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Application Note

Excimer Protect/Unprotect Facility

This document describes how to protect and unprotect sectors of Flash memory on the Excimer evaluation board. It describes the software commands in the DINK32 debug monitor that can be used with a 12-volt power supply to protect and unprotect sectors of the Flash memory on this board. Note that all provisions described for the Excimer board in this document also apply to the Maximer evaluation board.

In addition, this document describes the use of the MDINK32 program to update MDINK32. In most cases, MDINK32 does not need to be modified. The basic use for MDINK32 is to erase all of Flash memory except itself and download a new version of DINK32 and/or user programs. However, MDINK32 may also be improved in future releases and if the improvements are sufficient to warrant upgrading MDINK32, the user may also unprotect sector SA15, download a new version of MDINK32, and then protect sector SA15. See Part III, “Replacing MDINK32.”

The document contains the following topics:

1. The 12-volt power supply and where to attach it to the board
2. The software commands in DINK32 for protecting, erasing, and unprotecting sectors of Flash
3. Downloading a new version of MDINK32
4. References

Part I Flash Memory and the 12-Volt Power Supply

The Excimer board uses Am29LV800BB Flash memory devices. There are four per board, and they are addressed as bottom boot block sector devices. See Part IV, “References,” for a reference to the Flash memory documentation. The Flash memory can be hardware protected. The four flash memory devices on the Excimer board are configured as shown in Table 1.

Table 1. Excimer Flash Sector Protection and Ranges

Sector	Protection	Range
SA0	unprotected	0xFFC0_0000–0xFFC0_FFFF
SA1	unprotected	0xFFC1_0000–0xFFC1_7FFF
SA2	unprotected	0xFFC1_8000–0xFFC1_FFFF
SA3	unprotected	0xFFC2_0000–0xFFC3_FFFF
SA4	unprotected	0xFFC4_0000–0xFFC7_FFFF
SA5	unprotected	0xFFC8_0000–0xFFCB_FFFF
SA6	unprotected	0xFFCC_0000–0xFFCF_FFFF
SA7	unprotected	0xFFD0_0000–0xFFD3_FFFF
SA8	unprotected	0xFFD4_0000–0xFFD7_FFFF
SA9	unprotected	0xFFD8_0000–0xFFDB_FFFF
SA10	unprotected	0xFFDC_0000–0xFFDF_FFFF
SA11	unprotected	0xFFE0_0000–0xFFE3_FFFF
SA12	unprotected	0xFFE4_0000–0xFFE7_FFFF
SA13	unprotected	0xFFE8_0000–0xFFEB_FFFF
SA14	unprotected	0xFFEC_0000–0xFFEF_FFFF
SA15	protected	0xFFF0_0000–0xFFF3_FFFF
SA16	unprotected	0xFFF4_0000–0xFFF7_FFFF
SA17	unprotected	0xFFF8_0000–0xFFFB_FFFF
SA18	unprotected	0xFFFC_0000–0xFFFF_FFFF

Each sector is associated with a particular range of addresses and can be designated as protected or unprotected individually. Note that sector address SA15 is delivered in protected mode on the Excimer board. The program MDINK32 is loaded at address 0xFFF0_0000 (which corresponds to SA15); and it is protected so that the user can not inadvertently remove it. If the user wishes to update MDINK32, SA15 must be unprotected. DINK32 is loaded at address 0xFFC_0000, which corresponds to SA0.

It is never necessary for the user to change any of the protection on these sectors. However the user may wish to protect some sectors to preclude the possibility of changing the data in these sectors.

In order to change the protection for any sector, it is necessary to execute a DINK32 command while simultaneously applying 12 volts (11.5 to 12.5 volts) to the reset pin of the Flash memory devices. The reset pins of the Flash devices are labeled VPP on Excimer R3.0 or later. The positive pole of the 12 volts should be connected to this VPP pin, and the ground pole should be connected to the pin labeled GROUND.

The 12-volt power supply must be turned off before attaching or detaching the connections. Connecting +12V at VPP without the connection to ground will destroy the board.

Excimer Rev2.0 (or earlier) boards do not support the application of the 12 volts because the reset pins of the Flash devices are not connected to a VPP pin.

Note the following about the location of the VPP and GROUND pins for the 12-volt connections:

- On the Excimer board, the GROUND pin is located between J10, the serial port, SW1, the reset button. The VPP pin can be found near U3 (one of the Flash memory devices).
- On the Maximer board, the GROUND pin is located between SW1, the reset button and the J4 jumpers. The VPP pin can be found near U3 (one of the Flash memory devices).

Part II DINK32 Software Commands for Sectors

This section provides information on Dink32 software commands for sectors.

2.1 Sector Display Command

DINK32 Ver10.5 is the first version that includes the command `fl -dsi` for displaying the sectors, the protection status, and the range of memory associated with each sector. The memory range was implemented in Ver10.7.

The user should use the `fl -dsi` command to ascertain which vectors are protected and which are not, as well as the memory ranges. The `fl -dsi` command automatically detects whether the board is a Rev 2.0 or a Rev 3.0 board. The initial sector protection will be displayed as shown below:

```
DINK32_603e >>fl -dsi
Display Sector Information 0.7  Excimer Rev 3 and later
Manufacturer ID is 0x1, Device ID is 0x225b
Description     Value           Address Range
Sector SA0   UNPROTECTED   0xffc00000 - 0xffc0ffff
Sector SA1   UNPROTECTED   0xffc10000 - 0xffc17fff
Sector SA2   UNPROTECTED   0xffc18000 - 0xffc1ffff
Sector SA3   UNPROTECTED   0xffc20000 - 0xffc3ffff
Sector SA4   UNPROTECTED   0xffc40000 - 0xffc7ffff
Sector SA5   UNPROTECTED   0xffc80000 - 0xffcbffff
Sector SA6   UNPROTECTED   0xffcc0000 - 0xffcfffff
Sector SA7   UNPROTECTED   0xffd00000 - 0xffd3ffff
Sector SA8   UNPROTECTED   0xffd40000 - 0xffd7ffff
Sector SA9   UNPROTECTED   0xffd80000 - 0xffdbffff
Sector SA10  UNPROTECTED   0xffdc0000 - 0xffdfffff
Sector SA11  UNPROTECTED   0xffe00000 - 0xffe3ffff
Sector SA12  UNPROTECTED   0xffe40000 - 0xffe7ffff
Sector SA13  UNPROTECTED   0xffe80000 - 0xffebffff
Sector SA14  UNPROTECTED   0xffec0000 - 0xffefffff
Sector SA15  PROTECTED     0xfff00000 - 0xfff3ffff
Sector SA16  UNPROTECTED   0xfff40000 - 0xfff7ffff
Sector SA17  UNPROTECTED   0xfff80000 - 0xfffbffff
Sector SA18  UNPROTECTED   0xfffc0000 - 0xffffffff
```

2.2 Sector Erase and Protect Commands

DINK32 Ver10.7 is the first version that includes the command `fl -sp` for protecting sectors. The hardware and software allows the user to specifically protect any one of the 19 sectors individually. Sector protection can not occur until the 12V power supply is connected as described in Part I, “Flash Memory and the 12-Volt Power Supply.”

Note that while the 12 volts are applied as described in Part I, “Flash Memory and the 12-Volt Power Supply,” all the sectors appear to be unprotected. This can be verified by issuing the `fl -dsi` command. However, if no sector protection is changed, and the 12 volts are removed, the memory protection reverts back to the state of sector protection before the 12 volts were applied.

2.2.1 Erasing Sectors

Only unprotected sectors can be erased or written. If a sector has been explicitely unprotected or if the 12 volts are applied and all sectors appear unprotected, it is possible to erase one of these unprotected sectors using the `fl -se -n <value>` command.

For example, if SA18 is unprotected, it can be erased with the following:

```
DINK32_603e >>fl -se -n 18

Erasing sector 18
```

On the other hand, if the 12 volts are not being applied and the sector is protected (for example SA15), the erasure can not proceed as shown below:

```
DINK32_603e >>fl -se -n 15

Selected Sector 15 is PROTECTED, can not be erased

ERROR : (0xf100) : FLASH error
```

2.2.2 Writing to Sectors

Note that when the 12 volts are applied, it is also possible to write to a protected sector (because the application of the 12 volts temporarily unprotects all sectors). For example, in order to write a new MDINK32 program to SA15, which is protected, the 12 volts can be applied and then the `fw -e` command can be executed while MDINK32 is running on the board (see Part III, “Replacing MDINK32”). The `fw -e` command erases all of Flash (unprotected while the 12 volts are applied) and copies the program in RAM (MDINK32) into SA15 of Flash memory.

2.2.3 Protecting Sectors

While the 12 volts are applied, it is possible to change any particular unprotected sector (all of them temporarily unprotected) to a protected sector with the `fl -sp -n <value>` command. For example, to protect sector SA18 and SA7, the following commands are used.

```
DINK32_603e >>fl -sp -n 18

Protecting Sector 18

Sector Protect Successful for SA18

DINK32_603e >>fl -sp -n 7

Protecting Sector 7

Sector Protect Successful for SA7
```

Also, note that the sector number must be between 0 and 18, or an error is generated as follows:

```
DINK32_603e >>fl -sp -n 19
Must specify a sector number between 0 and 18
ERROR : (0xfd00) : NOT valid
```

2.3 Sector Unprotect Command

DINK32 Ver11.0 is the first version that includes the command `fl -su` for unprotecting all sectors. The hardware and software does not allow the user to unprotect only one of the 19 sectors individually.

When the 12 volts are applied to the Flash memory as described earlier, then the sector protect and unprotect commands are enabled. Note that as described earlier, while the 12 volts are applied, all the sectors appear to be unprotected. This can be verified by issuing the `fl -dsi` command.

When the user specifies a sector with the `fl -su` command that is already explicitely unprotected, then nothing changes, for example, the command is essentially a no operation. However, when the user specifies a sector that is protected (protected before the application of the 12 volts), then all the sectors change to unprotected upon execution of the `fl -su` command (and they remain unprotected upon removal of the 12 volts).

Thus, when 12 volts are applied, the unprotect command executes. However, the results are as follows:

- If the sector was not protected, then nothing changes.
- If the sector was explicitely protected before the 12 volts are applied, then all sectors are unprotected.

If the user desires that some sectors remain protected, it is necessary to protect those sectors individually as shown in Section 2.2.3, “Protecting Sectors,” after unprotecting all the sectors as shown in this section.

When a sector is protected and 12 volts are not applied, then the unprotect command fails as follows:

```
DINK32_603e >>fl -su -n 15

Unprotecting Sector 15

Sector Unprotect failed for SA15!!!

ERROR : (0xf100) : FLASH error
```

Part III Replacing MDINK32

There are three methods for replacing MDINK32:

1. If the Flash memory is erased and neither DINK32 nor MDINK32 can boot on Excimer, then a separate in-circuit emulator (ICE) such as a powertap or HP device must be used to replace MDINK32 as described in this method. Using the ICE, download MDINK32 to RAM and run it. Apply the 12-volt power supply as described in Part I, “Flash Memory and the 12-Volt Power Supply,” and then issue the MDINK32 command, `fw -e`. Finally, remove the 12-volt power supply.
2. If the user wishes to change the protection of Flash, then this method must be used. Using only the Excimer board, apply the 12-volt power supply as described in Part I, “Flash Memory and the 12-Volt Power Supply”. While running the current DINK32, issue the command, `fl -su -n 15`, to unprotect sector 15. Remove the 12-volt power supply. Download the new MDINK32 by issuing the command `dl -fl -o fff00000`. The download must not be stopped prematurely or MDINK32 will be corrupted and the board will no longer boot. When the download is complete,

apply the 12-volt power supply and protect sector 15 and other sectors desired (remember, all sectors are unprotected by the `fl -su` command) by issuing the command `fl -sp -n 15` (and others). Finally, remove the 12-volt power supply.

3. For all other cases, this method can be used to replace MDINK32. Using only the Excimer board, apply the 12-volt power supply as described in Part I, “Flash Memory and the 12-Volt Power Supply”. While running the current DINK32, issue the command, `fl -se -n 15`. This will erase sector 15 of Flash memory. Then issue the command, `dl -fl -o fff00000`, and download the new MDINK32 configured to load at 0xfff00000. The download must be performed after erasing sector 15 and must not be stopped prematurely or MDINK32 will be corrupted and the board will no longer boot. Remove the 12-volt power supply. This method has no side effects (specifically, it does not unprotect any sectors).

Part IV References

1. AMD *Am29Lv800B Data Sheet*, Publication Number 21490, available on the web site http://www.amd.com/products/nvd/techdocs/techdocs.html
2. AMD *Reset Pin Circuitry for Flash Memory Sector Protection Management Application Note*, Publication Number 22278, available on the web site http://www.amd.com/products/nvd/techdocs/techdocs.html
3. *Excimer User’s Manual*, available on the web site http://www.motorola.com/semiconductors
4. *MDINK32/DINK32 User’s Guide*, available on the web site http://www.motorola.com/semiconductors

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