

Lynx FlashCard

User Manual

Use with board 6 FlashCard with firmware versions 6.xx



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Foreword

During a two week leave in February 2007, I got a little bored.

So I decided to make use of my skills in circuit developing, microcontroller programming and printed circuit board design in order to refresh my attainments.

Luckily, I had some left over Flash-EEPROMs in my hobbyist-box which, for a long time, I wanted to put to use.

As a Lynx fanatic, I stumbled upon several demo and games on the Internet, but with burning EEPROMs being rather time consuming, I impulsively made the decision to build a FlashCard for the Lynx.

With this FlashCard, I want to give a tool to demo and game developers, which hopefully will help to increase the homebrew-scene around the Lynx, at least a little. I would be very glad to see some of the projects, even those already started, being completed with the help of the FlashCard.

After two years of developing this card, I'm looking forward to using my Lynx only for playing, for quite some time.

Bernd Thomas June 2009

Terms Of Use

All hints for the correct use of the terminal program refer to HTerm 0.81beta. If you are working with another version, you have to adjust the settings appropriately.

For HTerm, you have to make the following adjustment from the default setting:

Set "Newline" to "CR + LF" (See "Short Introduction to HTerm" on Page 16 for more details.)

The handling of the menu and all pop ups of the FlashCard are explained in reference to the English version.

This manual is only valid for "board 6" FlashCards.
(PCB variants 1.9xx)

Important: ESD

Electrostatic Discharge (ESD) is an unwelcome phenomenon in electronics.

Describing ESD and its effects in detail would go beyond the scope of this manual. There are other sources referring to this issue; Wikipedia being one of them.

It is very important that you do NOT touch the FlashCard when you are electrostatically charged.

You should always discharge yourself of any static prior to touching the FlashCard. You can do this by simply touching anything made of metal.

It is best not to touch the components or contacts of your FlashCard.

Important: Use of FlashCard with Lynx I & Lynx II

The FlashCard has been designed for use with a Lynx II.

You can also use the FlashCard with a Lynx I. However, due to the enclosed cartridge slot of the Lynx I, there is a danger of damaging the Card by plugging and unplugging it, as well as by the opening and closing of the cartridge door with the Card inserted.

I do not recommend the use of the FlashCard in an unmodified Lynx 1!

However, if you insist on using the FlashCard with your Lynx I, you should remove the door permanently, prior to inserting the FlashCard. Note: No documentation will be provided to assist you in removing the door.

Naturally, every change you make to your Lynx is done at your own risk.

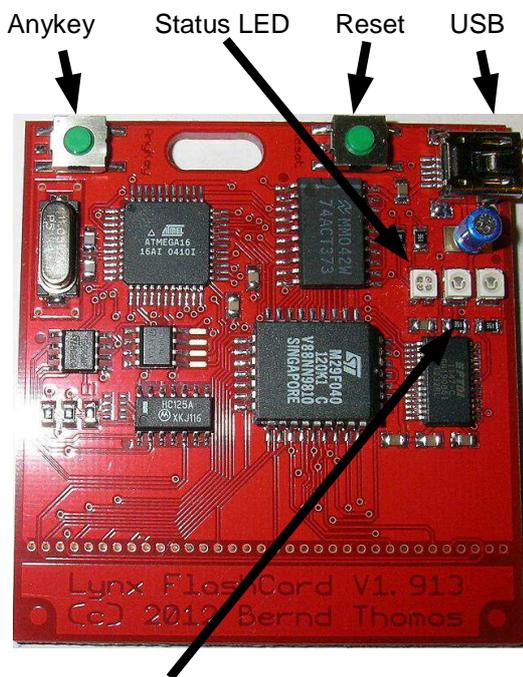
It is always a good idea to think before you position your screwdriver. ;-)

Important: Miscellaneous

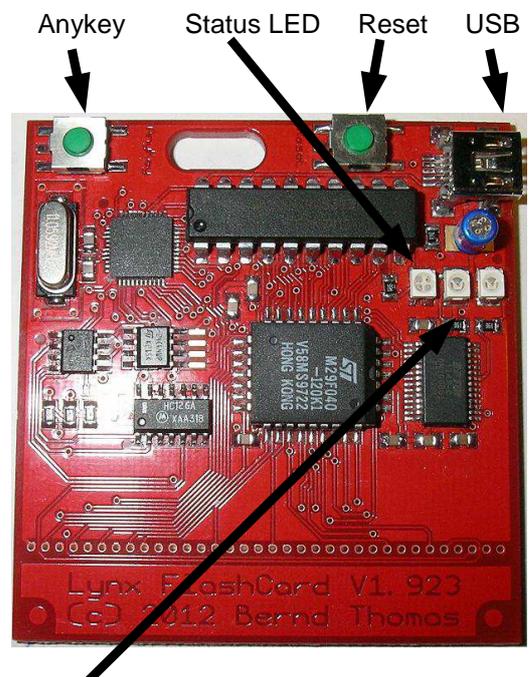
Use the Lynx FlashCard at your own risk. The creators of the FlashCard assume no liability or responsibility due to damage. No warranty is included with this product or the documentation. The FlashCard is not intended for use in any way that would violate the law.

Specifications

- 512K Flash ROM
- 93Cx6 EEPROM
 - 93Cx6 in 16 Bit Mode, for details see data sheet
- Data interchange by USB as serial connection via terminal program
- LEDs as status indicators and transfer-control
- Button to bring up the menu and confirm entries ("Anykey")
- Reset button for resetting the microcontroller and USB-connection



USB-Transfer LEDs (red=upload, green=download)



USB-Transfer LEDs (red=upload, green=download)

Variants:

Flash-Chip:

Standard: Flash-ROM: 29F040
Alternate: Flash-ROM: 39SF040*

93Cx6 EEPROM:

Standard: 93C46 (128 Byte)
Alternate: 93C66 (512 Byte) or 93C86 (2048 Byte)**

* Supported > Firmware 6.20

** Supported > Firmware 6.40

Requirements

- Computer with USB port
- available driver for FT232R by FTDI
- Terminal program (8N1, Newline CR + LF)

Driver for FT232R:

<http://www.ftdichip.com/Drivers/VCP.htm>

Terminal program:

I recommend HTerm, for Windows and Linux:

<http://www.der-hammer.info/terminal/>

File formats

The following file formats can be accessed by the FlashCard:

- *.bin
- *.lyx
- *.lnx
- *.o

Please note: Firmware 6.1x cannot use *.o files with the FlashCard.

Initial Operation

Connect the FlashCard to your PC by using the provided USB cable.

Caution! Using a USB-Hub can cause malfunctions and/or connection-terminations.

The operating system should automatically detect the device and install the needed USB drivers. Should the operating system not be able to find those drivers, you can get them from the FTDI homepage.

The FlashCard's factory setting for baudrate is 9600 baud. The FlashCard can use baudrates up to 115200. To change baudrate, see page 11.

Note - If you update the firmware or reset your FlashCard, it will reset to 9600 baud.

The Menu System

Displaying the Menu

After connecting the FlashCard to the computer and establishing the connection to the Terminal Program (On HTerm: Set the correct COM-Port then click "Connect" – See Pg 16 "Short Introduction to HTerm" for more details) you can display the Menu by pressing the "Anykey" on the FlashCard.

The menu items are displayed in the following order:

Flash, 93Cx6, Baudrate, Mode, Language and System

Entering Commands

After entering the Letter / Number command (shown below) in Brackets "[]" you have to press "Return" or "Enter." The action is then executed or the setting is changed. Remember, the setting that is marked with a big "X" is the current one.

After the following actions, a series of equals-sign "=" will be displayed: FLASH(all), "93C46" (all) and SYSTEM (only "system info") .

Default Settings are displayed as underlined text.

Unexpected Commands or Amount of Data

The FlashCard won't react to unknown or unexpected Commands.

When an unexpectedly large amount of data is sent or if commands are sent while the FlashCard isn't able to process, the following message might come up: "Stop upload and press Anykey." In this case, abort any running operations and press the "Anykey" on the FlashCard.

FLASH

content: xxxxxxxx (Available with Firmware 1.40)

If .bin/.lyx-file is used, "bin-file" is shown

If .o-file is used, "*.o-file" is shown

if .Inx-file is used, the filename stored in the header of the .Inx-file is shown

No content is shown if the FlashCard is erased

[w] write [v] verify

Write: After entering "w" the Flash Memory will be deleted. During the delete process, the Status-LED will flash red and green and the message "Erasing memory" will be displayed, followed by an increasing number of dots.

Regardless of how much memory is used, in normal condition it is up to 40 dots if a 29F040 Flash-ROM is used. If a 39SF040 is used it will be much faster in normal condition.

In case the delete takes abnormally long, the FlashCard detects a time out and the

message "erase memory failed - disconnect USB and try again" will be sent from the FlashCard. The FlashCard should be disconnected from the USB-Cable and reconnected after 5 seconds.

After a successful delete, the message "Please start upload data" is displayed. Now the data can be sent. (To send a Lynx file into FlashCard, push "Send File" button on HTerm, and select file from menu)

The end of the transmission is determined by the FlashCard via a Timeout. So, it's not necessary to send the configured number of KB.

During write operations, the Status-LED will flash red.

Verify: After entering "v" the message "Please start upload for verify" is displayed. Now the data can be verified. (To verify a Lynx file, push "Send File" button on HTerm, and select the same file from menu)

When the comparison is successful, the message "Verify successful" is displayed. Otherwise, if the two memory positions do not match, the message will read "Warning – verify not successful." "Stop upload and press Anykey," and the comparison will be aborted. During comparison, the LED flashes green.

93Cx6

[u] write [y] verify [r] read [e] erase [m] modify byte

Write: The EEPROM doesn't need to be deleted before writing. The data is overwritten. When transmitting less than 128/512/2048 Bytes*, the leftover Bytes are overwritten with "FF" while the Status-LED blinks red.

*depends on which version of the 93Cx6 is used:

93C46 and 93C66: the whole amount can be written at once. (128/512 Byte)

93C86: 4 blocks with 512 Byte blocks can be written.

Before writing the FlashCard, it will show which block will be written next.

(address (hex) x00 – xff). It can be cancelled with Anykey.

Verify: Analog to FLASH, LED blinks green.

Read: Complete 93Cx6 chip are read and outputted. The Status-LED blinks green.

Erase: Deletes the EEPROM.

Modify Byte: This new function is available on Firmware v1.10 and above.

This option allows you to modify one byte of the EEPROM memory.

After selecting "m" you have to send the address and the data, in Hex-Data.

To switch to Hex in HTerm, change the "Type" (lower left side, next to the input line) to HEX and insert the address and data, separated by a space.

Data and address format:

1 address (aa) and 1 data (dd) byte: 93C46 (aa dd)

1 address lowbyte (ll), 1 address highbyte (hh) and 1 data (dd) byte: 93C66/86 (ll hh dd)
dd – Data

aa – Address ll – Low Address hh – High Address

before 6.40: only 1 byte is changed every time "modify byte" is executed.

6.40: it is possible to change up to 128 bytes every time "modify byte" is executed. The data can be sent in random order.

BAUDRATE

[9] 9600 [2] 19200*** [3] 38400*** [5] 57600 [1] 115200

Baudrate is set by typing the corresponding number.

The message "Please switch Baudrate of PC and press Anykey" will appear. The FlashCard is already set to the correct Baudrate by then. You only have to set the correct Baudrate in the TerminalProgram and press the "Anykey."

The currently set Baudrate is marked with an big "X."

*** **6.40** - 19200 and 38400 baud rates are no longer available

MODE

[a] auto size (a) (Available with Firmware 6.40)

The auto size option is only visible in .lnx mode.

If the data in the header of the .lnx file is not correct, the memory scheme must be selected manually.

The memory scheme is only visible if .bin/.lyx is selected and if the auto size option is deactivated in .lnx mode.

[g] 128k [h] 256k/BLL [i] 512k [k] 512k-BLL

128k: Memory scheme of Atari Modules with 128kb memory capacity.
(512 Byte blocksize)

256k: Memory scheme of Atari Modules with 256kb memory capacity and of Games/Demos that were developed using the BLL and need less than 256kb of memory capacity.
(1024 Byte blocksize)

512k: Memory scheme of Atari Modules with 512kb memory capacity.
(1024 Byte blocksize)

512k-BLL: Memory scheme similar to 256k/BLL, for Games/Demos that use BLL and need more than 256kb capacity.
(1024 Byte blocksize 2 banks)

[l] lnx [b] bin/lyx [o] *.o

lnx: Games/Demos in the File Format *.lnx

bin/lyx: Games/Demos in File Format *lyx or *.bin

o: Games/Demos in File Format *.o

The Memory scheme/File Format is selected by entering the corresponding letter.

The currently selected Memory scheme/File Format is marked by an big "X."

When changing the Memory scheme / File Format, the menu will be displayed on the screen.

Note: the ".o" file format is only possible with Firmware 1.2x and newer

The FlashCard adds a small Bootloader to the o-file. You can load data to the Lynx DRAM to 0200hex – EFFFhex. The FlashCard uses settings from the standard o-file Header.

LANGUAGE

[0] English [4] Deutsch [6] Francais [7] Espanol [8] Nederlands

After entering the corresponding number, the menu and all messages are displayed in the newly selected language.

The selected language is marked with a big "X."

When changing the Language, the menu will be displayed on the screen.

SYSTEM

[s] systeminfo [c] credits [x] reset all

System Info: Output the Firmware Version, Languageset Version, Serial Number, Number of times the memory has been deleted, the Board-Variant and internal information.

Credits: Show the credits

Reset All: All settings, except the Baudrate, are reset. Also, the Flash memory and the EEPROM will be deleted.

The Bootloader

The Bootloader is independent software on the FlashCard. It's task is writing new Firmware versions in the memory of the microcontroller. The bootloader can not be exchanged.

The FlashCard's Bootloader is equipped with multiple security systems that prevent the Card from malfunctioning if an error occurs during an upgrade attempt.

Using the Bootloader

Since the bootloader has the transmission speed set to 2400 Baud, independent of the setting in the Firmware, you must first switch HTerm to 2400 baud.

To activate the Bootloader, Press and hold "Anykey."

While still holding "Anykey," press "Reset," hold for one second and release "Reset." (This disconnects the FlashCard from the PC and HTerm.) Continue holding "Anykey."

After about 4 seconds of holding "Anykey," the Status-LED will glow green. While still holding "Anykey," hit the "Disconnect" button on HTerm, then hit it again to "Connect." (Try to do this before the Status-LED turns red.)

About 3 seconds later, the Status-LED will glow red. Now you can release "Anykey." The Status-LED will glow yellow, meaning the bootloader is now ready to write a new Firmware to the Microcontroller.

If reconnecting was successful, you should see "send data" in HTerm's Received Data window

Note: After you release "Reset," the computer will be able to reconnect with the FlashCard. However, depending on your computer's setup (processor type, CPU speed, etc) the reconnection might take more, or less, time than indicated.

Also, the "send data" text is only visible if you are able to click the "Connect" button in HTerm before the "send data" text is sent by the FlashCard. This occurs between the green and red Status-LEDs. Even if "Connect" is not clicked quickly enough, it probably won't matter. The important thing to remember is, as long as the Status-LED glows yellow, the FlashCard is ready to accept the new Firmware.

Now you can send the new Firmware Version to the Card by clicking the "send file" button and choosing the new firmware file.

After the Firmware update is complete the message "press reset" will be send from the FlashCard.

On HTerm, hit the "disconnect" button, then the "connect" button, then change the Baudrate to 9600 baud.

Hit "Anykey" – this should display menu on data window

Hit "S" - this should display system info, including the newly updated firmware version number.

If the Firmware doesn't work or a different file is sent, the first security system will abort the update process and the message "Data does not match to this board – please reset" appears. The Status-LED will glow red until a reset is done. In this case, the old firmware is not overwritten and does still work.

Should a faulty file be accepted accidentally, another security system will stop the FlashCard from becoming unusable.

The FlashCard can be overwritten by starting the Bootloader again. This is always possible regardless of the state or the version of the Firmware.

The Firmware File

The filename has the following pattern:

“Firmware Vxxx yyymmdd Language Vxxx.fcb6“

This way it's easy to find out which firmware file you have.

The meaning of the extension fcb6 is FlashCard Board 6.

Inserting and Removing the FlashCard From the Lynx

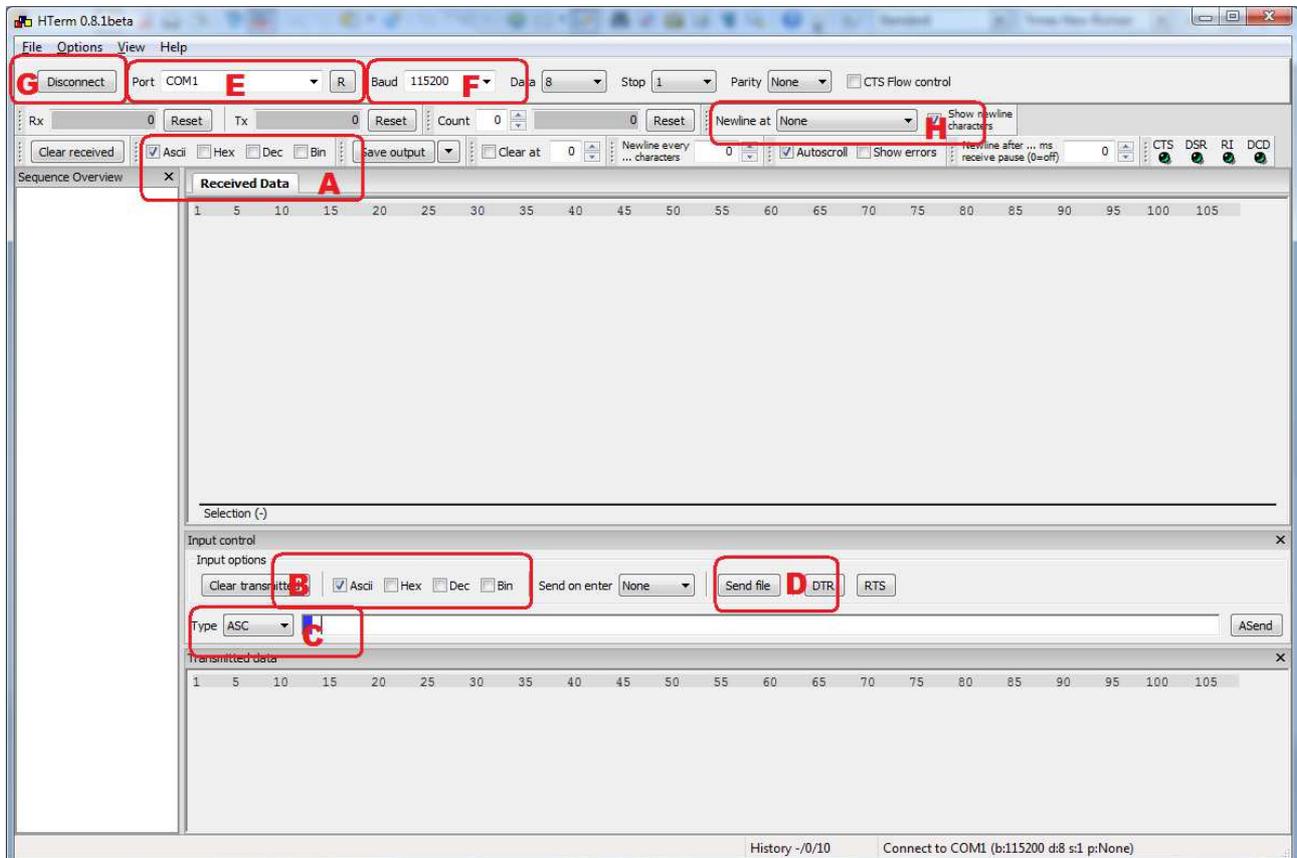
There is nothing special about inserting the FlashCard. Simply push the Card into the cartridge slot gently but firmly, then turn on the Lynx.

Before removing the Card, make sure the Lynx is turned off.

While using the Lynx with the FlashCard, do not press the "Reset" or "Anykey" buttons on the Card.

Short introduction to HTerm

A few basic things about HTerm:



A - Sets how the data sent by the FlashCard is displayed.

B - Sets the format in which the data sent to the Card is displayed.

C - Sets the format of the input data.

D - Selects which data to send. (Push this button after selecting “W” to write to FlashCard)

E - Sets the COM-Port the PC assigned to the Card. *

F - Sets the Baudrate.

G - Connects the Card to the Terminal. Press “Disconnect” to close the connection between the Card and the Terminal.

H - Set Newline to “CR+LF”

* In case you don't know which COM port to use, you can find out by starting HTerm without connecting the Card via USB. Select the Drop-Down list, and see which ports exist. Then connect the Card, and after the OS recognizes it, click the “R” Button and consult the Drop-Down menu again to see the added COM-Port.

Note: If you unplug the FlashCard from the computer's USB port, you will need to press “Disconnect” in HTerm, and when plugging the FlashCard back into the computer, you will need to press “Connect” in HTerm before you can use the Card. This is because HTerm can not detect if the FlashCard has been removed.

Error Messages and Common Problems

Message “Erase memory failed disconnect usb and try again” appears:

Just disconnect the USB-Cable and reconnect again after 5 seconds.

If that doesn't help, just do a “reset all” via the menu.

One or all “X”s are missing on the menu:

Do a “Reset All” and the “X”s should show up again.

Program not working after upload:

First, check the Card settings.

Is the Memory-scheme correct? Is the Memory Capacity correct? Is the file format set to the correct value? Does the Lynx file work at all in an Emulator? (e.g Handy)?

Note: some of the demos you can find in the internet do not work on a Lynx system. They only work with an Emulator.

Note: some .Inx-files do not have correct data in the header. This may cause problems with the Auto Size-Mode..

The Card doesn't react any more:

Connect the FlashCard to USB. Press and hold “Anykey,” then press “Reset.” Hold for 1 second, then release “Reset” while still holding “Anykey.” Wait 4 seconds until the Status-LED turns green. Release “Anykey.”

The card is then reset to the default Value of 9600 BAUD.

Note: If you continue to hold “Anykey” until the Status-LED turns from green, to red, to off, you can then release the “Anykey” without having to reset the Baudrate or jump in the Bootloader.

By pressing the “Reset” Key, the PC connection has been reset.

Don't do this - EVER

Reading via EEPROM Burner

Under no circumstances should you attempt to read the FlashCard memory with an EEPROM Burner. Some EEPROM Burners output 12V on some pins even when it is not reading. This has no effect on regular EEPROMs because they do not have a problem with this current. However, the FlashCard can not handle this current, and damage is very possible.

Connecting via an USB-Hub

When using a USB-Hub, malfunctions and "Connection Aborts" can occur, so we advise you to only use the Card with your Motherboard's USB ports.

Executing "MProg" (FTDI Tool)

Never execute the "Mprog" Program by FTDI.
When changing the Settings, the FlashCard might malfunction or even be damaged.

Cleansers /Cleaning with a Brush

Never use cleansers or abrasives to clean the FlashCard. However, the contacts can be cleaned using Isopropanol (Isopropyl Alcohol).

Never use a brush to clean the Card. There are ESD-aware brushes which can be used, though.

Removing the FlashCard from an running Lynx

Always power off your Lynx before removing the FlashCard. Removing the FlashCard from a running Lynx can damage the Card.

History:

Firmware:

6.15: First released Firmware for the board 6 FlashCard.

6.20: (available for download)

- add o-file support
- optimize code

6.40: (available for download)

- Menu Content
- Auto Size-Mode for .Inx-files
- Menu changes
- Support for 93C66 and 93C86
- Can modify 93Cx6 up to 128 Bytes at once
- Code optimization (e.g. Flash erase routine)

Bootloader:

Note: the Bootloader can not be updated.

1.02:

First released Bootloader for the board 6 FlashCard.

Credits:

Matthias Aschenbrenner

Fadest

Björn Spruck

Luis Caballero-Posadas

Milan Polle

Randy Pearson

Karri

Alex Thissen

Jair Moreno

...and anybody else i might have forgotten.

Links:

www.AtariAge.com

FlashCard Information-Thread:

<http://www.atariage.com/forums/topic/159711-flashcard-information-and-news/>

With link to Discussions-Thread and FlashCard-Blog (Firmware download and manual dt/en)

www.Atari-home.de

www.atari-lynx.de

www.nexgam.de