Memory Map

Address	Region
0FFFFFFF	Image Shadow
0E00FFFF	Game Pak RAM 0 - 64KB
0E000000	
	Game Pak Flash Wait State 2 1Mbit (128KB)
0DFE0000	
	Game Pak ROM Wait State 2 255Mbits (~32 MB)
0C000000	
	Game Pak Flash Wait State 1 1Mbit (128KB)
0BFE0000	
	Game Pak ROM Wait State 1 255Mbits (~32 MB)
0A000000	
	Game Pak Flash Wait State 0 1Mbit (128KB)
09FE0000	
	Game Pak ROM Wait State 0 255Mbits (~32 MB)
08000000	
	Image Shadow
070003FF	OAM 1KB
07000000	
	Image Shadow
06017FFF	VRAM 96KB
06000000	
	Image Shadow
050003FF	Palette RAM 1KB
05000000	
	Image Shadow
	Hardware Registers
04000000	
	Image Shadow
03007FFF	WRAM 32KB
03000000	
	Image Shadow
0203FFFF	EXRAM 256KB
02000000	
00003FFF	System ROM 16KB
00000000	

VRAM Memory Map BG Mode 0, 1 & 2

Address	Region
06017FFF	OBJ Character Data 16KB
0600A000	Frame Buffer 1 40KB
	Frame Buffer 0 40KB
06000000	

VRAM Memory Map BG Mode 3

Address	Region
06017FFF	OBJ Character Data 16KB
06014000	
	Frame Buffer 0 80KB
06000000	

VRAM Memory Map BG Mode 0, 1 & 2

Address	Region
06017FFF	OBJ Character Data 32KB
06010000	
	BG0 - BG3 Screen Data 32KB Maximum
	BG0 - BG3 Character Data 32KB Minimum
06000000	

Memory Access Width

	Bus	DMA Read	DMA Write	CPU Read	CPU Write
OAM	32	16/32	16/32	16/32	16/32
Palette RAM	16	16/32	16/32	16/32	16/32
VRAM	16	16/32	16/32	16/32	16/32
WRAM	32	16/32	16/32	8/16/32	8/16/32
EXRAM	16	16/32	16/32	8/16/32	8/16/32
Registers	32	16/32	16/32	8/16/32	8/16/32
Game PAK ROM	16	16/32	16/32	8/16/32	16/32
Game PAK Flash	8/16	16/32	16/32	8/16/32	8/16/32
Game PAK SRAM	8			8	8

RGB Colour

Bit	Meaning
15	Unused
14–10	Blue Colour value (0 to 31)
9–5	Green Colour Value (0 to 31)
4–0	Red Colour Value (0 to 31)

ASCII Character Set

		0 0000	1 0001	2 0010	3 0011	4 0100	5 0101	6 0110	7 0111
0	0000	NUL	DEL	SP	0	@	P	`	p
1	0001	SOH	DC1	!	1	A	Q	a	q
2	0010	STX	DC2	"	2	B	R	b	r
3	0011	ETX	DC3	#	3	C	S	c	s
4	0100	EOT	DC4	$	4	D	T	d	t
5	0101	ENQ	NAK	%	5	E	U	e	u
6	0110	ACK	SYN	&	6	F	V	f	v
7	0111	BEL	ETB	'	7	G	W	g	w
8	1000	BS	CAN	(	8	H	X	h	x
9	1001	HT	EM	)	9	I	Y	i	y
A	1010	LF	SUB	*	:	J	Z	j	z
B	1011	VT	ESC	+	;	K	[	k	{
C	1100	FF	FS	,	<	L	\	l		
D	1101	CR	GS	-	=	M	]	m	}
E	1110	SO	RS	.	>	N	^	n	~
F	1111	SI	US	/	?	O	_	o	DEL

Two's Complement

Value	Hex
0	$00
1	$01
2	$02
3	$03
4	$04
5	$05
6	$06
7	$07
8	$08
9	$09
10	$0A
11	$0B
12	$0C
13	$0D
14	$0E
15	$0F
16	$10
32	$20
48	$30
64	$40
80	$50
96	$60
112	$70
113	$71
114	$72
115	$73
116	$74
117	$75
118	$76
119	$77
120	$78
121	$79
122	$7A
123	$7B
124	$7C
125	$7D
126	$7E
127	$7F
−128	$80
−127	$81
−126	$82
−125	$83
−124	$84
−123	$85
−122	$86
−121	$87
−120	$88
−119	$89
−118	$8A
−117	$8B
−116	$8C
−115	$8D
−114	$8E
−113	$8F
−112	$90
−96	$A0
−80	$B0
−64	$C0
−48	$D0
−32	$E0
−16	$F0
−15	$F1
−14	$F2
−13	$F3
−12	$F4
−11	$F5
−10	$F6
−9	$F7
−8	$F8
−7	$F9
−6	$FA
−5	$FB
−4	$FC
−3	$FD
−2	$FE
−1	$FF

Powers of Two

Power	Value	Hex	Power	Value	Hex
0	1	$0001	16	65536	$10000
1	2	$0002	17	131072	$20000
2	4	$0004	18	262144	$40000
3	8	$0008	19	524288	$80000
4	16	$0010	20	1048576	$100000
5	32	$0020	21	2097152	$200000
6	64	$0040	22	4194304	$400000
7	128	$0080	23	8388608	$800000
8	256	$0100	24	16777216	$1000000
9	512	$0200	25	33554432	$2000000
10	1024	$0400	26	67108864	$4000000
11	2048	$0800	27	134217728	$8000000
12	4096	$1000	28	268435456	$10000000
13	8172	$2000	29	536870912	$20000000
14	16384	$4000	30	1073741824	$40000000
15	32768	$8000	31	2147483648	$80000000

Left section (Hardware Registers):

Register	Purpose	Comment	Access	Bit	Addr	Init
DISPCNT	Display Control	OBJ Window Display Flag	R/W	15	000	0080
		Window 1 Display Flag	R/W	14		
		Window 0 Display Flag	R/W	13		
		OBJ Display Flag	R/W	12		
		BG 3 Screen Display Flag	R/W	11		
		BG 2 Screen Display Flag	R/W	10		
		BG 1 Screen Display Flag	R/W	9		
		BG 0 Screen Display Flag	R/W	8		
		Forced Blank	R/W	7		
		OBJ Char Mapping Format	R/W	6		
		H-Blank OBJ Processing	R/W	5		
		Display Frame Buffer Number	R/W	4		
		CGB Mode -- not accessible		3		
		BG Mode	R/W	0-2		
DISPSTAT	Display Control	Vertical Count Setting	R/W	8-15	004	0000
		Vert Counter Match IRQ Enable	R/W	5		
		H-Blank IRQ Enable	R/W	4		
		V-Blank IRQ Enable	R/W	3		
		Vertical Counter Evaluation	R	2		
		H-Blank Status	R	1		
		V-Blank Status	R	0		
VCOUNT	Vertical Counter		R	0-7	006	0000
BG0CNT	BG 0 Text Screen Ctrl	Screen Size	R/W	14-15	008	0000
		Screen Base Block	R/W	8-12		
		Colour Mode	R/W	7		
		Mosaic	R/W	6		
		Character Base Block	R/W	2-3		
		Priority Specification	R/W	0-1		
BG1CNT	BG 1 Text Screen Ctrl	Screen Size	R/W	14-15	00A	0000
		Screen Base Block	R/W	8-12		
		Colour Mode	R/W	7		
		Mosaic	R/W	6		
		Character Base Block	R/W	2-3		
		Priority Specification	R/W	0-1		
BG2CNT	BG 2 Text Screen Ctrl	Screen Size	R/W	14-15	00C	0000
		Area Overflow Processing	R/W	13		
		Screen Base Block	R/W	8-12		
		Colour Mode	R/W	7		
		Mosaic	R/W	6		
		Character Base Block	R/W	2-3		
		Priority Specification	R/W	0-1		
BG3CNT	BG 3 Text Screen Ctrl	Screen Size	R/W	14-15	00E	0000
		Area Overflow Processing	R/W	13		
		Screen Base Block	R/W	8-12		
		Colour Mode	R/W	7		
		Mosaic	R/W	6		
		Character Base Block	R/W	2-3		
		Priority Specification	R/W	0-1		
BG0HOFS	BG 0 Horizontal Scrolling	Horizontal Offset	W	0-8	010	0000
BG0VOFS	BG 0 Vertical Scrolling	Vertical Offset	W	0-8	012	0000
BG1HOFS	BG 1 Horizontal Scrolling	Horizontal Offset	W	0-8	014	0000
BG1VOFS	BG 1 Vertical Scrolling	Vertical Offset	W	0-8	016	0000
BG2HOFS	BG 2 Horizontal Scrolling	Horizontal Offset	W	0-8	018	0000
BG2VOFS	BG 2 Vertical Scrolling	Vertical Offset	W	0-8	01A	0000
BG3HOFS	BG 3 Horizontal Scrolling	Horizontal Offset	W	0-8	01C	0000
BG3VOFS	BG 3 Vertical Scrolling	Vertical Offset	W	0-8	01E	0000
BG2PA	Direction of BG 2 DX	Distance of movement in x along same line	W	0-15	020	0000
BG2PB	Direction of BG 2 DMX	Distance of movement in x along next line	W	0-15	022	0000
BG2PC	Direction of BG 2 DY	Distance of movement in y along same line	W	0-15	024	0000
BG2PD	Direction of BG 2 DMY	Distance of movement in y along next line	W	0-15	026	0000
BG2X_L	Starting Point of Data for X	Rotation/Scaling results low byte	W	0-15	028	0000
BG2X_H	Starting Point of Data for X	Rotation/Scaling results low byte	W	0-15	02A	0000
BG2Y_L	Starting Point of Data for Y	Rotation/Scaling results low byte	W	0-15	02C	0000
BG2Y_H	Starting Point of Data for Y	Rotation/Scaling results high byte	W	0-15	02E	0000
BG3PA	Direction of BG 3 DX	Distance of movement in x along same line	W	0-15	030	0000
BG3PB	Direction of BG 3 DMX	Distance of movement in x along next line	W	0-15	032	0000
BG3PC	Direction of BG 3 DY	Distance of movement in y along same line	W	0-15	034	0000
BG3PD	Direction of BG 3 DMY	Distance of movement in y along next line	W	0-15	036	0000
BG3X_L	Starting Point of Data for X	Rotation/Scaling results low byte	W	0-15	038	0000
BG3X_H	Starting Point of Data for X	Rotation/Scaling results high byte	W	0-15	03A	0000
BG3Y_L	Starting Point of Data for Y	Rotation/Scaling results low byte	W	0-15	03C	0000
BG3Y_H	Starting Point of Data for Y	Rotation/Scaling results high byte	W	0-15	03E	0000
WIN0H	Window 0 Horiz Positions	Left Coord of Window	W	8-15	040	0000
		Right Coord of Window	W	0-7		
WIN1H	Window 1 Horiz Positions	Left Coord of Window	W	8-15	042	0000
		Right Coord of Window	W	0-7		
WIN0V	Window 0 Vert Positions	Lower Coord of Window	W	8-15	044	0000
		Upper Coord of Window	W	0-7		
WIN1V	Window 1 Vert Positions	Lower Coord of Window	W	8-15	046	0000
		Upper Coord of Window	W	0-7		
WININ	Inside Window Control	Wnd 1 OBJ Display Flag	R/W	12	048	0000
		Wnd 1 BG 3 Display Flag	R/W	11		
		Wnd 1 BG 2 Display Flag	R/W	10		
		Wnd 1 BG 1 Display Flag	R/W	9		
		Wnd 1 BG 0 Display Flag	R/W	8		
		Colour Special Effects Flag	R/W	5		
		Wnd 0 OBJ Display Flag	R/W	4		
		Wnd 0 BG 3 Display Flag	R/W	3		
		Wnd 0 BG 2 Display Flag	R/W	2		
		Wnd 0 BG 1 Display Flag	R/W	1		
		Wnd 0 BG 0 Display Flag	R/W	0		
WINOUT	Outside Window Control	Wnd 1 OBJ Display Flag	R/W	12	04A	0000
		Wnd 1 BG 3 Display Flag	R/W	11		
		Wnd 1 BG 2 Display Flag	R/W	10		
		Wnd 1 BG 1 Display Flag	R/W	9		
		Wnd 1 BG 0 Display Flag	R/W	8		
		Wnd 0 OBJ Display Flag	R/W	4		
		Wnd 0 BG 3 Display Flag	R/W	3		
		Wnd 0 BG 2 Display Flag	R/W	2		
		Wnd 0 BG 1 Display Flag	R/W	1		
		Wnd 0 BG 0 Display Flag	R/W	0		
MOSAIC	Mosaic Size	OBJ mosaic V size	W	12-15	04C	0000
		OBJ Mosaic H size	W	8-11		
		BG mosaic V size	W	4-7		
		BG mosaic H size	W	0-3		

Right section:

Register	Purpose	Comment	Access	Bit	Addr	Init
BLDMOD	Blending Mode	2nd target pixel on blend surface	R/W	13	050	0000
		2nd target pixel on OBJ	R/W	12		
		2nd target pixel on BG3	R/W	11		
		2nd target pixel on BG2	R/W	10		
		2nd target pixel on BG1	R/W	9		
		2nd target pixel on BG0	R/W	8		
		type of colour special effect	R/W	6-7		
		1st target pixel on blend surface	R/W	5		
		1st target pixel on OBJ	R/W	4		
		1st target pixel on BG3	R/W	3		
		1st target pixel on BG2	R/W	2		
		1st target pixel on BG1	R/W	1		
		1st target pixel on BG0	R/W	0		
COLEV	Blend Special Effect	Colour Coefficient Special FX EVB	W	8-12	052	0000
		Colour Coefcient Special FX EVA	W	0-4		
COLEY	Fading Special Effect	Colour Coefcient Special FX EVY	W	0-4	054	0000
DM0SAD_L	DMA 0 Source Addr	LSW	W	0-15	0B0	0000
DM0SAD_H	DMA 0 Source Addr	MSW	W	0-10	0B2	0000
DM0DAD_L	DMA 0 Destination Addr	LSW	W	0-15	0B4	0000
DM0DAD_H	DMA 0 Destination Addr	MSW	W	0-10	0B6	0000
DM0CNT_L	DMA 0 Control Low	# Words/Half-words to Transfer	W	0-13	0B8	0000
DM0CNT_H	DMA 0 Control High	DMA Enable Flag	R/W	15	0BA	0000
		Interrupt Request Enable Flag	R/W	14		
		Startup Timing	R/W	12-13		
		Transfer Width	R/W	10		
		Repeat Transfer	R/W	9		
		Source Address Control	R/W	7-8		
		Destination Address Control	R/W	5-6		
DM1SAD_L	DMA 1 Source Addr	LSW	W	0-15	0BC	0000
DM1SAD_H	DMA 1 Source Addr	MSW	W	0-11	0BE	0000
DM1DAD_L	DMA 1 Destination Addr	LSW	W	0-15	0C0	0000
DM1DAD_H	DMA 1 Destination Addr	MSW	W	0-10	0C2	0000
DM1CNT_L	DMA 1 Control Low	# Words/Half-words to transfer	W	0-13	0C4	0000
DM1CNT_H	DMA 1 Control High	DMA Enable Flag	R/W	15	0C6	0000
		Interrupt Request Enable Flag	R/W	14		
		Startup Timing	R/W	12-13		
		Transfer Width	R/W	10		
		Repeat Transfer	R/W	9		
		Source Address Ctrl Flag	R/W	7-8		
		Destination Address Ctrl Flag	R/W	5-6		
DM2SAD_L	DMA 2 Source Address	LSW	W	0-15	0C8	0000
DM2SAD_H	DMA 2 Source Address	MSW	W	0-11	0CA	0000
DM2DAD_L	DMA 2 Destination Address	LSW	W	0-15	0CC	0000
DM2DAD_H	DMA 2 Destination Address	MSW	W	0-10	0CE	0000
DM2CNT_L	DMA 2 Control Low	# Words/Half-words to Transfer	W	0-13	0D0	0000
DM2CNT_H	DMA 2 Control High	DMA Enable Flag	R/W	15	0D2	0000
		Interrupt Request Enable Flag	R/W	14		
		Startup Timing	R/W	12-13		
		Transfer Width	R/W	10		
		Repeat Transfer	R/W	9		
		Source Address Ctrl Flag	R/W	7-8		
		Destination Address Ctrl Flag	R/W	5-6		
DM3SAD_L	DMA 3 Source Address	LSW	W	0-15	0D4	0000
DM3SAD_H	DMA 3 Source Address	MSW	W	0-11	0D6	0000
DM3DAD_L	DMA 3 Destination Address	LSW	W	0-15	0D8	0000
DM3DAD_H	DMA 3 Destination Address	MSW	W	0-10	0DA	0000
DM3CNT_L	DMA 3 Control Low	# Words/Half-words to Transfer	W	0-13	0DC	0000
DM3CNT_H	DMA 3 Control High	DMA Enable Flag	R/W	15	0DE	0000
		Interrupt Request Enable Flag	R/W	14		
		Startup Timing	R/W	12-13		
		Transfer Width	R/W	10		
		Repeat Transfer	R/W	9		
		Source Address Ctrl Flag	R/W	7-8		
		Destination Address Ctrl Flag	R/W	5-6		
TM0D	Timer 0 Setting		R/W	0-15	100	0000
TM0CNT	Timer 0 Control	Timer Operation Flag	R/W	7	102	0000
		Interrupt Request Enable Flag	R/W	6		
		Count-up Timing	R/W	2		
		Pre-scalar Selection	R/W	0-1		
TM1D	Timer 1 Setting		R/W	0-15	104	0000
TM1CNT	Timer 1 Control	Timer Operation Flag	R/W	7	106	0000
		Interrupt Request Enable Flag	R/W	6		
		Count-up Timing	R/W	2		
		Pre-scalar Selection	R/W	0-1		
TM2D	Timer 2 Setting		R/W	0-15	108	0000
TM2CNT	Timer 2 Control	Timer Operation Flag	R/W	7	10A	0000
		Interrupt Request Enable Flag	R/W	6		
		Count-up Timing	R/W	2		
		Pre-scalar Selection	R/W	0-1		
TM3D	Timer 3 Setting		R/W	0-15	10C	0000
TM3CNT	Timer 3 Control	Timer Operation Flag	R/W	7	10E	0000
		Interrupt Request Enable Flag	R/W	6		
		Count-up Timing	R/W	2		
		Pre-scalar Selection	R/W	0-1		
SCD0	Serial Comms Data 0	Player Data (32-bit Mode)	R/W	0-15	120	0000
SCD1	Serial Comms Data 1	Player Data (32-bit Mode)	R/W	0-15	122	0000
SCD2	Serial Comms Data 2	Player 2 Data (16-bit multi-player)	R/W	0-15	124	0000
SCD3	Serial Comms Data 3	Player 3 Data (16-bit multi-player)	R/W	0-15	126	0000
SCCNT_L	Serial Ctrl LSW (normal)	Interrupt Request Enable Flag	R/W	14	128	0000
		Transfer Length Set Flag	R/W	12		
		Start Bit	R/W	7		
		Transfer Enable Tx Flag	R/W	3		
		Transfer Enable Rx Flag	R	2		
		Internal Shift Clock Frequency	R/W	1		
		Shift Clock Selection	R/W	0		
SCCNT_L	Serial Ctrl LSW (multiplayer)	Interrupt Request Enable Flag	R/W	14	128	0000
		If Master=Start Bit/If Slave=Busy Flag	R/W	7		
		Communication Error Flag	R/W	6		
		Multi-player ID Flag	R/W	4-5		
		SD Terminal	R	3		
		SI Terminal	R	2		
		Baud Rate	R/W	0-1		
SCCNT_H	Serial Ctrl MSW (normal)	Low 8-bits Used for 8-bit Transfers	R/W	0-7	12A	0000

Hardware Registers

Register	Purpose	Comment	Access	Bit	Address	Initial
P1	Player 1 Key Status	RIGHT SHOULDER Button Status	R/W	9	130	0000
		LEFT SHOULDER Button Status	R/W	8		
		DOWN Button Status	R/W	7		
		UP Button Status	R/W	6		
		LEFT Button Status	R/W	5		
		RIGHT Button Status	R/W	4		
		START Button Status	R/W	3		
		SELECT Button Status	R/W	2		
		B Button Status	R/W	1		
		A Button Status	R/W	0		
P1CNT	Player 1 Ctrl	Interrupt Condition Specification Flag	R/W	15	132	0000
		Interrupt Request Enable Flag	R/W	14		
		RIGHT SHOULDER Interrupt Enable	R/W	9		
		LEFT SHOULDER Interrupt Enable	R/W	8		
		DOWN Button Interrupt Enable	R/W	7		
		UP Button Interrupt Enable	R/W	6		
		LEFT Button Interrupt Enable	R/W	5		
		RIGHT Button Interrupt Enable	R/W	4		
		START Button Interrupt Enable	R/W	3		
		SELECT Button Interrupt Enable	R/W	2		
		B Button Interrupt Enable	R/W	1		
		A Button Interrupt Enable	R/W	0		
R	Communication Ctrl	Communication Function Set Flag	R/W	14-15	134	0000
		Interrupt Request Enable Flag	R/W	8		
		I/O Selection Flag SO,SI,SD,SC	R/W	4-7		
		Data bits SO,SI,SD,SC	R/W	0-3		
HS_CTRL	JOY Bus Comm Control	Interrupt Request Enable Flag	R/W	6	140	0000
		Send Complete Flag	R/W	2		
		Receive Complete Flag	R/W	1		
		Device Reset Signal Receive Flag	R/W	0		
JOYRE_L	JOY Bus Rx Data LSW		R/W	0-15	150	0000
JOYRE_H	JOY Bus Rx Data MSW		R/W	0-15	152	0000
JOYTR_L	JOY Bus Tx Data LSW		R/W	0-15	154	0000
JOYTR_H	JOY Bus Tx Data MSW		R/W	0-15	156	0000
JSTAT	JOY Bus Rx Status	General Purpose Flag	R/W	4-5	158	0000
		Send Status Flag	R/W	3		
		Receive Status Flag	R/W	1		
IE	Interrupt Enable	Game Pak (DREQ/IREQ)	R/W	13	200	0000
		Key	R/W	12		
		DMA 3	R/W	11		
		DMA 2	R/W	10		
		DMA 1	R/W	9		
		DMA 0	R/W	8		
		Joy/UART/Serial/General Comms	R/W	7		
		Timer 3	R/W	6		
		Timer 2	R/W	5		
		Timer 1	R/W	4		
		Timer 0	R/W	3		
		V Counter Match	R/W	2		
		Rendering H Blank	R/W	1		
		Rendering V Blank	R/W	0		
IF	Interrupt Request	Game Pak (DREQ/IREQ)	R	13	202	0000
		Key	R	12		
		DMA 3	R	11		
		DMA 2	R	10		
		DMA 1	R	9		
		DMA 0	R	8		
		Serial/General/JOY/UART Comms	R	7		
		Timer 3	R	6		
		Timer 2	R	5		
		Timer 1	R	4		
		Timer 0	R	3		
		V Counter Matching	R	2		
		Rendering H Blank	R	1		
		Rendering V Blank	R	0		
WSCNT	Cart Memory Wait State Ctrl	Game Pak Type Flag	R	15	204	0000
		Prefetch Buffer Flag	R/W	14		
		PHI Terminal Output Ctrl	R/W	11-12		
		Wait State 2/Wait Ctrl	R/W	8-10		
		Wait State 1/Wait Ctrl	R/W	5-7		
		Wait State 0/Wait Ctrl	R/W	2-4		
		RAM Wait Ctrl	R/W	0-1		
IME	Interrupt Master Enable		R/W	0	208	0000

Register	Purpose	Comment	Access	Bit	Addr	Init
SG10_L	Sweep Time	Interval of frequency change	R/W	4-6	060	0000
	Sweep Increase/Decrease	0=freq increases/1=freq decreases	R/W	3		
	Number of Sweep Shifts		R/W	0-2		
SG10_H	Envelope Initial Value		R/W	12-15	062	0000
	Envelope Increase/Decrease	0=attenuate/1=amplify	R/W	11		
	Number of Envelope Steps		R/W	8-10		
	Waveform Duty Cycle		R/W	6-7		
	Sound Length		W	0-5		
SG11	Initialisation Flag		W	15	064	0000
	Sound Length Flag	0=continuous/1=counter	R/W	14		
	Frequency Data		W	0-10		
SG20	Envelope Initial Value		R/W	12-15	068	0000
	Envelope Increase/Decrease	0=attenuate/1=amplify	R/W	11		
	Number of Envelope Steps		R/W	8-10		
	Waveform Duty Cycle		R/W	6-7		
	Sound Length		W	0-5		
SG21	Initialisation Flag		W	15	06C	0000
	Sound Length	0=continuous/1=counter	R/W	14		
	Frequency Data		W	0-10		
SG30_L	Sound Output Flag	0=stop output	R/W	7	070	0000
	Waveform RAM Bank Specification	0=bank #0/1=bank #1	R/W	6		
	Waveform RAM Data Association Spec	0=32 steps/1=64 steps	R/W	5		
SG30_H	Forced ¾ Output Level Spec. Flag		R/W	15	072	0000
	Output Level Selection		R/W	13-14		
	Sound Length		W	0-7		
SG31	Initialisation Flag		W	0-15	074	0000
	Sound Length Flag	0=continuous/1=counter	R/W	14		
	Frequency Data		W	0-10		
SG40	Envelope Initial Value		R/W	12-15	078	0000
	Envelope Increase/Decrease	0=attentuate/1=amplify	R/W	11		

Register	Purpose	Comment	Access	Bit	Addr	Init
SG41	Initialisation		W	0-15	07C	0000
	Sound Length Flag	0=continuous/1=counter	R/W	14		
	Polynomial Counter Shift Clock Freq. Select		R/W	4-7		
	Polynomial Counter Step Number Select		R/W	3		
	Divide Ratio Freq. Select		R/W	0-2		
SGCNT0_L	Sound 4 Left Output Flag		R/W	15	080	
	Sound 3 Left Output Flag		R/W	14		
	Sound 2 Left Output Flag		R/W	13		
	Sound 1 Left Output Flag		R/W	12		
	Sound 4 Right Output Flag		R/W	11		
	Sound 3 Right Output Flag		R/W	10		
	Sound 2 Right Output Flag		R/W	9		
	Sound 1 Right Output Flag		R/W	8		
	Left Output Level		R/W	4-6		
	Right Output Level		R/W	0-2		
SGCNT0_H	Direct Sound FIFO B Reset		R/W	15	082	0000
	Timer Select for Direct Sound B	0=timer #0/1=timer #1	R/W	14		
	Left Output of Direct Sound B	0=no output	R/W	13		
	Right Output of Direct Sound B	0=no output	R/W	12		
	Direct Sound FIFO A Reset		R/W	11		
	Timer Select for Direct Sound A	0=timer #0/1=timer #1	R/W	10		
	Left Output of Direct Sound A	0=no output	R/W	9		
	Right Output of Direct Sound A	0=no output	R/W	8		
	Output Ratio for Direct Sound B	0=½ range/1=full range	R/W	3		
	Output Ratio for Direct Sound A	0=½ range/1=full range	R/W	2		
	Output Ratio for Synthesis of Sounds	00 = ¼ output / 01 = ½ output / 10 = Full range	W	0-1		
SGCNT1	All Sounds Operation Flag	0=halt all sound	R/W	7	084	0000
	Sound 4 Operation Flag	0=sound halted	R	3		
	Sound 3 Operation Flag	0=sound halted	R	2		
	Sound 2 Operation Flag	0=sound halted	R	1		
	Sound 1 Operation Flag	0=sound halted	R	0		
SGBIAS	Amplitude Res./Sampling Cycle	00 = 9 bit amp/32.768kHz sample / 01 = 8 bit amp/65.536kHz sample / 10 = 7 bit amp/131.072kHz sample / 11 = 6 bit amp/262.144kHz sample	R/W	14-15	088	0200
	Bias Levels		R/W	0-9		
SGWR0_L	Step 2		R/W	12-15	090	
	Step 3		R/W	8-11		
	Step 0		R/W	4-7		
	Step 1		R/W	0-3		
SGWR0_H	Step 6		R/W	12-15	092	
	Step 7		R/W	8-11		
	Step 4		R/W	4-7		
	Step 5		R/W	0-3		
SGWR1_L	Step 10		R/W	12-15	094	
	Step 11		R/W	8-11		
	Step 8		R/W	4-7		
	Step 9		R/W	0-3		
SGWR1_H	Step 14		R/W	12-15	096	
	Step 15		R/W	8-11		
	Step 12		R/W	4-7		
	Step 13		R/W	0-3		
SGWR2_L	Step 18		R/W	12-15	098	
	Step 19		R/W	8-11		
	Step 16		R/W	4-7		
	Step 17		R/W	0-3		
SGWR2_H	Step 22		R/W	12-15	09A	
	Step 23		R/W	8-11		
	Step 20		R/W	4-7		
	Step 21		R/W	0-3		
SGWR3_L	Step 26		R/W	12-15	09C	
	Step 27		R/W	8-11		
	Step 24		R/W	4-7		
	Step 25		R/W	0-3		
SGWR3_H	Step 30		R/W	12-15	09E	
	Step 31		R/W	8-11		
	Step 28		R/W	4-7		
	Step 29		R/W	0-3		
SGFIFOA_L	Sound Data 0 & 1		W	0-15	0A0	
SGFIFOA_H	Sound Data 2 & 3		W	0-15	0A2	
SGFIFOB_L	Sound Data 0 & 1		W	0-15	0A4	
SGFIFOB_H	Sound Data 2 & 3		W	0-15	0A6	