
3708h	Equalizer Low Band Gain	0=-12dB, 40h=0dB, 7Fh=+12dB	60h (+6dB)
3709h	Equalizer Low Mid Band Gain	0=-12dB, 40h=0dB, 7Fh=+12dB	38h (-3dB)
370Ah	Equalizer High Mid Band Gain	0=-12dB, 40h=0dB, 7Fh=+12dB	38h (-3dB)
370Bh	Equalizer High Band Gain	0=-12dB, 40h=0dB, 7Fh=+12dB	60h (+6dB)
370Ch	Equalizer Low Band Freq	0=0Hz, 64=400Hz, 127=800Hz	0Ah (100Hz)
370Dh	Equalizer Low Mid Band Freq	0=0Hz, 64=1.28KHz, 127=2.5kHz	18h (500Hz)
370Eh	Equalizer High Mid Band Freq	0=60Hz, 64=5.1KHz, 127=10.7kHz	68h (8KHz)
370Fh	Equalizer High Band Freq	0=1kHz, 64=3.4KHz, 127=5.8kHz	7Fh
3710h	Equalizer Low Mid Band Q	0:Q=1, 40h:Q=2, 7Fh:Q=20	40h
3711h	Equalizer High Mid Band Q	0:Q=1, 40h:Q=2, 7Fh:Q=20	40h
Rear Output 4-bands Equalizer			
3712h	Equalizer Low Band Gain	0=-12dB, 40h=0dB, 7Fh=+12dB	60h (+6dB)
3713h	Equalizer Low Mid Band Gain	0=-12dB, 40h=0dB, 7Fh=+12dB	38h (-3dB)
3714h	Equalizer High Mid Band Gain	0=-12dB, 40h=0dB, 7Fh=+12dB	38h (-3dB)
3715h	Equalizer High Band Gain	0=-12dB, 40h=0dB, 7Fh=+12dB	60h (+6dB)
3716h	Equalizer Low Band Freq	0=0Hz, 64=400Hz, 127=800Hz	0Ah (100Hz)
3717h	Equalizer Low Mid Band Freq	0=0Hz, 64=1.28KHz, 127=2.5kHz	18h (500Hz)
3718h	Equalizer High Mid Band Freq	0=60Hz, 64=5.1KHz, 127=10.7kHz	68h (8KHz)
3719h	Equalizer High Band Freq	0=1kHz, 64=3.4KHz, 127=5.8kHz	7Fh
371Ah	Equalizer Low Mid Band Q	0:Q=1, 40h:Q=2, 7Fh:Q=20	40h
371Bh	Equalizer High Mid Band Q	0:Q=1, 40h:Q=2, 7Fh:Q=20	40h
Spatializer 3D Effect			
371Ch	Spatializer effect volume	0=no effect, till 7Fh=maximum effect	0
371Dh	Spatializer effect delay time	0=0ms, till 7Fh=max delay time	0
371Eh	Spatializer effect input mode	0=stereo, else mono	0
371Fh	Spatializer effect output mode	0=2 speaker, else 4 speaker	0
Front/Rear Mix			
3758h	Reverb Front level (0 to 7Fh)		7Fh
3759h	Reverb Rear level (0 to 7Fh)		0
375Ah	Chorus Front level (0 to 7Fh)		7Fh
375Bh	Chorus Rear level (0 to 7Fh)		0
375Ch	Delay Front level (0 to 7Fh)		7Fh
375Dh	Delay Rear level (0 to 7Fh)		0
375Eh	Output Front level (0 to 7Fh, 0=mute, … 40h=0dB, … 7Fh=+6dB)		60h (+3.5dB)
375Fh	Output Rear level (0 to 7Fh, 0=mute, … 40h=0dB, … 7Fh=+6dB)		60h (+3.5dB)
38xxh	Front/Rear mix of MIDI channel xxh xxh=0 to 0Fh if port 1, xxh=10h to 1Fh if port 2 value = 0 to 7Fh: 0=all Front, 40h=center, 7Fh=all Rear		0

Auto-Test

Built-in auto-test program is included which can be used for board production testing. To start the Auto-Test, send NRPN 3751H with value 23H. Sine waveforms at different frequencies will be output to the DAC to indicate test in progress, as follows:

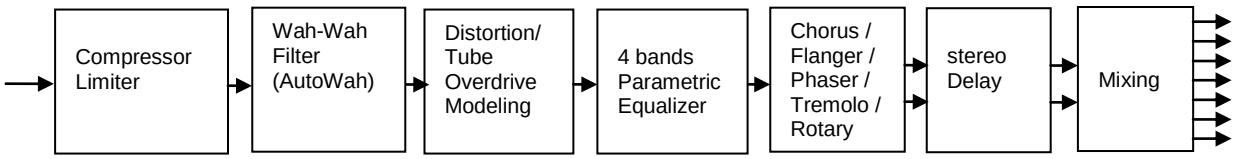
Test in progress	Output frequency
External RAM	1500 Hz
Internal RAM & ROM	1125 Hz
PASS	750 Hz

Last sine waveform is output constantly to allow test of audio output. Board must be reset to exit test mode and return in normal mode.

Insert Effects NRPN Controls

Using an Insert Effect means that a single MIDI part (or also several) can be switched to "Insert FX ON". In this case these MIDI parts are going through the Insert Effect block first (e.g. Guitar Multi-Effects) and after into mixing (Front L/R, Rear L/R, Reverb, Chorus and Delay send).

This is Insert Multi-Effect configuration, all effects can be used at same time:



Be aware that also single effects or combinations of only some of these effects are possible by switching OFF the other effects in the signal processing path.

Sysex message to switch Insert Effect ON: F0H 41H 00H 42H 12H 40H 4pH 22H nn xx F7H (xx = don't care)
with 'p'=MIDI track, 'nn': 0 = track in normal mode, 1 = send to MFX1, 2 = send to MFX2, 3 = send to both MFX (stereo)

NRPN messages for Insert MFX1 must be sent with NRPN High byte = 0x3A.
NRPN messages for Insert MFX2 must be sent with NRPN High byte = 0x3B.
NRPN messages for Insert MFX1&MFX2 (stereo) must be sent with NRPN High byte = 0x3C.

NRPN High	NRPN Low	Description	
Insert MFX General/Mix Controls			
3xh	20h	Amp Model Preset (see below)	
3xh	21h	Input gain, 0 to 7Fh	
3xh	22h	Lo-cut filter frequency: 0 = OFF, till 7FFFh = ~300Hz	
3xh	23h	Hi-cut filter frequency: 0 = ~1.5KHz,...100=~6KHz, till 7FFFh = OFF	
3xh	2Ah	Output level, 0 to 7Fh	
3xh	2Bh	Output panning, 0 to 7Fh (main output left/right mix, 0=left, till 7Fh=right)	
3xh	2Ch	Output Front/Rear Mix, 0 to 7Fh (0 = only Front, 40h = both, till 7Fh = only Rear)	
3xh	2Dh	Send to Global Reverb: 0=~ –oo, 1=~ -42dB, 127=~ 0dB	
3xh	2Eh	Send to Global Chorus: 0=~ –oo, 1=~ -42dB, 127=~ 0dB	
Insert MFX Compressor/Limiter Controls			
3xh	40h	Compressor Preset (see below)	
3xh	41h	Compressor ON/OFF: =0 OFF, else ON	
3xh	42h	Attack time: 0=fast attack (0.1ms), … 60=1ms, …100=10ms, till 127=slow attack (100ms), exp. curve	
3xh	43h	Release time: 0=fast release (10ms), … 60=100ms, … 100=1s, till 127=slow release (~5s), exp. curve	
3xh	44h	Threshold: 0=-42.3, 1=-42dB, 2=-41.66dB, 7Eh=-0.33dB, 7Fh=0dB	
3xh	45h	Ratio: 127=1:128, 126=2:128 (1:64), 125=3:128, … 64=64:128 (1:2), … 0=1:1	
3xh	46h	Boost (applied on signal after compression): 127= x8 … 64=x4 … 32=x2 … 0 = x1	
3xh	47h	Knee: 0=Hard Knee else Soft Knee	

Insert MFX Wah-Wah Controls			
3xh	50h	Wah-Wah Preset (see below)	
3xh	51h	Wah-Wah Filter type: 0 = low pass filter, 1 = band pass filter	
3xh	52h	Wah-Wah Filter frequency / Pedal Position: 0 = closed 0Hz , till 127 = open 8kHz	
3xh	53h	Wah-Wah Filter resonance: 0 = no resonance, till 127 = max resonance	
3xh	54h	Auto-Wah Sensitivity: 0=OFF, till 127=100%	
Insert MFX Distortion Controls			
3xh	60h	Distortion Preset (see below)	
3xh	61h	Distortion ON/OFF: =0 OFF, else ON	
3xh	62h	Pre Gain: 0=OFF, 1 = -42dB till 127 = 0dB	
3xh	63h	Type: 0=Tube, 1=asymmetric parabolic1, 2=asymmetric parabolic2	
3xh	64h	Low Pass Filter frequency: 0 = closed 0Hz , till 127 = open 8kHz	
3xh	65h	Low Pass Filter resonance: 0 = no resonance, till 127 = max resonance	
3xh	66h	Post Gain: 0=OFF, 1 = -42dB till 127 = 0dB	
3xh	67h	Drive: 0 till 7 (0 to +42dB)	
Insert MFX Parametric Equalizer Controls			
3xh	70h	Equalizer Preset (see below)	
3xh	71h	Parametric Equalizer: ON/OFF : 0=OFF, else ON	
3xh	72h	Low band gain: 0=-12dB, 64=0dB, 127=+12dB	
3xh	73h	Low-Mid band gain: 0=-12dB, 64=0dB, 127=+12dB	
3xh	74h	High-Mid band gain: 0=-12dB, 64=0dB, 127=+12dB	
3xh	75h	High band gain: 0=-12dB, 64=0dB, 127=+12dB	
3xh	76h	Low band frequency: 0=40Hz, till 127=1.5KHz	
3xh	77h	Low-Mid band frequency: 0=40Hz, till 127=2,5KHz	
3xh	78h	High-Mid band frequency: 0=40Hz, till 127=10KHz	
3xh	79h	High band frequency: 0=500Hz, til127=2KHz	
3xh	7Ah	Low-Mid band Q: 0=1.0 ... 64=2.0... 127=20.0	
3xh	7Bh	High-Mid band Q: 0=1.0 ... 64=2.0... 127=20.0	
Insert MFX Chorus/Flanger/Phaser/Tremolo/Rotary Controls			
3xh	30h	Chorus/Flanger/Phaser/Tremolo/Rotary Preset (see below)	
3xh	31h	Effect level, 0 to 7Fh	
3xh	32h	Chorus/Flanging delay time: 0 = 1ms, till 127 = 30ms	
3xh	33h	Chorus/Flanging feedback, 0 to 7Fh	
3xh	34h	Chorus/Flanging/Short-Delay high pass filter on input: 0 = no filter to 1.2 kHz	
3xh	35h	HDAMP: high frequency filter on delay feedback, , 0 to 7Fh = 0 to 100 %	
3xh	36h	Modulation rate: 0 = ~0,023 Hz, ...64=~0,89Hz, till 127 = ~5,8 Hz (~1Hz to ~20Hz for Tremolo)	
3xh	37h	Modulation depth, 0 to 7Fh	
3xh	38h	Tremolo modulation shape: 0 = triangle, till 127 = square	
3xh	39h	Rotary speed: 0=slow, 1=fast (only for Rotary preset # 23)	
3xh	3Ah	Rotary fast modulation rate: 0 = ~0,023 Hz, ...64=~0,89Hz, till 127 = ~5,8 Hz	
3xh	3Bh	Rotary acceleration time: 0-127	
3xh	3Ch	Rotary deceleration time: 0-127	
3xh	3Eh	Mod-FX type: 0=Chorus, 1=Flanger, 2=Phaser, 3=Tremolo, 4=Rotary	
3xh	3Fh	Mod-FX ON/OFF: 0=OFF, else ON	
Insert MFX Delay Controls			
3xh	58h	Delay Preset, 0..4 (off, mono1, mono2, stereo1, stereo2)	
3xh	59h	Delay ON/OFF, 0 = OFF, else ON	
3xh	5Ah	Delay Mode, 0=mono, 1=stereo	
3xh	5Bh	Delay PreLP, 0 to 7Fh	
3xh	5Ch	Delay Level, 0 to 7Fh	
3xh	5Dh	Delay Time, 0 to 7Fh = 0 to 574ms	
3xh	5Eh	Delay Feedback, 0 to 7Fh	
3xh	5Fh	HDAMP: high frequency filter on delay feedback, , 0 to 7Fh = 0 to 100 %	
Insert MFX Reset All			
3xh	7Fh	Reset All: all Effects OFF, LoCut/HiCut OFF, only Front, Pan center, Reverb/Chorus = 0 For NRPN 3C7Fh (stereo IMFX Reset) set IMFX1 Pan to Left, IMFX2 Pan to Right	

Insert MFX Compressor/Limiter Presets

Preset is selected by using MIDI NRPN 3x40h, with value = preset number, from 0 to 8

Nb	Name	Preset Default values				
		Attack	Release	Threshold	Ratio	Boost
0	NO COMPRESSION	64	0	127	0	0
COMPRESSOR						
1	COMPR 1: -18dB 2:1	64	0	73	64	24
2	COMPR 2: -15dB 3:1	64	0	82	84	32
3	COMPR 3: -18dB 5:1	64	0	73	100	48
4	COMPR 4: -21dB 7:1	64	0	64	110	48
5	COMPR 5: -24dB 12:1	64	0	55	117	64
LIMITER						
6	LIMITER 1: -6dB	64	0	109	127	0
7	LIMITER 2: -12dB	64	0	91	127	0
8	LIMITER 3: -18dB	64	0	73	127	0

Notes:
Preset value for Compressor Knee value is always 0 (Hard Knee).

Insert MFX Wah-Wah Presets

Preset is selected by using MIDI NRPN 3x50h, with value = preset number, from 0 to 7

Nb	Name	Preset Default values			
		Filter Type	Frequency	Resonance	Auto-Wah Sens
0	Off	0	127	0	0
1	Auto-Wah 1	0	67	107	127
2	Auto-Wah 2	0	50	75	127
3	Auto-Wah 3	1	70	100	100
4	Wah-Wah 1	0	127	80	0
5	Wah-Wah 2	1	64	80	0

Note:
If Auto-Wah is set ON (Auto-Wah sensitivity > 0), the Wah-Wah Filter Frequency (= Wah-Wah Pedal Position) will be modulated by the current value of the channel level detect. The parameters for setting up the level detector (attack and release) are taken from Compressor settings.

Insert MFX Distortion Presets

Preset is selected by using MIDI NRPN 3x60h, with value = preset number, from 0 to 13

Nb	Name	Preset Default values						
		Drive	Type	Hi-Cut Filter Frequency	Post Gain	Pre Gain	RC LP Filter	Low Lev Cut
OFF								
0	OFF	0	0	127	127	127	127	0
TUBE DISTORTION								
1	TUBE DIST Low 1	3	1	100	60	64	127	1
2	TUBE DIST Low 2	4	2	80	50	64	127	2
3	TUBE DIST Medium 1	5	1	70	40	64	127	2
4	TUBE DIST Medium 2	5	2	70	40	64	127	3
5	TUBE DIST High 1	6	1	60	40	64	127	3
6	TUBE DIST High 2	6	2	60	40	64	127	3
SPECIAL DISTORTION								
7	SMOOTH OD	6	6	50	30	64	80	3
8	DISTORTION	7	1	40	30	64	127	3
9	CRUNCH	5	5	60	40	64	80	3
10	FUZZ	6	7	80	40	64	127	3
11	GRUNGE	5	4	110	40	64	127	2
12	METAL	7	3	40	40	64	127	4
13	MESS	7	0	80	30	64	127	4

Notes:
Preset value for Hi-Cut Filter Q is always 0.

Insert MFX Parametric Equalizer Presets

Presets are selected by using MIDI 3x70h, with value = preset number, from 0 to 13

Nb	Name	Preset Default Values									
		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
0	Flat	64	64	64	64	40	24	64	127	0	64
1	JC Clean	80	30	90	64	40	20	50	60	0	80
2	Acoustic	90	20	110	64	40	26	113	50	30	100
3	Black Panel	80	40	90	64	40	28	30	40	0	40
4	Brit Combo	60	80	80	64	100	64	7	127	0	30
5	Tweed	64	30	80	64	50	42	28	60	100	20
6	Stack Classic	64	20	85	64	80	40	30	40	20	40
7	Metal	64	50	100	64	80	50	35	127	0	70
8	R-Fier	64	20	70	64	80	30	30	80	30	50
9	Dyna Amp	64	20	75	64	40	32	25	127	64	50
10	Crunch	64	75	30	64	40	10	8	127	20	70
11	VO Drive	64	64	90	64	40	20	30	127	64	60
12	BG Lead	64	64	70	64	40	20	64	127	64	64
13	MS HiGain	64	80	50	64	40	10	6	127	80	70

Insert MFX AMP-Model Presets

Preset is selected by using MIDI 3x20h, with value = preset number, from 0 to 13

Nb	Name	Preset Default Values							
		Input Gain	Lo-Cut Filter Frq	Hi-Cut Filter Frq	Compr Preset	Distortion Preset	Wah-Wah Preset	PEQ Preset	
0	OFF	90	0	127	0	0	0	0	
1	JC Clean	90	25	90	0	0	0	1	
2	Acoustic	90	40	127	0	1	0	2	
3	Black Panel	90	25	90	0	2	0	3	
4	Brit Combo	90	40	70	0	9	0	4	
5	Tweed	90	30	80	0	8	0	5	
6	Stack Classic	90	40	80	0	7	0	6	
7	Metal	90	30	70	0	12	0	7	
8	R-Fier	90	30	70	0	13	0	8	
9	Dyna Amp	90	30	70	1	12	0	9	
10	Crunch	90	20	80	0	7	0	10	
11	VO Drive	90	20	80	0	7	0	11	
12	BG Lead	90	20	80	0	8	0	12	
13	MS Higain	90	20	80	0	9	0	13	

Insert MFX Chorus/Flanger/Phaser/Tremolo/Rotary Presets

Preset is selected by using MIDI NRPN 3x30h, with value = preset number, from 0 to 23

Nb	Name	Preset Default Values					
		Volume	Delay	Feedback	Hdamph	Chorus Rate	Chorus Depth
0	OFF	0	/	/	/	/	/
1	Chorus Light 1	56	20	0	0	40	30
2	Chorus Light 2	56	40	0	0	30	30
3	Chorus Medium 1	64	26	0	0	45	40
4	Chorus Medium 2	64	60	0	0	35	50
5	Chorus Deep 1	64	64	0	0	40	70
6	Chorus Deep 2	64	80	0	0	45	90
7	Chorus Fast 1	64	30	0	0	70	10
8	Chorus Fast 2	64	60	0	0	60	20
9	Resonant Chorus	64	30	80	0	40	20
10	Long Time Chorus	64	100	0	0	20	20
11	Flange Light	64	8	32	0	30	30
12	Flange Medium	72	13	72	0	40	80
13	Flange Slow Deep	72	2	50	0	20	90
14	Flange Deep	72	6	100	0	50	100
15	Phaser Light	64	0	80	0	50	50

16	Phaser Medium	64	0	90	0	60	80
17	Phaser Slow Deep	64	0	100	0	20	110
18	Phaser Fast	64	0	40	0	120	60
19	Tremolo Slow	64	0	0	0	20	60
20	Tremolo Medium 1	64	0	0	20	40	70
21	Tremolo Medium 2	64	0	0	40	60	90
22	Tremolo Fast	64	0	0	60	100	110
23	Rotary Slow	90	30	0	0	50	20

Note:
Preset value for Pre-High-pass-Filter is always 0 (off).

Insert MFX Delay Presets

Preset is selected by using MIDI NRPN 3x58h, with value = preset number, from 0 to 4

Nb	Name	Preset Default values			
		Delay Mode	Level	Delay Time	Feedback
0	Off	0	0	0	0
1	Delay 1	0	64	20	8
2	Delay 2	0	64	35	20
3	Pan Delay 1	1	64	50	16
4	Pan Delay 2	1	64	70	32

Note:
Preset value for HDamp is always 0, Pre-Low-Pass-Filter is always 127.

Detailed MIDI Implementation

2 ports of 16 channels are provided for a total of 32 channels. MIDI Message “F5 nn” is used to switch between the two ports (nn=1 or 2).

MIDI Message	HEX Code	Description	Compatibility
NOTE ON	9nH kk vv	Midi channel n(0-15) note ON #kk(1-127), velocity vv(1-127). vv=0 means NOTE OFF	MIDI
NOTE OFF	8nH kk vv	Midi channel n(0-15) note OFF #kk(1-127), vv is don’t care.	MIDI
PITCH BEND	EnH bl bh	Pitch bend as specified by bh|bl (14 bits) Maximum swing is +/- 1 tone (power-up). Can be changed using « pitch bend sensitivity ». Center position is 00H 40H.	GM
PROGRAM CHANGE	CnH pp	Program (patch) change. Specific action on channel 10 (n=9) : select drumset. Refer to sounds / drumset list. Drumsets can be assigned to other channels (see SYSEX MIDI channel to part assign and part to rhythm allocation)	GM/GS
CHANNEL AFTERTOUCH	DnH vv	vv pressure value. Effect set using Sys. Ex. 40H 2pH 20H-26H	MIDI
CTRL 00	BnH 00H cc	Bank select : Refer to sounds list. No action on drumset	GS/ DREAM
CTRL 01	BnH 01H cc	Modulation wheel. Rate and maximum depth can be set using SYSEX	MIDI
CTRL 05	BnH 05H cc	Portamento time.	MIDI
CTRL 06	BnH 06H cc	Data entry : provides data to RPN and NRPN	MIDI
CTRL 07	BnH 07H cc	Volume (default=100)	MIDI
CTRL 10	BnH 0AH cc	Pan (default=64 center)	MIDI
CTRL 11	BnH 0BH cc	Expression (default=127)	MIDI/GM
CTRL 64	BnH 40H cc	Sustain (damper) pedal	MIDI
CTRL 65	BnH 41H cc	Portamento ON/OFF	MIDI
CTRL 66	BnH 42H cc	Sostenuto pedal	MIDI
CTRL 67	BnH 43H cc	Soft pedal	MIDI
CTRL 71	BnH 47H cc	TVF Resonnance modify (same as nrpn 0121h)	GM/GS
CTRL 72	BnH 48H cc	Env release time modify (same as nrpn 0166h)	GM/GS
CTRL 73	BnH 49H cc	Env attack time modify (same as nrpn 0163h)	GM/GS
CTRL 74	BnH 4AH cc	TVF cutoff freq modify (same as nrpn 0120h)	GM/GS
CTRL 75	BnH 4BH cc	Env decay time modify (same as nrpn 0164h)	GM/GS
CTRL 76	BnH 4CH cc	Vibrato rate modify (same as nrpn 0108h)	GM/GS
CTRL 77	BnH 4DH cc	Vibrato depth modify (same as nrpn 0109h)	GM/GS
CTRL 78	BnH 4EH cc	Vibrato delay modify (same as nrpn 010Ah)	GM/GS
CTRL 84	BnH 54H vv	Portamento control	GS
CTRL 91	BnH 5BH vv	Reverb send level vv=00H to 7FH	GS
CTRL 93	BnH 5DH vv	Chorus send level vv=00H to 7FH	GS
CTRL 98	BnH 62H vv	NRPN low	MIDI
CTRL 99	BnH 63H vv	NRPN high	MIDI
CTRL 100	BnH 64H vv	RPN low	MIDI
CTRL 101	BnH 65H vv	RPN high	MIDI
CTRL 120	BnH 78H 00H	All sound off (abrupt stop of sound on channel n)	MIDI
CTRL 121	BnH 79H 00H	Reset all controllers	MIDI
CTRL 123	BnH 7BH 00H	All notes off	MIDI
CTRL 126	BnH 7EH 00H	Mono on	MIDI
CTRL 127	BnH 7FH 00H	Poly on (default power-up)	MIDI

CTRL CC1	BnH ccH vvH	Assignable Controller 1. cc=Controller number (0-5Fh), vv=Control value (0-7Fh). Control number (ccH) can be set on CC1 CONTROLLER NUMBER (Sys. Ex 40 1x 1F). The resulting effect is determined by CC1 controller function (Sys.Ex. 40 2p 40-4A)	GS
CTRL CC2	BnH ccH vvH	Assignable Controller 2. cc=Controller number (00h-5Fh), vv=control value (0-7Fh). Control number can be set on CC2 CONTROLLER NUMBER (Sys.Ex. 40 1x 20). The resulting effect is determined by CC2 controller function (Sys.Ex.40 2p 50-5A).	GS
RPN 0000H	BnH 65H 00H 64H 00H 06H vv	Pitch bend sensitivity in semitones (default=2)	MIDI/GM
RPN 0001H	BnH 65H 00H 64H 01H 06H vv	Fine tuning in cents (vv=00 -100, vv=40H 0, vv=7FH +100	MIDI
RPN 0002H	BnH 65H 00H 64H 02H 06H vv	Coarse tuning in half-tones (vv=00 -64, vv=40H 0, vv=7FH +64	MIDI
NRPN 0108H	BnH 63H 01H 62H 08H 06H vv	Vibrate rate modify (vv=40H -> no modif)	GS
NRPN 0109H	BnH 63H 01H 62H 09H 06H vv	Vibrate depth modify (vv=40H -> no modif)	GS
NRPN 010AH	BnN 63H 01H 62H 0AH 06H vv	Vibrate delay modify (vv=40H -> no modif)	GS
NRPN 0120H	Bnh 63H 01H 62H 20H 06H vv	TVF cutoff freq modify(vv=40H -> no modif)	GS
NRPN 0121H	BnH 63H 01H 62H 21H 06H vv	TVF resonance modify (vv=40H -> no modif)	GS
NRPN 0163H	Bnh 63H 01H 62H 63H 06H vv	Env. attack time modify(vv=40H ->no modif)	GS
NRPN 0164H	BnH 63H 01H 62H 64H 06H vv	Env. decay time modify(vv=40H -> no modif)	GS
NRPN 0166H	BnH 63H 01H 62H 66H 06H vv	Env. release time modif(vv=40H ->no modif)	GS
NRPN 18rrH	BnH 63H 18H 62H rr 06H vv	Pitch coarse of drum instr. note rr in semitones (vv=40H -> no modif) (note 6)	GS
NRPN 1ArrH	BnH 63H 1AH 62H rr 06H vv	Level of drum instrument note rr (vv=00 to 7FH) (note 6)	GS
NRPN 1BrrH	BnH 63H 1BH 62H rr 06H vv	Front/Rear mix of drum instrument note rr (vv=00 to 7FH) (note 6)	DREAM
NRPN 1CrrH	BnH 63H 1CH 62H rr 06H vv	Pan of drum instrument note rr (40H = middle) (note 6)	GS
NRPN 1DrrH	BnH 63H 1DH 62H rr 06H vv	Reverb send level of drum instrument note rr (vv=00 to 7FH) (note 6)	GS
NRPN 1ErrH	BnH 63H 1EH 62H rr 06H vv	Chorus send level of drum instrument note rr (vv=00 to 7FH) (note 6)	GS
Standard Sysex	F0H 7EH 7FH 09H 01H F7H	General MIDI reset (note 4)	GM
Standard Sysex	F0H 7FH 7FH 04H 01H 00H ll F7H	Master volume (ll=0 to 127, default 127) (note 4). Not reset by GS reset	GM
SYSEX	F0H 41H 00H 42H 12H 40H 00H 00H dd dd dd dd xx F7H	Master tune (default dd= 00H 04H 00H 00H) -100.0 to +100.0 cents. Nibblized data should be used (always four bytes). For example, to tune to +100.0 cents, sent data should be 00H 07H 0EH 08H (note 4)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 00H 04H vv xx F7H	Master volume (default vv=7FH) (note 4) Not reset by GS reset.	GS
SYSEX	F0H 41H 00H 42H 12H 40H 00H 05H vv xx F7H	Master key-shift (default vv=40H, no transpose) (note 4)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 00H 06H vv xx F7H	Master pan (default vv=40H, center) (note 4)	
SYSEX	F0H 41H 00H 42H 12H 40H 00H 7FH 00H xx F7H	GS reset (note 4)	GS
SYSEX	F0H 41H 00H 42H 12H 40 01H 10H vv1 vv2 vv3 vv4 vv5 vv6 vv7 vv8 vv9 vv10 vv11 vv12 vv13 vv14 vv15 vv16 xx F7h	Voice reserve : vv1= Part 10 (Default vv=2) vv2 to vv10 = Part 1 to 9 (Default vv=2) vv11 to vv16= Part 11 to 16 (Default vv=0) (note 4)	GS

SYSEX	F0H 41H 00H 42H 12H 40H 01H 30H vv xx F7H	Reverb type (vv=0 to 7), default = 04H 00H : Room1 01H : Room2 02H : Room3 03H : Hall1 04H : Hall2 05H : Plate 06H : Delay 07H : Pan delay (note 5)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 01H 31H vv xx F7H	Reverb character, default 04H (note 5)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 01H 32H vv xx F7H	Reverb Pre-LPF, 0 to 7, default 0 (note 5)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 01H 33H vv xx F7H	Reverb master level, default = 64 (note 5)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 01H 34H vv xx F7H	Reverb time (note 5)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 01H 35H vv xx F7H	Reverb delay feedback. Only if reverb number=6 or 7 (delays) (note 5)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 01H 37H vv xx F7H	Reverb pre delay time (vv=0 to 7Fh = 0ms to 127ms). Only if reverb number=0 to 5 (reverbs)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 01H 38H vv xx F7H	Chorus type (vv=0 to 7), default = 02H 00H : Chorus1 01H : Chorus2 02H : Chorus3 03H : Chorus4 04H : Feedback 05H : Flanger 06H : Short delay 07H : FB delay (note 5)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 01H 39H vv xx F7H	Chorus Pre-LPF, 0 to 7, default = 0 (note 5)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 01H 3AH vv xx F7H	Chorus master level, default = 64 (note 5)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 01H 3BH vv xx F7H	Chorus feedback (note 5)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 01H 3CH vv xx F7H	Chorus delay (note 5)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 01H 3DH vv xx F7H	Chorus rate (note 5)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 01H 3EH vv xx F7H	Chorus depth (note 5)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 01H 3FH vv xx F7H	Chorus send level to reverb, default=0 (note 5)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 02H 00H vv xx F7H	EQ Low Freq, vv: 0=200Hz, 1=400Hz, default 0	GS
SYSEX	F0H 41H 00H 42H 12H 40H 02H 01H vv xx F7H	EQ Low Gain, vv: 0=-12dB, 40h=0dB, to7Fh=+12dB, default 60h=+6dB	GS
SYSEX	F0H 41H 00H 42H 12H 40H 02H 02H vv xx F7H	EQ High Freq, vv: 0=3KHz, 1=6KHz, default 0	GS
SYSEX	F0H 41H 00H 42H 12H 40H 02H 03H vv xx F7H	EQ High Gain, vv: 0=-12dB, 40h=0dB, to7Fh=+12dB, default 60h=+6dB	GS
SYSEX	F0H 41H 00H 42H 12H 40H 1pH 02H nn xx F7H	MIDI channel to part assign, p is part (0 to 15), nn is MIDI channel (0 to 15, 16=OFF). This SYSEX allows to assign several parts to a single MIDI channel or to mute a part. (note 3) Default assignment : <u>part</u> <u>MIDI channel</u> 0 9 (DRUMS) 1-9 0-8 10-15 10-15	GS

SYSEX	F0H 41H 00H 42H 12H 40H 1pH 15H vv xx F7H	Part to rhythm allocation, p is part (0 to 15), vv is 00 (sound part) or 01 (rhythm part). This SYSEX allows a part to play sound or drumset. There is no limitation of the number of parts playing drumset. Default assignment : part 0 plays drums (default MIDI channel 9) all other parts play sound. (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 1pH 40H v1 v2 ... v12 xx F7H	Scale tuning, p is part (0 to 15), v1 to v12 are 12 semi-tones tuning values (C, C#, D, ... A#, B), in the range -64 (00H) 0 (40H) +63(7FH) cents. This SYSEX allows non chromatic tuning of the musical scale on a given part. Default v1, v2, ... ,v12 = 40H, 40H,...,40H (chromatic tuning). Scale tuning has no effect if the part is assigned to a rhythm channel or if the sound played is not of chromatic type. (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 1pH 1AH vv xx F7H	Velocity slope from 00H to 7FH (default = 40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 1pH 1BH vv xx F7H	Velocity offset from 00H to 7FH (default = 40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 1pH 1FH vv xx F7H	CC1 Controller number (00-5FH) (default = 10H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 1pH 20H vv xx F7H	CC2 Controller number (00-5FH) (default = 11H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 00H vv xx F7H	Mod pitch control (-24,+24 semitone) (default = 40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 01H vv xx F7H	Mod tvf cutoff control (default = 40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 02H vv xx F7H	Mod Amplitude control (-100%-+100%) (default=40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 03H vv xx F7H	Mod lfo1 rate control (default = 40H). n is don't care. Rate is common on all channels	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 04H vv xx F7H	Mod lfo1 pitch depth (0-600 cents) (default=0AH) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 05H vv xx F7H	Mod lfo1 tvf depth (default = 0H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 06H vv xx F7H	Mod lfo1 tva depth (0-100%) (default = 0H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 10H vv xx F7H	Bend pitch control (-24,+24 semitone) (default = 42H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 11H vv xx F7H	Bend tvf cutoff control (default = 40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 12H vv xx F7H	Bend Amplitude control (-100%-+100%) (default=40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 14H vv xx F7H	Bend lfo1 pitch depth (0-600 cents) (default=00H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 15H vv xx F7H	Bend lfo1 tvf depth (default = 0H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 16H vv xx F7H	Bend lfo1 tva depth (0-100%) (default = 0H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 20H vv xx F7H	CAF pitch control (-24,+24 semitone) (default = 40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 21H vv xx F7H	CAF tvf cutoff control (default = 40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 22H vv xx F7H	CAF Amplitude control (-100%-+100%) (default=40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H	CAF lfo1 pitch depth (0-600 cents) (default=00H) (note 3)	GS

	2pH 24H vv xx F7H		
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 25H vv xx F7H	CAF lfo1 tvf depth (default = 0H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 26H vv xx F7H	CAF lfo1 tva depth (0-100%) (default = 0H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 40H vv xx F7H	CC1 pitch control (-24,+24 semitone) (default = 40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 41H vv xx F7H	CC1 tvf cutoff control (default = 40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 42H vv xx F7H	CC1 Amplitude control (-100%-+100%) (default=40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 44H vv xx F7H	CC1 lfo1 pitch depth (0-600 cents) (default=00H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 45H vv xx F7H	CC1 lfo1 tvf depth (default = 0H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 46H vv xx F7H	CC1 lfo1 tva depth (0-100%) (default = 0H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 50H vv xx F7H	CC2 pitch control (-24,+24 semitone) (default = 40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 51H vv xx F7H	CC2 tvf cutoff control (default = 40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 52H vv xx F7H	CC2 Amplitude control (-100%-+100%) (default=40H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 54H vv xx F7H	CC2 lfo1 pitch depth (0-600 cents) (default=00H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 55H vv xx F7H	CC2 lfo1 tvf depth (default = 0H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 2pH 56H vv xx F7H	CC2 lfo1 tva depth (0-100%) (default = 0H) (note 3)	GS
SYSEX	F0H 41H 00H 42H 12H 40H 4pH 22H nn xx F7H	with 'p'=MIDI track, 'nn': 0 = track in normal mode, 1 = send to MFX1, 2 = send to MFX2, 3 = send to both MFX	GS / DREAM

Notes :

1. NRPN sending method : CTRL#99=high byte, CTRL#98=low byte, CTRL#6=vv. Example : NRPN 0108h = 40h -> CTRL#99=1, CTRL#98=8, CTRL#6=64.
2. x or xx means « don't care »
3. Cross system exclusive :
   Address can be 040h xxh xxh or 050h xxh xxh
   If addresse=040h xxh xxh : system exclusive applies to midi port 1 (midi channels 0-Fh) if received on midi port1 , applies to midi port 2 (midi channels 10-1Fh) if received on midi port 2.
   If addresse=050h xxh xxh, cross system exclusive : applies to port 2 if received on port1, applies to port 1 if received on port2
4. Non cross system exclusive applying only on receiving port :
   System exclusive applies to midi port 1 (midi channels 0-Fh) if received on midi port1.
   System exclusive applied to midi port 2 (midi channels 10-1Fh) if received on midi port2.
5. Non cross system exclusive applying on both ports :
   System exclusive will be applied to all midi channels (0-1Fh). Can be received on port 1 or port 2 indifferently.
   This is the case for all system exclusive concerning reverb and chorus because reverb and chorus are the same for both ports 1 and 2.
6. Drumset edit Nrpn : 4 different drumset edit tables are implemented :
   - 1 for midi port 1 channel 10
   - 1 for midi port 2 channel 10
   - 1 for midi port 1 channels 1-9 or 11-16 : for all these channels, edit table is the same
   - 1 for midi port 2 channels 1-9 or 11-16 : for all these channels, edit table is the same