

Software Release Notice

GeneAmp® PCR System 9800

1. Items List

The release package includes:

- This Software Release Notice.
- A copy of the source code on a CD-RW for documentation control.

2. Supporting Documentation

The design of the firmware is outlined in the document Firmware Specification, Lotus (RDD0017R0_6.doc). The document is archived in the \tec\dr\others directory.

3. Hardware Configuration

The hardware required for running this software is Applied Biosystems 9800 Fast Thermal Cycler.

4. Software Configuration

Embedded in the firmware is a checksum for the boot section of code (address 0 to 0x3FFF) and a checksum for the application section of the code (address 0x4000 to 0x7FFFF). All firmware upgrade PC cards for Ver 1.01 should contain the following checksums, which can be verified by the instructions in Section 8, Subsection K of this document.

Section	Checksum
Boot	0xE5EA
Application	0x9AAE
PCCard	0x83AF

5. Software Generation

See Section 8. System Generation of this document.

6. Software Reproduction

See the Manufacturing guidelines for reproducing PCMCIA cards.

7. Software Installation

To install the software on a 9800 which has a raw CPU board and no existing code in the Flash:

- A. Remove the back panel of the 9800 as instructed in Part G of Section 8 below.
- B. On the CPU board, move jumper JP20 to position 1-3. This jumper position tells the 9800 to boot off of the PC card instead of the CPU board Flash memory.
- C. Insert a 9800 upgrade PC card into the card slot on the right hand side of the 9800.
- D. Turn on the 9800.
- E. Press the following keys:
 - F4-Util
 - F1-Diag
 - F4-Upgrad
 - F1-Cont
 - F1-Pccard
 - Stop/F3-Update and wait for the instrument to reboot.
- F. This key sequence will force an update of the boot and application section of the CPU board Flash memory.
- G. Turn off the 9800.
- H. On the CPU board, move jumper JP10 to position 1-2. This is the normal operating position that tells the 9800 to boot off the CPU board Flash memory.
- I. Turn on the 9800 and verify that the instrument powers up correctly and that the correct firmware version is displayed on the top-level screen.
- J. Turn off the 9800 and replace the back panel.

To upgrade a 9800 which has an existing version of software (using PC card):

- A. Turn on the 9800.
- B. Insert a 9800 upgrade PC card into the card slot on the right hand side of the 9800.
- C. Press the following keys:
 - F4-Util
 - F1-Diag
 - F4-Upgrad
 - F1-Cont
 - F1-PCcard
 - F3-Update and wait for the instrument to reboot.
- D. Verify the correct firmware version is displayed on the top level screen.

To upgrade a 9800 which has an existing version of software (using Serial Port):

- A. Turn on the 9800.
- B. Connect cable from RS485 port on 9800 to serial port on computer
- C. Press the following keys:
 - F4-Util
 - F1-Diag
 - F4-Upgrad
 - F1-Cont
 - F1-Serial
 - F3-Update
- D. Begin download of upgrade file from the computer using the Kermit protocol.
- E. Wait for instrument to reboot.
- F. Verify the correct firmware version is displayed on the top-level screen.

NOTE:

When upgrading the 9800 firmware through a PC card or the serial port, **DO NOT** pull out the PC card or disconnect the serial cable while the upgrade is in progress or there is the possibility that the boot sector of the CPU board Flash memory will only be partially written and the instrument will be **INOPERABLE** until it is re-programmed at the factory. If the PC card or serial cable is pulled out before the end of the upgrade, or there is an error during the programming of the CPU board Flash memory, the instrument will start issuing a series of beeps which can be deciphered by reading the error beep descriptions below.

Power-up Failures

This section describes beep patterns generated to indicate failures. These beeps will only be encountered at power on or reset of the instrument and when reprogramming the CPU board Flash memory during a firmware upgrade.

Microprocessor Standby RAM Failure

A read/write test is performed on the Microprocessor's standby RAM at power-on. If it fails, a steady on -off on - off... beep is generated as follows:

- - - - -

Resolution: Replace CPU board.

CPU Board RAM Failure

A read/write test is performed on the CPU board's RAM at power-on. If it fails, the following beep pattern is generated.

-- -- -- -- --

Resolution: Replace CPU board.

CPU Board Flash Memory Checksum Failure

The checksum of the application section of the Flash memory is verified at boot time. If it fails, 10 quick beeps are generated. The following message appears if **NO** upgrade card is recognized in the PC card slot.

FIRMWARE UPGRADE IS INCOMPLETE
BEGIN DOWNLOAD OF FILE FROM PC
-- OR --
POWER DOWN 9800
INSERT UPGRADE PC CARD IN SLOT
POWER UP 9800

The user can either initiate a serial port upgrade from their PC or follow the instructions for upgrading with a PC card.

If a 9800 upgrade PC card is in the slot at power up, the user will hear the 10 quick beeps and the message FIRMWARE UPGRADE IS INCOMPLETE is displayed on the top line. The messages CHECKING FOR UPGRADE PC CARD and UPGRADING FIRMWARE... will follow. The instrument will reboot when the firmware has been upgraded.

Invalid Checksum on Upgrade PC Card

If the CPU board Flash memory checksum failure, as described above, is encountered and a PC card with incorrect checksums is inserted in the card slot, the user will hear the 10 quick beeps and the message FIRMWARE UPGRADE IS INCOMPLETE is displayed on the top line. The messages CHECKING FOR UPGRADE PC CARD and NOT A VALID UPGRADE PC CARD will follow. The instrument will continually beep until the bad PC card is removed from the slot. When it is removed, the message in the box above will be displayed.

Firmware upgrade failure

If a firmware upgrade fails because the data verify failed, the instrument will beep 20 times and then reset itself. Possible causes of this failure include a faulty CPU board, a faulty PC card interface or the operator removing the PC card or serial cable before the upgrade is complete.

Resolution: When the instrument is powered on, a Flash checksum failure may be detected and the procedure to recover from this failure is outlined above. It is also possible that on reset or power on the software will start up correctly so check the firmware version displayed on the main screen. If not the same as the version on the PC card, repeat the firmware upgrade procedure.

8. System Generation

This section describes the generation of the GeneAmp® PCR System 9700 firmware.

To regenerate the firmware, the following resources are required:

Hardware	Description
IBM compatible computer	The PC must be running MS NT /Win 2000, have at least 15 MB of free hard disk space.
Nohau software development system	Nohau's 68332 BDM (<u>B</u> ackground <u>D</u> ebg <u>M</u> ode) emulator card must be installed in the PC.
Applied Biosystems 9800 Fast Thermal Cycler	Nohau's BDM emulator cable must attach to the BDM connector J10 on the 9800 CPU board.
512KB SRAM PCMCIA card	The Nohau BDM emulator will download a checksummed version of the 9800 firmware to this PC card.
1MB Flash PCMCIA card P/N 0940-1054	This PC card will be duplicated from the SRAM PC card and will hold the final version of firmware.
ELAN PCMICA card drive	This is the PCMCIA card reader/writer to duplicate the Flash cards.

Software	Description
MRI 68332 compiler and linker ccc68k Ver 2.0F mcc68k Ver 4.5G lnk68k Ver 7.1C	This is the Microtec Research C/C++ compiler and linker.
BDM300 Ver 2.2X HLD, Nohau Corp.	This is the Nohau emulator/debugger software.

A. Setup the computer

The PC must be loaded with MS NT or WIN2000 and should have at least 32MB of RAM and at least 15MB of free hard disk space.

B. Modifying autoexec.bat and config.sys

Add the following lines to your PC's autoexec.bat file:

- SET PATH=%PATH%; c:\tec\source;c:\mri\mcc68k;c:\mri\asm68k;
- Set
MRI_68K_INC=c:\tec\source\include;c:\tec\source\include\sys;c:\tec\source\rtxc;c:\tec\source\kernel;c:\tec\source\rtip\xnet;
- set MRI_68K_BIN=c:\mri\mcc68k;c:\mri\asm68k;c:\mri\mcc68k\cpu32;

Reboot the PC. Start MS Windows.

C. Installing Source Files and Directory Structure

1. Unzip the Lotus_V101.zip into c:\ (The source code can also be retrieved from lotus in the source code control database [\surf school\VSS_DB\PCR9700](http://surf.school/VSS_DB/PCR9700))
2. Unzip the mri.zip into c:\ (This is the compiler)
3. Copy 9700.bat to c:\ (This is the batch file to setup the build environment)

D. Building the 9800 executable hex file

The outcome of this will be a hex file named checksum.xeq in Motorola S-record format and will contain checksums for both the boot section and the application section of the code. This file is the actual executable hex file that will run the instrument.

- Procedure to recompile and link files,
 - ▶ Execute the 9700.bat from c:\
 - ▶ Then go to c:\tec\source and type " make -DALL -DHEX ", the source files will be recompiled and link, the output files are checksum.xeq
 - ▶ Run "srtobin checksum.xeq bootapp.bin 0 7fff 0 " , it will convert the srec file to the binary format

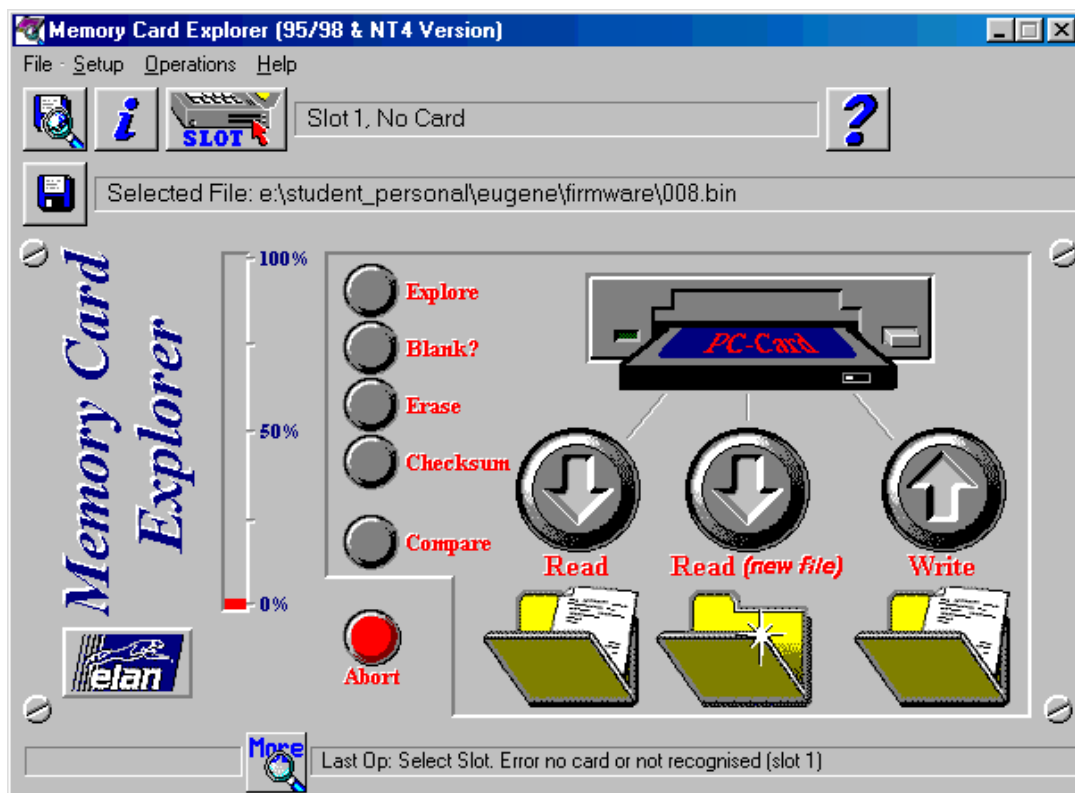
Setting up the Nohau emulator

- Install the Nohau BDM card in an empty slot in the PC.

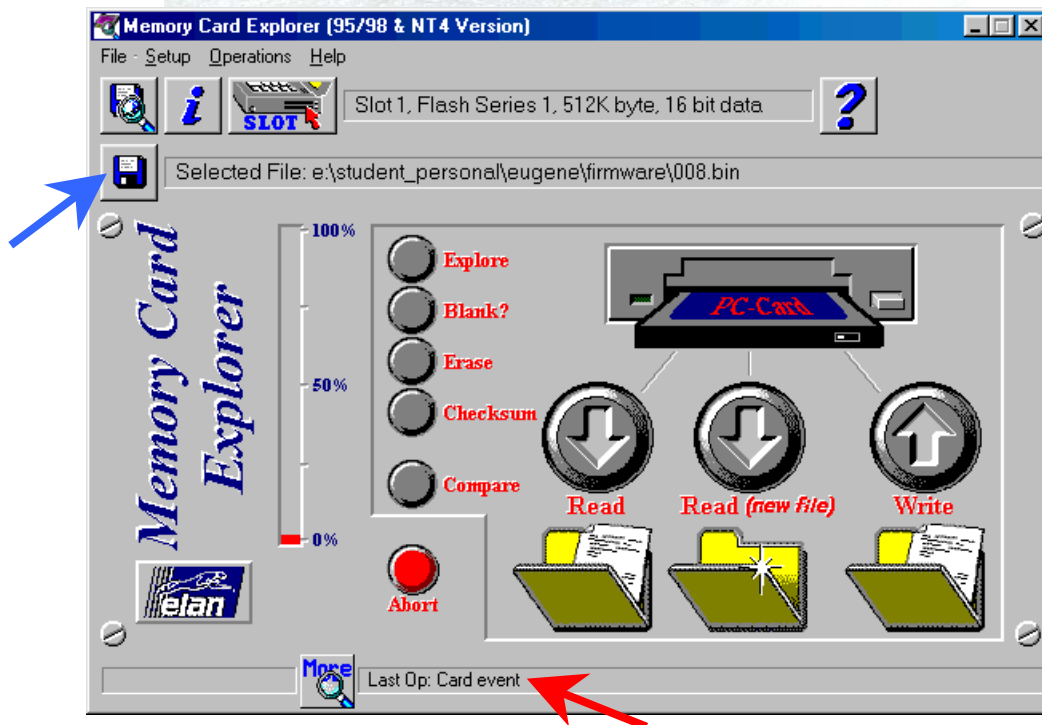
- Locate a 9800 thermal cycler. With the rear of the instrument facing you, undo the 2 screws on the back panel and gently pull the chassis of the 9800 about an inch away from the molded cover. Gently tilt the back panel about an inch away from the instrument.
- Locate the 10-pin BDM connector J10 at the top of the CPU board and attach the cable from the BDM card. Turn the 9800 around so the keypad is facing front. Turn on the 9800.
- From File Manager, locate the file k:\emul300\emul300.exe and double click on it to invoke the Nohau emulator.
- Click on menu Config | Project name.. and select the project TEC_LEV2. Click on the OK button.

G. Create a 9800 SRAM upgrade PC card

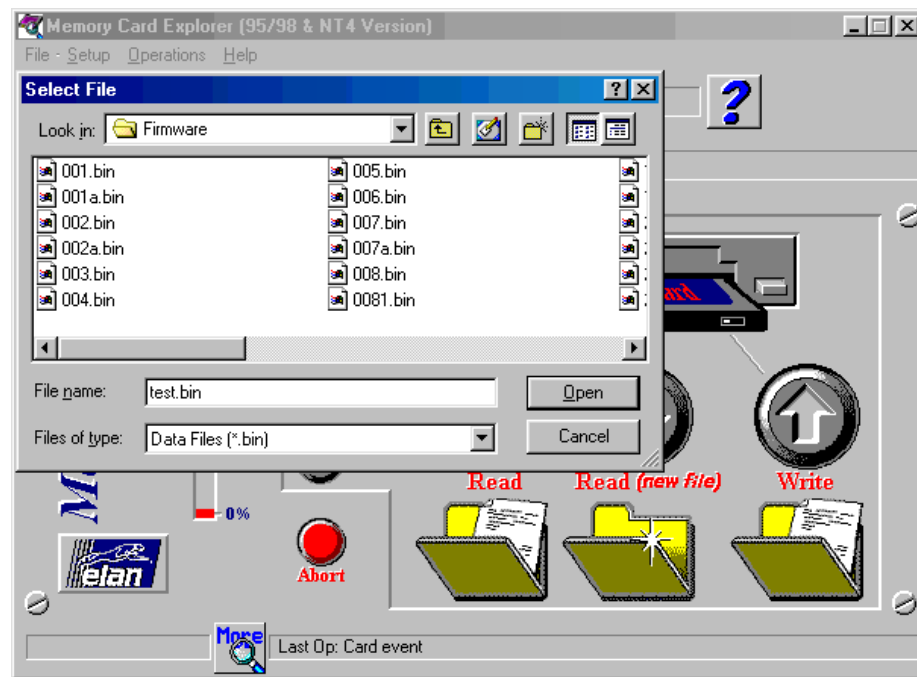
- Inside Windows, click Start → Programs → ElanPCCard → Memory Card Explorer
- The screen below will be shown.



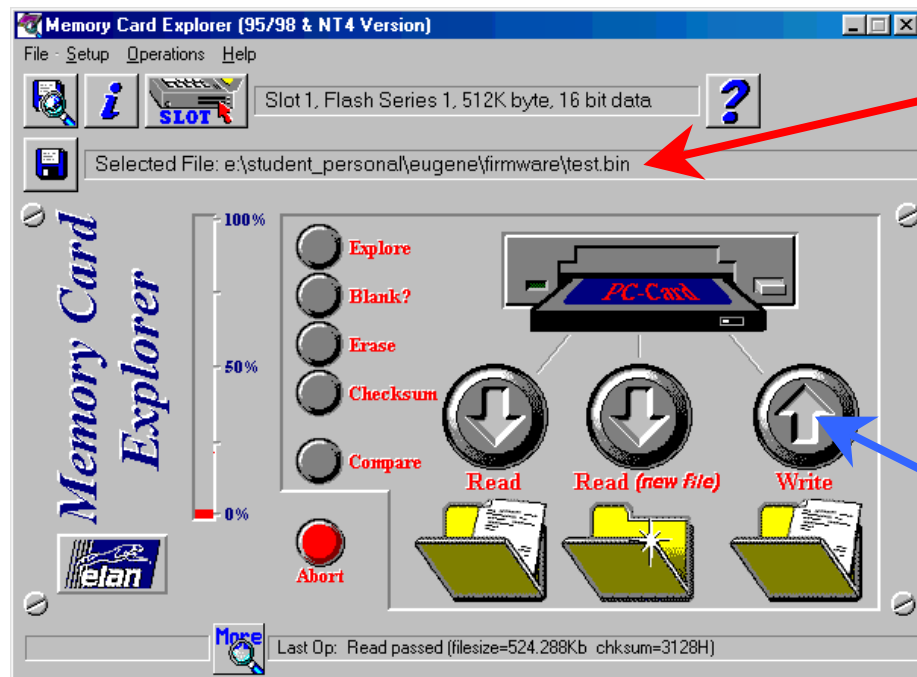
- Insert the SRAM card into the card reader right side up with the holes facing inwards as shown in the photos below.



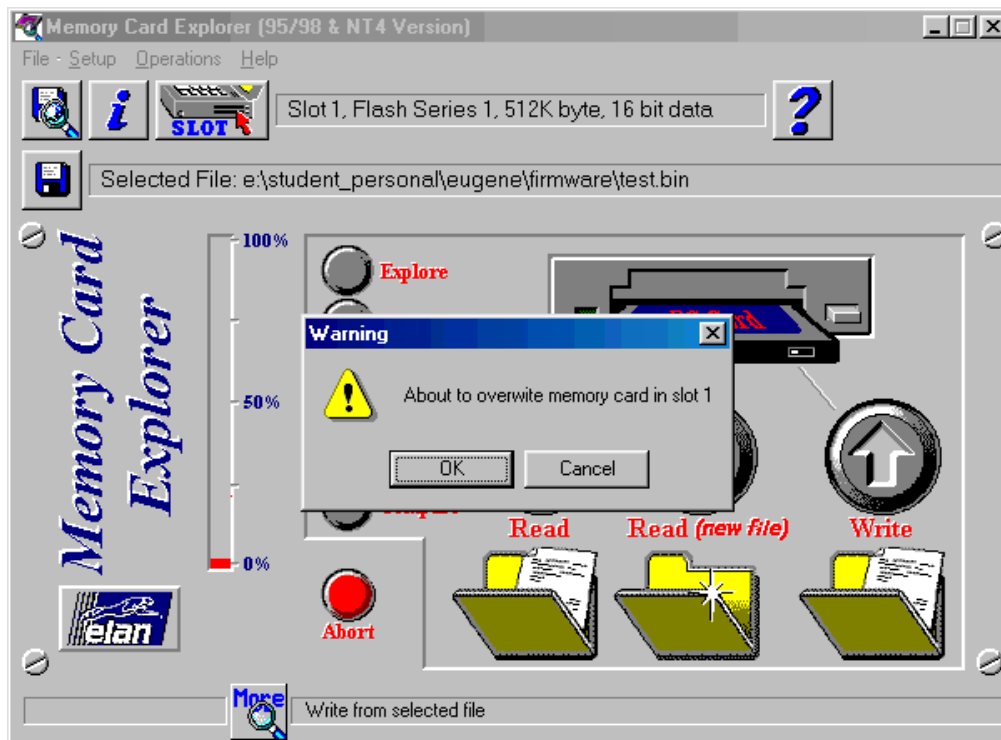
- Wait for the program to auto detect the type of memory card. When the detection has finished, the row at the bottom as pointed by the red arrow will displayed "Last Op: Card event"
- Next, click the icon on the top left as pointed by the blue arrow and the screen below will be displayed.

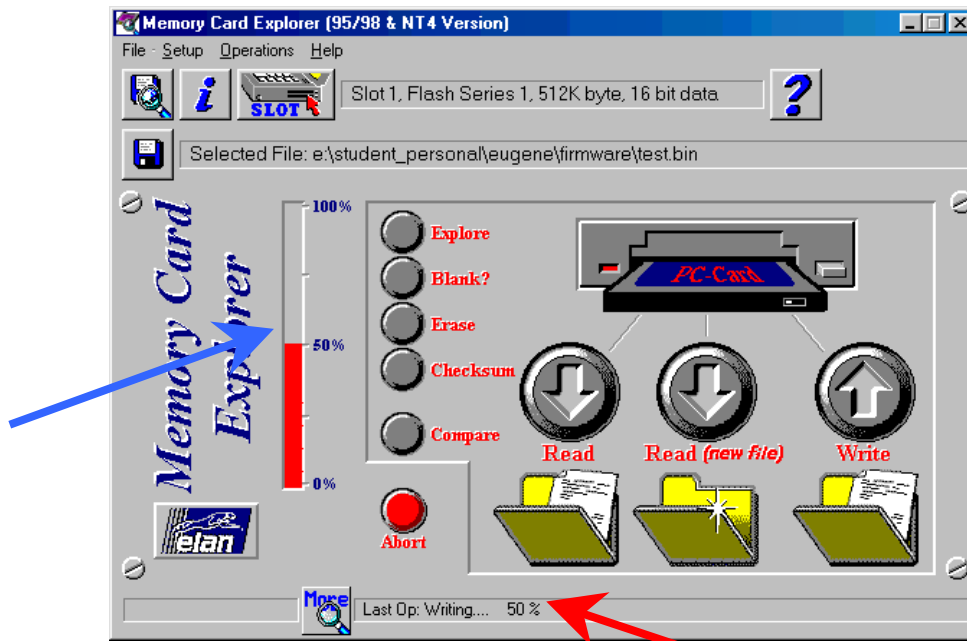


- Select the file that contains the data to be copied into the memory card and click open.

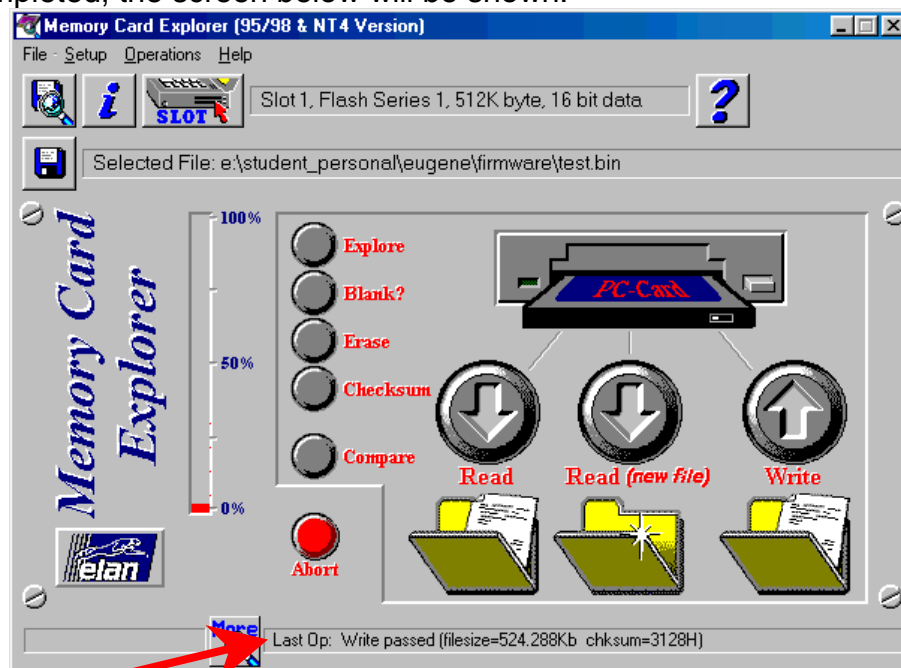


- The file that is being selected will be displayed at the position pointed by the red arrow.
- Click on the write button as pointed by the blue arrow.
- If there are data already in the memory card, the screen below will be shown. Click OK to continue the write operation.





- While the write is in progress, there will be a progress bar displaying the write progress as pointed by the blue arrow and the actions done by the program pointed by the red arrow.
- After the write, the program will verify the written data automatically.
- When completed, the screen below will be shown.

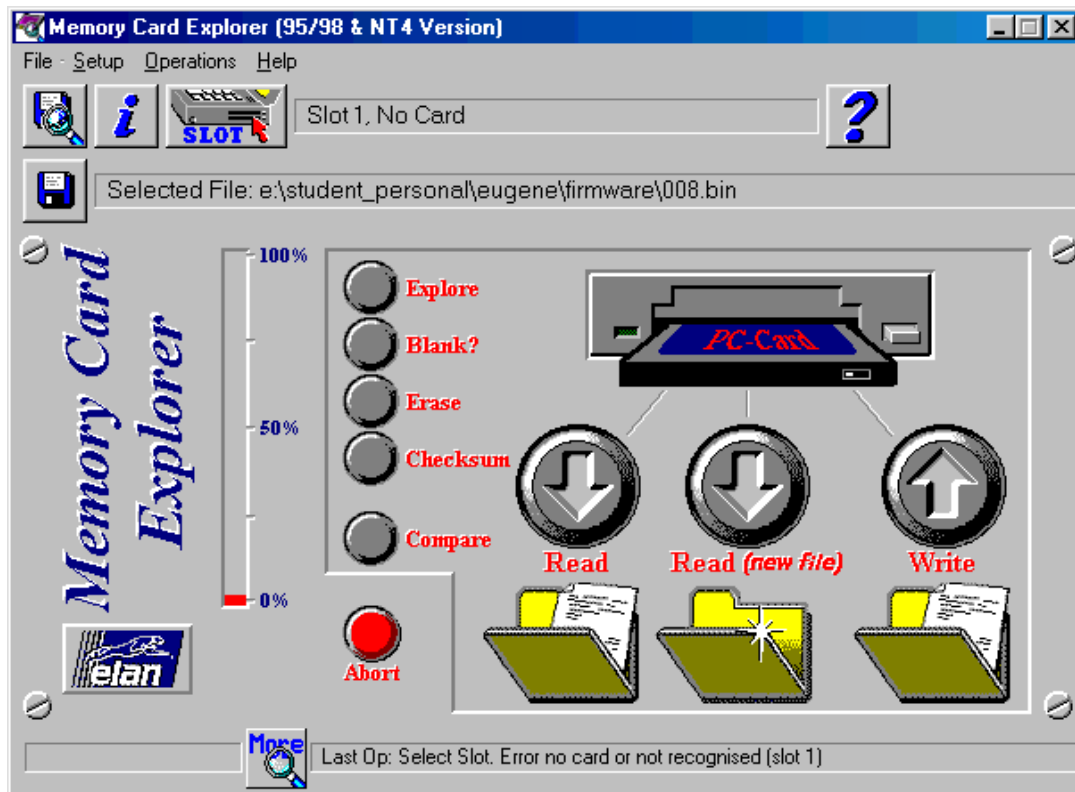


- Check that the green LED (shown by the blue arrow on the photo below) on the card reader is no longer blinking.
- The user can now take out the memory card.



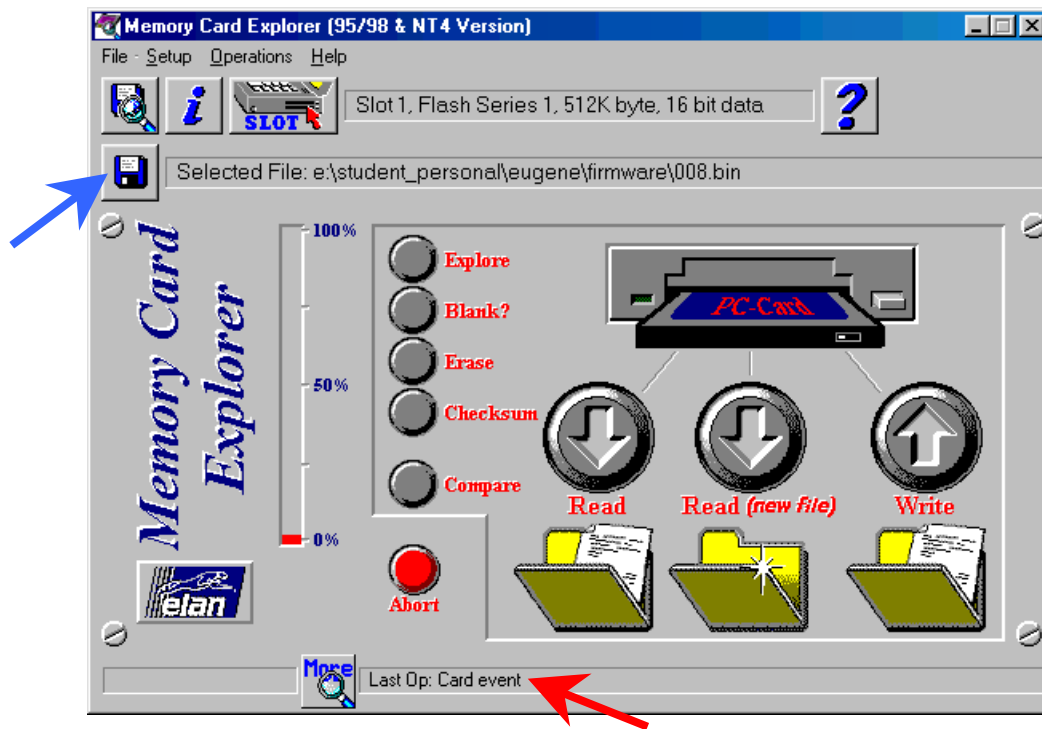
H. Create a 9800 Flash upgrade PC card

- Inside Windows, click Start → Programs → ElanPCCard → Memory Card Explorer
- The screen below will be shown.

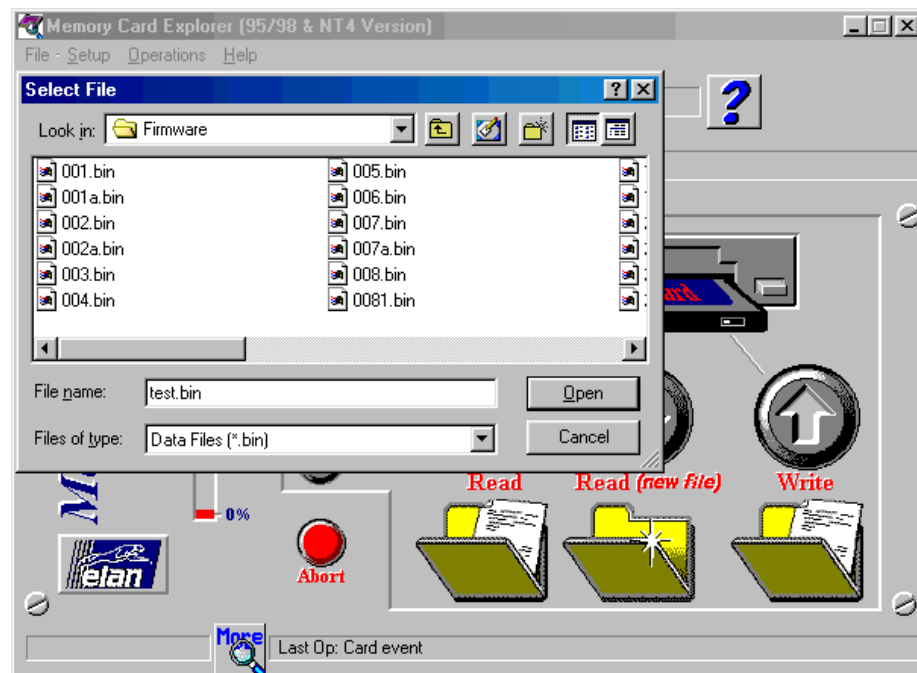


- Insert the Flash card into the card reader right side up with the holes facing inwards as shown in the photos below.

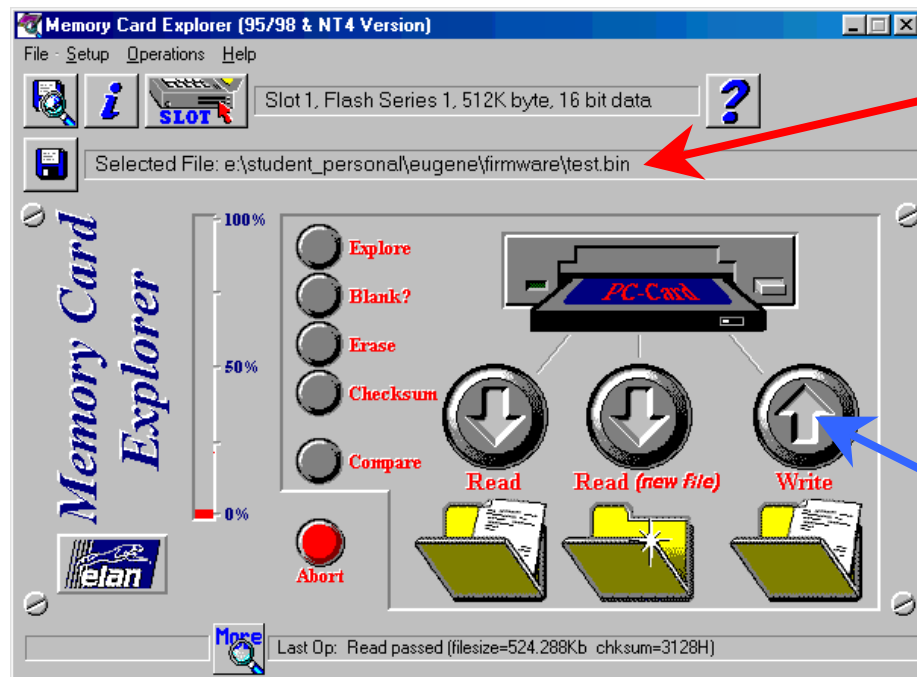




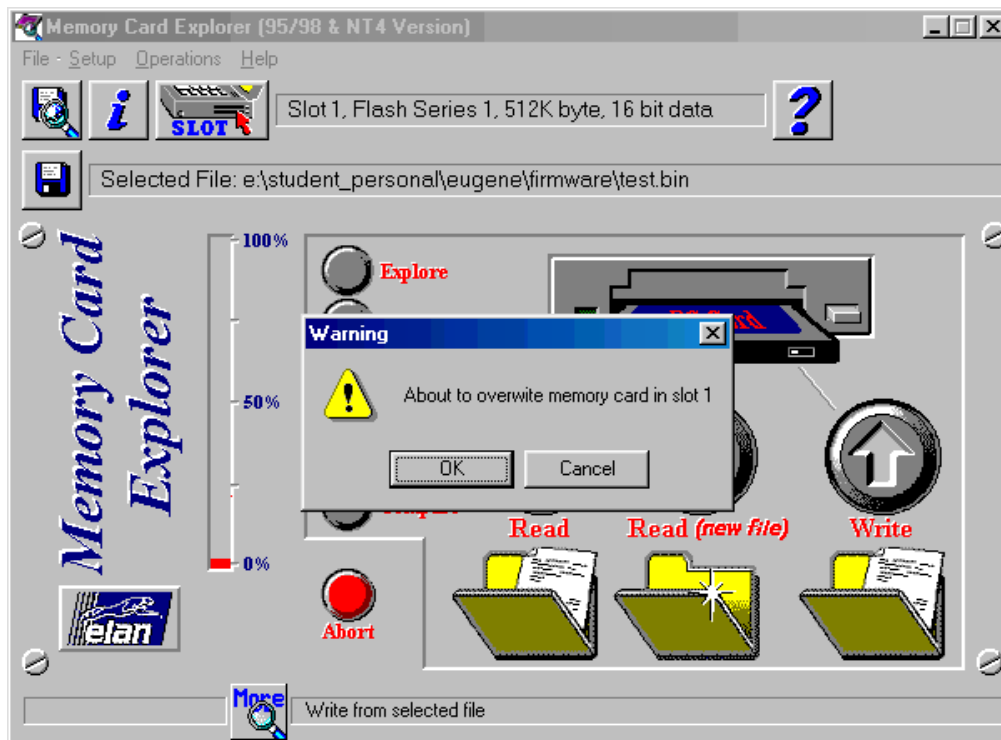
- Wait for the program to auto detect the type of memory card. When the detection has finished, the row at the bottom as pointed by the red arrow will displayed “Last Op: Card event”
- Next, click the icon on the top left as pointed by the blue arrow and the screen below will be displayed.

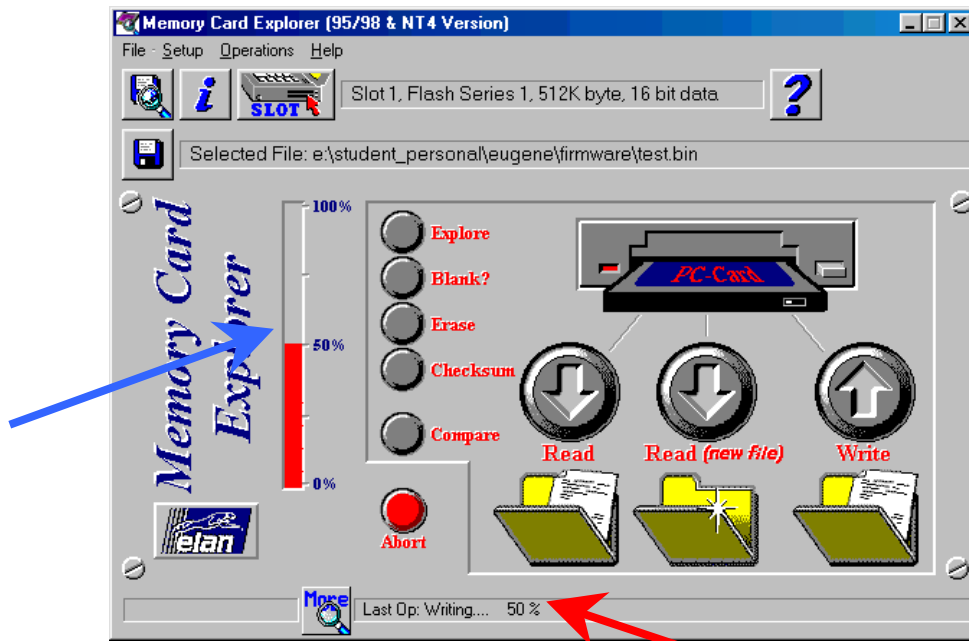


- Select the file that contains the data to be copied into the memory card and click open.

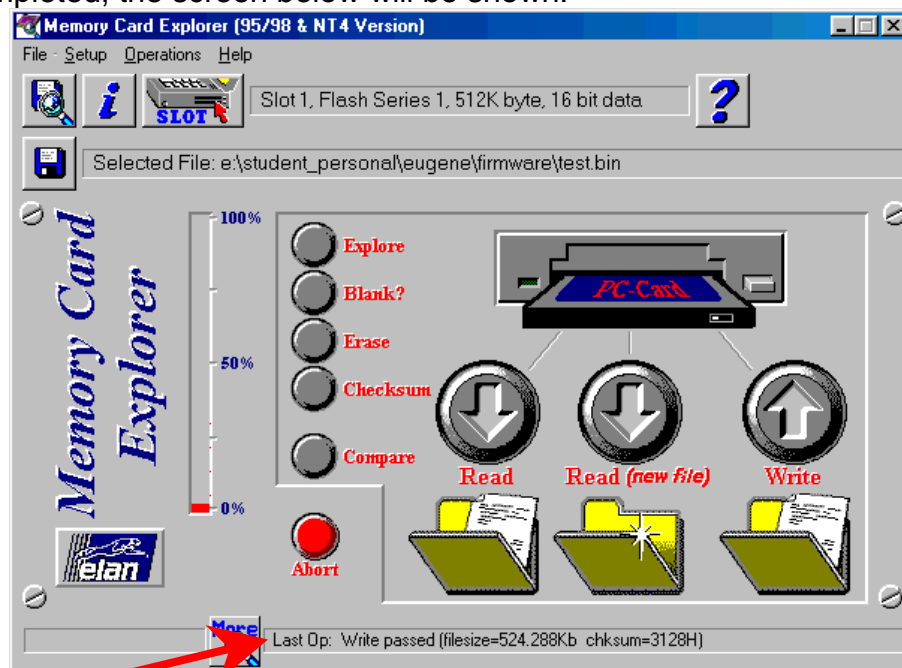


- The file that is being selected will be displayed at the position pointed by the red arrow.
- Click on the write button as pointed by the blue arrow.
- If there are data already in the memory card, the screen below will be shown. Click OK to continue the write operation.





- While the write is in progress, there will be a progress bar displaying the write progress as pointed by the blue arrow and the actions done by the program pointed by the red arrow.
- After the write, the program will verify the written data.
- When completed, the screen below will be shown.



- Check that the green LED (pointed by the blue arrow on the photo below) on the card reader is no longer blinking.
- The user can now take out the memory card.

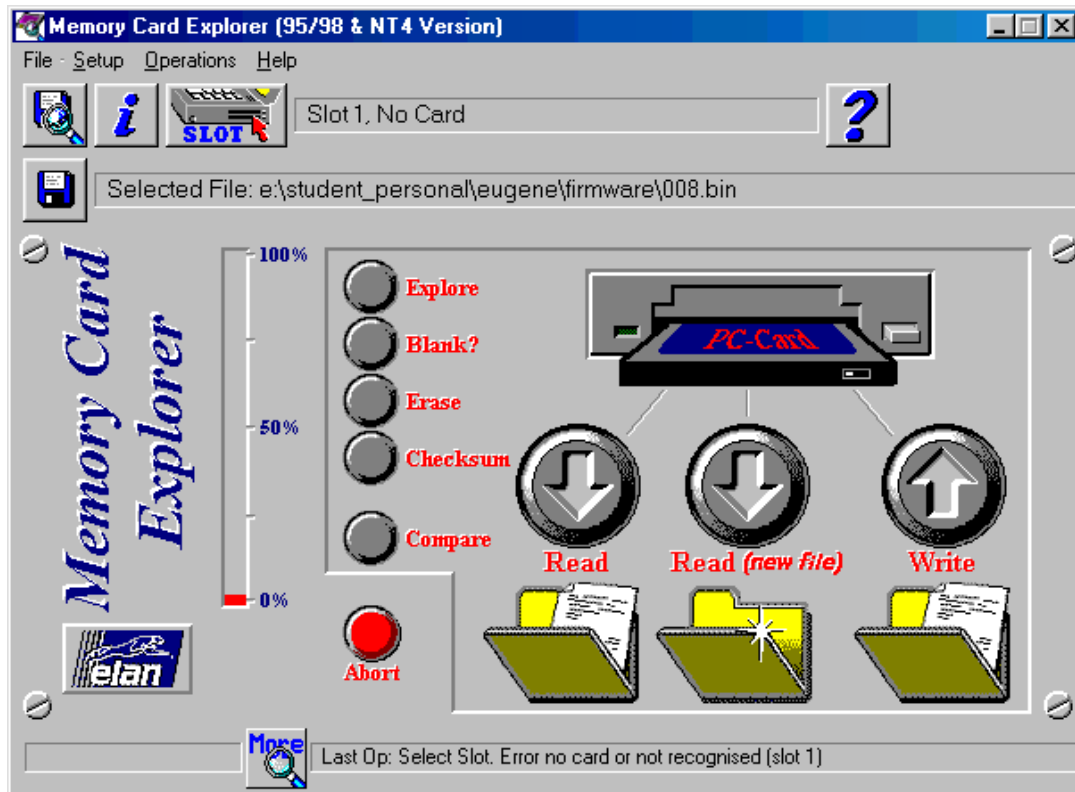


Note1: If a **Card Selection Mismatch** error occurs. On the menu bar, click Setup → Card Detection → Manual. User can then select from a list the memory card type and its properties.

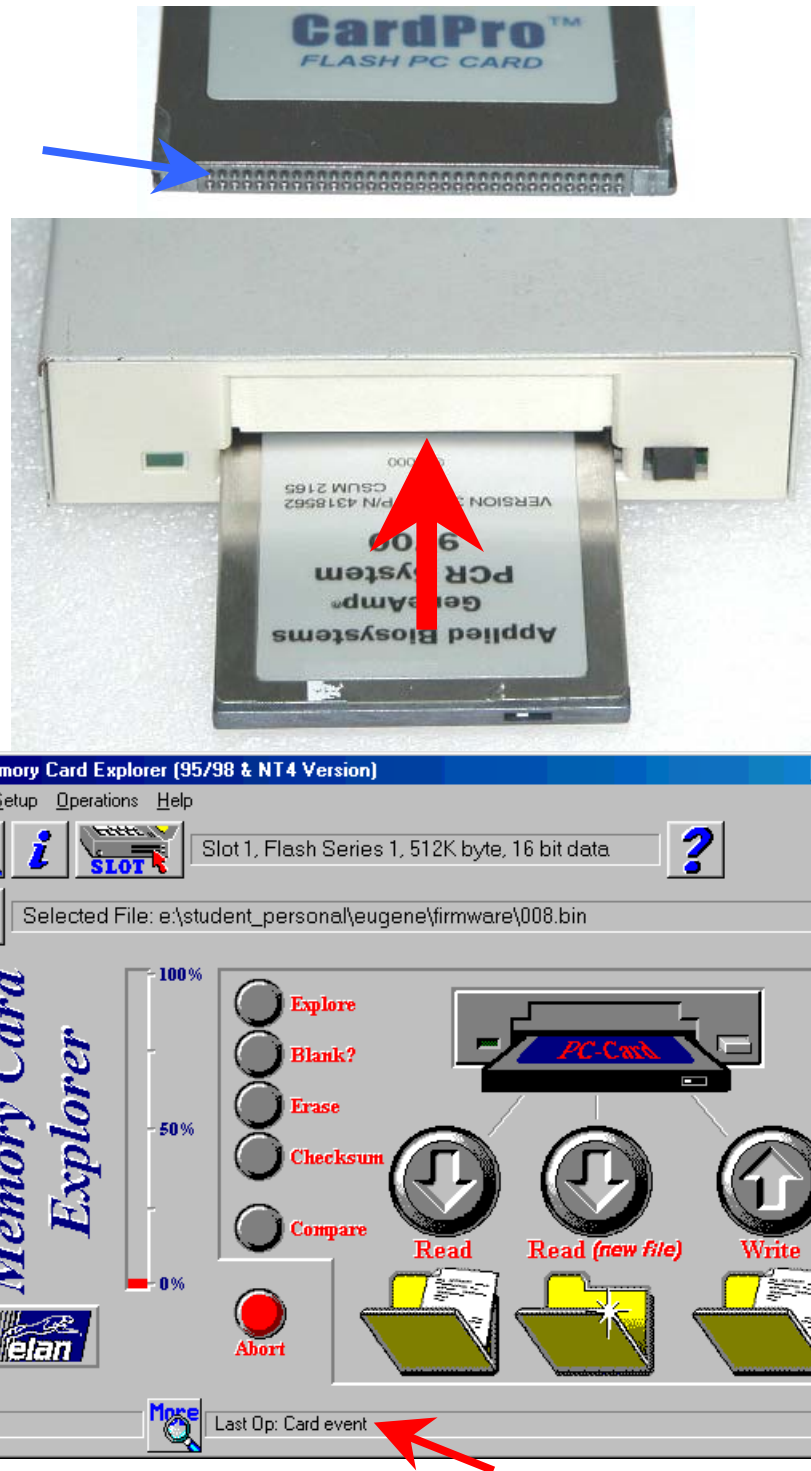
Note2: If a **Blank Check Error** occurs the card needs to be manually erased before it can be used. On the menu bar, click Operations → Erase.

J. Duplicate a 9800 Flash upgrade PC card

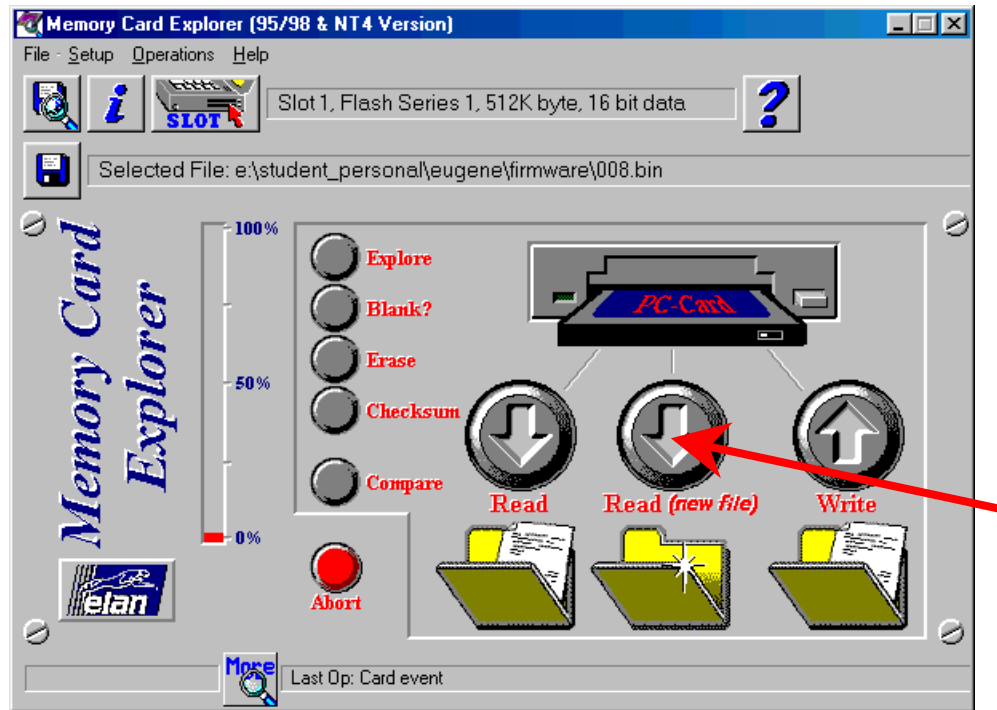
- Inside Windows, click Start → Programs → ElanPCCard → Memory Card Explorer
- The screen below will be shown.



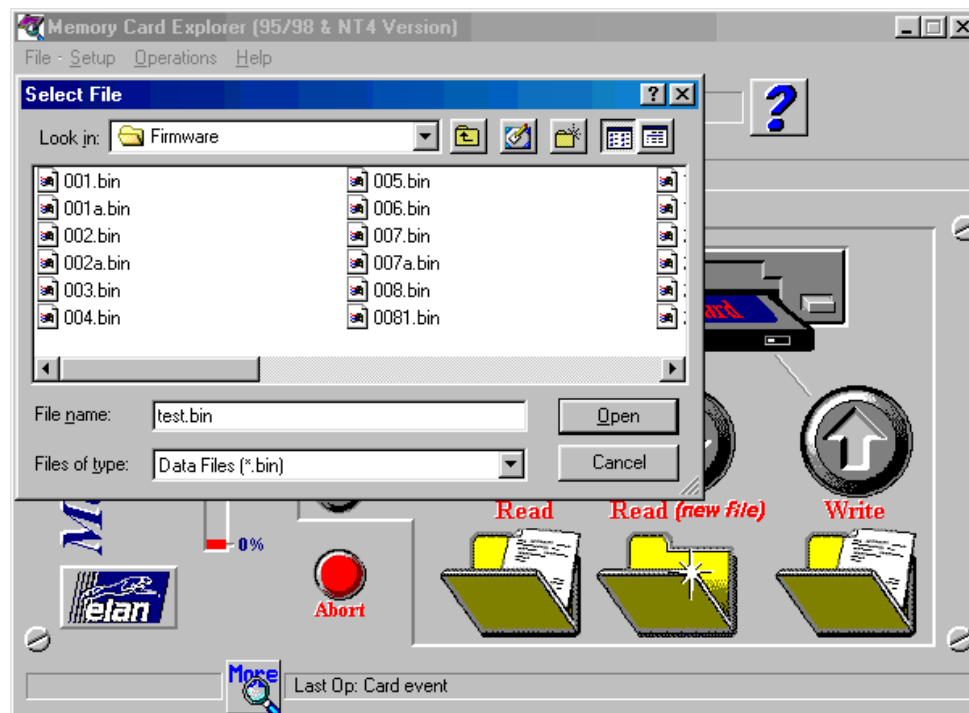
- Insert the PC card into the card reader right side up with the holes facing inwards as shown in the photos below.

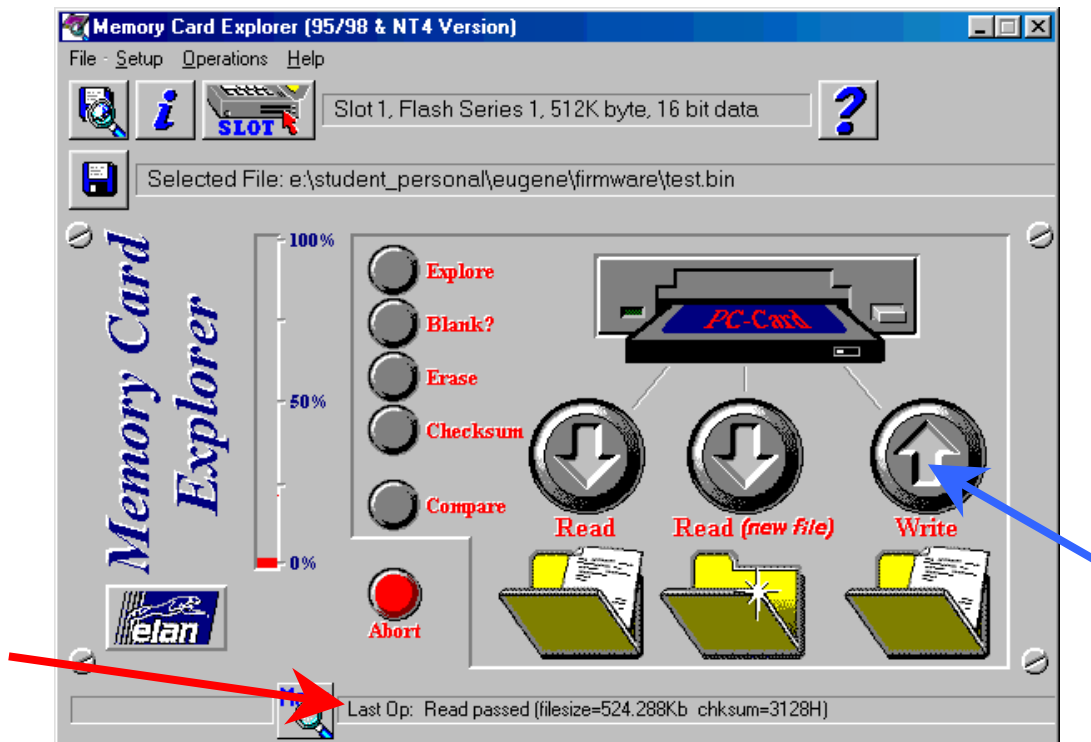


- Wait for the program to auto detect the type of memory card. When the detection has finished, the row at the bottom as pointed by the red arrow will displayed "Last Op: Card event"

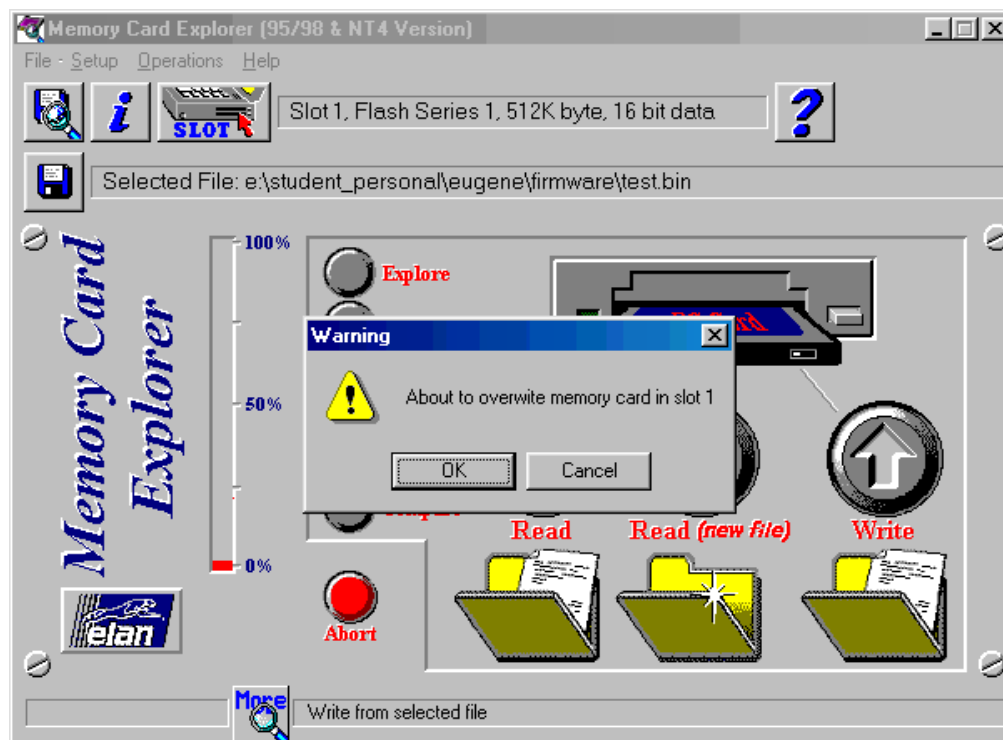


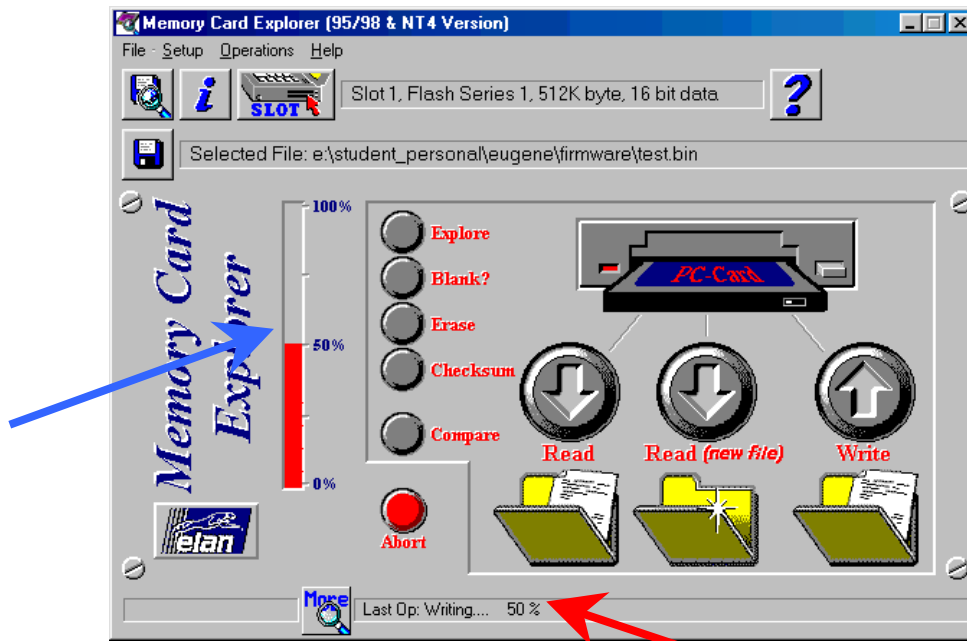
- Click on the Read (new file) button pointed by the red arrow in the photo above and the screen below will appear.
- Key in the name of the temporary file to store the data and click open.



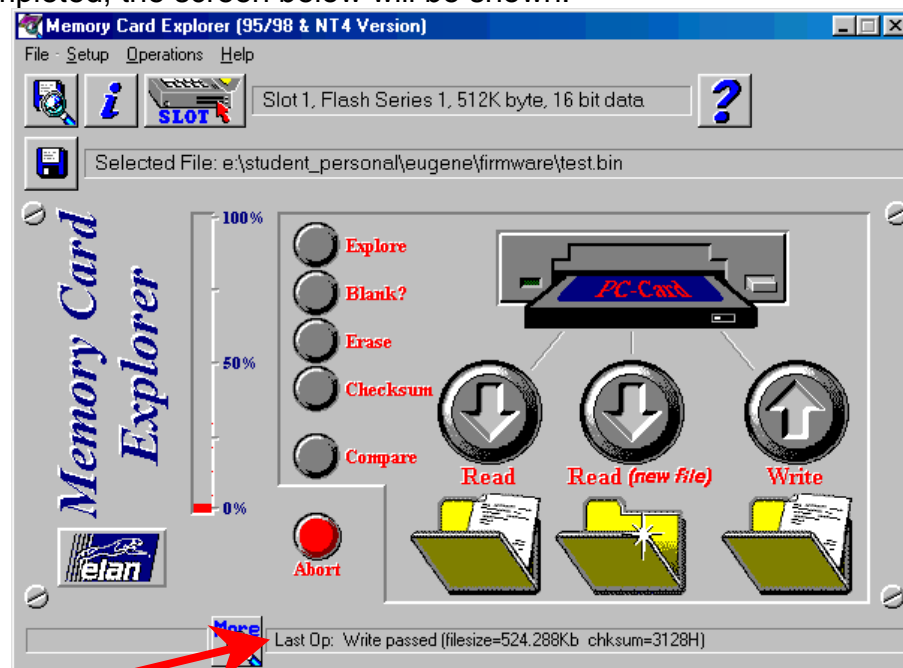


- Wait for the Read process to finish and the row at the bottom will display the line as pointed by the red arrow in the photo above.
- Next, click on the Write button pointed by the blue arrow in the photo above.
- If there are data already in the memory card, the screen below will be shown. Click OK to continue the write operation.





- While the write is in progress, there will be a progress bar displaying the write progress as pointed by the blue arrow and the actions done by the program pointed by the red arrow.
- After the write, the program will verify the written data.
- When completed, the screen below will be shown.



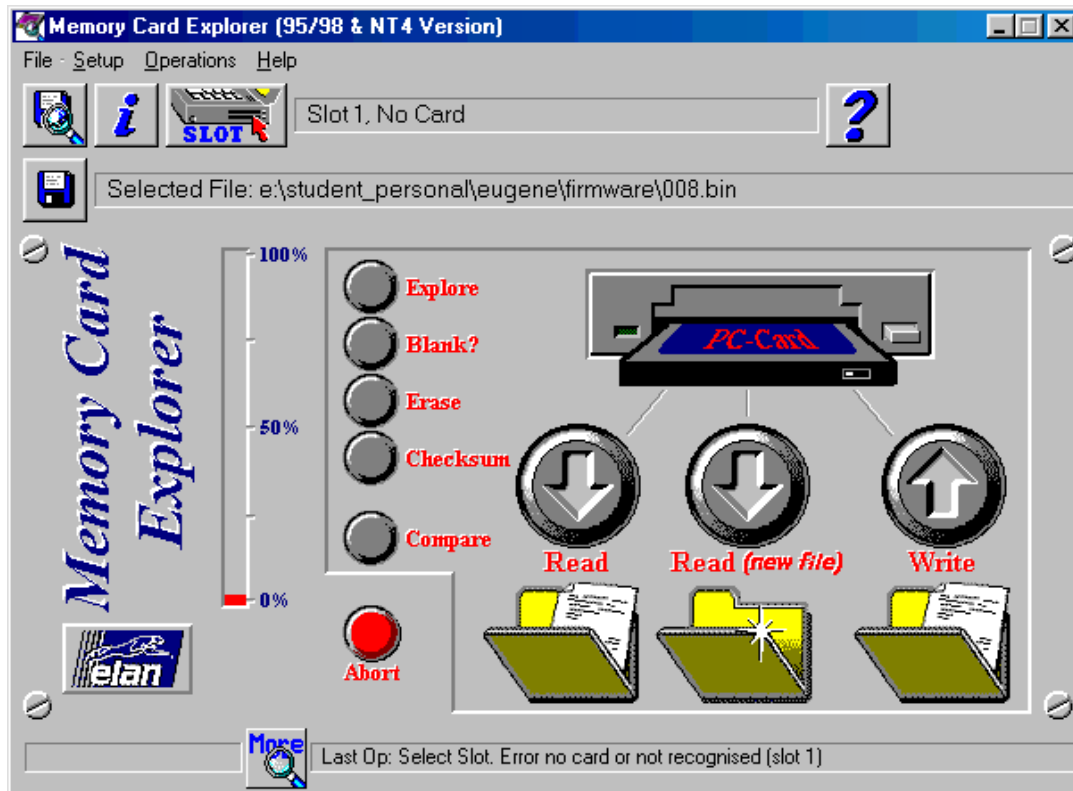
- Check that the green LED (pointed by the blue arrow on the photo below) on the card reader is no longer blinking.
- The user can now take out the memory card.



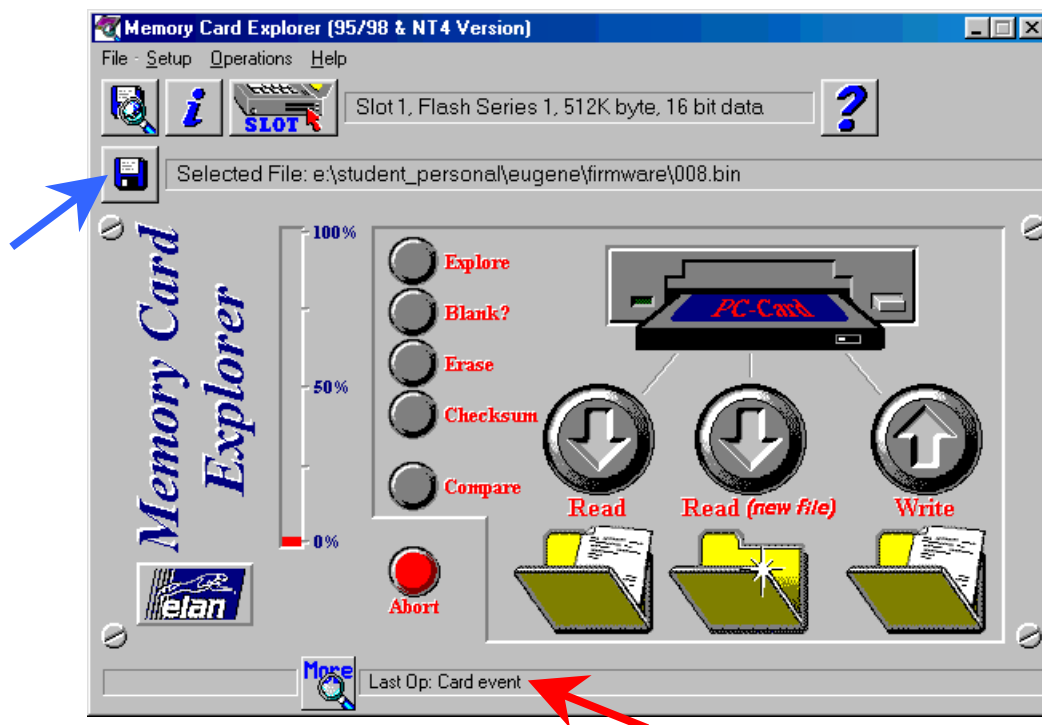
K. Verify the upgrade PC card (SRAM or Flash)

Should there be a need to verify the data in the memory card, user can follow the following steps.

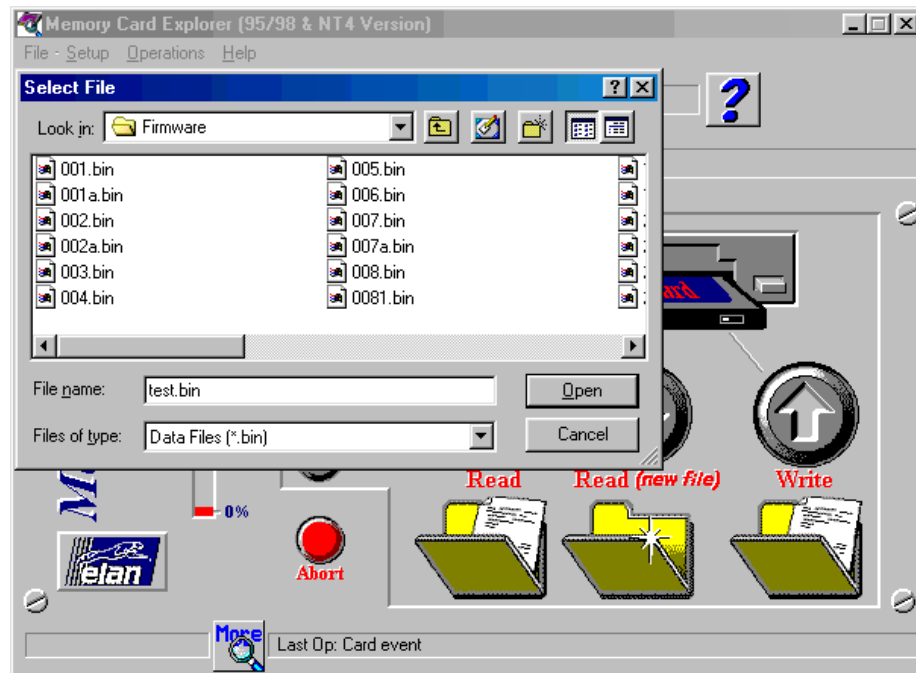
- Inside Windows, click Start → Programs → ElanPCCard → Memory Card Explorer
- The screen below will be shown.



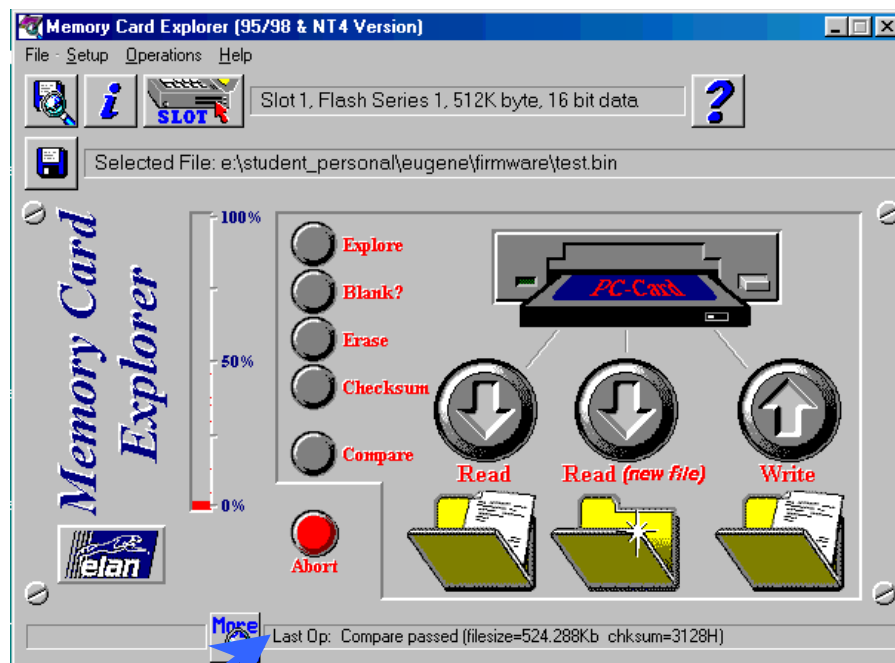
- Insert in the Flash card into the card reader right side up with the holes facing inwards as shown in the photos below.



- Wait for the program to auto detect the type of memory card. When the detection has finished, the row at the bottom as pointed by the red arrow will displayed “Last Op: Card event”
- Next, click the icon on the top left as pointed by the blue arrow and the screen below will be displayed.



- Select the file that contains the data to be verified with the memory card and click open.
- On the menu bar, click Operations → Compare



- If the data are the same, the line pointed by the blue arrow in the photo above will be displayed, the checksum value must be equal to bootcode checksum + application checksum + bootcode checksum highbyte + bootcode checksum lowbyte + application checksum highbyte + application checksum lowbyte.
- If the data are different, the line displayed will be "Last Op: Compare. Error Card & file different"