REGISTER DESCRIPTION

VERSION 0.0
06/05/2011

CONTROL REGISTERS

$DE00

7	6	5	4	3	2	1	0
A20	A19	A18	A17	A16	A15	A14	A13

$DE01

7	6	5	4	3	2	1	0
						A22	A21

$DE02

7	6	5	4	3	2	1	0
LED 0 = LED OFF	USB DISABLE 0= DISABLED				JUMPER 0 = BOOT JUMPER ENABLED	EXROM 0 = /EXROM HIGH	GAME 0 = /GAME HIGH

$DE03

7	6	5	4	3	2	1	0
	A19-A22 UNPROTECT 0 = PROTECT ON	A18 PROTECT 0 = PROTECT OFF	A17 PROTECT 0 = PROTECT OFF	AR RAM $8000 0 = DISABLED	AR MODE 0 = DISABLED	ROM X SWITCH ROML & ROMH 0 = DISABLED	RAM 0 = $DF00 RAM ENABLED

$DE03 DESCRIPTION

RAM:
This bit enables and disables RAM at $DF00, RAM is enabled by default. Disabling possibly allows other devices to be placed at $DF00 (such as REU?).

ROM X:
By default the High ROM is selected by /ROMH and the Low ROM is selected by /ROML, setting this bit will switch the High and Low ROMs around. Meaning for example, the High ROM can be seen at $8000 and the Low ROM can be seen at $A000.

AR MODE:
Enables Freezer cartridge mode.

AR RAM $8000:
Enables the AR MODE (Freezer cartridge) RAM at $8000 without having to enter AR MODE.

A17 PROTECT AND A18 PROTECT:
Setting these bits whill disable writes to A17 & A18 allowing virtual 512k and 256k cartridges.

A19-A22 UNPROTECT:
Setting these bits will allow A19-A22 to be written to, after writing an address to $DE00 & $DE01 and then clearing this bit again allows a 16MB cartridge to be treated as though it is a 1MB cartridge. It is possible to treat the 16MB cartridge as though it is 16 x 1MB cartridges.

$DE02 DESCRIPTION

USB DISABLE:
Setting this bit will enable the USB to write to the Flash ROM.

AR MODE

$DE00

7	6	5	4	3	2	1	0
A15	RESUME	AR RAM $8000 ENABLE	A14	A13	KILL	EXROM 0 = /EXROM LOW	GAME 0 = /GAME HIGH

$DE01

7	6	5	4	3	2	1	0
						A22	A21

$DE02

7	6	5	4	3	2	1	0
LED 0 = LED OFF	USB DISABLE 0= DISABLED		AR RAM BANK (A14)	AR RAM BANK (A13)	JUMPER 0 = BOOT JUMPER ENABLED	EXROM 0 = /EXROM LOW	GAME 0 = /GAME HIGH

$DE03

7	6	5	4	3	2	1	0
	A19-A22 UNPROTECT 0 = PROTECT ON	A18 PROTECT 0 = PROTECT OFF	A17 PROTECT 0 = PROTECT OFF	AR RAM $8000 ENABLE 0 = DISABLED	AR MODE 0 = DISABLED	ROM X SWITCH ROML & ROMH 0 = DISABLED	RAM 0 = $DF00 RAM ENABLED

$DE00 DESCRIPTION

AR Mode is for compatibility with freezer cartridges, While AR Mode is enabled the usual $DE00 register is switched out and the AR MODE register are switched in. Most of the control bits are mirrors of the other control bits and therefore share the same name as the bit that they mirror (e.g. changing bit 1 of $DE03 is the same as changing the bit 1 at $DE00).

EXROM:
While AR MODE is enabled EXROM now asserts a low on the /EXROM line when not set.

KILL:
Setting this bit will kill $DE00 (While in AR MODE). $DE00 comes back when a freeze takes place.

A13, A14 & A15:
Controls the banking of the cartridge ROM.

AR RAM $8000 ENABLE:
Setting this bit will place 8k of AR RAM at $8000. While in AR MODE $DF00 - $DFFF will normally mirror the last page of the ROM in the $8000 - $9FFF area (as per a genuine AR cartridge), however with the AR RAM enabled, $DF00 - $DFFF will instead mirror the last page of the AR RAM in the $8000 - $9FFF area (as per a genuine AR cartridge).

With the AR RAM bit enabled, any writes to RAM at $8000 - $9FFF will be written to both the system RAM and the AR RAM. Reading from RAM at $8000 - $9FFF will read the system RAM only and not the AR RAM with the exception of when accessing the ROM at $8000 - $9FFF (this is when /EXROM is asserted LOW by a cartridge while LORAM & HIRAM are high), causing the read to come from the AR RAM.

While in Ultimax mode (with AR RAM enabled) all reads and writes are to AR RAM exclusively.

The Alien Flash has correct RAM operation as per a genuine AR cartridge, surprisingly, other AR compatible cartridges do not have 100% correct RAM operation as they do not allow writing to the AR RAM outside of Ultimax mode, however a genuine AR cartridge allows this and this feature is used by some software.

There is one difference between a genuine AR cartridge and the Alien Flash, a genuine AR cartridge does contain what could be described as a flaw or a bug where it reads from both system RAM and the AR RAM simultaneously causing contention on the Data Bus if the system RAM and the AR RAM do not contain the exact same data. This flaw has been corrected in the Alien Flash, reads from system RAM will read the system RAM only.

Please refer to the following table showing the operation of the RAM in genuine AR cartridge & the Alien Flash cartridge.

Genuine AR cartridge & Alien Flash on board RAM operation.

	READS FROM	WRITES TO
NORMAL	SYSTEM RAM*	SYSTEM RAM & AR RAM
ACCESSING ROM @ $8000	AR RAM	SYSTEM RAM & AR RAM
ULTIMAX MODE	AR RAM	AR RAM

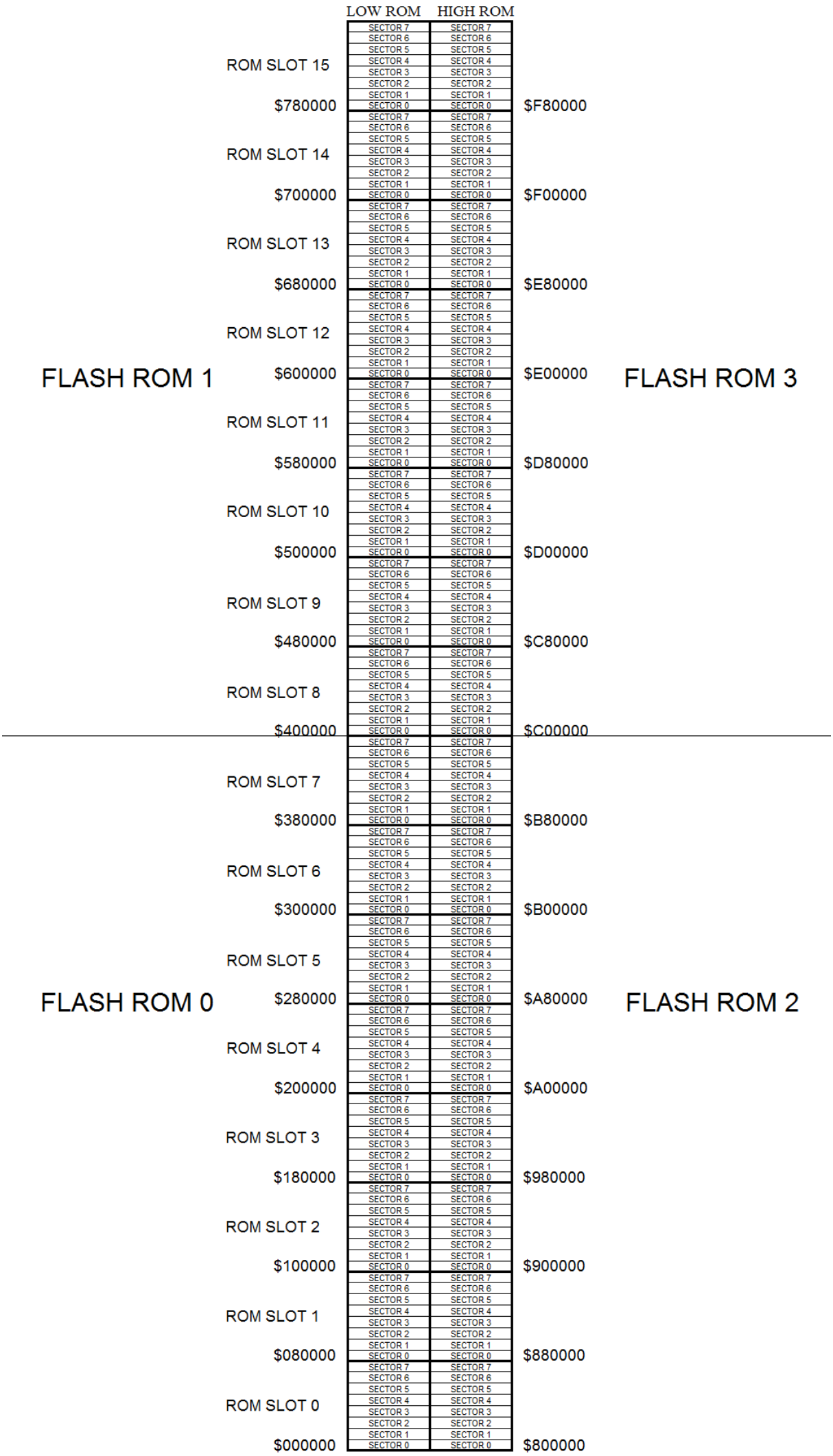
*A genuine AR cartridge will exhibit a flaw under some circumstances as it will also read from AR RAM.

RESUME:
When the system is in a frozen state, this bit is set to resume from the freeze.

$DE02 DESCRIPTION

AR RAM BANK (A13) & AR RAM BANK (A14):
These bits are for banking the $8000 RAM, they allow you to select 1 out of the 4 8K RAM banks. Changing the bank for RAM at $8000 also changes the bank for RAM at $DF00. These bits are also available while not in AR MODE. Please note that ROM banking and RAM banking are independent of each other.

Alien Flash ROM Map



POSSIBLE FUTURE REGISTERS

$DE00

7	6	5	4	3	2	1	0
A20	A19	A18	A17	A16	A15	A14	A13

$DE01

7	6	5	4	3	2	1	0
A28	A7	A26	A25	A24	A23	A22	A21

$DE02

7	6	5	4	3	2	1	0
LED 0 = LED OFF	USB DISABLE 0= DISABLED	AR RAM BANK (A15)	AR RAM BANK (A14)	AR RAM BANK (A13)	JUMPER 0 = BOOT JUMPER ENABLED	EXROM 0 = /EXROM HIGH	GAME 0 = /GAME HIGH

$DE03

7	6	5	4	3	2	1	0
>A22 UNPROTECT 0 = PROTECT ON	A19-A22 UNPROTECT 0 = PROTECT ON	A18 PROTECT 0 = PROTECT OFF	A17 PROTECT 0 = PROTECT OFF	AR RAM $8000 0 = DISABLED	AR MODE 0 = DISABLED	ROM X SWITCH ROML & ROMH 0 = DISABLED	RAM 0 = $DF00 RAM ENABLED

POSSIBLE FUTURE REGISTERS:
The light grey control bits show implementation of control registers for a possible expanded cartridge in the future that could have larger ROM and 64K RAM.