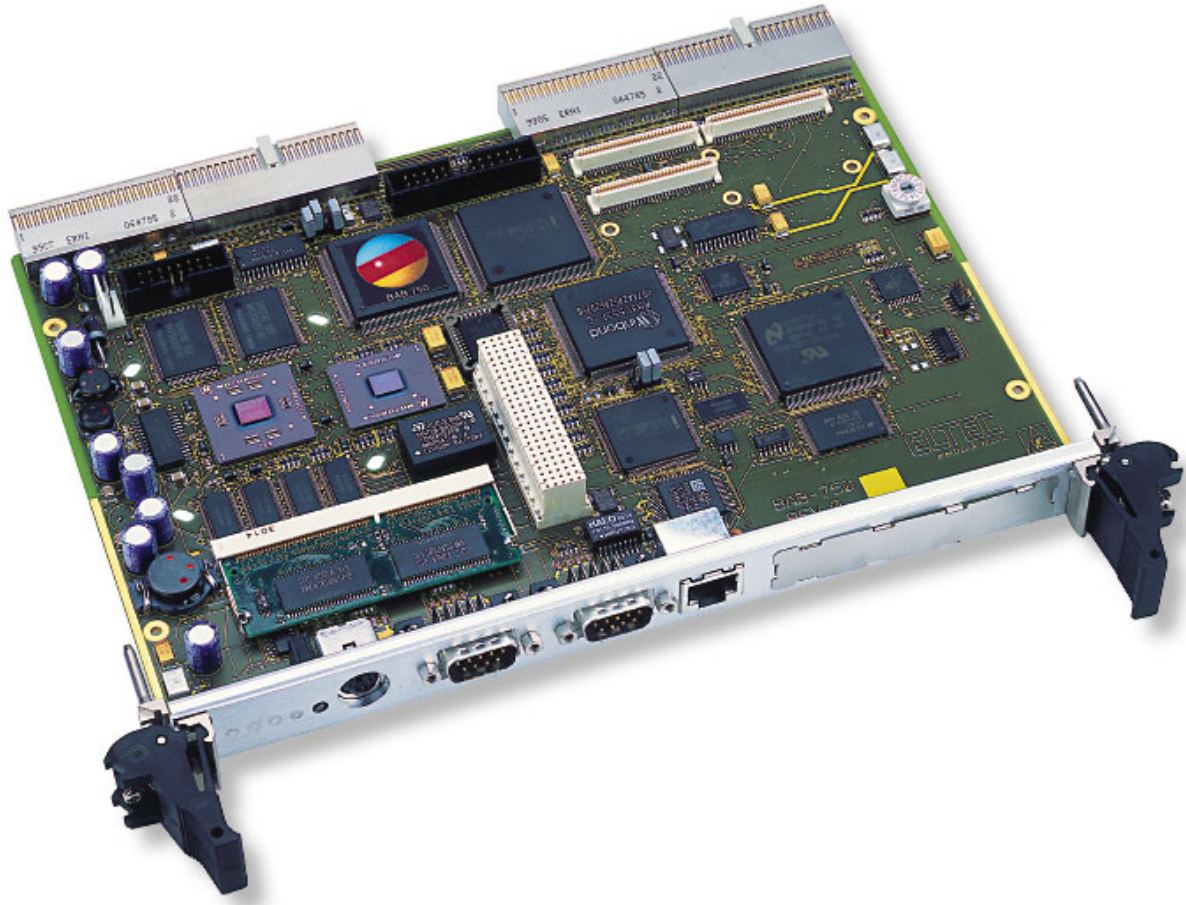


BAB750



Linux Manual

Revision 1A



Revision Info		
1A	First edition	fg, uw

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Chapter 1. Introduction

1.1. About this document

This document describes the ELTEC BAB750 running under LINUX.

For all questions concerning the hardware, please see the *BAB750 Hardware Manual*, which can be downloaded from our website.

Chapter 2 describes how to prepare your development system for ELINOS cross development. It explains the first steps needed to compile and start the sample project available.

Chapter 3 describes the bootloader *PPCBoot* and its configuration.

Chapter 4 shows how to clone *ELinOS* sample projects and use them with the BAB750.

Chapter 2. Prepare your development system

2.1. Serial terminal program

In order to connect to the targets serial console, you need a terminal program. This is necessary during development, as the bootloader and the Linux output can only be seen at the serial console. Later you may connect to the camera using a telnet or rsh client.

We recommend to use *minicom*, which is a text based terminal program. If it is not installed on your system, you need to install it and do some basic setup.

2.1.1. Installation of minicom under SuSE Linux

Under SuSE Linux *minicom* is contained in the package *n* (Network). Install it with *yast* or *yast2*.

2.1.2. Minicom setup

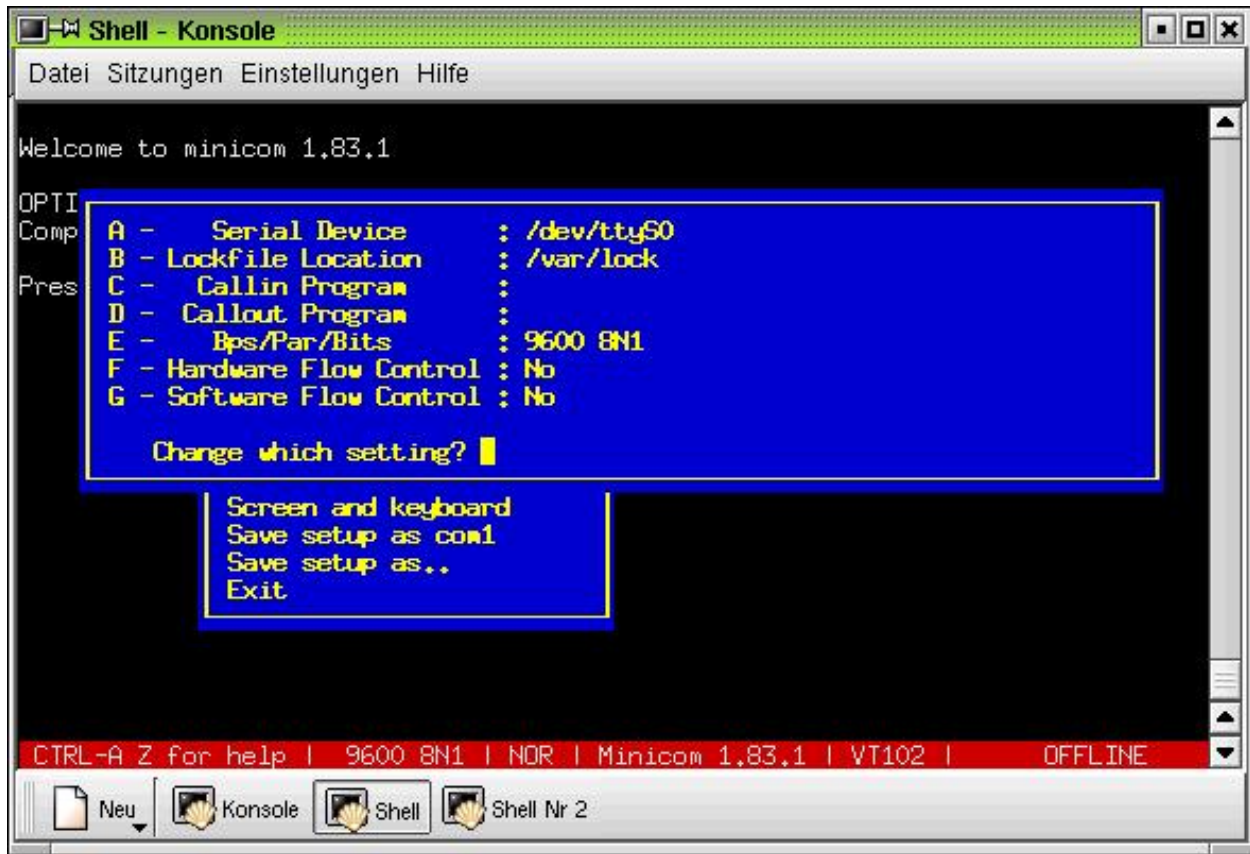
The bootloader and Linux are using the following serial parameters: 9600 8N1 (9600 baud, 8 data bits, 1 stop bit, no parity). You must adjust these parameters as *root*.

Start *minicom* as root with the parameter *-s*:

```
minicom -s
```

2.1.2.1. Serial port setup

Use the menuitem *serial port setup* to see the following menu:

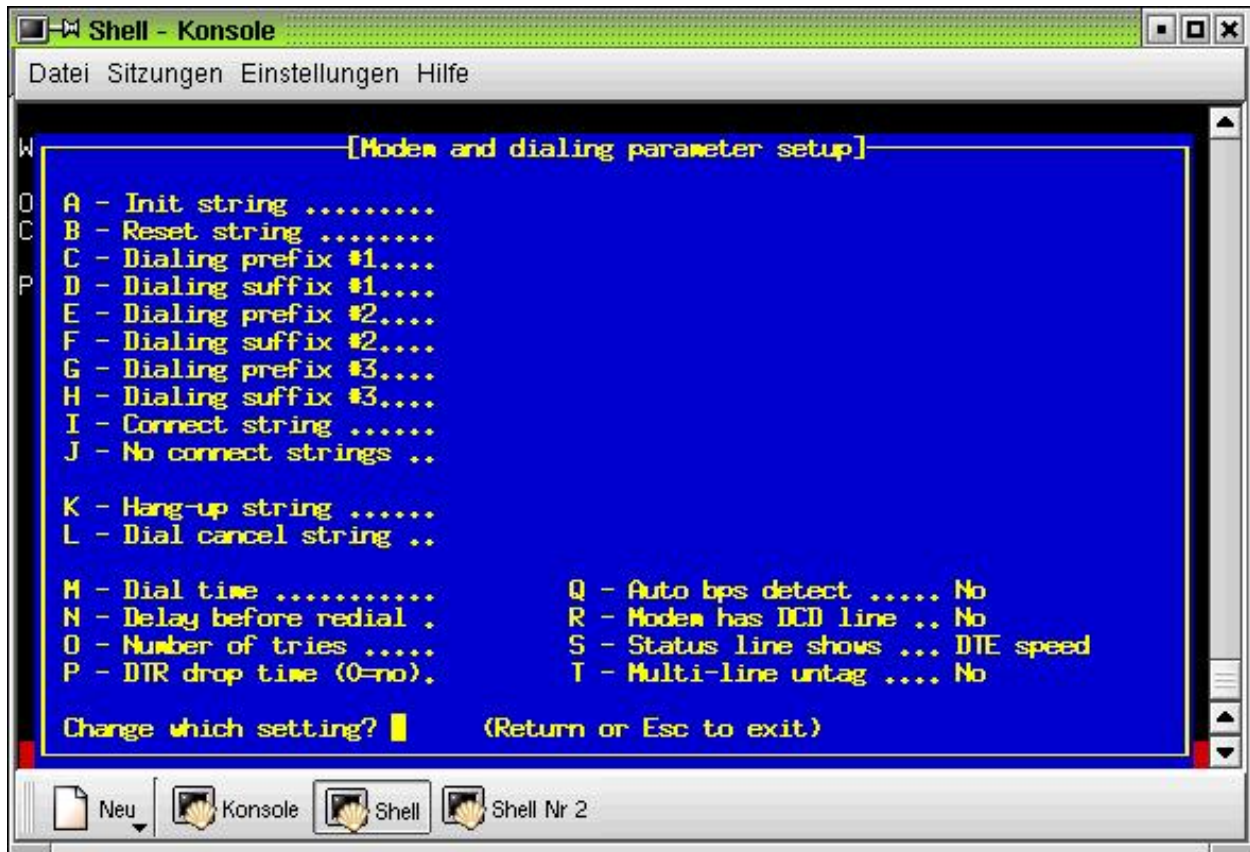


Minicom setup screen

The important items are "A", "E", "F" and "G". In this case we use COM1 on the development system (/dev/ttyS0), the baud setup explained before and no flow control.

2.1.2.2. Modem parameter setup

Minicom is intended to be used for modem connections too. As we do not want so send e.g. dialup prefixes to the BAB750 we need to delete all strings in the next dialog box.



Minicom serial parameters

2.1.2.3. Saving the setup

Save the setup e.g. as *com1*. Later, minicom can be used with this setup by normal users just by typing *minicom com1*.

2.2. Bootp server

If you want to develop applications for the BAB750, you need to transfer the Linux image to the BAB750 in order to store it to flash or to boot it. This is done by a *bootp* and a *tftp* daemon. If one of the daemons is missing, have a look at the following description.

2.2.1. Installing the bootp daemon under SuSE Linux

Under SuSE Linux the bootp daemon *bootp-DD2* is contained in the package *n* (Network). Install it with *yast* or *yast2*.

The *tftp* daemon is contained in the package *n* (Network) too.

2.2.2. Important configuration files

You need to edit some configuration files. This can only be done as *root*.

2.2.2.1. /etc/services

Be sure that the lines containing *tftp* and *bootp* are not commented out with "#".

2.2.2.2. /etc/inetd.conf

Look for the two lines beginning with *tftp* and *bootp*. They must look like this.

```
tftp dgram udp wait root /usr/sbin/in.tftpd in.tftpd -s /tftpboot
bootps dgram udp wait root /usr/sbin/bootpd bootpd -c /tftpboot
```

2.2.2.2.1. tftpboot directory

You need to create the directory */tftpboot* for your boot images and change the access right as root. If you choose another name, change the name in */etc/inetd.conf*.

```
mkdir /tftpboot
chmod 777 /tftpboot
```

2.2.2.3. /etc/bootptab

This file contains the parameters for each bootp client. The following example shows the entry for *one* BAB750 with the ethernet *hardware address* 00005b0097cc. It will get the network address 192.168.4.159. The boot image will be *BAB750_sample.img*.

```
BAB750 :hd=:\
      :ip=192.168.4.159:\
      :sm=255.255.255.0:\
      :hn:\
      :ht=ethernet:\
      :ha=00005b0097cc:\
      :bf=BAB750_sample.img:
```

You can find the hardware address by using the *printenv* command in the PPCBoot bootloader. See the *PPCBoot* chapter for details.

2.2.3. Restarting inetd

After changing all configuration files you need to restart Linux or at least the *inetd*, *bootpd* and *tftpd*. You need not to restart if you only changed */etc/bootptab* !

To restart all daemons invoked you can do the following as root:

```
killall inetd
killall in.tftpd
killall bootpd
inetd
```

2.3. ELinOS Installation

The installation of ELinOS is described in detail in the ELinOS manual. Please read it, its excellent.

For simplicity you should perform a full install.

2.4. Installation of BAB750 kernel sources

The kernel sources for BAB750 are not contained on the ELinOS CD, but provided seperatly by ELTEC, and must be installed after installing ELinOS.

ELinOS is installed in the directory */opt/elinos*. One subdirectory contains the Linux kernel sources. It is named *linux-2.4.18* or similar.

You must install the BAB750 kernel in the directory */opt/elinos* too. This is simply done by unpacking the shipped *tgz* file.

We assume that the BAB750 kernel is contained on a cdrom. Perform the following steps as *root*.

```
mount /cdrom
cd /opt/elinos
tar xjvf /cdrom/linux-2.4.18-2.4.18-eltec-1.tar.bz2
umount /cdrom
```

Note

The file name of the linux kernel may differ from the one noted above. Please have a look at the file *README* distributed with the kernel.

2.5. BAB750 sample projects

There are sample projects available for the BAB750. This section explains how to install these samples. For detail concerning these samples please see the *README* coming with the samples.

The sample project is assumed to be on a cdrom too. Copy it to a directory of your choice. You need not to do this as *root*.

```
mount /cdrom
cd ~/elinos
tar xzvf /cdrom/BAB750-20021212.tgz
umount /cdrom
cd BAB750
```

These steps create a directory *BAB750* which contains the BAB750 sample project.

1. Change to the directory *BAB750* and call *configure*. All questions can simply be answered by pressing "ENTER". This step is done to set up directory paths properly.

```
user@host:~ > cd BAB750
user@host:~/BAB750 > ./configure
...
ELINOS_CPU      = ppc
ELINOS_ARCH     = 60x
ELINOS_LIBC     = libc6
ELINOS_DOSNAME  = BAB750
ELINOS_BOOT_STRAT = ppcboot_multi
```

2. Call *ELINOS.sh* as described in the ELinOS manual. . *ELINOS.sh*
3. Connect the project to the proper kernel ! *elinos-linkkernel -n --kernelsrc=/opt/elinos/linux-2.4.18-2.4.18-eltec-1*

Now you can start the ELinOS configurator *elk*, compile the kernel, modules and user applications as described in the ELinOS manual.

2.6. Downloading and running the sample project

After building, the BAB750 kernel image should be located in the */ftpbboot* directory. The PPCBoot monitor can now load and execute the image with *boot* command.

For details see the *README* coming with the sample.

Chapter 3. PPCBoot

3.1. What is PPCBoot ?

PPCBoot is a monitor for Embedded PowerPC boards, which can be installed in a boot ROM and used to test the hardware or download and run application code. PPCBoot is free software developed under GNU General Public License. The development of PPCBoot is closely related Linux. The latest version can be taken from <http://ppcboot.sourceforge.net>.

3.2. Common PPCBoot commands

The following is a description of common PPCBoot commands. A full list of supported commands is printed by command *h* at PPCBoot commandline. Parameters for any command can be obtained with *h [command]*.

All address, size, offset, etc. values have to be entered in HEX format without leading '0x' or 'h'.

Table 3.1. Common PPCBoot commands

Command	Parameter	Description
boot		Exec boot command <i>bootcmd</i> .
bootm	bootm [addr]	Boots a previous at address "addr" loaded PPCBoot image. "addr" has not to be given, because last load address from <i>bootp</i> , will be taken as default.
bootp	bootp addr	Exec a BOOTP request and store the loaded image at address "addr". A few environment variables will be set: <i>ipaddress</i> , <i>bootfile</i> , etc. ... If no addr is given a board specific compiled in default is used.
cp	cp [.b, .w, .l] source destination count	Copy memory areas (in previous erased Flash also). .b : Byte .w : Short .l : Long
protect on	protect on start end	Enable FLASH write protection (software)
protect off	protect off start end	Disable FLASH write protection (software)
erase	erase start end	Erases Flash-ROM
flinfo		Print information about installed Flash-ROM.
h	h [command]	Print compiled in help text for command.
md	md[.b .w .l] addr len	Memory Dump .b : Byte

Variable	Default	Description	Example
	\$(hostname):\n eth0:none;\n bootm		
bootdelay	not set:	Autoboot without delay	Delay time in seconds till exec of command <i>boot</i> . Environment variable <i>bootcmd</i> is used for command <i>boot</i> . setenv bootdelay 5
gatewayip		Gateway IP address Is set from <i>bootp</i> command with informations supplied by Bootp-Server. Can be passed to Linux kernel as kernel parameter.	
hostname		Hostname Is set from <i>bootp</i> command with informations supplied by Bootp-Server. Can be passed to Linux kernel as kernel parameter.	
ipaddr		Own IP address Is set from <i>bootp</i> command with informations supplied by Bootp-Server. Can be passed to Linux kernel as kernel parameter.	
netmask		IP network mask Is set from <i>bootp</i> command with informations supplied by Bootp-Server. Can be passed to Linux kernel as kernel parameter.	
serverip		IP address of Bootp-Server	

Variable	Default	Description	Example
		Is set from <i>bootp</i> command with informations supplied by Bootp-Server. Can be passed to Linux kernel as kernel parameter.	

3.3.2. Extended Environment

The following is a description of ELTEC specific PPCBoot environment extentions for BAB750.

All changes with command *setenv* are temporary only and will be lost after next *reset*. To store changes permanently the *saveenv* command has to be used.

3.3.2.1. Extended Environment

Table 3.3. Extended PPCBoot environment (ELTEC)

Variable	Default	Description	Example
ata_reset_time	10 seconds	Timeout for ATA devices to respond after bus reset. NOTE: Time may be set to zero if board does not have an IDE interface.	setenv ata_reset_time 60
scsi_reset_time	10 seconds	Timeout for SCSI devices to respond after bus reset. NOTE: Time may be set to zero if board does not have an SCSI interface.	setenv ata_reset_time 60
l2cache	not set means L2 cache enabled	Enable or disable L2 caching	setenv l2cache 0
ide_dma_off	not set	Setup user register of IDE controller to disable DMA transfers. For some IDE devices like ZIP drives this environment must be set to work under Linux. For the Linux kernel a patched IDE driver (sl82c105.c) is provided. value 1 for Device 0 on Bus 0 value 2 for Device 1 on Bus 0 value 4 for Device 0 on Bus 1 value 8 for Device 1 on Bus 1 Add values to disable DMA for	setenv ide_dma_off 15 (disable all DMA for Dev 0/1 on Bus 0/1)

Variable	Default	Description	Example
		multiple devices. Enter decimal value.	
videomode	not set means videomode 800x600 8bit	If board is equipped with PMC graphic extension PMView (SMI7xx) PPCBoot console will be switched to graphic mode as default. With this environment the videomode can be changed in size and frame buffer bit depth. To switch mode save environment and reset board. value 303 for 800 x 600 x 8bit (default) value 314 for 800 x 600 x 16bit value 315 for 800 x 600 x 24bit value 305 for 1024 x 768 x 8bit value 317 for 1024 x 768 x 16bit value 318 for 1024 x 768 x 24bit value 307 for 1280 x 1024 x 8bit value 31a for 1280 x 1024 x 16bit value 31b for 1280 x 1024 x 24bit	setenv videomode 317; saveenv; reset
console	not set - means default is graphic console	If board is equipped with PMC graphic extension PMView (SMI7xx) PPCBoot console will be switched to graphic mode as default. With this environment the console i/o can be forced to serial port. string "serial" force switching to serial console i/o.	setenv console serial

3.4. Flash-ROM mapping for BAB750

BAB750 is equipped with 2 MByte User Flash and 512 KByte System Flash eeprom. The factory default mapping (User ROM BOOT jumper not set) starts at address at 0xFF800000. See also hardware documentation for details.

Table 3.4. BAB750 Flash ROM mapping

Start	End	Description
0xFF800000	0xFE9FFFFFFF	2 MByte User Flash for JFFS/JFFS2 (Journalling Flash Filesystem).
0xFFC00000	0xFFFFFFFF	512 KByte System Flash eight times mirrored.
0xFFF00000	0xFFF3FFFF	256 KByte for PPCBoot Monitor code (System Flash).
0xFFF40000	0xFFFFFFFF	256 KByte reserved (System Flash).

3.5. Standalone Boot

1. Build a kernel image (including a demo or other application; type `ppcboot_multi`) with support for MTD for BAB750 , JFFS2 and NFS option (this is all included in delivered default *kernel-config*). Make sure that the *eraseall* command is included. Boot this image via *bootp*.
2. On BAB750 shell check the MTD entry with command `cat /proc/mtd`. The first entry 'mtd0' represents the whole Flash device. Depending on the hardware the PPCBoot Monitor part is located together with the JFFS in a single Flash or is stored in a separate Sytem Flash device. To store the standalone boot image the entry called *JFFS Persistant storage* must be used. In the text below this device is called *mtdX* where *X* is the block number.

On BAB750 the *JFFS Persistant storage* is limited to 2MB Flash, so the default *kernel-config* must be reduced to a minimum to fit into Flash.

If *JFFS Persistant storage* is used for the first time (or for cleanup) the *mtdX* must be formatted with:

```
eraseall /dev/mtdX
```

3. Insert JFFS device into target file system.


```
~ # mount /dev/mtdblock# /mnt -t jffs2
```
4. Configure the network and copy kernel/application via NFS into Flash


```
~ # ifconfig eth0 192.168.2.105
~ # mount 192.168.2.100:/nfsroot /host -o nolock,noac,mountvers=2
~ # cp /host/network.img /mnt
~ # ls -l /mnt
```
5. Reboot linux and boot the new kernel with PPCBoot commands.


```
=> ls
=> fsload 1000000 network.img
=> bootm 1000000
```
6. The PPCBoot *bootcmd* may be changed to autoboot after powerup directly from Flash. (You need to type the "\ " to mask the ";".)


```
=> setenv bootcmd fsload 1000000; setenv bootargs root=ramfs; bootm
```

7. To configure the network at Linux kernel load the environment *ipaddr* may be set and saved. Otherwise the network can be configured in init-task with *ifconfig eth0*

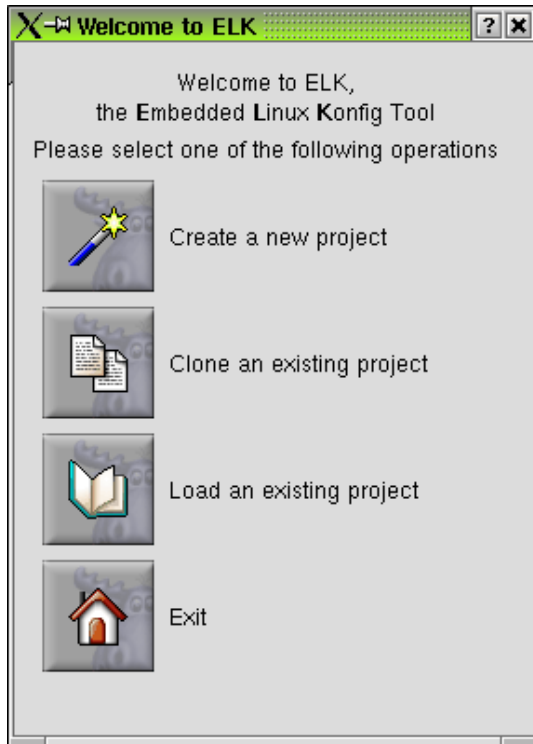
Chapter 4. Using ELinOS demonstration projects

4.1. Cloning a project

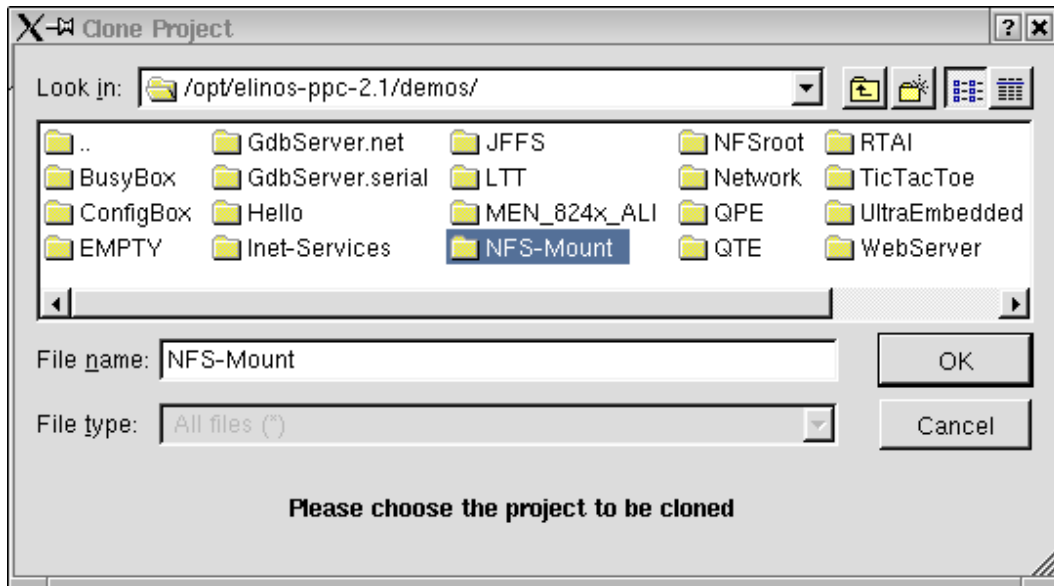
After installing ELinOS and the BAB750 linux kernel, you can use ELinOS *elk* for cloning the ELinOS demo projects.

Please read the ELinOS manual for details.

Start `/opt/elinos/bin/elk` e.g. from a shell. Elk comes up with a dialog. Use *Clone an existing project*.

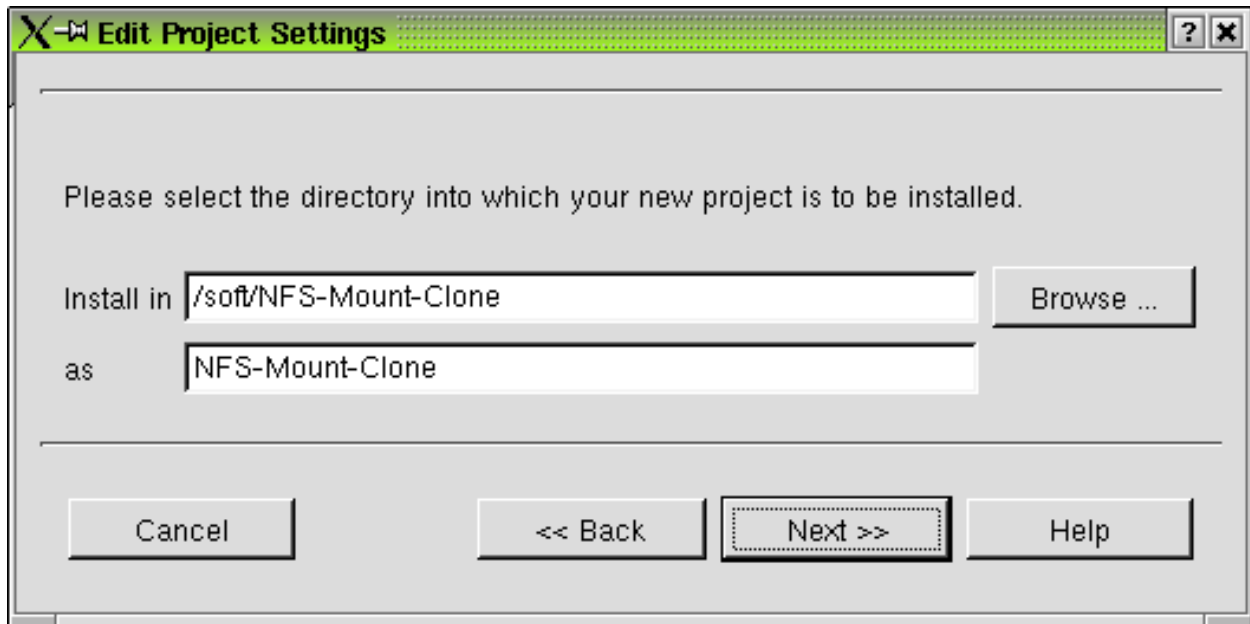


Now choose one of the ElinOS sample project directories in the file-select-box

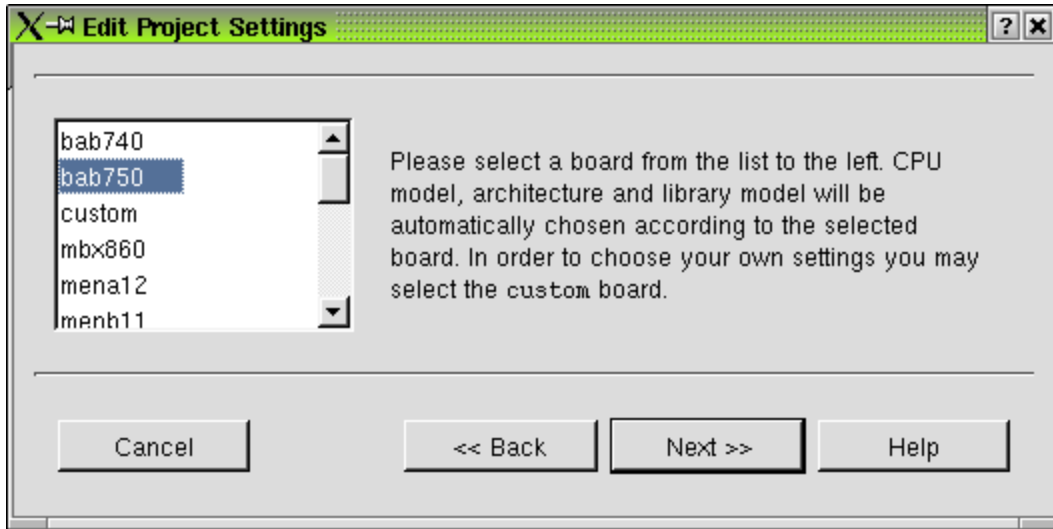


Choose *next* in the dialog box.

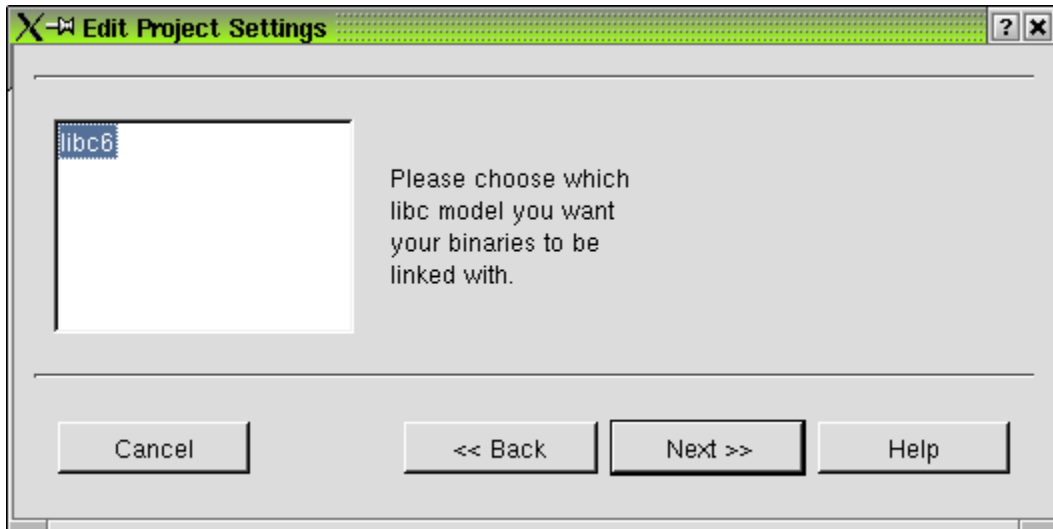
Select a directory for installation in the next dialog.



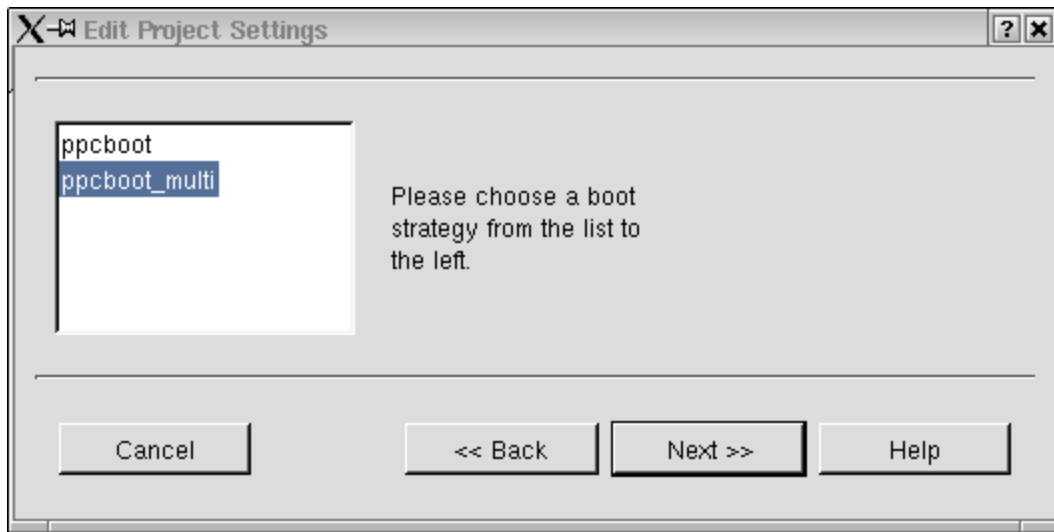
Choose the BAB750 from the list.



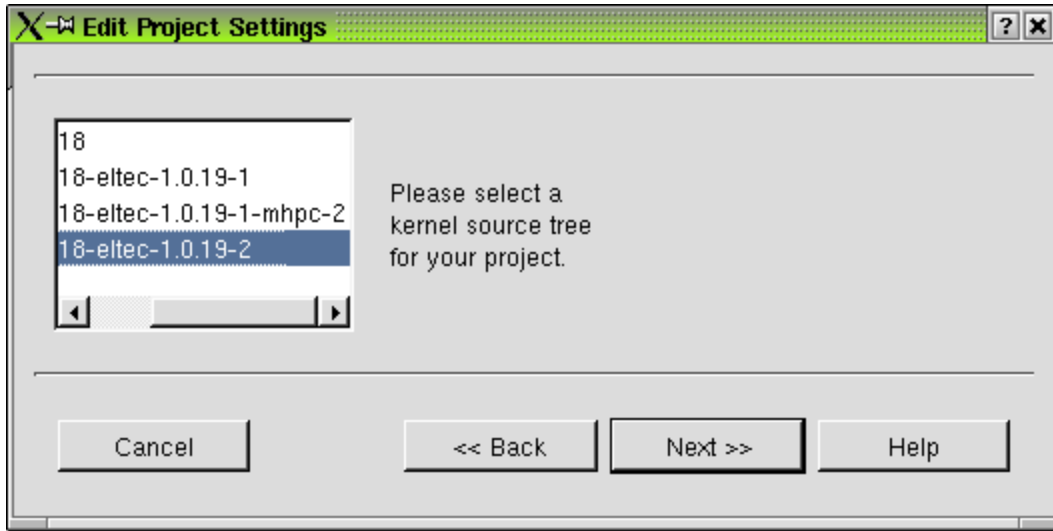
Choose the libc model you want your binaries to be linked with.



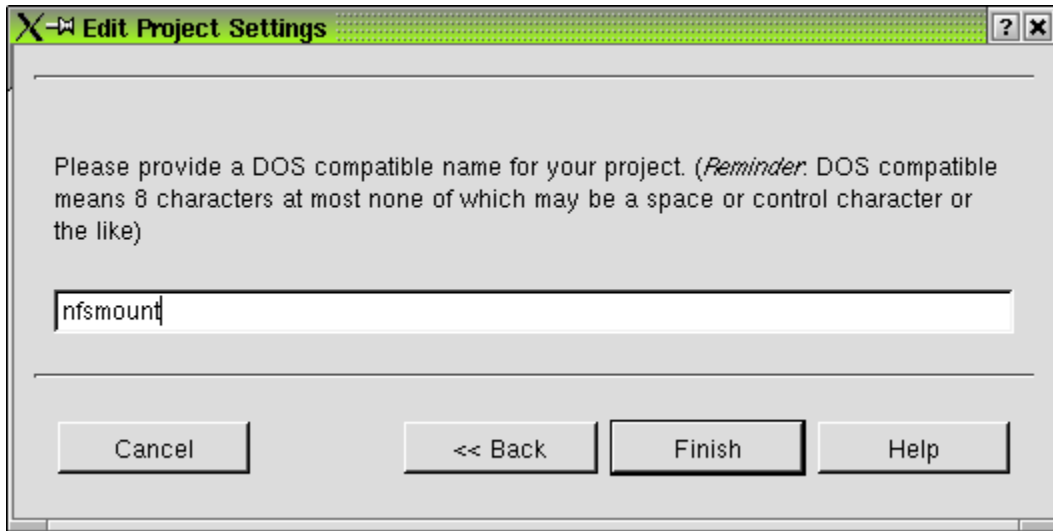
In the next step choose the *ppcboot_multi* boot strategie for the BAB750.



Now you have to select the previously installed ELTEC kernel for the BAB750.



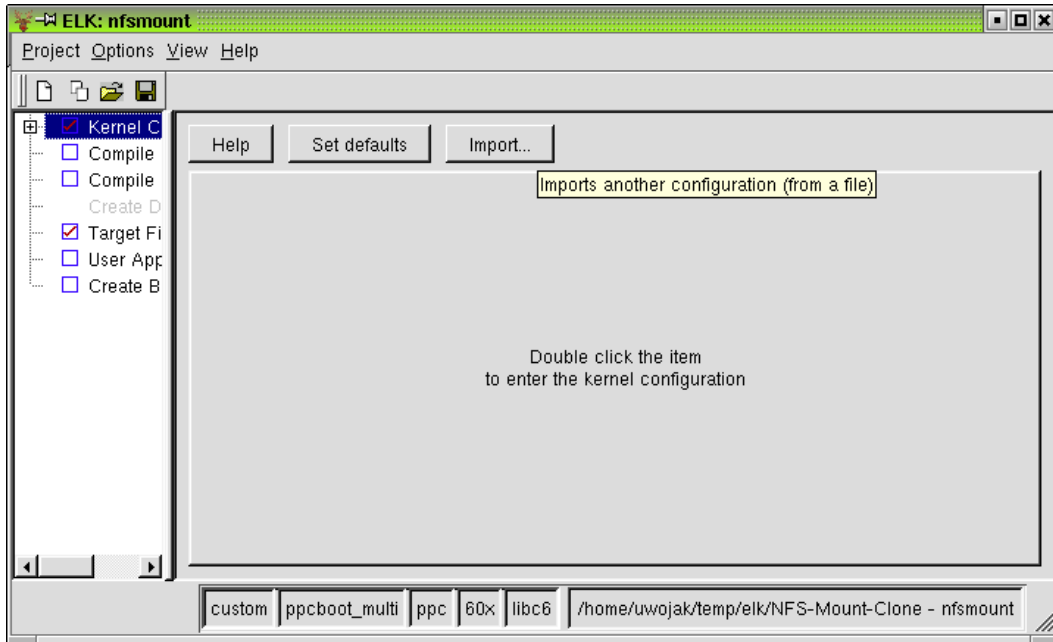
The last step is to provide a DOS compatible name for your project.



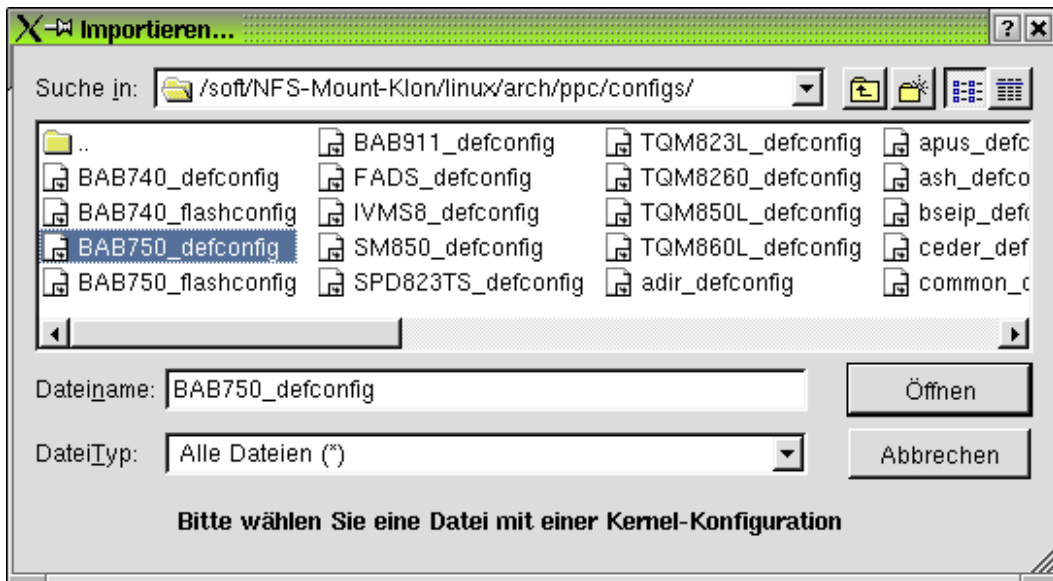
Now you have cloned a project and are nearly ready to compile it.

The last step is to import a proper *.config* file into your linux directory. The most recent *.config* file is contained in the previously installed kernel sources

Select *Kernel Configuration* in the left panel of *elk* and use the *Import* button.



Switch to the subdirectory *linux/arch/ppc/configs* and choose the default configuration.



Now you are ready to compile your project. Please remember to copy the image to your tftboot directory.

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