ABLE User Guide

Simtec Electronics

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Preface

About this document. This document describes the Simtec Electronics Advanced Boot Load Environment (ABLE) which provides a flexible environment for both experimentation and integrator solutions.

Intended Audience. This document is aimed at anyone using the ABLE bootloader. The first part is more useful to the beginner but the reference parts allow the book to remain useful to the more experienced user.

Chapter Summary.

Chapter 1, *Overview*	Gives an outline of what functions ABLE does and does not provide and a brief discussion of possible features.
Chapter 2, *Getting Started*	Gives an introduction to the facilities of ABLE and methods for interacting with the bootloader.
Chapter 3, *Command Line Interface*	Gives a comprehensive guide to using the in built command line interface.
Chapter 4, *The ABLE shell*	Provides a guide to the use of the ABLE shell.
Chapter 5, *ABLE Console*	Shows how ABLE communicates with the user and how that is controlled.
Chapter 6, *Starting an Operating System*	Shows how Operating systems may be started. Including how OS are located and identified both for manual and automated loading.
Chapter 7, *Networking*	Gives details on how to configure network interfaces from ABLE
Chapter 8, *Upgrading*	Gives details on how to upgrade the bootloader.
Part II, “Built-in Command Reference”	Is a complete reference to all the built in commands within ABLE.
Appendix A, *Non-Volatile Variables Reference*	Is a complete reference to all the non volatile variables available within ABLE.

Acknowledgements. Several people contributed to the creation of this book in various ways. I would especially like to thank R. Parry and M Gillard for proofreading.

Feedback. Any suggestions, comments or corrections concerning this document are welcomed, please contact Simtec Electronics giving:

The document title
The document revision
A clear explanation of your comments and how they apply

Part I. Usage

Chapter 1. Overview

The Simtec Electronics Advanced Boot Load Environment (ABLE) is a portable modular boot loader for use in applications where an Operating System (OS) must be retrieved and started. ABLE provides extended functionality providing modules for a command line, video consoles, serial consoles, network booting and numerous other facilities.

ABLE is a powerful tool and provides a flexible environment useful for both the development and deployment of systems. ABLE is a boot loader, not an Operating System, this distinction can sometimes lead to misunderstandings about the capabilities provided by ABLE. A boot loader in this context is a self contained program which retrieves and starts execution of an Operating System it does not execute user programs itself (all the CLI commands are built in) and does not provide services to an Operating System once started (PC BIOS perform this role).

The modular nature of ABLE allows the use of the same building blocks for every supported platform. The integration and omission of various modules allow for specific driver sets depending on the peripherals of a platform. The flexibility of this approach allows for a common familiar environment across all supported platforms while still supporting a complete feature set.

This user guide covers the operation of ABLE from its command line interface (CLI). For details on the programming interface and more advanced topics please see the ABLE Reference manual or contact Simtec Electronics support directly.

ABLE is typically provided in any board directly manufactured by Simtec Electronics. Customer applications which are not manufactured by Simtec Electronics may still use ABLE once a suitable binary distribution licence is obtained.

Chapter 2. Getting Started

When a platform is initially powered or a hard reset performed, the Initial Program Loader (IPL) is started. The IPL is a very small program which retrieves and starts the full boot loader. If the IPL is unsuccessful it will attempt an XModem transfer using the primary serial port. The IPL is not a boot loader, the image it loads can only be retrived from the flash it was loaded from, it takes no user input, produces no output and configures no peripherals.

The IPL retrives ABLE and passwes execution to it. ABLE is constructed using a small core and numerous modules. Each module represents a specific set of functionality and may provide additional functionality to other modules. Each component module is loaded in turn according to a priority. The **modules** command may be used to examine the currently loaded modules and their priorities.

The last module loaded is the ABLE shell which will present the user with a command line interface.

ABLE is interacted with using a textural Command Line Interface. This interface is most commonly presented on a serial port but may be on a video console or via the network.

ABLE has a flexible console system for its input and output which can be configured to meet most requirements. The console system is controlled with **console** command and the `console.read` and `console.write` parameters. Details on using the console system can be found in **Chapter 5, *ABLE Console***

The default console operation is to use all suitable input and output devices available.

On the EB2410ITX both the first serial port and the video display will be used for output and the serial port and USB keyboard for input.

Example 2.1. Display after starting ABLE on EB2410ITX

This example shows the typical default output shown when ABLE is started.

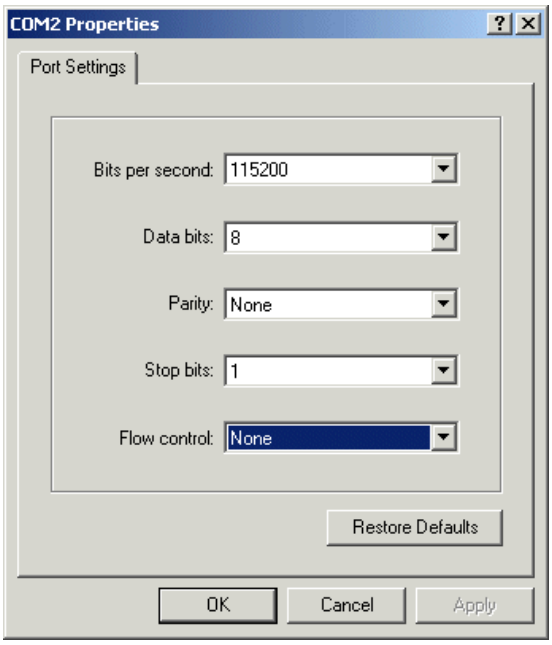
```
selected all-wr for console write
selected all-rd for console read
DRAM: 128 Mb (134217728 bytes)
BAST: PMU version 1.02, ID 00:01:3d:00:01:6a
ABLE 2.20 Copyright 2001-2005,2006 Simtec Electronics
hdb: ATAPI CDROM: TOSHIBA CD-ROM XM-7002B PIO mode 4
hdc: FUJITSU MHF2043AT: ATA PIO mode 4
hdc:Diagnosing disc drive: ok
(hdc) 4GB
(hd0) on ((hdc1):ext2)
(hdb) Drive Empty
DM9000: dm0: r1, 00:01:3d:00:01:6a int phy, link ok, 100Mbit full duplex
NE2000: ne0: ISA/Generic, 00:01:3d:00:01:6b
TMP101: not detected
sys.autoshadow unset, automatically shadowing
>
```

Unless the boot parameters are altered from their default settings the automatic boot process will commence. To manually start an operating system the command line must be used.

2.1. Using hyperterm as a serial console

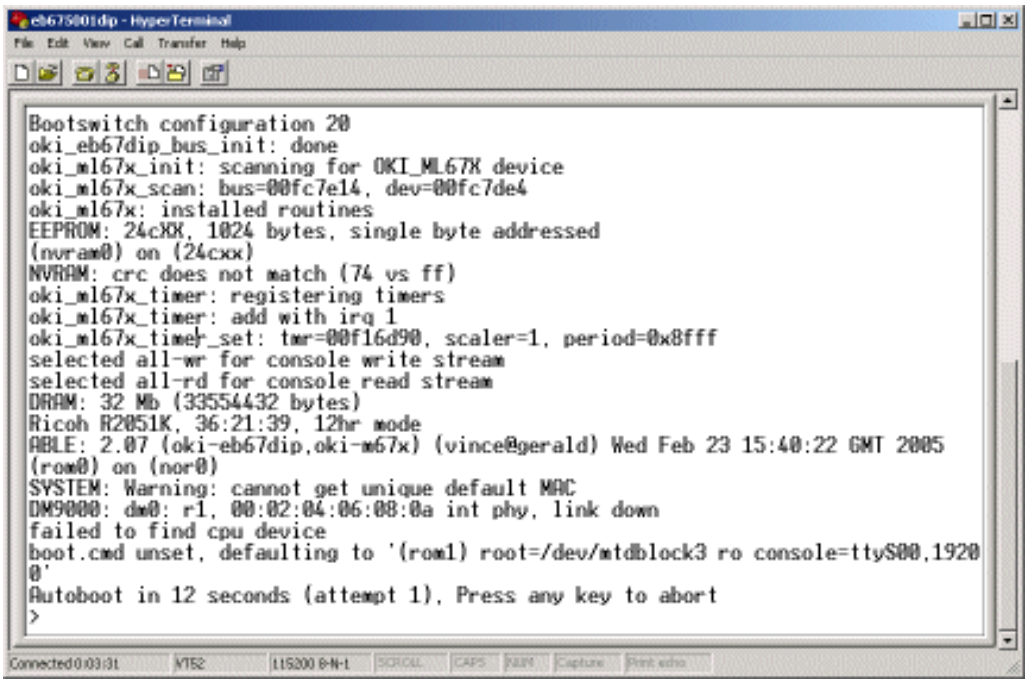
To access the serial console from windows the Hyperterm program can be used. Identify which serial port the platform is connected to and ensure a note is made of the correct COM port, e.g. COM1 or COM2.

Figure 2.1. Hyperterm settings window



Start HyperTerm and create a new connection. When prompted for which modem to use, instead choose the appropriate COM port, as noted earlier. Then the appropriate settings for your platform (please refer to platform specific documentation) typically these settings are 115200 bits per second, 8 data bits, no parity, 1 stop bit and no flow control.

Figure 2.2. Hyperterm displaying ABLE output



Once the connection is established the output from ABLE should be seen in the Hyperterm window

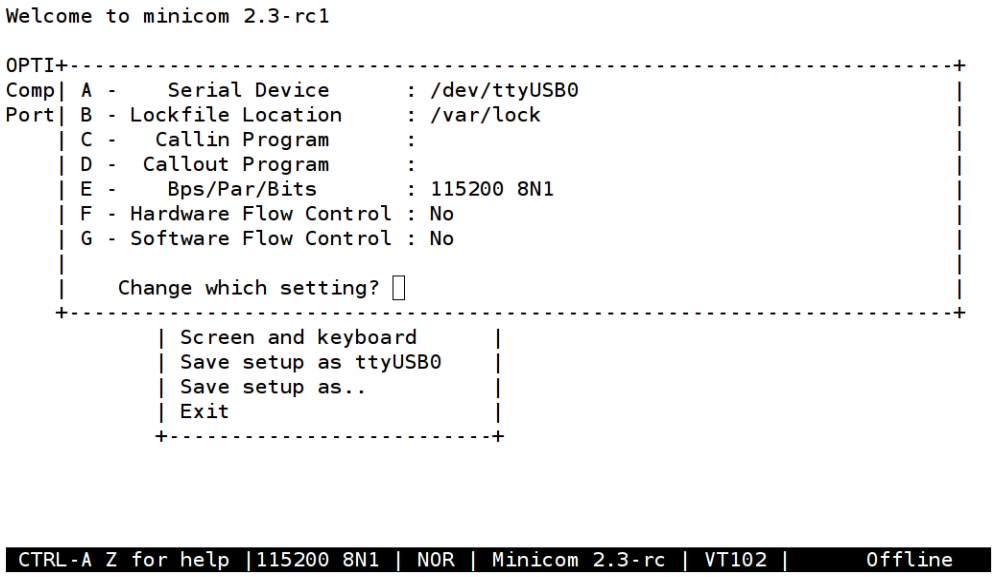
2.2. Using minicom as a serial console

To access the serial console from Linux® the minicom program can be used. Identify which serial port the EB675001DIP is connected to and ensure a note is made of the correct device node, e.g. something like /dev/ttyS0 or /dev/ttyUSB0.

Start Minicom and ensure the correct configuration is selected. The default keyboard action to access the configuration screen in Ctrl-A followed by o. The “Serial port setup” option should be selected.

The serial device should be set (setting A) to that noted earlier. The serial parmeters should be set apropriately (option E), the parameters most common for Simtec Electronics boards are 115200 baud, 8 data bits, no parity and 1 stop bit. Hardware and software flow control should also be disabled.

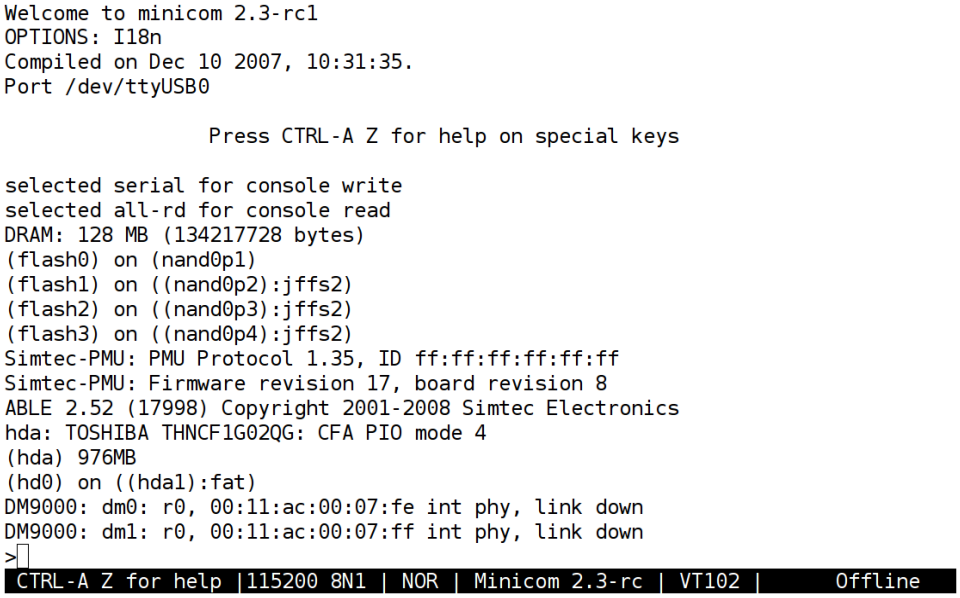
Figure 2.3. Minicom settings window



Minicom may be started with the *-s* switch and a configuration name. This allows a configuration to be created which may be used in future invocations removing the need to reconfigure Minicom each time it is started.

Figure 2.4. Minicom displaying ABLE output

Minicom started with *ttyUSB0* causing a named configuration to be used.



Chapter 3. Command Line Interface

The ABLE command line interface (CLI) provides the primary method for interacting with ABLE. The command line is the interactive interface to the ABLE shell.

The CLI is a flexible environment and commands can be placed in a script file for automation purposes. All the current commands are documented in Part II, “Built-in Command Reference”.

3.1. Command line editing

The default prompt is “>”, this can be altered by setting the value of the `PS1` shell variable. Commands can be entered at the prompt and executed by pressing **return**.

If an error is made while typing a command the left and right arrow keys can be used to position the cursor and insert or delete characters.

Once a command has been executed it may be recalled by using the up arrow, indeed several commands are stored in the command history to a depth determined by the shell.hist parameter. By using the **up** and **down** arrow keys the desired line in the history may be selected. The command may then optionally be edited and then executed by pressing **return**.

Depending on the terminal in use some standard control characters can be used, for example Control U to clear a line.

3.2. Simple commands

The shell processes commands as a series of tokens separated by unquoted space, tab, ||, && and ; characters. The first token specifies the command to be executed and is passed as the first argument, all the remaining tokens are passed as parameters to the command.

Each command exits with a status, this status is represented by a number between 0 and 255. A command which exits with a status of 0 has succeeded any other value is taken to indicate a failure.

The shell itself will return the status of the last command it executed or the value specified if using the exit command.

3.3. Quoting

Some characters and words have special meanings to the shell. The quoting process is used to remove these special properties.

There are three ways to quote special values

- The escape character (\)
- Single quotation marks (')
- Double quotation marks (")

The escape character, a backslash \, causes the shell to ignore the special properties of the following character.

Single quotes around characters stop any special meanings. Strings escaped with single quotes may not contain a single quote because the escape character has no effect within single quotes.

Double quotes preserve all characters within them except **$**, **'** and \. The escape character only works for a limited number of characters within double quotes, these are **$**, **'**, **"** and \.

3.4. Filesystem navigation

ABLE has the ability to fully navigate detected filesystems. The Chapter 12, *File Navigation* commands may be used to move around and list the entries within any filesystem which supports directory enumeration (currently only the tftpboot

pseudo filesystem does not). It should be noted that only devices with a valid filesystem recognised and supported by ABLE can be navigated in this way.

ABLE presents all available filesystems and devices in a hierarchical structure. The root of this filesystem is a virtual representation of all the available devices. The devices are either direct representations of devices or aliases which show the detected filesystems on devices.

At initial boot time the Present Working Directory (`PWD`) is set to `/` which represents the root of the filesystems. The `PWD` is changed with the **cd** command and displayed with the **pwd** command. The **dumpfile(1)** command without any parameters lists the `PWD`. With a parameter it lists the specified directory. The currently available aliases can be show by using **dumpfile(1)** on the root directory. The all switch (`-a`) will show all the available filesystems too.

Example 3.1. Navigating a filesystem

```
>pwd
/
>ls
(hd0) -> (hda1):ext2
(flash3) -> (nand0p4):jffs2
(flash2) -> (nand0p3):jffs2
(flash1) -> (nand0p2):jffs2
(flash0) -> nand0p1
(fb0) -> sm501fb
(s3c2410_serial2) -> char6
(s3c2410_serial1) -> char5
(s3c2410_serial0) -> char4
(u16550_serial3) -> char3
(u16550_serial2) -> char2
(u16550_serial1) -> char1
(u16550_serial0) -> char0
(sbcd0) -> 24cxx1p1
(nvram0) -> 24cxx0p2
(uid0) -> 24cxx0p1
>cd (hd0)
>ls
var
etc
usr
bin
boot
dev
home
lib
proc
root
sbin
tmp
sys
>cd boot
>ls -l
-rw-r--r-- 1 0 0     176 2008-08-11 13:07 able.sh
-rw-r--r-- 1 0 0  804326 2008-08-12 08:35 System.map-2.6.26-simtec1-s3c24xx-oabi
-rwxr-xr-x 1 0 0 1943012 2008-08-12 08:35 vmlinuz-2.6.26-simtec1-s3c24xx-oabi
-rw-r--r-- 1 0 0   56694 2008-08-12 08:35 config-2.6.26-simtec1-s3c24xx-oabi
>
```

3.5. Getting help

The ABLE command line has a useful help system available, the **help** command gives a list of all known commands, some commands have a --help parameter which is another way to obtain the help text.

Example 3.2. Getting help on the uname command

```
>help
Internal commands are:
sh           autoboot     sbcd         bast-hdlcd   pic-wr       pic-rd
bast-at2     bast-at      dmcfg-rd     dmcfg-wr     pmu          shadow
mii          ifconfig     [            test         console      display
file         hwinfo       wrout        version      nvclear      nvunset
nvsave       nvshow       nvset        uname        sum          tasks
sleep        showhz       sysmsg       setopt       showargs     setargs
reset        memset       meminfo      peek         poke         modules
ls           lsfs         help         echo         dumpfile     dump
cat          cp           cd           pwd          boot         load
history      sysspeed     settime      setdate      devls        date
Use:
  help <command> to get brief explanation
  <command> --help for command usage (if available)
>help uname
Help on uname:
Usage: uname [OPTION]...
Print system information.  No OPTION is the same as -s.

  -a, --all              all information in the order:
  -s, --kernel-name      kernel name
  -n, --nodename         network node hostname
  -r, --kernel-release   kernel release
  -v, --kernel-version   kernel version
  -m, --machine          machine hardware name
  -o, --operating-system operating system
      --help             display this help and exit
      --version          display version and exit

Please report bugs to <support@simtec.co.uk>
>uname --help
Usage: uname [OPTION]...
Print system information.  No OPTION is the same as -s.

  -a, --all              all information in the order:
  -s, --kernel-name      kernel name
  -n, --nodename         network node hostname
  -r, --kernel-release   kernel release
  -v, --kernel-version   kernel version
  -m, --machine          machine hardware name
  -o, --operating-system operating system
      --help             display this help and exit
      --version          display version and exit

Please report bugs to <support@simtec.co.uk>
>uname -a
ABLE unknown 2.20 #1 Tue Feb 14 12:06:59 GMT 2006 s3c2410x ABLE
>
```

3.6. Setting Options

ABLE has the ability to store settings which remain after reset or power cycle and are hence referred to as non-volatile. This feature is available on all systems, however the amount of storage may vary which will limit the maximum lengths of some parameters such as the default boot command.

The settings are presented as non-volatile variables which can be simply assigned. However these settings will not be made permanent until a **nvsave** command is issued.

The variables are numbers, strings or boolean values. The **nvshow** command can be used without arguments in order to list the current values of all variables.

Example 3.3. Using the nvshow command to list the default variables

```
>nvshow
shell.hist (is unset)
boot.fs (is unset)
boot.auto  = off
boot.cmd (is unset)
boot.timeout (is unset)
ide.multi-limit (is unset)
usb.hubdepth (is unset)
usb.enable (is unset)
console.level  = 9
console.write (is unset)
console.read (is unset)
fb.enable (is unset)
fb.output (is unset)
fb.refresh (is unset)
fb.y (is unset)
fb.x (is unset)
sys.autoshadow (is unset)
sys.speed (is unset)
>
```

Section 4.2.2, “Non volatile variables” fully explains the use of these variables and the alternative commands for manipulating them. Appendix A, *Non-Volatile Variables Reference* is a list of variables, their meanings and default values.

Values altered by assignment or the **nvset** command are not permanent *until* the **nvsave** command has been issued. The **nvsave** command commits the current changes to the non volatile storage, without this the changes will be lost upon a system reset.

The **nvclear** command can be used to restore the values back to the defaults. The **nvsave** should not be used to attempt to save these values, this would result in the current settings state being saved *not* the default values.

Chapter 4. The ABLE shell

The ABLE shell is a *very* basic UNIX® bourne shell and should be familiar to anyone experienced with that environment.

The shell executes a series of commands one after another provided from either the command line (see Chapter 3, *Command Line Interface*) or from a file (see Section 4.5, “Shell script”.

Each command completes with an exit code which is a simple integer number. Command execution can be made conditional on the exit code values of previous commands. The test(1) command may be used to perform a variety of logical tests which allows for script execution control.

Commands may be grouped together using curly brackets ({}) the commands within these groups must be separated by conditionals and the list must be terminated by a semicolon. One notable difference to standard bourne shell is that command groups may not use newlines as separators.

A command group may be used as a function which allows for simple procedural programming.

variables may be set to store information and control program execution. In addition these user variables access is available to the non volatile settings of ABLE.

4.1. Conditional execution

Multiple commands can be placed on a single line each command separated with a conditional operator which controls execution of subsequent commands

Commands may be separated with one of three conditional operators:

- The first ; is not really a conditional, each command will be executed despite the exit code of the previous command.
- The second && will only execute the next command if the previous one exited with a non zero exit code.
- The third || will only execute the second command if the first command exits with a zero exit code.

With these constructs simple conditional decision processes can be built.

The **test(1)** command can be used to test logical expressions and combined with the conditional operators make decisions based upon a variety of tests.

Example 4.1. Using the test command and conditional operators

This example shows how to use the **test(1)** command to perform some simple textural and numeric comparisons. The full range of comparisons available can be found in Table 10.2, “Possible test expressions”

```
>[ 1 -lt 2 ] && echo "1 < 2"
1 < 2
>[ 2 -lt 1 ] && echo "2 < 1"
>[ 1 -gt 2 ] && echo "1 > 2"
>[ 2 -gt 1 ] && echo "2 > 1"
2 > 1
>[ "text" = "text" ] && echo "true"
true
>[ "text" != "text" ] || echo "true"
true
>foo="bar" ; [ -z ${foo} ] && echo "true" ||echo  "false"
false
>foo="" ; [ -z ${foo} ] && echo "true" ||echo  "false"
true
>
```

4.2. Shell variables

4.2.1. Simple variables

The ABLE shell supports simple variables, these variables are in the form:

`name=[value]`

where the `name` must start with a letter of the alphabet (upper or lower case) or an underscore (_) and continue with letters of the alphabet, numbers or an underscore (_). The `value` may contain any arbitrary numeric or textural value and when omitted is a null (empty) string. The `value` may need to be quoted in order to get a correct assignment.

4.2.2. Non volatile variables

The non-volatile variables are also accessible from within the shell. The variable form is identical to that of simple variables with one exception, the body of the variable name will contain a full stop (**.**).

Any changes to the non-volatile variables will not be made permanent until a **nvsave** command is issued.

A non-volatile variable my be “unset”, an unset parameter will use the system default value. A variable may be unset by assigning to an empty value or using the **nvunset** command.

The **nvclear** command can be used to restore the values back to the defaults. The **nvsave** should not be used to attempt to save these values, this would result in the current settings state being saved *not* the default values.

The value is interpreted differently depending on the settings data type, as with simple variables the `value` may need to be quoted to get a correct assignment.

Table 4.1. Non-volatile data types

Variable type	Values
Boolean	“on” and “off” (“true” or “false” and “0” or “1” may also be used).
Numeric	Any numeric value using only the digits between 0 and 9.
String	Any alphanumeric string.

In addition to simple assignment non-volatile variables may be changed with the **nvset** command. The syntax of the command is

`nvset {variable} {value}`

Where the *`variable`* is one of those shown in Appendix A, *Non-Volatile Variables Reference* and the value is correct for the variables type.

4.2.3. Positional variables

The positional parameters are similar to the simple variables except the variable name is a positive integer number. Each parameter is set from the arguments to the shell or script when it was started.

The single digit 0 has special meaning and is set to the name of the shell or script.

Positional parameters cannot be assigned with the normal assignment operator and are read only.

When the tenth or later positional parameters are referenced they must be disambiguated using curly braces this is shown fully in Example 4.3, “Accessing positional parameters”

4.2.4. Special variables

In addition to simple variables there are a small number of “special” variables which do not match the syntax for simple variable names. These typically access specific information within the shell and are read only.

Table 4.2. Special variables

Variable name	Value
?	Exit status of last command
-	Shell parameters
*	All the positional parameters separated by the first character of the `IFS` variable.
#	The number of positional parameters.

4.2.5. Accessing variables

Variables are accessed within the shell by using the dollar symbol followed by the variable name `$name`. The variable name my also be surrounded by curly braces `${name}`.

The curly brace form is less ambiguous because if the braces are omitted the shell may not be able to distinguish between a variable name and the text surrounding it. The curly brace form is unambiguous as the variable name is clearly delimited.

Example 4.2. Using curly braces to disambiguate variables

This example shows a variable `myvariable` being set and then displayed using the two forms showing the ambiguity problem.

```
>myvariable=hello
>echo foo $myvariable bar
foo hello bar
>echo foo$myvariablebar
foo
>echo foo${myvariable}bar
foohellobar
>
```

Special care must be taken of positional parameters, the simple version with no braces is limited to the nine single digits 1-9 to access the the later positional parameters curly braces must be used.

Example 4.3. Accessing positional parameters

This example shows accessing the first positional parameter, then the first positional parameter when the tenth was meant and finally accessing the tenth parameter correctly.

```
>echo $1
one
>echo $10
one0
>echo ${10}
ten
>
```

4.2.6. Variables with special meanings

There are a small number of shell variables which have special meaning to the shell environment itself. These variables generally affect some aspect of the shell environment. Several of these variables have defaults which are assigned by the shell upon initialisation.

Table 4.3. Variables with special meanings

Variable	Meaning
PS1	This variable contains the text of the prompt to use, which allows users to alter their prompt or scripts to use the same prompt as the shell. This value is set to > by default.
PS4	This variable is the forth level prompt, it is used when the -x switch is in operation to preface output lines. This value is set to + by default.
PWD	This variable is the present working directory within the filesystem. Consult Section 3.4, “Filesystem navigation” for more details. This value is set to / by default.
OLDPWD	The previous working directory. Consult Section 3.4, “Filesystem navigation” for more details.
IFS	The Internal Field Separator that is used for word splitting after expansion and to split lines into words with the read command. This value is set to “**space tab newline**” by default.
PATH	The search path for commands. A series of directories to search for external commands. The directores are **colon** separated and may include the PWD which is represented by a single dot.
ABLE_VERSION	The version of ABLE currently running. The major and minor version numbers are available seperately as ABLE_VERSION0 and ABLE_VERSION1 respectively.

4.3. Functions

A function is simply a named command group. It is created by the use of the function keyword followed by the function name a pair of brackets and command group.

A function gets its own positional parameters derived from the options passed to it when called. The positional parameters from the parent calling level are not available and must be explicitly passed to the function if required.

Function calls may be nested to any depth but must not be recursive. Functions may be called within Section 4.4, “Command substitution”.

Example 4.4. Defining and using functions.

This example shows a function being defined and called with serveral times with differing parameters.

```
>function bar { echo $1; }
>function foo { echo -n $1; [ "$2" = "bar" ] && bar tree || echo "foo bar baz"; }
>foo baz
bazfoo bar baz
>foo baz bar
baztree
>foo baz tree
bazfoo bar baz
>
```

4.4. Command substitution

Command substitution allows the output of a command to be substituded anywhere a variable can be used. The command may be a function call, shell builtin or external program.

Example 4.5. Using substitutions.

This example shows the use of command substitution with a builtin, a function and an external program.

```
>lsout="$(ls \(flash1\))"
>echo ${lsout}
MD5Sums MD5Sums.able bin bootimg.000 bootimg.009 doc
>fbout="$(fbset)"
>echo ${fbout}
mode 800x600-60 # D: 40.000 MHz, H: 37.878 KHz, V: 60.315 Hz, geometry 800 600
>function foo { echo -n $1; echo "baz"; [ "$2" = "bar" ] || echo "foo bar baz"; }
>funcout="$(foo bar baz)"
>echo ${funcout}
barbazfoo bar baz
>
```

4.5. Shell script

ABLE has the ability to execute shell scripts. These are simple text files with commands in them. The shell commands in the file are executed in consecutive order as if they had been typed at the command line.

To be recognised, a script file *must* start with a line `#!sh` or `#!/bin/sh`. After this, commands may be placed on each line as desired. Lines starting with a "#" are interpreted as comments and are ignored.

Example 4.6. Example shell script

This is an example shell script which tests the **test** command and shell quoting.

```
#!/bin/sh
# ABLE shell test
echo "TEST: test"
[ 1 -lt 2 ] && echo "1 < 2"
[ 2 -lt 1 ] && echo "2 < 1"
[ 2 -gt 1 ] && echo "2 > 1"
[ 1 -gt 2 ] && echo "1 > 2"
echo "TEST: simple variable expansion"
foo=bar
echo $foo
echo "TEST: variable expansion within test"
bar=10
[ 1 -lt $bar ] && echo "1 < $bar"
[ 1 -gt $bar ] && echo "1 > $bar"
echo $bar
echo "TEST: quoting tests"
echo TEST: single quotes
echo '\\ \$ \w $bar $+ $foo \$foo'
echo TEST: double quotes
echo "\\ \$ \w $bar $+ $foo \$foo"
echo TEST: no quotes
echo \\ \$ \w $bar $+ $foo \$foo
echo TEST: quoted single var
echo "$foo$foo"
echo TEST: quoted curly brace single var
echo "${foo}${foo}"
echo TEST: positional parameters
echo There are $# positional parameters
echo All parameters  ">$*< after"
echo Parameter 0,1,2 ">$0 $1 $2<"
```

```
echo Parameter 0:$0
echo Parameter 1:$1
echo Parameter 2:$2
echo Parameter 3:$3
```

When executed, the above script should produce the following output.

```
>(tftpboot)test.sh one two three
readudp: incorrect length
TEST: test
1 < 2
2 > 1
TEST: simple variable expansion
bar
TEST: variable expansion within test
1 < 10
10
TEST: quoting tests
TEST: single quotes
\\ \$ \w $bar $+ $foo \$foo
TEST: double quotes
\ $ \w 10 $+ bar $foo
TEST: no quotes
\ $ w 10 $+ bar $foo
TEST: quoted single var
barbar
TEST: quoted curly brace single var
barbar
TEST: positional parameters
There are 4 positional parameters
All parameters >one two three< after
Parameter 0,1,2 >(tftpboot)test.sh one two<
Parameter 0:(tftpboot)test.sh
Parameter 1:one
Parameter 2:two
Parameter 3:three
>
```

Chapter 5. ABLE Console

ABLE generally has to communicate with the end user, it does this by using any of the connected devices for which it has drivers.

5.1. Console drivers

Console drivers are categorised as either input and output sources. The sources for the console can be found using the **console** command.

Example 5.1. Using the console command to show available drivers

This shows the available drivers and if they can be used for read, write or both.

```
>console -d
(-w-a)  s3c2410x-video
(r---)  usbkbd
(rw--)  multi
(rw--)  null
(-w--)  all-wr
(r---)  all-rd
(rw--)  serial
(rw--)  (s3c2410_serial0)
(rw--)  (s3c2410_serial1)
(rw--)  (s3c2410_serial2)
(rw--)  (u16550_serial0)
(rw--)  (u16550_serial1)
>
```

These drivers allow access to the peripherals on a system. They can be used to provide input from a user to ABLE and output from ABLE to the user. Any number of them may be used simultaneously, it is possible (though not practical) to have ABLE appear on every serial port and video console attached to a system.

Table 5.1. Available console drivers

Driver	Description
s3c2410x-video	Video display driver for the s3c2410 internal controller.
sm501-video	Video display driver for the Silicon motion 501 controller.
usbkbd	Reads input from any HID USB keyboard attached to the system.
ps2kbd	Reads input from any PS2 keyboard attached to the system
null	The null driver is a special driver which swallows all output sent to it and never produces any output.
multi	The multi driver is a pseudo driver which allows for multiple console sources, it should *never* be directly used.
all-wr	The “all write” driver is the default output driver if no other is specified. This driver sets the output to be all the available output devices. However it *only* selects the basic `serial` driver not any of the other possible serial targets, this is to limit ABLE to a sensible number of peripherals (on some boards there might be more than ten serial ports which will probably be connected to peripherals which would not respond well to the ABLE console)
all-rd	The “all read” driver is the read equivalent to the `all-wr` driver. This driver selects all the available input sources, again only selecting the basic `serial` driver.
serial	This driver is a read/write capable driver which is connected to what is historically considered the “console” serial port. This is typically the first serial port. On the EB2410ITX, for instance, it is the first internal port of the s3c2410, on the EB110ATX it is the footbridge debug port and on the

Driver	Description
	EB675001DIP it is the main 16550 based port. The port will have the settings of 115200 baud, eight data bits, no parity and a single stop bit.
(s3c2410_serial*X*)	The serial ports on the s3c2410 are presented as a series of three devices. These devices may have their settings (baud rate, parity etc.) altered as required at initialisation time or later with the setopt command.
(u16550_serial*X*)	A given system may have several standard 16550 based serial ports each will have an entry. As with all serial devices (except the `serial` driver) in ABLE the port settings may be altered as required at initialisation time or later with the setopt command.

5.2. Setting parameters on serial drivers

The serial port drivers (s3c2410_serial and u16550_serial) can be given parameters when they are initialised. This is achieved by placing additional comma separated parameters after the driver name within the containing brackets.

The configuration format is in one of the forms:

```
(driverX)
(driverX,baud)
(driverX,baud,data-format)
```

Options may be omitted. Such options are either left as the current settings or set to defaults as necessary. The default settings, when the ports are first initialised, is 115200 baud, eight data bits, no parity and a single stop bit (115200,8n1)

The data format is specified as three single character values. The first denotes the number of data bits, typically eight or seven. The second sets the parity type one of none (*n*), odd (*o*) or even (*e*). The third is the number of stop bits either one or two.

Example 5.2. Setting serial console driver parameters

To use the s3c2410_serial driver first port at 19200 baud using the default data format

```
(s3c2410_serial0,19200)
```

To use the s3c2410_serial driver second port at 38400 baud, 8 data bits, no parity and a single stop bit

```
(s3c2410_serial1,38400,8n1)
```

To use the u16550_serial driver first port with the current baud rate, 8 data bits, no parity and a single stop bit

```
(u16550_serial0,,8n1)
```

5.3. Configuring the console system

At boot, the console output is sent to all the devices listed in `console.write`. The list is a comma separated set of driver names (the serial devices must be bracketed and may contain additional parameters). Likewise for the console input using the `console.read` non volatile variable. When these variables are not set they default to `all-wr` and `all-rd` respectively.

The current active drivers may be displayed with:

```
console -l
```

The output of this command is split into two sections for the write(console output) and read(console input).

Example 5.3. Showing the consoles of an unconfigured system

```
>nvshow console.write
console.write (is unset)
>nvshow console.read
console.read (is unset)
>console -l
Console (write):
all write:
 => s3c2410x-video: S3C24XX Framebuffer (640x480 @ 60Hz, 31.5 KHz)
 => null: NULL
 => serial: low level serial

Console (read):
all read:
 => usbkbd: USB Keyboard Driver
 => null: NULL
 => serial: low level serial

>
```

Once a system is running it is sometimes useful to add an additional driver. Adding a driver allows access to ABLE on that new device. This can be especially useful in scripts which can add displays based upon shell decisions. Section 5.5, “Practical use of the console system” contains more examples on using this feature.

Example 5.4. Adding console drivers to a running system

This example shows the adding of the second s3c2410 serial port, once added the serial port can be used to interact with ABLE

```
>console -l
Console (write):
all write:
 => s3c2410x-video: S3C24XX Framebuffer (640x480 @ 60Hz, 31.5 KHz)
 => null: NULL
 => serial: low level serial

Console (read):
all read:
 => usbkbd: USB Keyboard Driver
 => null: NULL
 => serial: low level serial

>console -a (s3c2410_serial1)
adding console (s3c2410_serial1)
>console -l
Console (write):
all write:
 => (s3c2410_serial1): fd (s3c2410_serial1)
 => s3c2410x-video: S3C24XX Framebuffer (640x480 @ 60Hz, 31.5 KHz)
 => null: NULL
 => serial: low level serial

Console (read):
all read:
 => (s3c2410_serial1): fd (s3c2410_serial1)
 => usbkbd: USB Keyboard Driver
 => null: NULL
 => serial: low level serial
```

```
>
```

5.4. Setting the logging level

The ABLE console output is split into levels of importance. Only messages with a level lower than the current logging level are displayed.

The logging level is set at boot time by the `console.level` variable, if unset the value defaults to 6. All messages of any priority can be viewed with the **sysmsg** command after boot.

Warning

Setting this value to 0 will result in no output being displayed from ABLE unless a critical error occurs. However the console input will still function correctly. The console level can be dropped by using

```
console -s 6
```

This will allow what is being typed to be seen once more.

5.5. Practical use of the console system

The practical applications of the console system may not be immediately apparent. The flexibility of the system allows for configurations in deployed solutions which meet the needs to the developer.

The following sections outline a few use cases from which a developer should be able to construct many functionalities. Some of these make use of the scripting capabilities which are described in Chapter 3, *Command Line Interface*.

Warning

It is possible to configure the console settings so no input or output can be made to the console! In this case the non volatile ignore jumper on the board should be used to recover the unit. This will cause the default “all” drivers to be used.

5.5.1. Basic serial debug console

In this scenario the requirement is to get a serial console on the first 16550 based serial port *only*. It should be configured to 9600 baud, eight data bits , no parity and a single stop bits.

This is achieved trivially by setting `console.read` and `console.write` to

```
(u16550_serial0,9600,8n1)
```

Example 5.5. Setup of basic serial console

```
>nvshow console.write
console.write (is unset)
>nvshow console.read
console.read (is unset)
>nvset console.write (u16550_serial0,9600,8n1)
>nvshow console.write
console.write  = (u16550_serial0,9600,8n1)
>nvset console.read (u16550_serial0,9600,8n1)
>nvshow console.read
console.read  = (u16550_serial0,9600,8n1)
>nvsave
verifying written data...
>
```

5.5.2. No console at all

In this scenario no console output whatsoever is required. Generally this is only useful when a project has reached final production and a fixed OS image is being retrieved from reliable storage.

This is straightforward to achieve by using the “null” driver. Set the `console.read` and `console.write` variables to:

```
null
```

Be sure to set the `boot.cmd` and other boot variables to correctly boot your OS *before* setting this or you will need to recover the system with the physical non volatile ignore jumper.

As a precaution against loosing the console completely you can add a

```
console -a serial
```

to the end of the `boot.cmd` variable.

Example 5.6. Using the null drivers safely

This example shows how the addition of the console command can recover from a situation where otherwise the physical jumper would have to be accessed.

```
>nvset boot.cmd "(hd0)/nosuchkernel ; console -a serial"
>nvset boot.auto on
>nvset console.write null
>nvset console.read null
>nvsave
verifying written data...
>reset
Autoboot attempt 2, Press any key to abort
Autobooting in   6
>
```

Even using this technique it is easy to get a system into an unbootable state, because of this setting the consoles to null is generally inadvisable if another approach can be found.

5.5.3. Displaying a logo and boot abort

This scenario the console is required if user input is given at a specific point in the boot sequence after a boot logo is displayed.

This is a slightly more complex situation and the developer may decide to place this in a shell script rather than try and cram it all into a single `boot.cmd` line. The general solution is:

- Set the console logging level to 0 to inhibit any other ABLE output
- Use the **display(1)** command to plot the image
- Use the **echo** command to display the user message
- Use the **read** command to wait for user input with a two second timeout
- If the user input is the correct key to abort the boot process set a variable to indicate this
- If the abort variable is unset start the OS
- Set the console log level to something reasonable and start a shell

Example 5.7. A method to display logo and boot abort

```
#!sh
display -d s3c2410x-video (tftpboot)logo.bmp.Z
echo -n "press c to enter ABLE"
ABORT=no
read -t 2 -n 1 -s RES && [ $RES = "c" ] && ABORT=yes
[ $ABORT = "no" ] && (hd0)kernel root=/dev/hdc1 console=ttySAC0,115200
console -s 6
sh -i
```

This script would be stored somewhere accessible to ABLE(flash, hard disc or network) and `boot.cmd` set to that location. Once verified, consoles could be configured as required and `console.level` set to 0.

Chapter 6. Starting an Operating System

ABLE is a powerful tool but its ultimate aim is simply to obtain the operating system image and start its execution with the appropriate parameters. This chapter shows how to use ABLE to achieve this aim using the Command Line Interface.

6.1. Data sources

To obtain the operating system image, ABLE can retrieve data from a number of sources. A source may be a “block” device where data can be random accessed in discrete chunks or a “stream” device where data can be accessed serially. ABLE insulates the user from these details and provides a unified interface.

Any device, for which ABLE has a driver, can act as a source. Devices that ABLE can create sources from include ATA hard drives, ATAPI cdroms, memory devices, USB devices and network interfaces.

ABLE identifies a sources by placing the source name in brackets. Sources can be found from the ABLE command line by using the **dumpfile(1)** command on the “root” directory.

Example 6.1. Using the ls command to list available sources.

The **dumpfile(1)** when performed on the “root” directory, with the `-a` option, shows all available sources.

```
>ls -a -l /
drwxr-xr-x 1 0 0        0 .
drwxr-xr-x 1 0 0        0 ..
brw-rw-rw- 1 0 0   0,   0 nor0
brw-rw-rw- 1 0 0   0,   0 hdc1
brw-rw-rw- 1 0 0   0,   0 hdc
brw-rw-rw- 1 0 0   0,   0 tftpboot
brw-rw-rw- 1 0 0   0,   0 xmodem
brw-rw-rw- 1 0 0   0,   0 console
brw-rw-rw- 1 0 0   0,   0 char4
brw-rw-rw- 1 0 0   0,   0 char3
brw-rw-rw- 1 0 0   0,   0 char2
brw-rw-rw- 1 0 0   0,   0 char1
brw-rw-rw- 1 0 0   0,   0 char0
brw-rw-rw- 1 0 0   0,   0 24cxx0p1
brw-rw-rw- 1 0 0   0,   0 24cxx0
brw-rw-rw- 1 0 0   0,   0 nand0p2
brw-rw-rw- 1 0 0   0,   0 nand0p1
brw-rw-rw- 1 0 0   0,   0 nand0
brw-rw-rw- 1 0 0   0,   0 s3c2410x
lrwxrwxrwx 1 0 0       11 hd0 -> (hdc1):ext2
lrwxrwxrwx 1 0 0        5 s3c2410_serial2 -> char4
lrwxrwxrwx 1 0 0        5 s3c2410_serial1 -> char3
lrwxrwxrwx 1 0 0        5 s3c2410_serial0 -> char2
lrwxrwxrwx 1 0 0        5 u16550_serial1 -> char1
lrwxrwxrwx 1 0 0        5 u16550_serial0 -> char0
lrwxrwxrwx 1 0 0        8 nvram0 -> 24cxx0p1
lrwxrwxrwx 1 0 0       15 flash1 -> (nand0p2):jffs2
lrwxrwxrwx 1 0 0        7 flash0 -> nand0p1
>
```

The sources listed as links are “aliases” which build upon or “cook” the behaviour of other sources.

6.2. Alias sources

The previous section described how to identify a possible data source within ABLE. Typically these data sources are a raw unprocessed set of data, to be useful a data source is generally partitioned and has a filing system placed upon it. The process of building upon a raw data source is sometimes referred to as “cooking” which gives a cooked data source.

To make the users interaction with ABLE easier a set of alias sources are automatically generated. Each of these aliases may be referred to as a source in its own right. The **dumpfile(1)** command can be used to list these aliases.

Example 6.2. Using the ls command to list cooked sources

The **dumpfile(1)** command performed on the root directory.

```
>ls -l /
lrwxrwxrwx 1 0 0       11 hd0 -> (hdc1):ext2
lrwxrwxrwx 1 0 0        8 nvram0 -> 24cxx0p1
lrwxrwxrwx 1 0 0       15 flash1 -> (nand0p2):jffs2
lrwxrwxrwx 1 0 0        7 flash0 -> nand0p1
>
```

ABLE detects and creates a cooked source for every raw source that can provide files. Each of the raw sources will be examined for recognised filesystems and, if a partitioned device, each partition will be scanned. ABLE can interpret several filesystems, these include EXT2, FFS, ISO9660 (including rockridge extensions) and FAT. Filesystems are only scanned for on suitable sources i.e. ISO9660 filesystems would only be searched for on cdrom sources.

The user need not use the aliases and may specify the full source descriptor if desired. The sources “(hd0)” and “((hdc1):ext2)” from the previous examples are completely equivalent. The full construct may be used to attempt to force ABLE to interpret filesystems where it has not automatically detected one but this will almost certainly result in unexpected and incorrect behaviour.

6.3. Network sources

The network is treated differently to other sources. It is accessed through a source which defines the access protocol. Currently the only supported access protocol is TFTP. The tftpboot source uses the currently configured network interface which is set with **ifconfig**. Chapter 7, *Networking* describes the configuring and setup of network interfaces in more detail.

The tftpboot source cannot be enumerated, that is a list of files cannot be obtained with the **ls** command, the filename to be retrieved must be already known. To use the filename provided by the DHCP server the tftpboot source can be used without a file specified.

Example 6.3. Using the tftpboot source

This example shows that the tftpboot source is unable to enumerate the contents of the source, using the tftpboot source with an explicit filename and using the server provided filename when its present and when not set.

```
>ls -l (tftpboot)
-r--r--r--    0 0 0       -1 (tftpboot)
>sum (tftpboot)batty
18014 33 (tftpboot)batty
>sum (tftpboot)
tftpboot: using bootp filename 'batty'
18014 33 (tftpboot)
>sum (tftpboot)
tftpboot: using bootp filename ''
warning: filename is null, tftp may fail
Error loading (tftpboot) :No such file or directory
>
```

6.4. XModem source

The XModem source is treated differently to other sources. It provides a way to obtain files over a serial connection using the XModem protocol. The implementation of the XModem protocol within ABLE accepts 128byte or 1Kbyte packets and checksum or CRC16 checks.

The filename used with the XModem source is the serial port source on which to perform the transfer, these can be identified as aliases for char sources within a full source listing (see Example 6.1, “Using the dumpfile(1) command to list available sources.”). The parameters for a serial driver source are more fully described in Section 5.2, “Setting parameters on serial drivers”.

If the transfer is performed on the same source as is being used for the console care must be taken not to use commands which produce output during their reading of the file. Because of this the **sum** command may be used in its non verbose mode but would cause the transfer to fail if the `-v` option is used because it would output . characters to denote progress. Similarly the **dumpfile** and **cat** commands would cause a failure. Obviously this is not an issue if the transfer source is not used as a source for the console.

Example 6.4. Using the XModem source

This example shows a file being checksummed from the first S3C2410 serial port source. The C characters are the XModem receive characters signifying the start of the XModem sequence. The same file is then checksummed using the network interface to show the correctness of the transfer.

```
>sum (xmodem)s3c2410_serial0
CCCCCC
39872 33 (xmodem)s3c2410_serial0
>sum (tftpboot)batty
39872 33 (tftpboot)batty
>
```

6.5. Navigating a filesystem

Sources with filesystems that support enumeration (EXT2, ISO9660 etc.) can be browsed and navigated. A filesystem arranges information as files within directories. The file navigation commands (see Chapter 12, *File Navigation*) can be used to change the present working directory (PWD) and enumerate (list) the contents of directories.

A filesystem is presented as a hierarchical tree of directories which contain files and more directories. ABLE presents directories in the UNIX® manner and includes the . and .. directories which represent the current directory and the parent directory respectively. Any file or directory name prefixed by a . is considered “hidden” and will not be listed with the **ls** command unless the `-a` option is used.

ABLE starts with the PWD set to the root directory /. As already seen in Example 6.1, “Using the dumpfile(1) command to list available sources.” this directory contains all available sources, by default only the alias sources are listed, the raw sources being “hidden”.

The **cd** command is used to change the PWD. The **dumpfile(1)** command with no parameters lists the available files in the PWD.

Once a file is located the file manipulation commands can be used (see Chapter 13, *File manipulation commands*) to examine or verify the file. The **file** command is especially useful for determining if ABLE can identify a file as an operating system image.

6.6. How ABLE identifies files.

ABLE uses a set of heuristics to determine a files contents. The methods used include “magic” numbers (sequences of well known values at fixed offsets in the file) and common executable binary format headers. The overall approach is similar to the UNIX® **file** command which is provided with the ABLE shell built-in **file** command.

Once a files contents are identified ABLE will use the appropriate module to load and execute the file. If a unrecognised filetype or one for which no loader module is present, ABLE will report the error and return to the command line.

6.6.1. ABLE shell script

This file type is identified by the string “#!sh” in the first four bytes of the file. Such files are executed with the ABLE shell as detailed in Section 4.5, “Shell script”.

6.6.2. ABLE executable

This file type is identified by the hexadecimal value AB1E0001 at the beginning of the executable file. This filetype is used for ABLE binary program extensions for code which it is not desirable to ship within ABLE because of space or licencing constraints. Examples of such programs are the **romwrite** reflash tool and **batty** test tool.

6.6.3. ARM Linux® zImage

This file type is identified by the hexadecimal value 016F2818 thirty six bytes into the file. This file type is used for compressed Linux® kernel images.

When a file of this type is executed ABLE sets up an appropriate parameter list and starts execution of the kernel image. Full details of the ARM Linux® booting procedure can be found in the Booting ARM Linux [http://www.simtec.co.uk/products/SWLINUX/files/booting_article.html] document.

6.6.4. ELF and AOUT files

The ELF and AOUT binary file detection is provided for NetBSD and OpenBSD operation. The ELF header is detected from the hexadecimal value 464C457F at the beginning of the file and the various AOUT formats with several differing magic numbers (The AOUT types supported are the old “impure” format, the read-only text format, the “compact” demand load format and the demand load format.

When a file of this type is executed the relevant sections are loaded and relocated as described by their binary headers. The code is entered at its entry point with the MMU *running* and the parameters and command line passed as expected by the BSD kernel.

Although the Linux® kernel can be extracted as an ELF object ABLE is unlikely to execute the image correctly, the zImage format should be used.

6.6.5. UNIX® Compress files

UNIX® compress files are identified by their first two bytes which contain 0x9D and 0x1F. These files when loaded (to be executed) are decompressed and the result file typed again.

6.6.6. Gzip files

Gzip files are identified by their header of 0x8B1F at the beginning of the file. These files when loaded (to be executed) are decompressed and the result file typed again.

6.6.7. Images, text and data files

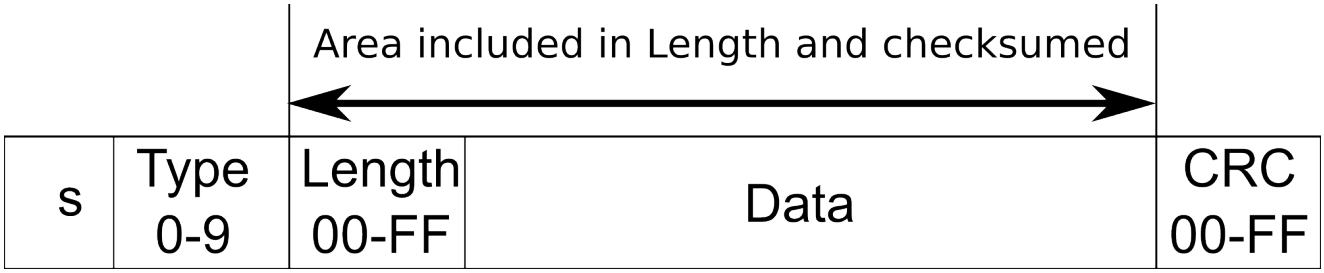
These files are identified by various methods but all share the common property that they cannot be executed. These files must be manipulated with other commands such as the **display(1)** command for images, the **cat** command for text and the **dumpfile(1)** for data.

6.6.8. Motorola S-Record

Files of this type are identified by their format which must be correct for the first few lines of the file. When loaded the whole file must be of the correct format.

The recognised S-Record format is well defined. Each file consists of a series of lines. Each line begins with an S character and is terminated by a newline. Each line represents an individual record, its type is determined by the second character on the line (0 to 9) followed by a record length, type dependant data and finally a checksum. All data after the type field is presented as 8 bit octets coded as two hexadecimal values e.g. the value 255 is presented as the text FF.

Figure 6.1. Outline of Motorola S-Record



The checksum is calculated as a ones complement of the data octets including the length.

The header record is typically the first record in the file, ABLE does not interpret this record beyond printing the data section as ASCII output on the console. Any number of headers may be included as they have no impact on the decoding of the other lines.

s	0	Length 3 + Data	Address 0000	Data	CRC 00-FF

Header record

The four byte (32 bit) addressed data record may be repeated as often as required to load all the program into memory. The four byte address gives access to the entire 4GB memory region of the ARM memory map. The address is specified as a physical location.

s	3	Length 5 + Data	Address XXXXXXXX	Data	CRC 00-FF

Four byte addressed data

The four byte (32 bit) address end record is used to specify the address that execution will start from. The address is specified as a physical location. This record should only occur once at the end of the data.

s	7	Length 5	Entry Address 00000000-FFFFFFFF	CRC 00-FF

Four byte addressed data end.

During the parsing of an S-Record it is possible a syntax error in the input data may occur. If this happens an error report will be reported in the form:

```
error 1 on line 1
```

Table 6.1. S-Record loader error codes

Code	Error
1	Line didn't start with S
2	Line finished before type
3	Type was not 0-9
4	Line finished before length

Code	Error
5	Length field contained invalid characters
6	Line finished early in data
7	Data contained invalid characters
8	Checksum failed

Where the errors refer to invalid characters this means characters other than 0-9 and A-E were found in the line.

Example 6.5. An example S-Record

The S0 record starts the file. The S3 records contain the data. The S7 record contains the entry address and completes the file load.

```
S0030000FC
.
.
S325000004403C0880018D08DD900000000011000026000000003C0880012508DC50C50000B401
S32500000460C50100B8C50200BCC50300C0C50400C4C50500C8C50600CCC50700D0C50800D4FA
S32500000480C50900D8C50A00DCC50B00E0C50C00E4C50D00E8C50E00ECC50F00F0C51000F49A
S325000004A0C51100F8C51200FCC5130100C5140104C5150108C516010CC5170110C518011434
.
.
S70500000000FA
```

6.7. Starting an Operating System

Once a complete file path to an operating system image has been decided upon the boot process is simple. ABLE may be used to start a recognised operating system in two ways.

The two methods for starting an operating system are the “setargs, load and boot” method or the “command line” method. As can be seen from Example 6.6, “Using the "setargs, load and boot" method to start a Linux kernel” and Example 6.7, “Using the "command line" method to start a Linux kernel” both these methods produce exactly the same result and the kernel is passed exactly the same parameters in both cases.

The “command line” method is preferred as it is simpler and more obvious but there are some limited circumstances where it is not sufficient (multiple boot files) and the “setargs, load and boot” is necessary.

6.7.1. The "setargs, load and boot" method

The "setargs, load and boot" method as its description suggests uses a three stage method in order to start an operating system:

- The **setargs** command is used to set the arguments with which to call the OS.
- The **load** command with the path to the OS kernel or image to load.
- The **boot** command to start the loaded image with the specified parameters.

This method gives the most flexibility and control but is cumbersome to use.

Example 6.6. Using the "setargs, load and boot" method to start a Linux® kernel

```
>setargs "root=/dev/hda1 console=ttySAC0,115200"
>load (hd0)vmlinuz
loaded (hd0)vmlinuz, 0x16a6e0 bytes at 0x00008000
>boot
boot: booting 'linux'
Booting Linux
Uncompressing Linux.....................................................
Linux version 2.6.11 (vince@gerald)
CPU: ARM920Tid(wb) [41129200] revision 0 (ARMv4T)
CPU0: D VIVT write-back cache
CPU0: I cache: 16384 bytes, associativity 64, 32 byte lines, 8 sets
CPU0: D cache: 16384 bytes, associativity 64, 32 byte lines, 8 sets
Machine: Simtec-BAST
Memory policy: ECC disabled, Data cache writeback
CPU S3C2410A (id 0x32410002)
S3C2410: core 266.000 MHz, memory 133.000 MHz, peripheral 66.500 MHz
S3C2410 Clocks, (c) 2004 Simtec Electronics
USB Power Control, (c) 2004 Simtec Electronics
Built 1 zonelists
Kernel command line: root=/dev/hda1 console=ttySAC0,115200
...
```

A user wishing to use the this method in the boot.cmd setting should make use of the “;” to separate the commands. To set the command from the above example would be

```
nvset boot.cmd "setargs root=/dev/hda1 console=ttySAC0,115200";  \
load (hd0)vmlinuz ; boot
```

6.7.2. The "command line" method

The "command line" method is a less flexible but much simpler and obvious method of starting an OS kernel or image. The image to be executed is simply given on the command line followed by its parameters, exactly like running any other command.

Note

Any parameters set with the setargs command are *not* considered when using this method.

Example 6.7. Using the "command line" method to start a Linux® kernel

```
>(hd0)vmlinuz root=/dev/hda1 console=ttySAC0,115200
loaded (hd0)vmlinuz, 0x16a6e0 bytes at 0x00008000
boot: booting 'linux'
Booting Linux
Uncompressing Linux.....................................................
Linux version 2.6.11 (vince@gerald)
CPU: ARM920Tid(wb) [41129200] revision 0 (ARMv4T)
CPU0: D VIVT write-back cache
CPU0: I cache: 16384 bytes, associativity 64, 32 byte lines, 8 sets
CPU0: D cache: 16384 bytes, associativity 64, 32 byte lines, 8 sets
Machine: Simtec-BAST
Memory policy: ECC disabled, Data cache writeback
CPU S3C2410A (id 0x32410002)
S3C2410: core 266.000 MHz, memory 133.000 MHz, peripheral 66.500 MHz
S3C2410 Clocks, (c) 2004 Simtec Electronics
USB Power Control, (c) 2004 Simtec Electronics
Built 1 zonelists
Kernel command line: root=/dev/hda1 console=ttySAC0,115200
...
```

6.8. Starting an Operating System Automatically

ABLE has a flexible system to automatically run a given user command at boot time. The command to be run is controlled by the `boot.cmd` non volatile variable. If the boot command is not set it defaults to the **autoboot** command.

The execution of the boot process may be prevented by setting the `boot.auto` variable to true. If the `boot.auto` variable is not set or set to false the boot command is run after a delay set by the `boot.timeout` variable. The delay is in seconds and allows the user to abort the boot process by pressing a key. The console input from which the keypress is accepted is described in detail in Chapter 5, *ABLE Console*.

The boot command is executed by the ABLE shell. Any shell script command may be placed in the `boot.cmd` seperated by semicolons. If more than a small number of commands need to be issued they should be placed in a shell script and the script executed.

Example 6.8. Displaying a logo during the automatic boot process

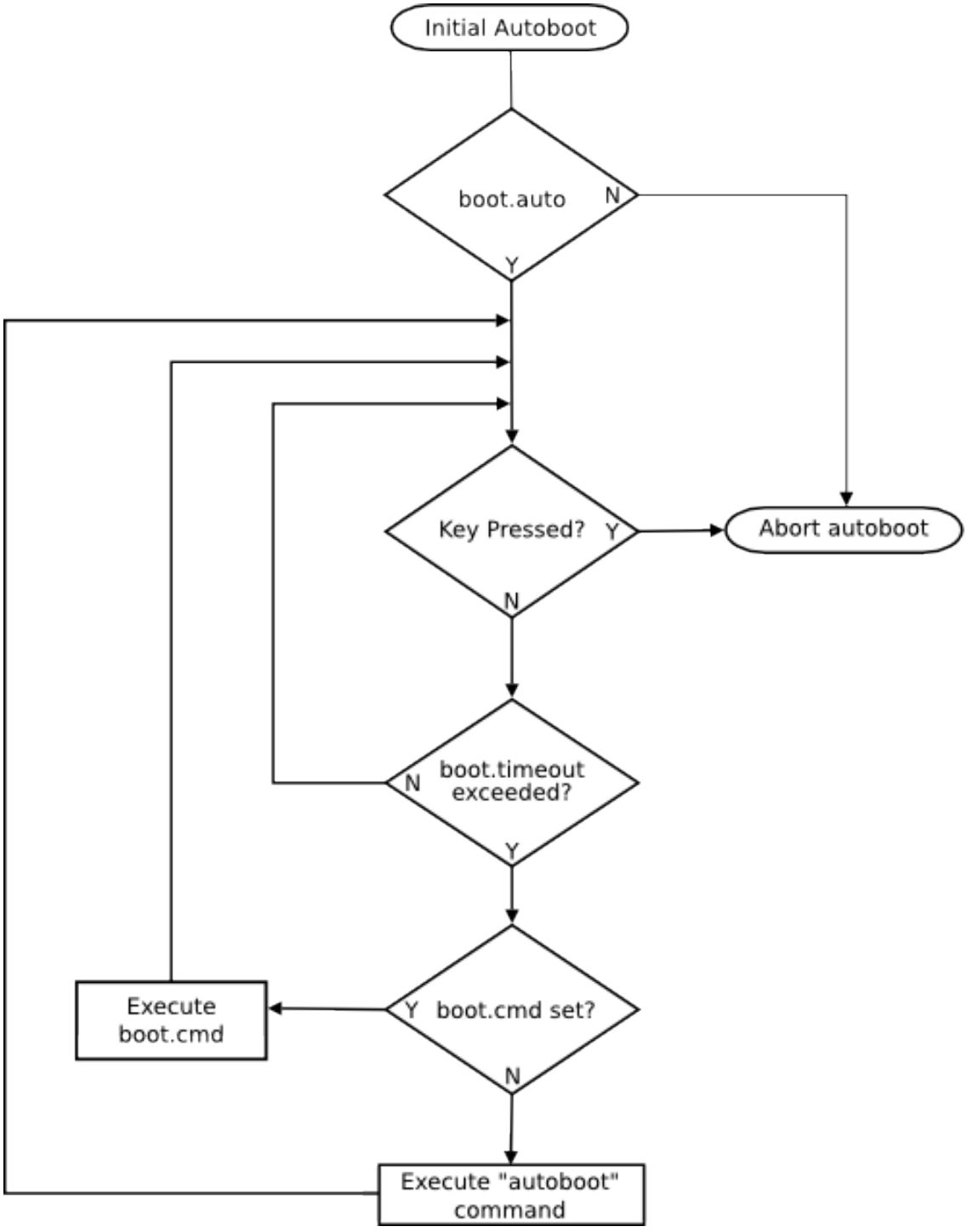
This example shows how the `boot.cmd` can be set to display a logo on the video console before continuing with an automated boot using the **autoboot** command.

```
>nvset boot.cmd "display -d s3c2410x-video (tftpboot)logo.bmp.Z ; autoboot"
>nvshow boot.cmd
boot.cmd  = display -d s3c2410x-video (tftpboot)logo.bmp.Z ; autoboot
>nvset boot.auto true
>nvshow boot.auto
boot.auto  = on
>nvset boot.timeout 1
>nvshow boot.timeout
boot.timeout  = 1
>nvset console.level 5
>nvsave
>reset
No Available Targets
>
```

Some of the examples presented in Section 5.5, “Practical use of the console system” make user of the automatic boot process and may be of interest.

Figure 6.2, “Initial boot operations” shows the logic of the initial start process. The operation is to loop for keyboard input for the time specified in `boot.timeout`. If no user input is received before the timeout the `boot.cmd` variable is inspected, if set the command is executed with the ABLE shell otherwise the **autoboot** command is executed by default.

Figure 6.2. Initial boot operations



Flowchart for the initial boot operations.

Chapter 7. Networking

ABLE has basic networking facilities allowing it to transfer data using the User Datagram Protocol (UDP) running over Internet Protocol (IP).

ABLE has drivers for a common set of Ethernet adaptors encompasing those found on Simtec Electronics boards and common PCI cards. The supported cards include those based upon Davicom DM9000 chipset, Tulip chipset, Realtek chipset and the traditional NE2000 based devices. ABLE does not currently have support for serial based protocols such as Serial Line Internet Protocol (SLIP) or Point to Point Protocol (PPP) but there is provision for XModem protocol (see Section 6.4, “XModem source”)

IP network settings can set maunually or be retrieved from the network from a Dynamic Host Configuration Protocol (DHCP) or Bootstrap Protocol (BOOTP) server.

To transfer files ABLE uses the Trivial File Transfer Protocol (TFTP) protocol. TFTP is a very simple protocol it lacks the ability to list directory contents, has no authentication or encryption mechanisms and performs its transfers in lock-step with only one packet on the network at any time which reduces its performance. Despite its lack of facilitys it is sufficient for retreving files.

7.1. Finding a network interface

ABLE will create an interface for every supported device it can find. All IP capable interfaces available on a platform can be listed with the **ifconfig** command.

```
>ifconfig -a
dm0       Link encap:Ethernet  HWaddr 00:01:3d:00:01:6a
          inet addr:0.0.0.0  Mask:0.255.255.255
          gateway addr:0.0.0.0  tftpserver:0.0.0.0
          UP MTU:1500  Metric:1

ne0       Link encap:Ethernet  HWaddr 00:01:3d:00:01:6b
          inet addr:0.0.0.0  Mask:0.0.0.0
          gateway addr:0.0.0.0  tftpserver:0.0.0.0
          MTU:1500  Metric:1

>
```

In this case two interfaces are available dm0 and ne0. Some platforms may have more than one of the same type of interface which will be presented as dm0, dm1, dm2 etc.

7.2. Configuring a network interface

Once the required interface is identified it can be configured for use. This is achieved using the `up` option to the **ifconfig** command. This is only required if the required interface does not already have the UP flag, in the above case the dm0 interface is marked such because the first interface is marked up by default.

If the DHCP protocol is used no futher configuration is required and the settings will be recovered the first time the interface is accessed.

If an automatic server is unavailable or cannot be used for other reasons manual configuration is neccisary. Applying IP settings manually requires an IP address and netmask and an optional default gateway. Although not an IP setting the address of the TFTP server is specified too. The **ifconfig** command is used to set the desired values.

Full details on setting fixed addresses and other aspects of configuring interfaces can be found in the **ifconfig** command documentation.

7.3. Using the network to obtain files

Once the interface settings are configured files may be retrieved from the network using the TFTP protocol. Files are accessed with the `(tftpboot)` source. If no *`filename`* is given the one provided by the DHCP server will be used, if the DHCP server doesn't provide a filename one based upon the hardware unique ID is used (the **hwinfo** command can be used to find the unique ID).

Most of the operations described here are not usually required if a properly configured DHCP and TFTP servers are used. Any file that can be accessed using TFTP can be used wherever a filename is used within ABLE, no distinction between network and local files is explicitly made (the one exception being that filesystem stat calls cannot be sensibly answered via TFTP).

The ability to use the network in this way allows for a very rapid compile, execute and test cycle. No physical media is involved and mistakes can be rectified and retested in a short time.

Example 7.1. Executing a program using the tftpboot pseudo filesystem

This example shows the batty board test tool being retrieved over the network using a default DHCP configuration.

```
>(tftpboot)batty
DHCP: Attempting network autoconfiguration for dm0.
DHCP: Automatic network configuration for dm0 successful.
DHCP: Address: 192.168.7.250
DHCP: Netmask: 255.255.255.0
DHCP: Gateway: 192.168.7.1
DHCP: Server: 192.168.7.1
DHCP: DNS server: 192.168.7.1
Simtec Board Test Tool, Version 1.00
Copyright 2005-2009 Simtec Electronics

OSIRIS (IM2440D20) Test Suite

Testing S3C24XX CPU Core
  CPU ID 32440001, OK [S3C2440A]

Testing S3C24XX 4kB internal SRAM block
  Pattern: all ones
  Pattern: all zeros
  Pattern: alternate zero/ones (LSB set)
  Pattern: alternate zero/ones (LSB unset)
  Writing address to each location


...


DONE: 37 tests, 37 ok, 0 failed, 0 warnings
PASSED: all tests OK
>
```

Chapter 8. Upgrading

ABLE is usually stored in non-volatile memory. On boards on which ABLE runs there are two types of flash memory in common usage. These are NOR and NAND devices. The NOR devices are relatively small, perhaps 16 or 32Mb, and ABLE is executed directly from them. The NAND devices are much larger, a gigabit or more, and behave more like a disc drive. ABLE stored on NAND devices must be copied into system RAM and executed from there.

Upgrading ABLE on these two memory types is described in seperate sections, the user must assure themselves they are using the correct procedure for their board. Some boards have both forms of memory and care must be taken to overwite the correct memory device.

All systems (except those lacking an MMU such as the EB675001DIP) have the ability to use the **reloader** tool to load a copy of ABLE into RAM, instead of writing directly to flash. This is a recommended step to ensure the new version of ABLE is suitable before making the update permenant.

Caution

It is generally recommended that users only upgrade if they are suffering a specific issue with a prior version or require an added feature. Every effort is made to ensure errors are not introduced in updates but Simtec Electronics offer no warranty.

8.1. Upgrading a NAND based systems

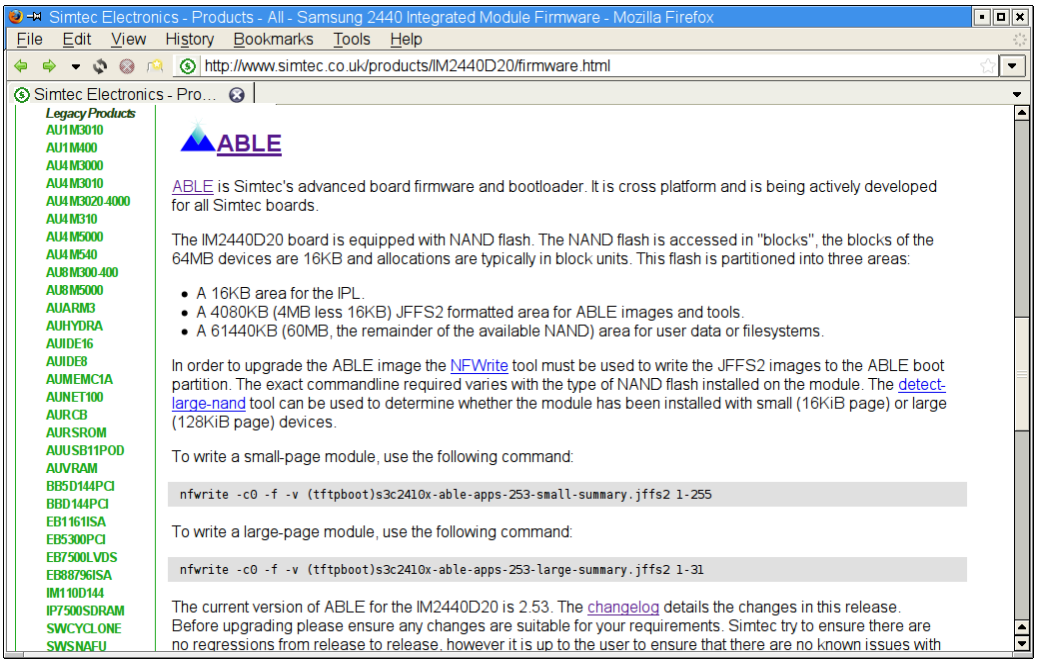
NAND flash is accessed in "blocks", the blocks of the curently supported devices are either 16KiB or 128KiB in size. Storage allocations are in block units. A detect-large-nand(1) utility is provided to allow the user to discover this information.

8.1.1. Obtaining Upgrades

Simtec Electronics generally provide ABLE upgrades for NAND as a JFFS2 image suitable for replacing the entire boot partition. However the new version of ABLE can simply be copied into the mounted JFFS2 from Linux® if desired.

Upgrades to the latest version can be obtained for each supported product on the Simtec Electronics website from the products firmware page. e.g The firmware page [http://www.simtec.co.uk/products/IM2440D20/firmware.html] for the IM2440D20.

Figure 8.1. IM2440D20 firmware page



IM2440D20 firmware webpage.

A version of ABLE which is up-to-date at the time of shipping is provided on the boards support CD. It is always recommended that the latest update be obtained from the website in preference to the CD version.

8.1.2. Applying the update

The boot flash is partitioned into three areas:

A 16KB area for the IPL.
A 4080KB (4MB less 16KB) JFFS2 formatted area for ABLE images and tools.
A 61440KB (60MB, the remainder of the available NAND) area for user data or filesystems.
In order to upgrade the ABLE image the NFWrite tool must be used to write the JFFS2 images to the ABLE boot partition. The exact commandline required varies with the type of NAND flash installed on the module.

The small page NAND devices require:

```
nfwrite -c0 -f -v (tftpboot)s3c2410x-able-apps-253-small-summary.jffs2 1-255
```

The large page NAND devices require:

```
nfwrite -c0 -f -v (tftpboot)s3c2410x-able-apps-253-large-summary.jffs2 1-31
```

8.2. Upgrading NOR based systems

8.2.1. Obtaining Upgrades

Simtec Electronics generally provide ABLE upgrades as a **romwrite** package which combines both the programming utility and the upgrade in a single binary image.

Upgrades to the latest version can be obtained for each supported product on the Simtec Electronics website from the products firmware page. e.g The firmware page [http://www.simtec.co.uk/products/EB2410ITX/firmware.html] for the EB2410ITX.

Figure 8.2. EB2410ITX firmware page

EB2410ITX firmware webpage.

A version of ABLE which is up-to-date at the time of shipping is provided on the boards support CD. It is always recommended that the latest update be obtained from the website in preference to the CD version.

8.2.2. Loading the Upgrade

It may be upgraded either by running the **romwrite** ABLE executable or by reprogramming the non-volatile storage directly e.g. by use of an EEPROM programmer.

The upgrade can be retrieved from any available boot device. Some examples for a EB2410ITX are:

cdrom - (cd0)eb2410itx-romwrite-v220.bin
tftp - (tftpboot)eb2410itx-romwrite-v220.bin
hard disc - (hd0)eb2410itx-romwrite-v220.bin

ABLE can navigate several types of filesystem Section 6.5, “Navigating a filesystem” has more details on how to locate files. Upgrades, because of their transient nature, are typically retrieved from the network using TFTP Chapter 7, *Networking* details configuring and using network interfaces.

ABLE may need to be moved to execute from memory on some platforms such as the EB7500ATX. This is achieved with the **shadow** command. If the shadow operation is not performed, then **romwrite** will prompt the user to issue the shadow command.

Example 8.1. The romwrite command requiring the shadow command

```
>(tftpboot)eb2410itx-romwrite-v174.bin
.............................boot: booting 'able app1'
ROM Write: Version 1.00
(c) 2002, 2003 Simtec Electronics

cannot run without ABLE shadowed.
use the 'shadow' command and then re-run this application
>
```

8.2.3. Running the upgrade

The **romwrite** command also performs several checks to ensure the update is suitable. These include downgrading and checking the machine type matches the image.

Warning

Overriding any warnings may result in an inoperable system, so be sure you understand any warnings before continuing with the upgrade.

Example 8.2. The romwrite command producing warnings

```
>(tftpboot)eb110atx-romwrite-v173.bin
.............................boot: booting 'able app1'
ROM Write: Version 1.00
(c) 2002, 2003 Simtec Electronics

Replacing current version 174 with image version 173
warning: Image version 173 is lower than running version 174
Image release number is 2003062801
warning: Image release 2003062801 is lower than running release 2003071701
warning: machine 3 is not supported by image
Warnings detected, proceed with upgrade (yes to continue) ? no
Upgraded cancelled by user input
>
```

The **romwrite** command may fail at the “Erasing Device” stage if the system supports physical non-volatile storage protection. This feature is currently present on all Simtec Electronics boards *except* the EB110ATX

A successful flash operation will result in a message asking the user to reset the platform. Until the system is reset, the *old* version of ABLE is still running.

Example 8.3. The romwrite command completing successfully

```
>shadow
shadowing ABLE into main memory
>(tftpboot)able.bast
.............................boot: booting 'able app1'
ROM Write: Version 1.00
(c) 2002, 2003 Simtec Electronics

Replacing current version 174 with image version 220
Image release number is 2003091701
Machine is BAST
Flash: SST 39LF160 [0x00BF, 0x2782]
Initialising programmer:
Erasing device: done
Writing data: ............. done
Verifying data: ......................... done
Finishing operation:  done
Done! - Please Reset machine
>
```

Part II. Built-in Command Reference

The sections in Part II split the commands available into groupings by type.

Each command is documented in the standard UNIX® manual page layout. The page is separated into several parts:

Name	The name of the command and its purpose.
Synopsis	Command synopsis which may illustrate several invocations.
Options	This part is only present if the command has arguments. The command arguments are listed together with a description.
Description	Describes the detailed use of the command.
See also	This optional section gives references to other commands which may be relevant.

Conventions used in this part:

- **command** text.
- {`arguments`} within { } are required.
- *`replaceable`* text for arguments.
- [`arguments`] within [ ] are optional.
- `argument` | `argument` separated by | cannot be used together.
- *`argument`*... is repeatable
- [*`expression`*]... entire expression is repeatable.

Table 6. Commands in alphabetical order

Command	Purpose
autoboot	Attempt to locate and boot suitable images automatically.
boot	Starts loaded OS images
cat	Displays contents of a text file
cd	Change present working directory
console	Controls ABLE console.
cp	Copy a file.
date	Show the current real time clock date and time.
dev	Display and manipulate the ABLE device tree.
dhclient	Configure a network interface using DHCP.
dump	Displays an area of memory in hex dump
dumpfile(1)	Displays a file in hex dump
echo	Output some text to standard output
exit	Exit ABLE shell
file	Tests each argument in an attempt to classify it.
help	Display help on built in commands
history	Lists the commands in the command line history.
host	Query the DNS.
hwinfo	Print hardware information.

Command	Purpose
ifconfig	Network device configuration and selection
load	Load executable images
dumpfile(1)	List files in directory
mii	MII phy control
meminfo	Shows memory information.
memset	Set range of memory to a specific value.
modules	List ABLE modules
more	Page a file to the console.
mutexes	Display the internal mutual exclusion states for ABLE.
nc(1)	Read data from a network socket.
nvclear	Reset non-volatile settings to defaults
nvset	Set non-volatile parameters
nvsave	Save altered non-volatile settings
nvshow	Show non-volatile parameters
nvunset	Clears non-volatile parameter
passwd(1)	Alter ABLE interactive shell passwd
peek	Examine a memory location
pmu	Power management control
poke	Poke memory location
pwd	Show present working directory
read	Reads a line of input into shell variables
reset	Reset machine
sbcd(1)	Manipulates the board configuration data.
setargs	Sets arguments to be passed to an OS started with the boot command
setdate	Sets the date in the real time clock
setopt	Sets device options.
settime	Sets the real time clock
sh	Start a new ABLE shell
showargs	Shows arguments to be passed to any booted OS
shadow	Moves ABLE into RAM
showhz	Shows how long a system has been running
sleep	Delay for a specified amount of time
sum	Checksum a file
sysmsg	Show system messages.
sysspeed	Sets the system clock speed
tasks(1)	Displays tasks running on system.
test(1)	Performs test operations
uname(1)	Print system identification
version(1)	Display ABLE shell version

Chapter 9. Core Commands

These are the core commands available from the shell command line of ABLE from version 2.20 and later.

autoboot

autoboot — Attempt to locate and boot suitable images automatically.

Synopsis

```
autoboot
```

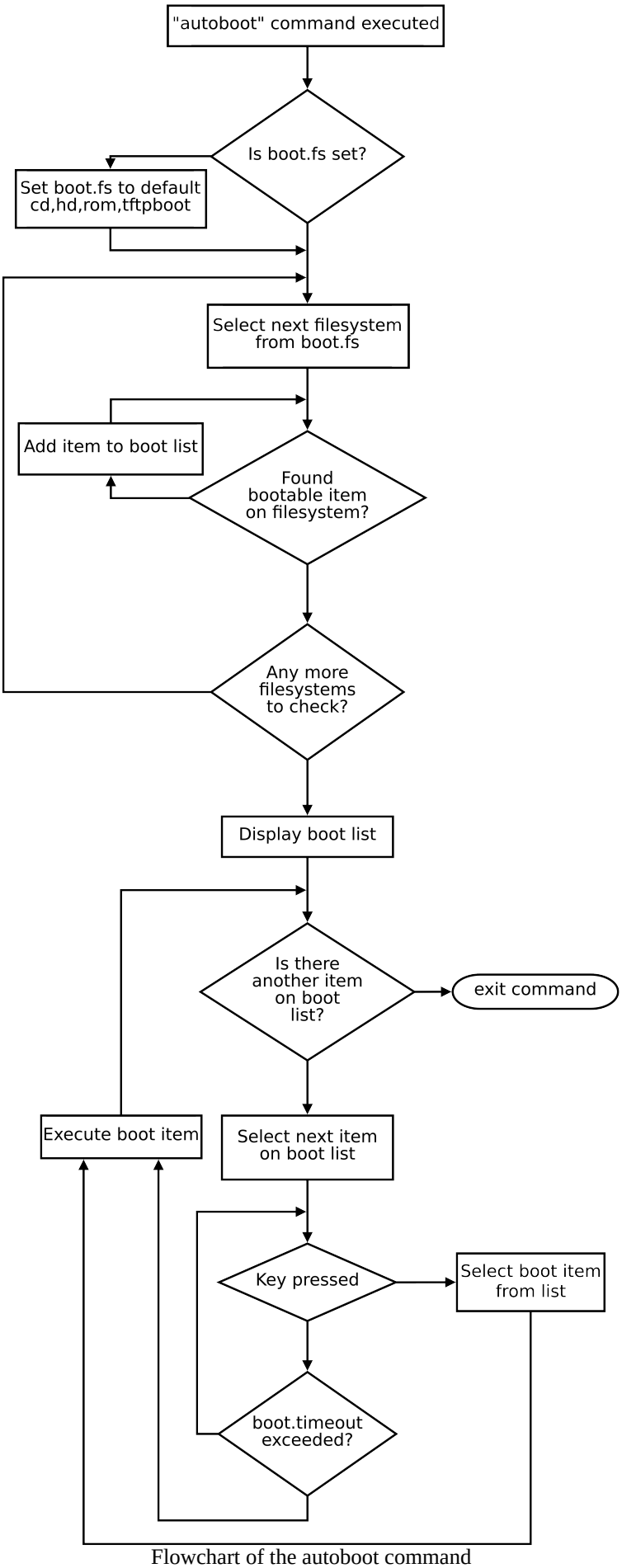
Description

This command may be executed from the Command Line Interface however it is usually executed as part of the automated boot sequence as explained in Section 6.8, “Starting an Operating System Automatically”.

This command takes each filesystem in turn from the boot.fs variable and searches it for bootable images. As each possible image is located a suitable set of parameters are derived (if possible) and the image and the commands are added to a list.

Once all the filesystems have been checked the list is displayed and a countdown commenced starting with the boot.timeout value. If a user selects one of the entries they are then prompted to alter the guessed parameters and asked if they wish to make the resulting command line the boot.cmd entry. If the user does not interact with the command before the countdown completes the first entry on the list is attempted, if that fails the second is tried and so on down the list until all entries have been attempted.

Figure 9.1. Autoboot command flowchart



Flowchart of the autoboot command

console

console — Controls ABLE console.

Synopsis

`console` [-a, --add {*`driver`*}] [-d, --drivers] [-s, --level [*`level`*]] [-l, --list] [-h, --help]

Options

`-a, --add` adds a new console driver to those currently active.

`-d, --drivers` shows all available display drivers which can be used with the `-a` switch.

`-s, --level` sets the logging level to new value (if given) and displays the current logging level.

`-l, --list` lists the currently active consoles.

`-h, --help` displays the short help text and exits.

Description

This command is used to manipulate the ABLE console system. At boot, the active console is determined by the `console.read` and `console.write` values. The **console** command allows the current active console sources to be altered while the system is running.

The console command allows the level of messages displayed ("logged") on the console to be altered.

Any messages with a level lower than the current log level will be output to the console. For example, if the logging level is set to 6 all messages except those of level Log and Debug will be shown.

The initial log level is controlled by `console.level` and defaults to 6 if the variable is unset.

Table 9.1. Defined console log levels

Level	Value	Description
Critical	0	Critical errors that will prevent proper continued operation of ABLE
Error	1	Error messages
Warn	3	Warning messages
Info	5	Messages which give more information about an operation
Log	7	Messages which are the result of normal operation
Debug	9	Debugging messages, these will rarely be seen on non debugging releases of ABLE.

Example 9.1. Using the console command

This example shows the use of the console command and its switches. First all the available drivers are listed, then the current log level is displayed and changed. Finally the active drivers are listed, a new driver added and listed again to show the addition was successful.

```
>console -d
(-w-a)  s3c2410x-video
(r---)  usbkbd
(rw--)  null
(-w--)  all-wr
(r---)  all-rd
```

```
(rw--)  serial
(rw--)  (s3c2410_serial2)
(rw--)  (s3c2410_serial1)
(rw--)  (s3c2410_serial0)
>console -s
Current console level 6
>console -s 4
Changing log level 6 to 4
>console -l
Console (write):
all write:
 => s3c2410x-video: S3C24XX Framebuffer (640x480 @ 60Hz, 31.5 KHz)
 => null: NULL
 => serial: low level serial
Console (read):
all read:
 => usbkbd: USB Keyboard Driver
 => null: NULL
 => serial: low level serial
>console -a (s3c2410_serial1)
adding console (s3c2410_serial1)
>console -l
Console (write):
all write:
 => (s3c2410_serial1): fd (s3c2410_serial1)
 => s3c2410x-video: S3C24XX Framebuffer (640x480 @ 60Hz, 31.5 KHz)
 => null: NULL
 => serial: low level serial
Console (read):
all read:
 => (s3c2410_serial1): fd (s3c2410_serial1)
 => usbkbd: USB Keyboard Driver
 => null: NULL
 => serial: low level serial
>
```

date

date — Show the current real time clock date and time.

Synopsis

```
date
```

Description

Show the current real time clock date and time. The settime and setdate commands can be used to set the real time clock and date.

Example 9.2. Using the date command

This example shows the use of the date command to get the current date and time, the date and time being kept across a reset and finally used to show a delay.

```
>date
Fri Mar 10 01:38:00 2006
>date
Fri Mar 10 01:38:08 2006
>reset
selected all-wr for console write
selected all-rd for console read
DRAM: 128 Mb (134217728 bytes)
BAST: PMU version 1.02, ID 00:01:3d:00:01:6a
ABLE 2.20 Copyright 2001-2005,2006 Simtec Electronics
hdb: ATAPI CDROM: TOSHIBA CD-ROM XM-7002B PIO mode 4
hdc: FUJITSU MHF2043AT: ATA PIO mode 4
hdc:Diagnosing disc drive: ok
(hdc) 4GB
(hdb) Drive Empty
DM9000: dm0: r1, 00:01:3d:00:01:6a int phy, link ok, 100Mbit full duplex
NE2000: ne0: ISA/Generic, 00:01:3d:00:01:6b
ne0: PHY 0180:bb10, state 7869, LPA 45e1,0007
ne0: starting PHY reset (260)
TMP101: not detected
sys.autoshadow unset, automatically shadowing
>date
Fri Mar 10 01:38:24 2006
>date; sleep 22; date
Fri Mar 10 01:38:44 2006
Fri Mar 10 01:39:06 2006
>
```

See also

settime, setdate.

dev

dev — Manipulate and display the ABLE device tree.

Synopsis

help

help — Display help on built in commands

Synopsis

`help` [*command*]

Options

command inbuilt command name

Description

Without a parameter this command lists the in-built commands understood by the shell. Specifying a command name prints a brief help message for that command which is typically the same as using the `--help` option.

Example 9.3. Using the help command

This shows the help command being used to get help on the help command itself, it then shows obtaining help on the **sh** command and obtaining the same information with the --help option.

```
>help
Internal commands are:
sh           autoboot     sbcd         bast-hdlcd   pic-wr       pic-rd
bast-at2     bast-at      dmcfg-rd     dmcfg-wr     pmu          shadow
mii          ifconfig     set          [            test         console
display      file         hwinfo       wrout        version      nvclear
nvunset      nvsave       nvshow       nvset        uname        sum
tasks        sleep        showhz       sysmsg       setopt       showargs
setargs      reset        memset       meminfo      peek         poke
modules      ls           lsfs         help         echo         dumpfile
dump         cat          cp           cd           pwd          boot
load         history      vtp5         vtp4         vtp3         vtp2
vtp1         sysspeed     settime      setdate      devls        date

Use:
  help <command> to get brief explanation
  <command> --help for command usage (if available)
>help help
Help on help:
Lists available commands, Optional arg gives help on specific command.
Please report bugs to <support@simtec.co.uk>
>help sh
Help on sh:
Usage: sh [OPTION] [FILE]
start a shell.

  -i             start an interactive shell
       --help     display this help and exit
       --version  output version information and exit


Please report bugs to <support@simtec.co.uk>
>sh --help
Usage: sh [OPTION] [FILE]
start a shell.
```

```
  -i              start an interactive shell
       --help     display this help and exit
       --version  output version information and exit

Please report bugs to <support@simtec.co.uk>
>
```

The Example 3.2, “Getting help on the uname command” is another example of using the **help** command.

history

history — Lists the commands in the command line history.

Synopsis

```
history
```

Description

Lists the commands in the command line history. Each command is numbered in the list. The number of commands kept in the history is set with the shell.hist non-volatile variable.

Commands are accessed in the history by using the up and down arrows. The command may be edited in place and then executed as with any other command line as if typed in.

Example 9.4. Using the history command

```
>history
 1 history
 2 meminfo
 3 tasks
 4 hwinfo -a
 5 hwinfo
>
```

hwinfo

hwinfo — Print hardware information.

Synopsis

`hwinfo` [[-a] | [-u]] [--help] [--version]

Options

`-a`	displays all the hardware info fields.
`-u`	displays the systems unique ID
`--help`	display short helptext and exit
`--version`	display commands version and exit

Description

Show hardware specific information, typically the machines unique identification bytes.

Example 9.5. Using the hwinfo command

```
>hwinfo
  Unique ID:0x00:0x01:0x3d:0x00:0x01:0x6a
>
```

meminfo

meminfo — Shows memory information.

Synopsis

`meminfo`

Description

Shows the memory availabe within the system and the ABLE current memory usage.

Example 9.6. Using the meminfo command

```
>meminfo
Memory regions:
        30000000, size 04000000 (65536 KiB)
        34000000, size 04000000 (65536 KiB)

Memory pool: 382/3752 KiB, 18 free blocks
>
```

modules

modules — List ABLE modules

Synopsis

```
modules
```

Description

Lists all the ABLE modules within a particular build. ABLE is constructed using a small section of “head” or initialisation code and a number of modules. Each module provides a specific piece of functionality to the system e.g. the cmd_time module provides the **time** command to the shell.

The modules are loaded according to their priority, the lowest (most important) priority first rising to the highest (lowest importance). This priority system ensures a fixed load order so facilities and drivers are available in the appropriate sequence.

Example 9.7. Using the modules command

```
>modules
current modules:
 cmd_time, priority=0x100
 cmd_devls, priority=0x100
 cmd_setdate, priority=0x100
 ax88796, priority=0x50000
 dm9000, priority=0x50000
 simtec_ide, priority=0x50000
 bbd2016a_ide, priority=0x50000
 anubis_bus, priority=0x65000
 bast_bus, priority=0x65000
 osiris_bus, priority=0x65000
 smdk2440_bus, priority=0x65000
 vr1000_bus, priority=0x65000
 samsung_s3c2410x, priority=0x65100
 dev_24cxx, priority=0x65801
 nvram_init, priority=0x65880
 s3c2410x_timer, priority=0x71000
 hztimer, priority=0xa0000
 cmd_sysspeed, priority=0xa6000
 romfs, priority=0xa7000
 serial_u16550, priority=0xa8800
 serial_s3c2410, priority=0xa8800
 serial_console, priority=0xa8a00
 allrd_console, priority=0xa8a00
 allwr_console, priority=0xa8a00
 null_console, priority=0xa8a00
 multi_console, priority=0xa8a00
 usbkbd, priority=0xa8a00
 ps2kbd_serpic, priority=0xa8a00
 s3cvid_console, priority=0xa8a00
 sm501vid_console, priority=0xa8a00
 console, priority=0xa8a01
 draminit, priority=0xa8a05
 drv_pmu_bast, priority=0xa9100
 usb_core, priority=0xa9800
 usb_ohci, priority=0xa9802
 announce, priority=0xa9fff
```

```
  confs, priority=0xaa001
  iso9660fs, priority=0xaa002
  ffs, priority=0xaa002
  ext2fs, priority=0xaa002
  jffs2, priority=0xaa002
  tftpboot, priority=0xaa002
  char_code, priority=0xaa003
  ide, priority=0xb0000
  ide_disc_drv, priority=0xb0001
  ide_cdrom_drv, priority=0xb0001
  rom, priority=0xb1000
  net_dm9000, priority=0xd1001
  netudp, priority=0xd1002
  netipv4, priority=0xd1002
  netif, priority=0xd1002
  net_isa_ne2k, priority=0xd1002
  net_ax88796, priority=0xd1002
  net_test1, priority=0xd1003
  cyclone_code, priority=0xd1101
  sh_osloader, priority=0xe0000
  app1_osloader, priority=0xe0000
  lzw_osloader, priority=0xe0000
  netbsd_osloader, priority=0xe0000
  linux_osloader, priority=0xe0000
  srec_osloader, priority=0xe0000
  zlib_osloader, priority=0xe0000
  tmp101, priority=0xe8000
  cmdload, priority=0xf0000
  cmdboot, priority=0xf0000
  cmd_cd, priority=0xf0000
  cmd_cp, priority=0xf0000
  cmd_cat, priority=0xf0000
  cmd_dump, priority=0xf0000
  cmd_echo, priority=0xf0000
  cmd_help, priority=0xf0000
  cmd_lsfs, priority=0xf0000
  cmd_ls, priority=0xf0000
  cmd_modules, priority=0xf0000
  cmd_poke, priority=0xf0000
  cmd_meminfo, priority=0xf0000
  cmd_memset, priority=0xf0000
  cmd_reset, priority=0xf0000
  cmd_sleep, priority=0xf0000
  cmd_wrout, priority=0xf0000
  cmd_hwinfo, priority=0xf0000
  cmd_file, priority=0xf0000
  cmd_display, priority=0xf0000
  cmd_cons, priority=0xf0000
  cmd_test, priority=0xf0000
  cmd_set, priority=0xf0000
  cmd_ifconfig, priority=0xf0000
  cmd_mii, priority=0xf0000
  cmd_autoboot, priority=0xf0001
  shell, priority=0xf0002
>
```

mutexes

mutexes — Display the internal mutual exclusion states for ABLE.

Synopsis

passwd

passwd — Alter ABLE interactive shell passwd

Synopsis

```
passwd
```

Description

The interactive shell can be proteced from unauthorised access by a password. The password up to eight characters in length and must only use characters typable from the ABLE console.

The password is hashed with a salt value and stored in a non-volatile variable console.password. When the system is booted, immediately after thr automatic boot processing is completed, the password will be prompted for. If an incorrect password is entered three times the system will be reset.

This command prompts the user for a password, places a suitably hashed value in the console.password and prompts the user to save the new password with nvsave if they wish to make the password permenant.

Example 9.8. Using the passwd command

```
>passwd
Enter new password:
Retype new password:
Password changed, please run 'nvsave' to ensure the change persists.
>
```

See also

nvsave.

pmu

pmu — Power management control

Synopsis

`pmu` [-o] [-r] [-w {*`state`*}] [-n {*`state`*}] [-s] [-a] [-l]

Options

`-o` turns power off

`-r` hard reset

`-w` set global wake on state to on with 1 or off with 0

`-n` set wake on LAN state to on with 1 or off with 0

`-s` set PMU value

`-a` perform PMU action

`-l` list current PMU values

Description

Used to manipulate the Power Management Unit of a platform.

reset

reset — Reset machine

Synopsis

```
reset
```

Description

This command may be used to reset the machine, the exact behaviour is system dependant.

On the EB7500ATX and EB2410ITX boards this command will communicate with the power management device to perform a physical system reset while the EB110ATX will perform a simple soft reset.

sbcd

sbcd — Manipulates the board configuration data.

Synopsis

`sbcd` [-l, --load {*`file`*}] [-s, --show] [-d, --drivers] [-h, --help]

Options

`-l, --load`	Load Simtec Electronics board configuration data for passing to an OS.
`-s, --show`	Show Simtec Electronics board configuration data
`-d, --drivers`	List Simtec Electronics board configuration data drivers
`-h, --help`	display short help message

Description

Simtec board configuration data control command, allows manipulation of the board configuration data on supported machines.

setdate

setdate — Sets the date in the real time clock

Synopsis

`setdate` {*`day`*} {*`month`*} {*`year`*}

Options

`day` day of month to set

`month` month to set

`year` year to set, two digit values will have 2000 added

Description

This command allows the date to be set in the real time clock. The real time clock is typically battery backed and the settings are retained across reboots.

Example 9.9. Using the setdate command to set the real time clock

```
>setdate 1 2 3
setdate: assuming year value is offset from 2000
>date
Sat Feb 01 17:59:52 2003
>reset
selected all-wr for console write
selected all-rd for console read
DRAM: 128 Mb (134217728 bytes)
BAST: PMU version 1.02, ID 00:01:3d:00:01:6a
ABLE 2.20 Copyright 2001-2005,2006 Simtec Electronics
hdb: ATAPI CDROM: TOSHIBA CD-ROM XM-7002B PIO mode 4
hdc: FUJITSU MHF2043AT: ATA PIO mode 4
hdc:Diagnosing disc drive: ok
(hdc) 4GB
(hdb) Drive Empty
DM9000: dm0: r1, 00:01:3d:00:01:6a int phy, link ok, 100Mbit full duplex
NE2000: ne0: ISA/Generic, 00:01:3d:00:01:6b
ne0: PHY 0180:bb10, state 7869, LPA 45e1,0007
ne0: starting PHY reset (264)
TMP101: not detected
sys.autoshadow unset, automatically shadowing
>date
Sat Feb 01 18:00:04 2003
>setdate 10 3 2006
>date
Fri Mar 10 18:00:33 2006
>
```

See also

settime, date.

setopt

setopt — Sets device options.

Synopsis

`setopt` {*`device`*} {*`options`*}

Options

`device` device on which to set options.

`options` options to apply to device

Description

This command allows device options to be altered, typically baud rates and data formats on character devices.

The device which options are applied to is typically a serial port. The **console** command can be used to obtain a list of appropriate devices with the `-d` option.

The options are in the form:

```
baud,data-format
```

The baud rate is a simple numeric value e.g. 115200 or 19200. The data format is specified as three single character values. The first denotes the number of data bits, typically eight or seven. The second sets the parity type one of none (*`n`*), odd (*`o`*) or even (*`e`*). The third is the number of stop bits either one or two.

The initial port options are detailed in Section 5.2, “Setting parameters on serial drivers”.

Example 9.10. Using the setopt command to alter serial port options.

This example shows the setopt command altering the baud rate of the second s3c2410 serial port to 19600.

```
>console -d
(-w-a)  s3c2410x-video
(r---)  usbkbd
(rw--)  multi
(rw--)  null
(-w--)  all-wr
(r---)  all-rd
(rw--)  serial
(rw--)  (s3c2410_serial2)
(rw--)  (s3c2410_serial1)
(rw--)  (s3c2410_serial0)
(rw--)  (u16550_serial1)
(rw--)  (u16550_serial0)
>setopt (s3c2410_serial1) 19600,8n1
>
```

settime

settime — Sets the real time clock

Synopsis

`settime` {*`hour`*} {*`minute`*} {*`second`*}

Options

`hour` hour to set using 24 hour clock

`minute` minute to set

`second` second to set

Description

This command allows the time to be set in the real time clock. The real time clock is typically battery backed and the settings are retained across reboots.

Example 9.11. Using the settime command to set the real time clock

This example shows the time being altered, the system reset and the retention and correct update of the time across the reset.

```
>date
Wed Mar 22 16:37:11 2006
>settime 1 2 3
>date
Wed Mar 22 01:02:03 2006
>reset
selected all-wr for console write
selected all-rd for console read
DRAM: 128 Mb (134217728 bytes)
BAST: PMU version 1.02, ID 00:01:3d:00:01:6a
ABLE 2.21r1 Copyright 2001-2005,2006 Simtec Electronics
hdb: ATAPI CDROM: TOSHIBA CD-ROM XM-7002B PIO mode 4
hdc: FUJITSU MHF2043AT: ATA PIO mode 4
hdc:Diagnosing disc drive: ok
(hdc) 4GB
(hdb) Drive Empty
DM9000: dm0: r1, 00:01:3d:00:01:6a int phy, link ok, 100Mbit full duplex
NE2000: ne0: ISA/Generic, 00:01:3d:00:01:6b
ne0: PHY 0180:bb10, state 7869, LPA 45e1,0007
ne0: starting PHY reset (262)
TMP101: not detected
sys.autoshadow unset, automatically shadowing
>date
Wed Mar 22 01:02:26 2006
>settime 16 40 0
>date
Wed Mar 22 16:40:00 2006
>
```

See also

setdate, date.

shadow

shadow — Moves ABLE into RAM

Synopsis

```
shadow
```

Description

Moves ABLE into RAM. This allows systems where ABLE executes directly from flash memory to move ABLE into RAM where it will execute faster, this is also required if the underlying flash memory is to be reprogrammed e.g. when upgrading ABLE

This command is largely deprecated and is generally now only used on the EB7500ATX. Most platforms are running ABLE shadowed as most current designs do not have directly mapped memory to execute from.

showhz

showhz — Shows how long a system has been running

Synopsis

```
showhz
```

Description

ABLE maintains an internal timer which increments 100 times a second. The timer is started from 0 and hence gives an indication of the amount of time since the last reset.

This command displays the value of the system timer in hexadecimal, the value is also converted into seconds for convenience.

Example 9.12. Using the showhz command

```
>showhz; sleep 10; showhz
HZ: be36 (486 seconds)
HZ: c227 (497 seconds)
>showhz
HZ: 1f6b9 (1286 seconds)
>
```

sysmsg

sysmsg — Show system messages.

Synopsis

```
sysmsg
```

Description

Displays the system message history buffer. This buffer contains all the messages ABLE has produced. Not all of these messages may have been output to the console, the console.level variable and the console command control which messages are displayed and which are simply placed in the message buffer.

Example 9.13. Displaying the system messages after a default boot

The system message log contains more information than will normally be output to the console, these messages can be useful for discovering problems.

```
selected all-wr for console write
selected all-rd for console read
DRAM: 128 Mb (134217728 bytes)
BAST: PMU version 1.02, ID 00:01:3d:00:01:6a
ABLE 2.20 Copyright 2001-2005,2006 Simtec Electronics
hdb: ATAPI CDROM: TOSHIBA CD-ROM XM-7002B PIO mode 4
hdc: FUJITSU MHF2043AT: ATA PIO mode 4
hdc:Diagnosing disc drive: ok
(hdc) 4GB
(hd0) on ((hdc1):ext2)
(hdb) Drive Empty
DM9000: dm0: r1, 00:01:3d:00:01:6a int phy, link ok, 100Mbit full duplex
NE2000: ne0: ISA/Generic, 00:01:3d:00:01:6b
TMP101: not detected
sys.autoshadow unset, automatically shadowing
>sysmsg
1: dcc: status 20000000, read 80f403c8
2: low level serial 00000000
3: log level is now 1
4: ABLE: 2.20 (s3c2410x) (vince@gerald) Thu Feb 16 14:47:40 GMT 2006
5: Processor: Samsung S3C2410A (arm920)
6: System: Machine bast/s3c2410x, Linux id 0x014b
7: S3C2410X RTC: 13:49:57, 03/01/2003
8: (s3c2410x) character device
9: NAND: configured boot slot is 0 (card slot)
10: NAND device 0: Samsung K9F1208u0a [131072,32,512]
11: (flash0) on (nand0p1)
12: (flash1) on ((nand0p2):jffs2)
13: EEPROM: 24cXX, 1024 bytes, single byte addressed, UID unset
14: (nvram0) on (24cxx0p1)
15: sys.speed is unset, Setting CPU Speed to 266MHz
16: (u16550_serial0) aliased to (char0)
17: (u16550_serial1) aliased to (char1)
18: s3c2410_serial: 115200, 8n1, 16 byte fifo on, u clock
19: (s3c2410_serial0) aliased to (char2)
20: s3c2410_serial: 115200, 8n1, 16 byte fifo on, u clock
21: (s3c2410_serial1) aliased to (char3)
22: s3c2410_serial: 115200, 8n1, 16 byte fifo on, u clock
```

```
23: (s3c2410_serial2) aliased to (char4)
24: all-wr: adding console 'serial'
25: all-wr: adding console 'null'
26: no configuration, defaulting to VGA
27: Chrontel CH7006 detected
28: screen mode is 640x480, ?Hz, ?Hz HSync
29: video: video size 300K
30: s3c-fb: VClk=22166666 HZ
31: configuring ch7006: vga
32: all-wr: adding console 's3c2410x-video'
33: failed to find SM501 device
34: no console level set, setting 6
35: selected all-wr for console write
36: selected all-rd for console read
37: DRAM: 128 Mb (134217728 bytes)
38: BAST: PMU version 1.02, ID 00:01:3d:00:01:6a
39: usb.enable not set, setting 1
40: usb.hubdepth not set, setting 2
41: new hc e036d1b4
42: starting hc e036d1b4
43: ABLE 2.20 Copyright 2001-2005,2006 Simtec Electronics
44: hdb: ATAPI CDROM: TOSHIBA CD-ROM XM-7002B PIO mode 4
45: hdc: FUJITSU MHF2043AT: ATA PIO mode 4
46: hdc:Diagnosing disc drive: ok
47: (hdc) 4GB
48: (hd0) on ((hdc1):ext2)
49: (hdb) Drive Empty
50: DM9000: dm0: r1, 00:01:3d:00:01:6a int phy, link ok, 100Mbit full duplex
51: NE2000: ne0: ISA/Generic, 00:01:3d:00:01:6b
52: ne0: PHY 0180:bb10, state 7849, LPA 0000,0004
53: ne0: starting PHY reset (238)
54: TMP101: not detected
55: sys.autoshadow unset, automatically shadowing
56: >ne0: bringing PHY up (489)
57: sysmsg
>
```

sysspeed

sysspeed — Sets the system clockspeed

Synopsis

`sysspeed` [*speed*]

Options

`speed` system speed in MHz, a integer number is required and the MHz units should be omitted.

Description

Displays possible speeds with no parameters or sets the system speed in MHz.

Example 9.14. Using the syspeed command on a EB2410ITX

This shows the sysspeed command being used to list possible values with the * indicating the current selected speed. The speed is changed to 226 MHz from 266MHz and redisplayed.

```
>sysspeed
    34 MHz        45 MHz        51 MHz        48 MHz        56 MHz
    68 MHz        79 MHz        85 MHz        90 MHz       101 MHz
   113 MHz       118 MHz       124 MHz       135 MHz       147 MHz
   152 MHz       158 MHz       170 MHz       180 MHz       186 MHz
   192 MHz       203 MHz       210 MHz       226 MHz    *  266 MHz
   268 MHz       270 MHz
>sysspeed 226
Setting CPU Speed to 226MHz
CPU Speed successfully changed
>sysspeed
    34 MHz        45 MHz        51 MHz        48 MHz        56 MHz
    68 MHz        79 MHz        85 MHz        90 MHz       101 MHz
   113 MHz       118 MHz       124 MHz       135 MHz       147 MHz
   152 MHz       158 MHz       170 MHz       180 MHz       186 MHz
   192 MHz       203 MHz       210 MHz    *  226 MHz       266 MHz
   268 MHz       270 MHz
>
```

tasks

tasks — Displays task threads currently running on system.

Synopsis

```
tasks
```

Description

ABLE runs several threads to control various hardware devices. This command displays the currently running threads.

The information is presented in a tabular form. The columns are:

Task name and address
Priority of execution
Current state
Register context block
Time thread was last scheduled

The scheduling for the threads is a simple “round robin” method which suffices for ABLE requirements.

Example 9.15. Using the tasks command

This example shows the tasks command when run on a EB2410ITX. The showhz command is used to show the current system time which is the same as used in the “Last Run” column. It shows the Ethernet PHY control task, the USB host controller driver, the reaper task to clean up after other tasks, the init task which starts the system and the main task which typically runs the autoboot or interactive shell.

```
>showhz ; tasks ; showhz
HZ: 0xf519 (62745) (100/sec => 627 seconds)
                 Task Prio State   Regs     Last Run Sleeping  Wakeup  Preempts
-------------------- ---- ------- -------- -------- -------- -------- --------
       tasks e00898c4 0004 r-----c e0089920 0000f51a 00000000 00000000 00000002
     usb-hub e008b2a4 0001 ------- e008b300 0000008b e008c288 -0062747 00000000
     usb-hub e0087e54 0001 ------- e0087eb0 0000f51c e0012178 00000001 00000000
  IP dev dm1 e0084e14 0001 ------- e0084e70 0000f51c e0084dd4 00000001 00000000
  IP dev dm0 e0082c24 0001 ------- e0082c80 0000f51d e0082be4 00000001 00000000
      usb-hc e0080ae4 0001 ------- e0080b40 0000f51e e0012178 00000001 00000000
      reaper e007c6f4 0000 ------- e007c750 0000f519 e0012164 -0062751 00000000
    IP Stack e0079b54 0003 ------- e0079bb0 0000f51a e0075704 00000005 00000000
        idle e0075514 0008 r------ e0075570 0000691b 00000000 00000000 00000226
        init e00757c4 0004 ------- e0075820 0000f519 e008988c -0062753 00062365
HZ: 0xf521 (62753) (100/sec => 627 seconds)
>
```

uname

uname — Print system identification

Synopsis

`uname` [-a, --all] [-s, --kernel-name] [-n, --nodename] [-r, --kernel-release] [-v, --kernel-version] [-m, --machine] [-o, --operating-system] [--help] [--version]

Options

`-a, --all`	print all information, in the following order:
`-s, --kernel-name`	print the kernel name
`-n, --nodename`	print the network node hostname
`-r, --kernel-release`	print the kernel release
`-v, --kernel-version`	print the kernel version
`-m, --machine`	print the machine hardware name
`-o, --operating-system`	print the operating system
`--help`	display this help and exit
`--version`	output version information and exit

Description

Print system identification, this command is practically identical in use to equivalent commands under UNIX®.

The **uname** command prints information about the machine and operating system it is run on. If no options are given the `-s` option is assumed.

The information printed is always in the order `kernel-name`, `nodename`, `kernel-release`, `machine` and `operating system`. The values displayed may contain spaces or punctuation.

Example 9.16. Using the uname command on the EB2410ITX

```
>uname
ABLE
>uname -a
ABLE unknown 2.53 #18035 Mon Jan 26 12:22:21 2009 s3c2410 ABLE
>uname -r
2.53
>uname -v
#18035 Mon Jan 26 12:22:21 2009
>
```

See also

version(1).

version

version — Display ABLE shell version

Synopsis

```
version
```

Description

Displays the version number and build information of the currently executing instance of ABLE. This is the same text which is output during the boot process.

The information provided by this command is also available from the **uname** command.

Example 9.17. Using the version command

```
>version
ABLE 2.53 (18035) Copyright 2001-2008 Simtec Electronics
>
```

See also

uname(1).

Chapter 10. Shell Commands

These are the commands which can be used to perform operations related to the ABLE shell.

echo

echo — Output some text to standard output

Synopsis

`echo` [-n] [-e] {text}

Options

`-n` do not output the trailing newline

`-e` enable interpretation of the backslash-escaped characters

`text` text to display

Description

This command is used to display text on the output console. One use is in scripts to indicate what actions are being performed.

If the `-e` option is used, the following sequences are recognised:

Table 10.1. Escaped echo characters

Character	Result
\0NNN	the character whose ASCII code is NNN (octal)
\\	backslash
\a	alert (BEL)
\b	backspace
\c	suppress trailing newline (same as the `-n` option)
\f	form feed
\n	new line
\r	carriage return
\t	horizontal tab
\v	vertical tab

Example 10.1. Using the echo command

```
>echo pepper;echo fish
pepper
fish
>echo -n pepper;echo fish
pepperfish
>
```

exit

exit — Exit ABLE shell

Synopsis

`exit` [status]

Options

`status` integer exit status.

Description

Cause the shell to exit with a specified status. If the status code is omitted the exit status is that of the last command executed.

If the initial shell is exited any additional modules with lower priority will be executed, ultimately if no further modules are available the system will halt.

read

read — Reads a line of input into shell variables

Synopsis

`read` [-d {*`delimiter`*}] [-e] [-n {*`number`*}] [-p {*`prompt`*}] [-s] [-t {*`timeout`*}] [-u {*`file`*}] {*`variable`*...}

Options

`-d` *`delimiter`* The delimiter is a single character which is used to terminate the input line the default if this option is not given is newline.

`-e` If the input is not coming from a file (`-u` isn't used) the input will be read with a line editor. This line editor is the same as the main shell but with no history.

`-n` *`number`* The command exits after reading the specified number of characters.

`-p` *`prompt`* The prompt will be output before starting to accept input. The prompt is only displayed if `-u` is not being used.

`-s` If the `-u` is not being used characters entered are usually displayed, this switch inhibits this display. This can be used for password entry.

`-t` *`timeout`* this stops reading input after the timeout and exits with a non zero exit code. The option has no effect if the `-u` option is being used.

`-u` *`fd`* Instead of reading input from the console read from the given file descriptor.

`variable` The names of the variables to place the read text into. If no names are supplied the input is put into the `REPLY` variable.

Description

One line is read from the console, or from the file descriptor supplied as an argument to the -u option, and the first word is assigned to the first variable name, the second word to the second name, and so on, with leftover words and their intervening separators assigned to the last name. If there are fewer words read from the input stream than names, the remaining names are assigned empty values.

The characters in `IFS` are used to split the line into words unless the delimiter switch is used.

The return code is zero, unless end-of-file is encountered, read times out, or an invalid file is supplied as the argument to `-u`.

Example 10.2. Using the read command

This example shows the use to the **read** command in several ways. Firstly reading simple text without a prompt and then with a long prompt.

```
>read
some text
>echo $REPLY
some text
>read -p "a long prompt $"
a long prompt $some text with a long prompt
>echo $REPLY
some text with a long prompt
>
```

This shows reading values into a specified variable and how the `REPLY` variable is unaffected.

```
>REPLY="no reply"
>read -p $ VARIABLE
$some text with a prompt in VARIABLE
>echo $VARIABLE
some text with a prompt in VARIABLE
>echo $REPLY
no reply
>
```

This shows the use of the silent switch to suppress echoing of output.

```
>read -s VARIABLE

>echo $VARIABLE
some text in VARIABLE with silent enabled
>
```

This shows the use of the delimiter and timeout options to read a preset number of characters and perform a read within a set amount of time.

```
>read -n 5 VARIABLE
12345>echo $VARIABLE
12345
>read -d 9 VARIABLE
this text continues until a 9>echo $VARIABLE
this text continues until a
>echo $?
0
>read -t 3 VARIABLE
>echo $?
1
>echo $VARIABLE
this text continues until a
>
```

set

set — Set or clear shell options and positional parameters

Synopsis

`set` {*`filename`*}

Options

`filename` File to display

Description

See also

dumpfile(1).

sh

sh — Start a new ABLE shell

Synopsis

`sh` [-x] [-e] [-v] [-i] [--help] [--version]

Options

`-x`	Display the command to be executed with its variables expanded.
`-e`	Exit immediately if a command fails
`-v`	Display lines of input as they are read.
`-i`	Start an interactive shell
`--help`	Display short helptext and exit
`--version`	Display commands version and exit

Description

This command starts a new ABLE shell, for full information on using the shell refer to Chapter 3, *Command Line Interface*. The newly created shell environment is separate from the invoking shell, variables from the parent are not available and upon exit any variables set within the shell are lost.

Example 10.3. Subshell variable scope

This example shows setting variables in the outer shell and in the subshell and their scope.

```
>echo ${FOO}

>echo ${BAR}

>FOO="hello and goodbye"
>BAR="goodbye and hello"
>sh
>echo ${FOO}

>echo ${BAR}

>BAR="something else"
>FOO="entirely"
>echo ${FOO} ${BAR}
something else entirely
>exit
>echo ${FOO}
hello and goodbye
>echo ${BAR}
goodbye and hello
>
```

The `-x`, `-e` and `-v` switches control the shells overall behaviour, these variables are accessed from the shell using the special variable `$_`.

sleep

sleep — Delay for a specified amount of time

Synopsis

`sleep` {*time*}

Options

time Time in seconds to delay

Description

This command is used to pause execution for a given length of time. The time given must be a simple integer number of seconds.

Example 10.4. Using the sleep command to delay execution

```
>date ; sleep 15 ; date ; sleep 9 ; date ; sleep 292 ; date
Fri Jan 05 04:25:51 2003
Fri Jan 05 04:26:06 2003
Fri Jan 05 04:26:15 2003
Fri Jan 05 04:31:07 2003
>
```

test

test — Performs test operations

Synopsis

`test` [--help] [--version] *`expression`*

Options

`--help` Display this help and exit

`--version` Output version information and exit

`expression` Expression to evaluate.

Description

Exit with the status determined by the expression (shown in Table 10.2, “Possible test expressions”).

An omitted expression defaults to false. Otherwise, the expression is evaluated to a true or false result and sets exit status accordingly.

An alias is provided so this command can be called as **[** this gives a more familiar way to use this command.

For the tests which check for a file having UNIX® read or write permissions ABLE assumes the root (UID 0 and GID 0) superuser is being used.

Table 10.2. Possible test expressions

Test	Result is true if
(*`expression`*)	*`expression`* is true
! *`expression`*	*`expression`* is false
`expression1` -a *`expression2`*	both *`expression1`* and *`expression2`* are true
`expression1` -o *`expression2`*	either *`expression1`* or *`expression2`* is true
-n *`string`*	the length of *`string`* is nonzero
`string`	equivalent to -n *`string`*
-z *`string`*	the length of *`string`* is zero
`string1` = *`string2`*	the strings are equal
`string1` != *`string2`*	the strings are not equal
`integer1` -eq *`integer2`*	*`integer1`* is equal to *`integer2`*
`integer1` -ge *`integer2`*	*`integer1`* is greater than or equal to *`integer2`*
`integer1` -gt *`integer2`*	*`integer1`* is greater than *`integer2`*
`integer1` -le *`integer2`*	*`integer1`* is less than or equal to *`integer2`*
`integer1` -lt *`integer2`*	*`integer1`* is less than *`integer2`*
`integer1` -ne *`integer2`*	*`integer1`* is not equal to *`integer2`*
`file1` -ef *`file2`*	*`file1`* and *`file2`* have the same device and inode numbers
`file1` -nt *`file2`*	*`file1`* is newer (modification date) than *`file2`*
`file1` -ot *`file2`*	*`file1`* is older than *`file2`*
-b *`file`*	*`file`* exists and is block special

Test	Result is true if
-c *file*	*file* exists and is character special
-d *file*	*file* exists and is a directory
-e *file*	*file* exists
-f *file*	*file* exists and is a regular file
-g *file*	*file* exists and is set-group-ID
-G *file*	*file* exists and is owned by the effective group ID
-h *file*	*file* exists and is a symbolic link (same as -L)
-k *file*	*file* exists and has its sticky bit set
-L *file*	*file* exists and is a symbolic link (same as -h)
-O *file*	*file* exists and is owned by the effective user ID
-p *file*	*file* exists and is a named pipe
-r *file*	*file* exists and read permission is granted
-s *file*	*file* exists and has a size greater than zero
-S *file*	*file* exists and is a socket
-t *fd*	file descriptor *fd* is opened on a terminal
-u *file*	*file* exists and its set-user-ID bit is set
-w *file*	*file* exists and write permission is granted
-x *file*	*file* exists and execute (or search) permission is granted

Except for `-h` and `-L`, all file-related tests dereference symbolic links. Beware that parentheses need to be escaped (e.g., by back-slashes) for shells.

Example 10.5. Performing assorted tests

This example shows the use of the test command with various expressions. Each test uses "&& echo true" to make it clear when the expression returns a true (zero) exit status.

```
>test ! ( 1 -ge 0 ) && echo true
>echo $?
1
>test ( 1 -ge 0 ) && echo true
true
>echo $?
0
>test ! ( 1 -ge 0 ) && echo true
>test ! ( 0 -ge 1 ) && echo true
true
>test -f (hd0)/etc/services && echo true
true
>test -f (hd0)/etc/services -a ( 1 -ge 0 ) && echo true
true
>test -f (hd0)/etc/services -a ( 1 -ge 2 ) && echo true
>test -f (hd0)/etc/services -o ( 1 -ge 2 ) && echo true
true
>test -n "foo" && echo true
true
>test -n "" && echo true
>test -z "foo" && echo true
>test "foo" = "foo" && echo true
true
>test "foo" = "bar" && echo true
>test "foo" != "bar" && echo true
```

```
true
>test 1 -eq 2 && echo true
>test 1 -eq 1 && echo true
true
>test 1 -ge 0 && echo true
true
>test 1 -ge 1 && echo true
true
>test 1 -ge 2 && echo true
>test 1 -gt 1 && echo true
>test 1 -le 2 && echo true
true
>test 1 -le 1 && echo true
true
>test 1 -le 0 && echo true
>test 1 -lt 1 && echo true
>test 1 -ne 1 && echo true
>test 1 -ne 0 && echo true
true
>test -f (hd0)/etc/services
>test -f (hd0)/etc/services && echo true
true
>test -d (hd0)/etc/services && echo true
>test -d (hd0)/etc && echo true
true
>test -b (hd0)/etc/services && echo true
>test -b (hd0)/dev/hda && echo true
true
>test -c (hd0)/dev/hda && echo true
test -c (hd0)/dev/tty  && echo true
true
>
```

Chapter 11. Network operations

These are the commands for controlling the network interfaces.

ifconfig

ifconfig — Network device configuration and selection

Synopsis

`ifconfig` [-a] [-s] [--help] [--version] {*`interface`*} [*`address`*] [netmask{*`address`*}] [gateway{*`address`*}] [tftpserver{*`address`*}] [[up] | [down]]

Options

`-a`	Displays information about all available interfaces
`-s`	Changes output to short format
`--help`	Display commands syntax then exits
`--version`	Displays commands version then exits
`address`	Address to assign to interface e.g. 192.168.7.101
`interface`	Name e.g. ne0 or de0 unless `-a` is used
`netmask`	Netmask to assign to interface e.g. 255.255.255.0
`gateway`	Default gateway to assign to interface e.g. 192.168.7.1
`tftpserver`	TFTP server address to use e.g. 192.168.7.10
`up`	Selects the interface as operational and the default.
`down`	Disables the interface.

Description

This command allows network interfaces to be manually configured and different interfaces to be selected.

Normally ABLE will use DHCP on the default interface when retrieving files over tftp, the default interface may be changed with this command by using *just* the `up` flag (see Example 11.1, “Using the **ifconfig** command to select default interface”)

By using the other parameters the interface may be configured with IPv4 addresses. Configuring in this way removes the requirement of using a DHCP server.

Example 11.1. Using the ifconfig command to select default interface

```
>ifconfig -a
dm0       HWaddr 00:01:3d:20:20:20

ne0       HWaddr 00:01:3d:ff:ff:00

>ifconfig dm0 up
looking for net.dm0
net.dm0:selected as boot interface
>ifconfig ne0 up
looking for net.ne0
net.ne0:selected as boot interface
>
```

Example 11.2. Using the ifconfig command to configure a fixed address

This example shows the first davicom interface (dm0) being configured with the IP protocol address 192.168.7.101 with a netmast of 255.255.255.0 and to use the tftpserver 192.168.7.10 no default gateway has been specified.

```
>ifconfig dm0 192.168.7.101 netmask 255.255.255.0 tftpserver 192.168.7.10 up
looking for net.dm0
net.dm0:selected as boot interface
>
```

dhclient

dhclient — Automatically configure a network interface using DHCP.

Synopsis

`dhclient` [-k] {*`interface`*}

Options

`-l` Terminate an extant dhclient instead of starting a new one. Releases the lease.

`interface` The interface to start or stop DHCP on.

Description

ABLE is capable of using the Dynamic Host Configuration Protocol (DHCP) to provide IP, DNS and boot-server configuration information. ABLE can use DHCP on any (or all) of its interfaces on multi-ethernet-device boards.

Example 11.3. Using the dhclient command

This shows the configuration of the first Davicom ethernet device on a board.

```
>dhclient dm0
DHCP: Attempting network autoconfiguration for dm0.
DHCP: Automatic network configuration for dm0 successful.
DHCP: Address 192.168.0.100
DHCP: Netmask 255.255.255.0
DHCP: Gateway 192.168.0.1
DHCP: Server 192.168.0.5
DHCP: Next Server 192.168.0.3
DHCP: DNS Server 192.168.0.2
>
```

host

host — Look up hostnames and optionally set DNS server values.

Synopsis

`host` [-s, --set *`resolver`*] [--help] [--version] name...

Options

`-s, --set`	set the resolver to use. The default is the one provided by the DHCP response.
`--help`	display short helptext and exit
`--version`	display commands version and exit
`name`	The host name to resolve.

Description

Perform a DNS lookup.

Example 11.4. Using the host command to resolve an address.

```
>host www.simtec.co.uk
www.simtec.co.uk is at 217.147.94.109
>
```

See also

dhclient.

mii

mii — MII phy control

Synopsis

`mii` {-d, --dev *`device`*} [-p, --phy *`address`*] [-s, --show] [-r, --read *`address`*] [-w, --write *`address value`*] [-h, --help]

Options

`-d, --dev`	Performs operation on the specified device
`-p, --phy`	Specify phy address on device
`-s, --show`	Show all registers for phy
`-r, --read`	Read mii register
`-w, --write`	Write mii register
`-h, --help`	Display short help message

Description

Gives control of MII phy parameters on supported network controllers.

Example 11.5. Using the mii command to show all the registers in a phy

```
>mii -d ne0 -s
 [00] = 3000  [01] = 7849  [02] = 0180  [03] = bb10
 [04] = 01e1  [05] = 0000  [06] = 0004  [07] = 2001
 [08] = 0000  [09] = 0000  [10] = 0000  [11] = 0000
 [12] = 0000  [13] = 0000  [14] = 0000  [15] = 0000
 [16] = 0000  [17] = 0283  [18] = 11dd  [19] = 0000
 [20] = 0000  [21] = 5256  [22] = 07ec  [23] = 4001
 [24] = 0800  [25] = 2041  [26] = 07cf  [27] = 1c11
 [28] = 0010  [29] = 1000  [30] = 0000  [31] = 0001
>
```

nc

nc — Read and display data from a network socket

Synopsis

nc {*address*} {*port*}

Options

address The IP address to connect to.

port The port on the remote server to connect to.

Chapter 12. File Navigation

These are the file commands are available from the shell command line of ABLE from version 2.20 and later.

cd

cd — Change present working directory

Synopsis

`cd` [*`directory`*]

Options

`directory` Directory to set as present working directory.

Description

This changes the present working directory of the shell to the specified directory, the change may be relative to the current directory or an absolute path.

Example 12.1. Using the cd and ls commands to navigate a filesystem

This shows using the **cd** command to change into the boot directory of the first hard drive and then perform a relative move into the var directory.

```
>cd (hd0)/boot
>ls
config-2.6.13-simtec1
vmlinuz-2.6.13-simtec1
>cd ../var
>ls
lib
cache
backups
local
lock
log
run
spool
tmp
opt
mail
>
```

dumpfile

ls — List files in a directory.

Synopsis

`ls` [-l] [-a] [*`directory`*]

Options

`-l`	Long listing giving more information.
`-a`	Listing includes all files.
`directory`	Directory to list.

Description

This command produces a list of all the files in a given directory, if no directory is specified then the present working directory is shown. Example 12.1, “Using the cd and ls commands to navigate a filesystem” shows the listing of the `PWD`.

Listing the “root” directory (**ls** /) lists all the available filesystems.

Example 12.2. Using the ls command

This shows a simple directory listing of the first hard disc partition with a filesystem.

```
>ls (hd0)
lost+found
etc
media
var
usr
bin
boot
dev
home
lib
mnt
proc
root
sbin
tmp
sys
srv
opt
>
```

This shows a detailed directory listing of the first hard disc partition with a filesystem.

```
>ls -l -a (hd0)
drwxr-xr-x   22 0 0     4096 .
drwxr-xr-x   22 0 0     4096 ..
drwxr-xr-x    2 0 0    49152 lost+found
drwxr-xr-x   73 0 0     4096 etc
drwxr-xr-x    2 0 0     4096 media
```

```
drwxr-xr-x   13 0 0     4096 var
drwxr-xr-x   12 0 0     4096 usr
drwxr-xr-x    2 0 0     4096 bin
drwxr-xr-x    2 0 0     4096 boot
drwxr-xr-x    7 0 0    24576 dev
drwxrwxr-x    5 0 50    4096 home
drwxr-xr-x    9 0 0     4096 lib
drwxr-xr-x    2 0 0     4096 mnt
drwxr-xr-x    2 0 0     4096 proc
drwxr-xr-x    5 0 0     4096 root
drwxr-xr-x    2 0 0     4096 sbin
drwxrwxrwx    4 0 0     4096 tmp
drwxr-xr-x    2 0 0     4096 sys
drwxr-xr-x    2 0 0     4096 srv
drwxr-xr-x    2 0 0     4096 opt
>
```

This shows the `PWD` being changed and the **ls** command used to display the directory contents.

```
>cd (hd0)
>ls -l -a
drwxr-xr-x   22 0 0     4096 .
drwxr-xr-x   22 0 0     4096 ..
drwxr-xr-x    2 0 0    49152 lost+found
drwxr-xr-x   73 0 0     4096 etc
drwxr-xr-x    2 0 0     4096 media
drwxr-xr-x   13 0 0     4096 var
drwxr-xr-x   12 0 0     4096 usr
drwxr-xr-x    2 0 0     4096 bin
drwxr-xr-x    2 0 0     4096 boot
drwxr-xr-x    7 0 0    24576 dev
drwxrwxr-x    5 0 50    4096 home
drwxr-xr-x    9 0 0     4096 lib
drwxr-xr-x    2 0 0     4096 mnt
drwxr-xr-x    2 0 0     4096 proc
drwxr-xr-x    5 0 0     4096 root
drwxr-xr-x    2 0 0     4096 sbin
drwxrwxrwx    4 0 0     4096 tmp
drwxr-xr-x    2 0 0     4096 sys
drwxr-xr-x    2 0 0     4096 srv
drwxr-xr-x    2 0 0     4096 opt
>
```

pwd

pwd — Show present working directory

Synopsis

```
pwd
```

Description

This command can be used to show the present working directory. This information is also available in the `PWD` shell variable.

Example 12.3. Using the pwd command and `PWD` variable to show the present working directory

```
>cd (hd0)/boot
>pwd
(hd0)/boot
>echo $PWD
(hd0)/boot
>cd ../var
>pwd
(hd0)/var
>
```

Chapter 13. File manipulation commands

These are the commands to manipulate files and are available from the shell command line of ABLE from version 2.20 and later.

cat

cat — Displays contents of a text file

Synopsis

`cat` {*`filename`*}

Options

`filename` File to display

Description

Use to display the contents of a file. The file will be displayed in ASCII text, non printable characters and escape sequences may cause various effects. This is usually only an issue if binary files are displayed.

Example 13.1. Using cat command to display files contents

This example shows the display of two files one text and one binary.

```
>cat (hd0)/etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/bin/sh
bin:x:2:2:bin:/bin:/bin/sh
sys:x:3:3:sys:/dev:/bin/sh
sync:x:4:65534:sync:/bin:/bin/sync
>
```

This shows the display of part of a binary file and the undesirable effects.

```
>cat (hd0)/bin/ls
fb..p@VaeM`mLXkZ/.([=+$P*.nqBo      NU^.......!.,.&.>.AI)04RD"
<8 \ WQ J]:G9$..4 .(..44.4.....oo.o........b..b.... . . .P.U..... .. .. .bb...Hl
K ;[.T.  |.*.P. *.+., I|.  ....< i..
. ....8. +...` ...   . nye...  1.U&. nyy....  ...+ ..a.( 2.... c.u., i.0 >. . ..
|....w...4..?.o.....1.p..aP#......T#........e..4..`.e.a.H>.0.U&..nyR.i....i.0...
T.U.o.e.....o. ....H....o.`.H.h. ..ny<.U&..ny......m.A.0..i...L...t..
.0....$...$.....0...k<....g.H.d.n.T.D..&.`.
..
.l.8.x.T.......o...P..
...
..... . ..... .P#..nya....P.U&..nyb......b.a..~.a. .......Uu....u. .x..H.w. ....
P.. .\.0 ..".   ....  1.+.  K.\#..  a...
...".  A". 8+". >I". .". AP#. %T#. &X#. o\#. A. . .u . .!. ..!. !. __#+ _+ o+ .
$!. (!. ,!...0!...4!...8!...<!...@!...D!..H!...L!..P!..!...X!...\!...`!...d!.."R
"..S."..T."..U"..V."..X "..Z$"..[("..\,"..]0"..^4"..._8"..`<"..a@"..bD"..cH"..d.a
```

See also

dumpfile(1).

cp

cp — Copy a file.

Synopsis

cp {*source*} {*destination*}

Options

source	File to copy from.
destination	File to copy to.

Description

Copy source file to destination.

dumpfile

dumpfile — Displays a file in a hexadecimal dump

Synopsis

`dumpfile` {*`filename`*} [-s, --start {*`offset`*}] [-l, --length {*`length`*}] [-b, --blksize {*`size`*}] [-t, --text] [--help]

Options

`filename`	File to dump
`-s, --start` *`offset`*	Offset, in bytes, into the file to start the dump
`-l, --length` *`length`*	Length of data, in bytes, to dump
`-b, --blksize` *`size`*	Block size
`-t, --text`	Dump text only, no hex output
`--help`	Display short helptext and exit

Description

Use to display the contents of a file in a hexadecimal dump. The output will be put through a pager and can be aborted with **q**.

Care should be taken with the parameters to this command which come *after* the filename.

Example 13.2. Using the dumpfile command

This example shows the dumpfile command being used in text only mode to show the first 300 bytes of a file.

```
>dumpfile (hd0)/etc/services -t -l 300
dump: (hd0)/etc/services is 17571 bytes long, dumping 0 to 300
00000000: # Network services, Internet style.#.# Note that it is presently
00000040:  the policy of IANA to assign a single well-known.# port number
00000080: for both TCP and UDP; hence, officially ports have two entries.#
000000c0:  even if the protocol doesn't support UDP operations..#.# Update
00000100: d from http://www.iana.org/assignments/port-numbers and other.#
>
```

This shows the file dump of the same file with hex output and starting with a hundred byte offset into the file.

```
>dumpfile (hd0)/etc/services -s 100
dump: (hd0)/etc/services is 17571 bytes long, dumping 100 to 17571
00000064: 7720656c 2d6c6c65 776f6e6b 20230a6e : le well-known.#
00000074: 74726f70 6d756e20 20726562 20726f66 : port number for
00000084: 68746f62 50435420 646e6120 50445520 : both TCP and UDP
00000094: 6568203b 2c65636e 66666f20 61696369 : ; hence, officia
000000a4: 20796c6c 74726f70 61682073 74206576 : lly ports have t
000000b4: 65206f77 6972746e 230a7365 65766520 : wo entries.# eve
000000c4: 6669206e 65687420 6f727020 6f636f74 : n if the protoco
000000d4: 6f64206c 276e7365 75732074 726f7070 : l doesn't suppor
000000e4: 44552074 706f2050 74617265 736e6f69 : t UDP operations
000000f4: 0a230a2e 70552023 65746164 72662064 : ..#.# Updated fr
00000104: 68206d6f 3a707474 77772f2f 61692e77 : om http://www.ia
00000114: 6f2e616e 612f6772 67697373 6e656d6e : na.org/assignmen
```

```
00000124: 702f7374 2d74726f 626d756e 20737265 : ts/port-numbers
00000134: 20646e61 6568746f 20230a72 72756f73 : and other.# sour
00000144: 20736563 656b696c 74746820 2f2f3a70 : ces like http://
00000154: 2e777777 65657266 2e647362 2f67726f : www.freebsd.org/
00000164: 2f696763 77737663 632e6265 732f6967 : cgi/cvsweb.cgi/s
00000174: 652f6372 732f6374 69767265 20736563 : rc/etc/services
00000184: 20230a2e 2077654e 74726f70 69772073 : ..# New ports wi
00000194: 62206c6c 64612065 20646564 72206e6f : ll be added on r
--MORE--
>
```

See also

cat.

file

file — Tests each argument in an attempt to classify it.

Synopsis

`file` [-i, --mime] [--help] [--version] *`filename`*...

Options

`-i, --mime`	Causes the file command to output mime type strings rather than the more traditional human readable ones.
`--help`	Display short helptext and exit
`--version`	Display commands version and exit
`filename`	Name of file to checksum

Description

The file command examines a given file and tries to determine the files type. The underlying detection code is the same as that used by ABLE when determining how to load and execute files, this is useful if the user wishes to check ABLE is correctly determining a files type. Section 6.6, “How ABLE identifies files.” has more information on the detection method.

Example 13.3. Using the file command to determine filetypes

```
>file (hd0)/boot/vmlinuz-2.6.13-simtec1
(hd0)/boot/vmlinuz-2.6.13-simtec1: Linux Kernel
>file (tftpboot)test.sh
(tftpboot)test.sh: shell
>file (tftpboot)srec
(tftpboot)srec: Motorola S Record
>file (hd0)/etc/services
(hd0)/etc/services: data
>file (hd0)/bin/ls (hd0)/etc/services (hd0)/boot/vmlinuz-2.6.13-simtec1
(hd0)/bin/ls: elf
(hd0)/etc/services: ASCII text
(hd0)/boot/vmlinuz-2.6.13-simtec1: Linux Kernel
>file -i (hd0)/bin/ls (hd0)/etc/services (hd0)/boot/vmlinuz-2.6.13-simtec1
(hd0)/bin/ls: application/x-executable
(hd0)/etc/services: text/plain
(hd0)/boot/vmlinuz-2.6.13-simtec1: application/octet-stream
>
```

more

more — Page output.

Synopsis

sum

sum — Checksum a file

Synopsis

`sum` {*`filename`*}

Options

`filename` Name of file to checksum

Description

Checksum a file, the value produced is the same as the **sum** command under UNIX®. This allows for files to be verified before loading with ABLE.

Example 13.4. Checksumming a file with the sum command

```
>sum (tftpboot)s3c2410-romwrite-220.bin
..................................................
.....................................
crc = 32182, 417 Kb processed,  (tftpboot)s3c2410-romwrite-220.bin
>
```

Chapter 14. Non-volatile settings

These are the commands to manipulate non-volatile memory entries and are available from the shell command line of ABLE from version 1.55 and later.

nvclear

nvclear — Reset non-volatile settings to defaults

Synopsis

```
nvclear
```

Description

This command wipes the nvvars stored in the hardware but does not update the values in memory. This allows the in memory values to be saved with the nvsave command.

Warning

A common mistake when using this command is to assume the **nvsave** command is required, this will simply result in the current in memory settings being retained, the additional **nvsave** command is *not* required.

nvsave

nvsave — Save altered non-volatile settings

Synopsis

```
nvsave
```

Description

This command commits any changed non-volatile variables to real storage. Without this command changes will not be retained across a reset.

nvset

nvset — Set non-volatile parameters

Synopsis

`nvset` {*`variable`*} {*`value`*}

Options

`variable` A non-volatile variable name

`value` Value to set variable to

Description

Sets a non-volatile variable to a given value. The same effect can be achieved by simply setting the shell variable appropriately. The `value` is usually free form text for general options, for boolean values the values “on” and “off” are used (true/false and 0/1 may also be used)

Example 14.1. Using the nvset command and shell method to alter a non-volatile variables

```
>nvshow fb.enable
fb.enable  = on
>nvset fb.enable off
>nvshow fb.enable
fb.enable  = off
>fb.enable=on
>nvshow fb.enable
fb.enable  = on
>fb.enable=false
>nvshow fb.enable
fb.enable  = off
>nvset fb.enable true
>nvshow fb.enable
fb.enable  = on
>
```

Example 14.2. Using the nvset command

This example shows the setting of three variables, one of each type, and their effects on the variables as shown by nvshow. It should be noted that to set string values with spaces in them the values must be quoted appropriately.

```
>nvshow
boot-cmd =
boot-time =
shell-hist = 0
auto-boot = off
auto-shadow = off
cons-write =
cons-read =
>nvset boot-cmd "boot (hd0)/vmlinuz root=/dev/hda1"
>nvset boot-time 1
>nvset auto-boot on
>nvshow
boot-cmd = boot (hd0)/vmlinuz root=/dev/hda1
boot-time = 1
shell-hist = 0
auto-boot = on
auto-shadow = off
cons-write =
cons-read =
>
```

nvshow

nvshow — Show non-volatile parameters

Synopsis

`nvshow` [*`variable`*]

Options

`variable` non-volatile variable name

Description

This command shows the current settings of the non-volatile variables. If the `variable` is omitted a complete list is shown, otherwise only the specified variable is shown. Single non-volatile settings are also available as variables in the shell, because a full stop is ambiguous within a variable name the required non-volatile setting must be placed within curly braces.

Example 14.3. Using the nvshow command

```
>nvshow
hist (is unset)
boot.fs (is unset)
boot.auto  = off
boot.cmd  = (hd0)/boot/vmlinuz-2.6.13-simtec1 root=/dev/hdc1 console=ttySAC0,110
boot.timeout (is unset)
ide.multi-limit (is unset)
usb.hubdepth (is unset)
usb.enable (is unset)
console.level (is unset)
console.write (is unset)
console.read (is unset)
fb.enable  = on
fb.output (is unset)
fb.refresh (is unset)
fb.y (is unset)
fb.x (is unset)
sys.autoshadow (is unset)
sys.speed (is unset)
>nvshow fb.enable
fb.enable  = on
>echo ${fb.enable}
on
>
```

nvunset

nvunset — Clears non-volatile parameter

Synopsis

`nvunset` {*`variable`*}

Options

`variable` A non-volatile variable name

Description

Unsets a non-volatile variable so the default value will be used.

Chapter 15. OS manipulation commands

These are the commands to start and manipulate loaded executable images entries and are available from the shell command line of ABLE from version 1.55 and later.

These commands are deprecated since ABLE version 1.50. Their functionality has altered somewhat and they are implemented as shell functions.

boot

boot — Starts loaded OS images

Synopsis

`boot` [--help] [--version]

Options

`--help` Display short help message and exit

`--version` Display the version of the boot command and exit

Description

This command starts execution of a previously loaded OS image. Its operation is described in Section 6.7.1, “The "setargs, load and boot" method”. The arguments passed to the image are set with the setargs command.

Example 15.1. Using the boot command

```
>boot
boot: an image must be loaded with the load command first
>load (tftpboot)batty
tftp: attempting bootp
bootp: sending request
bootp: serverip: 192.168.7.1
bootp: netmask: 255.255.255.0
bootp: serverip: 192.168.7.1
bootp: netmask: 255.255.255.0
bootp: address: 192.168.7.29
>boot
Simtec Board Test Tool, Version 0.23
(c) 2005 Simtec Electronics

EB2410ITX (BAST) Test Suite
...
```

See also

setargs.

load.

load

load — Load executable images

Synopsis

`load` {file...}

Options

`file` File paths to load

Description

This command is used to load OS files which can be started using the boot command. The way a file is loaded is determined by the files type. The file type is found using the internal detection code. The type of a file may be examined using the file command.

The Section 6.7, “Starting an Operating System” provides a description of using this command to start an operating system.

See also

setargs.

boot.

file.

showargs

showargs — Shows arguments to be passed to any booted OS

Synopsis

```
showargs
```

Description

Shows arguments to be passed to an OS started with the boot command.

Example 15.2. Using the showargs command

```
>showargs
BOOTARGS=root=/dev/hda3
>
```

setargs

setargs — Sets arguments to be passed to an OS started with the boot command

Synopsis

`setargs` {*`arguments`*…}

Options

`arguments` Arguments to be passed to OS

Description

Sets arguments to be passed to an OS started with the boot command.

Example 15.3. Using the setargs command

```
>showargs
BOOTARGS=root=/dev/hda3
>setargs root=/dev/hdc1 console=ttySAC0,115200
>showargs
BOOTARGS='root=/dev/hdc1 console=ttySAC0,115200'
>
```

Chapter 16. Debugging commands

These are commands used to debug issues with ABLE and manipulating specific system functions. Some of these commands may not be available in all configurations and platforms.

dump

dump — Displays an area of memory in hex dump

Synopsis

`dump` {*`start`*} [*`end`*]

Options

`start` Memory address to dump from in hex. Address is in logical memory space.

`end` Last memory address to dump in hex. Address is in logical memory space.

Description

Use to display the contents of a memory area in a hex dump. The output will be put through a pager and can be aborted with **q**.

Example 16.1. Using the dump command to examine memory

This example shows the dump command being used to display the first 4KB of memory. The output is aborted with **q** after the first page.

```
>dump 0 1000
00000000: e59ff034 e59ff014 e59ff014 e59ff014 : 4...............
00000010: e59ff014 e59ff014 e59ff014 e59ff014 : ................
00000020: f004458c f00410fc f00444d4 f004441c : .E.......D...D..
00000030: 00000000 f004464c 00000000 f0004008 : ....LF.......@..
00000040: ffffffff ffff7fff ffffffff ffffffff : ................
00000050: ffffffff ffffffff ffffffff ffffffff : ................
00000060: ffdfffff ffffffff ffffffff ffffffff : ................
00000070: dfffffff ffffffff ffffffbf ffffffff : ................
00000080: 7fffffff ffffffff ffffffff ffffffff : ................
00000090: ffffffff ffffffff ffffffff dfffffff : ................
000000a0: ffffffdf ffffffff dfffffff ffffffff : ................
000000b0: ffffffff ffffffff ffffffff ffffffff : ................
000000c0: ffffffff ffffffff ffffffff ffffffff : ................
000000d0: ffffffff fff7ffff ffffffff 7fffffff : ................
000000e0: ffffffff ffffffff ffffffff ffffffff : ................
000000f0: ffffffff ffffffff ffffffff ffffffdf : ................
00000100: ffffffff ffffffff ffffffff ffffffff : ................
00000110: ffffffff ffffffff ffffffff ffffffff : ................
00000120: ffffffff ffffdfff ffffffff ffffffff : ................
00000130: ffffffff ffffffff ffffffff ffffffff : ................
--MORE--
>
```

See also

peek, poke, memset.

memset

memset — Set range of memory to a specific value.

Synopsis

`memset` {*`address`*} {*`length`*} [*`value`*]

Options

`address` Start address of memory to set in hex

`length` Length of area to set in hex

`value` Value to set memory region to in hex (defaults to 0 if unspecified)

Description

This command alters an area of memory starting at `address` and spanning the specified `length` to the specified `value`. The address specified is dependant on the machine architecture and is the *translated* by the MMU.

See also

peek, poke, dump.

nand

nand — Display contents or OOB data from a range of NAND blocks.

Synopsis

`nand` [--help] [--version] [-b, --block {*block*}] [-s, --start {*block*}] [-e, --end {*block*}] [-p, --page {*block*}] [-r, --read] [-o, --oob]

Options

`--help`	Display commands syntax then exits
`--version`	Displays commands version then exits
`-b, --block` *block*	Selects start and end values for a single block of NAND.
`-s, --start` *block*	Selects start block of NAND.
`-e, --end` *block*	Selects end block of NAND.
`-p, --page` *page*	Selects start and end values for a single page of NAND.
`-r, --read`	Read NAND data from selected block range.
`-o, --oob`	Read the OOB data from selected block range.

Description

This command aids in debugging NAND devices. Both the data and out of band attribute data can be examined. The range of data to be show can be selected by block, block range and page.

Example 16.2. Using the nand command to display a range of NAND blocks

```
>nand -s 1 -e 2 -r
Reading 0x00000020
00004000: 20031985 0000000c e41eb0b1 e0011985 : ... ............
00004010: 00000034 755c292f 00000001 00000000 : 4.../)\u........
00004020: 00000002 45b4fcbc 0000080c fe565ec6 : .......E.....^V.
00004030: 30cb53b0 656c6261 3133322d 6e69622e : .S.0able-231.bin
00004040: e0021985 000013a6 fae16f87 00000002 : .........o......
00004050: 00000001 000081a4 03f603f6 00029058 : ............X...
00004060: 45b4fcbc 45b4fcbc 45b4fcbc 00000000 : ...E...E...E....
00004070: 00001362 00004000 00000006 877ec7af : b....@........~.

...

00007d90: 276d1d3a ea156311 574dc3e6 5e3314c1 : :.m'.c....MW..3^
00007da0: 60df5137 00e50d58 112a0370 8f49def0 : 7Q.`X...p.*...I.
00007db0: 5f1cf463 555addcf be72b4d0 81c75c16 : c.._..ZU..r..\..
00007dc0: cdce76ff 937b83e0 8db7e6c3 d17ba9cf : .v....{.......{.
00007dd0: 7efa4ba5 670228e1 2d2ea80a 2c0e019a : .K.~.(.g...-...,
00007de0: fd6da4d2 07e19fe8 c04541ae bf2d7557 : ..m......AE.Wu-.
00007df0: fc6f7d52 f8ae87cc 5b05aedc f88eaa4d : R}o........[M...
>
```

peek

peek — Examine memory location

Synopsis

`peek` [[p] | [v]] [[b] | [h] | [w]] [rpt {*`count`*}] [--help] [--version] {*`address`*}

Options

`p`	Interpret address as physical.
`v`	Interpret address as virtual (the default if not specified).
`b`	Byte (8bit) wide read.
`h`	Half word (16bit) wide read.
`w`	Word (32bit) wide read (default if not specified).
`rpt` *`count`*	Repeats the read *`count`* times.
`address`	Memory address to read in hexadecimal.

Description

This command retrieves a memory location and prints it in hexadecimal. The address specified is dependant on the machine architecture and is the *translated* by the MMU.

The `p` option causes the physical address specified to be translated into a virtual address suitable for use within ABLE, the *virtual* translated address is shown during display.

See also

poke, dump, memset.

poke

poke — Poke memory location

Synopsis

`poke` [[p] | [v]] [[b] | [h] | [w]] [[eor] | [orr] | [bic] | [set]] [rpt {*`count`*}] {*`address`*} {*`value`*}

Options

`p`	Interpret memory address as physical location.
`v`	Interpret address as virtual (the default if not specified).
`b`	Byte (8bit) wide read.
`h`	Half word (16bit) wide read.
`w`	Word (32bit) wide read (default if not specified).
`eor`	Exclusive or the *`value`* with the current contents of memory.
`orr`	Or the `value` with the current contents of memory.
`bic`	Clear the bits of the memory location which are set in `value`.
`set`	Alter the memory to the `value`.
`rpt` *`count`*	Repeats the read *`count`* times.
`address`	Memory address to read in hexadecimal.
`value`	Value to set in hexadecimal.

Description

This command alters a memory location to the specified value. The address specified is dependant on the machine architecture and is the *translated* by the MMU.

The `p` option causes the physical address specified to be translated into a virtual address suitable for use within ABLE, the *virtual* translated address is shown.

See also

dump, peek, memset.

Part III. External Command Reference

Part III lists the external commands available. The commands have their own documentation in addition to that provided here.

Each command is documented in the standard UNIX® manual page layout. The page is separated into several parts:

Name	The name of the command and its purpose.
Synopsis	Command synopsis which may illustrate several invocations.
Options	This part is only present if the command has arguments. The command arguments are listed together with a description.
Description	Describes the detailed use of the command.
See also	This optional section gives references to other commands which may be relevant.

Conventions used in this part:

- **command** text.
- {`arguments`} within { } are required.
- *`replaceable`* text for arguments.
- [`arguments`] within [ ] are optional.
- `argument` | `argument` separated by | cannot be used together.
- *`argument`*... is repeatable
- [*`expression`*]... entire expression is repeatable.

Table 10. Commands in alphabetical order

Command	Purpose
display(1)	Display bitmap images on a framebuffer.
fbset(1)	Set a framebuffers video mode and timings.

Chapter 17. Framebuffer commands

display

display — Display a bitmap image on framebuffer.

Synopsis

`display` [-d, --dev *`device`*] [-q, --quantize *`method`*] [-x *`x`*] [-y *`y`*] [-w, --width *`width`*] [-h, --height *`height`*] [--delay *`time`*] [--help] [--version] file...

Options

`-d, --device`	The output device on which to display the image. This defaults to (fb0)
`-q, --quantize`	Select the palette quantization method used for 8 bit per pixel or lower output devices.
	`p` per pixel `t` table `l` linear
`-x`	x co-ordinate to place image on screen.
`-y`	y co-ordinate to place image on screen.
`-w, --width`	width of image on screen.
`-h, --height`	height of image on screen.
`--delay`	time to delay between displaying each image.
`--help`	display short helptext and exit
`--version`	display commands version and exit

Description

The display tool is used to display bitmap image files on ABLE video framebuffers. The tool automatically detects the source image file format and determines the best colour match.

The target framebuffer may be selected from the available devices, aliases to suitable devices are created and the first alias (fb0) selected as the default.

The target framebuffer depth (number of bits used to represent a pixel) may be 1, 2, 4, 8, 16, 24 or 32bits.

The source image may be in the BMP, JPEG or PNG image formats. The image file may additionally be compressed with the gzip tool.

The source image colour depth is unconstrained by the display command and all images are upsampled to a 32bit depth. If the source image uses indexed colour and has a palette and the framebuffer is in an indexed colour mode the images palette will be applied to the framebuffer.

When an image has to be quantised to a framebuffer depth using indexed colours the quantisation method may be selected. This process, by definition, reduces the quality of an image by reducing the number of colours available. This will introduce numerous image artefacts on high colour images such as photographs.

If lower framebuffer depths are to be targeted explicitly reducing the source images colour depth, with an external program, is recommended as this will produce superior colour conversion.

The quantisation is performed using the framebuffers current palette. The methods available are:

- The per-pixel method performs, for every pixel, a linear Euclidean distance calculation for each colour in the palette to determine the closest match. This is the most accurate and slowest method.

- The table method constructs a reduced depth linear colour cube table (5 bits for each R,G,B element) and computes the closest Euclidean colour distance for each entry in the table. Each pixel in the source image is then reduced in depth and looked up in this table. This method is less accurate than the per-pixel method but has greatly improved performance. This method is the default.
- The linear method simply assumes the palette is the default linear colour cube (3:3:2 - RGB) and truncates each pixel value appropriately. This method is very fast but gives poor results on anything but simple images with few colours.

Example 17.1. Using the display command

This shows using the **display** command on the EB2410ITX to display a bitmap file from a tftp server.

```
>display (tftpboot)logo.bmp
>
```

Simtec logo displayed with the **display** command on an EB2410ITX framebuffer

See also

fbset(1).

fbset

fbset — Set a framebuffers video mode and timings.

Synopsis

`fbset` [-s, --show] [-i, --info] [-d, --dev *`device`*] [-x, --xres *`x`*] [-y, --yres *`y`*] [--depth *`depth`*] [--list] [--help] [--version] mode

Options

`-d, --device`	The output device on which to set the parameters. This defaults to (fb0)
`-s, --show`	Show current settings this is the default if no other option is set.
`-i, --info`	Show framebuffer information.
`-x, --xres`	x resolution to set.
`-y, --yres`	y resolution to set.
`--depth`	The depth in bits per pixel (1,2,4,8,16 and 32 are the common values).
`--list`	List all the built in modes.
`--help`	fbset short helptext and exit
`--version`	fbset commands version and exit

Description

The fbset tool is used to set a framebuffers video mode and timings. The tool has an internal list of suitable default video modes which can be selected by name.

Example 17.2. Using the fbset command

This shows using the **fbset** command to set an 800 x 600 mode at 60Hz refresh and 16 bits per pixel.

```
>fbset --depth 16 800x600-60
>fbset --show
mode "800x600-60"
    # D: 40.000 MHz, H: 37.878 KHz, V: 60.315 Hz,
    geometry 800 600 0 0 8
    timings 25000 88 40 23 1 128 4
endmode
>
```

See also

display(1).

Chapter 18. I2C commands

i2c-rd

i2c-rd — Read from an I²C® device.

Synopsis

`i2c-rd` [--bus *`bus`*] [--help] [--version] address [length]

Options

`--bus`	allows the specification of which I²C® bus to use if several are available on a system. This parameter defaults to the first bus (0).
`--help`	display short helptext and exit
`--version`	display commands version and exit
`address`	The 7bit I²C® bus address to read from.
`length`	The number of bytes to read. The default is one.

Description

Read one or more bytes from an I²C® device.

Example 18.1. Using the i2c-rd command

To read a byte of data from a simtec power management unit you can execute

```
>i2c-rd 0x6b
Reading 1 bytes from bus 0xe0075224 at address 0x6b
53
>
```

See also

i2c-scan(1).

i2c-wr(1).

i2c-wr

i2c-wr — Write to an I^{2}C® device.

Synopsis

`i2c-wr` [--bus *`bus`*] [--help] [--version] address value...

Options

`--bus`	allows the specification of which I^{2}C® bus to use if several are available on a system. This parameter defaults to the first bus (0).
`--help`	display short helptext and exit
`--version`	display commands version and exit
`address`	The 7bit I^{2}C® bus address to write to.
`value`	The value to be written, at least one value must be given, an empty write is not permitted.

Description

Write one or more bytes to an I^{2}C® device.

Example 18.2. Using the i2c-wr command

To write a byte of data to the first register in a simtec power management unit you can execute.

```
>i2c-wr 0x6b 0x00 0x01
Writing 2 bytes to bus 0xe0075224 at address 0x6b
00 01
>
```

See also

i2c-rd(1).

i2c-scan(1).

i2c-scan

i2c-scan — Scan all available I2C busses for devices.

Synopsis

```
i2c-scan
```

Description

Scan all available I2C busses for devices.

Example 18.3. Using the i2c-scan command

```
i2c-scan
I2C Bus Scan V1.04 Copyright 2006 Simtec Electronics
-----------------------------------------------------

found 1 busses:
Enumerating bus 0 (0xe0075224):

     0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
00: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- 48 49 -- -- -- -- -- --
50: 50 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
```

See also

i2c-wr(1).

Chapter 19. Miscellaneous commands

ablefis

ablefis — Flash Information Services (FIS) tool for ABLE.

Synopsis

```
ablefis
```

Description

ABLE supports the use of Flash Information Services (FIS) partitions placed in the NOR flash of some Simtec Electronics boards. The **ablefis** tool allows the user to manipulate these tables and arrange the flash in any way they choose.

Warning

The ABLE boot loader partition must *never* be removed or altered. Moving or altering this partition will corrupt the boot loader and the system will no longer start (see Simtec Electronics website for details on recovering such systems).

Example 19.1. Starting ABLE FIS

```
>(tftpboot)ablefis
ABLE RedBoot FIS Partition Tool, V0.20
(c) 2003 Simtec Electronics

Machine is BAST
Flash: SST 39LF160 [0x00BF, 0x2782]
read valid RedBoot FIS table
Partitions (3 of 16):
 00: 0x00000000 -> 00080000: ABLE
 01: 0x00000000 -> 00000000: Partition Marker
 02: 0x00080000 -> 001ff000: Namedspace

Free space:

commands:
         p - print current table
         d - delete partition
         e - edit partition
         x - extend table (add new partititon)
         s - shorten table (remove last partition)
         w - write table to flash
         q - quit
main>
```

When executed the ABLE FIS tool prints its introduction banner including its version number.

```
ABLE RedBoot FIS Partition Tool, V0.20
(c) 2003 Simtec Electronics
```

This is followed by a brief summary of the flash device in use and the system name.

```
Machine is BAST
Flash: SST 39LF160 [0x00BF, 0x2782]
```

The current FIS table is displayed showing the partition numbers, sizes and any free space.

```
Partitions (3 of 16):
 00: 0x00000000 -> 00080000: ABLE
 01: 0x00000000 -> 00000000: Partition Marker
 02: 0x00080000 -> 001ff000: Namedspace

Free space:
```

Finally a brief list of possible commands is shown followed by the command prompt.

```
commands:
         p - print current table
         d - delete partition
         e - edit partition
         x - extend table (add new partititon)
         s - shorten table (remove last partition)
         w - write table to flash
         q - quit
main>
```

The command prompt shows which menu is currently active within the tool and allows easy navigation. If there is no valid FIS table already configured the tool will create a default.

Example 19.2. ABLE FIS creating a default FIS table

```
ABLE RedBoot FIS Partition Tool, V0.20
(c) 2003 Simtec Electronics

Machine is BAST
Flash: SST 39LF160 [0x00BF, 0x2782]
did not find valid RedBoot FIS table on device, creating new
Created default table
Partitions (2 of 16):
 00: 0x00000000 -> 00080000: ABLE
 01: 0x00000000 -> 00000000: Partition Marker

Free space:
  0x00080000 -> 0x001ff000 (0x0017f000 bytes)

commands:
         p - print current table
         d - delete partition
         e - edit partition
         x - extend table (add new partititon)
         s - shorten table (remove last partition)
         w - write table to flash
         q - quit
main>
```

Warning

It is essential to realise that the system will no longer boot if the ABLE partition is altered or written to.

Main Menu

The main menu

```
commands:
         p - print current table
         d - delete partition
         e - edit partition
         x - extend table (add new partititon)
         s - shorten table (remove last partition)
         w - write table to flash
         q - quit
```

is the root for all other operations.

This menu is indicated by its "main>" prompt. As on all menus the "h" will redisplay all the commands available.

The "q" command will quit the program and return to ABLE.

The "p" command will print the current table, this table will not be written to the flash device until the "w" command is used.

The "d" command will prompt for a partition number and remove it from the table, this command returns to the main menu.

Example 19.3. Removing a partition from a FIS table

```
main> p
Partitions (3 of 16):
 00: 0x00000000 -> 00080000: ABLE
 01: 0x00000000 -> 00000000: Partition Marker
 02: 0x00080000 -> 00080000: Unused 2

Free space:
  0x00080000 -> 0x001ff000 (0x0017f000 bytes)
main> d
Which partition to delete (0-2) ?2
free_space: could not find allocated area 0x00080000->0x00080000
Deleted entry
main> p
Partitions (3 of 16):
 00: 0x00000000 -> 00080000: ABLE
 01: 0x00000000 -> 00000000: Partition Marker
 02: 0x00000000 -> 00000000: Unused 2

Free space:
  0x00080000 -> 0x001ff000 (0x0017f000 bytes)
main>
```

The "e" command will prompt for a partition number to edit and change to the the section called “Edit Menu”

Example 19.4. Adding and Editing a FIS table partition

```
main> x
Adding partition 2
main> p
Partitions (3 of 16):
 00: 0x00000000 -> 00080000: ABLE
 01: 0x00000000 -> 00000000: Partition Marker
 02: 0x00080000 -> 00080000: Unused 2

Free space:
  0x00080000 -> 0x001ff000 (0x0017f000 bytes)
main> e
Which partition to edit (0-2) ?2
Partition 2:
         Name                 = Unused 2
         Flash Address        = 0x00080000
         Flash Length         = 0x00000000
         Data Execution Base  = 0x00000000
         Data Execution Entry = 0x00000000
         Data Length          = 0x00000000

Edit commands:

         n - edit name
         p - edit position in flash
         d - edit data-length
         b - edit execution base
         e - edit execution address
         r - return to main menu
         s - show parition information again
         h - print this help message
edit 2>
```

The "x" command will add a new partition in the next available numerical partition number.

Example 19.5. Adding partition to FIS table

```
main> p
Partitions (2 of 16):
 00: 0x00000000 -> 00080000: ABLE
 01: 0x00000000 -> 00000000: Partition Marker

Free space:
  0x00080000 -> 0x001ff000 (0x0017f000 bytes)
main> x
Adding partition 2
main> p
Partitions (3 of 16):
 00: 0x00000000 -> 00080000: ABLE
 01: 0x00000000 -> 00000000: Partition Marker
 02: 0x00080000 -> 00080000: Unused 2

Free space:
  0x00080000 -> 0x001ff000 (0x0017f000 bytes)
main>
```

The "s" command will remove the last partition in the table.

Example 19.6. Shortening a FIS table

```
main> p
Partitions (3 of 16):
 00: 0x00000000 -> 00080000: ABLE
 01: 0x00000000 -> 00000000: Partition Marker
 02: 0x00000000 -> 00000000: Unused 2

Free space:
  0x00080000 -> 0x001ff000 (0x0017f000 bytes)
main> s
free_space: could not find allocated area 0x00000000->0x00000000
main> p
Partitions (2 of 16):
 00: 0x00000000 -> 00080000: ABLE
 01: 0x00000000 -> 00000000: Partition Marker

Free space:
  0x00080000 -> 0x001ff000 (0x0017f000 bytes)
main>
```

The "w" will write the current partition table to the flash. ABLE will not re-read these changes until the system is reset.

Example 19.7. Writing current FIS partition table

```
main> w
Writing new FIS table to flash
Erasing device: . done
Writing data: . done
Verifying data: . done
Done. Changes will not take effect until next reset
main>
```

Edit Menu

The edit menu

```
Edit commands:
         n - edit name
         p - edit position in flash
         d - edit data-length
         b - edit execution base
         e - edit execution address
         r - return to main menu
         s - show parition information again
         h - print this help message
```

allows for the manipulation of a specific FIS partition. The number after the "edit" prompt indicates which partition is being edited. The "h" command wil redisplay the available commands and the "q" command will return to the main menu.

The "n" command will edit the name of the partition up to a maximum length of 15 characters.

Example 19.8. Editing the name of a FIS partition

```
edit 2> s
Partition 2:
         Name                 = Unused 2
         Flash Address        = 0x00080000
         Flash Length         = 0x00000000
         Data Execution Base  = 0x00000000
         Data Execution Entry = 0x00000000
         Data Length          = 0x00000000

edit 2> n
Enter new name for parititon (max 15 characters): BootSpace
edit 2> s
Partition 2:
         Name                 = BootSpace
         Flash Address        = 0x00080000
         Flash Length         = 0x00000000
         Data Execution Base  = 0x00000000
         Data Execution Entry = 0x00000000
         Data Length          = 0x00000000

edit 2>
```

The "p" command changes the starting position and length of the partition within the flash.

Example 19.9. Changing the length of a partition.

```
edit 2> s
Partition 2:
         Name                 = BootSpace
         Flash Address        = 0x00080000
         Flash Length         = 0x00000000
         Data Execution Base  = 0x00000000
         Data Execution Entry = 0x00000000
         Data Length          = 0x00000000

edit 2> p
Free space:
  0x00080000 -> 0x001ff000 (0x0017f000 bytes)
Current position is 0x00080000 -> 00080000 (0 bytes)
New value for start position in flash (0x00080000) ?
New value for length in flash (0x00000000) ?17f000
edit 2> s
Partition 2:
         Name                 = BootSpace
         Flash Address        = 0x00080000
         Flash Length         = 0x0017f000
         Data Execution Base  = 0x00000000
         Data Execution Entry = 0x00000000
         Data Length          = 0x00000000

edit 2>
```

The d option changes the data length of the partition
The b option changes the data execution base of the partition
The e option changes the data execution address of the partition
The s option shows information on the partition being edited.

batty

batty — Hardware unit test tool for ABLE.

Synopsis

`batty` [--nomem] [--nonet] [--nocore] [--novideo] [--noadc] [--nocpld] [--noextserloop] [--noserial] [-s, --sbqs] [-i *`indent`*] [--help] [--version]

Options

`--nomem`	Do not perform the memory tests.
`--nonet`	Do not perform networking device tests.
`--nocore`	Do not perform core system tests.
`--novideo`	Do not test video devices.
`--noadc`	Do not test the ADCs.
`--nocpld`	Do not test the core system logic.
`--noextserloop`	Do not test the serial external loopback.
`--noserial`	Do not test serial devices.
`-i`	Adjust the indentation level when operating in human readable mode.
`-s, --sbqs`	Enable SBQS formatting mode.
`--help`	Show basic help message and exit.
`--version`	Show batty version and exit.

Description

Batty is an ABLE tool which performs hardware unit tests. It runs on all platforms. The number and nature of its tests vary between platforms depending on factors such as availability of hardware and features preset. To be used effectively batty must be run on ABLE versions later than 2.05.

The latest version is usually available either from the ABLE support page or the specific board support page on the Simtec Electronics website.

Example 19.10. Starting batty from the command line

A typical execution of batty on an EB2410ITX. On this particular platform a fairly small number of tests are performed, specifically a series of memory tests and a verification that the ABLE stored in flash is viable. The DONE line shows the number of tests attempted and the number passed along with any warnings.

```
>batty
Simtec Board Test Tool, Version 1.00
Copyright 2005-2009 Simtec Electronics

BAST (EB2410ITX) Test Suite

Testing S3C24XX CPU Core
  CPU ID 32410002, OK [S3C2410A]

Testing S3C24XX 4kB internal SRAM block
  Pattern: all ones
  Pattern: all zeros
```

```
  Pattern: alternate zero/ones (LSB set)
  Pattern: alternate zero/ones (LSB unset)
  Writing address to each location

Testing system RAM [0x00400000..0x07a00000]
  Pattern: all ones
  Pattern: all zeros
  Pattern: alternate zero/ones (LSB set)
  Pattern: alternate zero/ones (LSB unset)
  Writing address to each location

Testing ABLE CRC
  CRC OK

Testing ABLE version information
  Version 252
  Release 2009012101
  Supported machine number 3
  Supported machine number 6
  Supported machine number 9
  Supported machine number 11

Testing CPLD registers
  CPLD ID register (value 00) OK

Hardware voltage monitoring
  Vcore is 1.959V (raw 608) []

Testing NE2000
  MAC Address 00:11:ac:00:01:6a

Testing Davicom DM9000 ID 0a46, 9000 rev 01
  MAC Address 00:01:3d:00:01:6a
  Verifying packet RAM.
    Checking with zeroes
    Checking with ones
    Checking with alternation (lsb=0)
    Checking with alternation (lsb=1)
    Checking with addresses
    Checking with zeroes once more (to clear packet ram)

Testing 16550 style UART
  Testing UART presence
  Testing internal loopback
  Testing external loopback
  External serial loopback test disabled. Assuming success.

Testing 16550 style UART
  Testing UART presence
  Testing internal loopback
  Testing external loopback
  External serial loopback test disabled. Assuming success.

Checking that all 16550s are unique (2)
UART blocks are unique

DONE: 27 tests, 27 ok, 0 failed, 0 warnings
PASSED: all tests OK
>
```

detect-large-nand

detect-large-nand — Shows if boot NAND device has 128KiB blocks.

Synopsis

`detect-large-nand` [-c *`chip`*] [-v, --version]

Options

`-c`	Select the chip to examine defaults to 0.
`-v, --version`	Show detect-large-nand version and exit.

Description

Detect-Large-Nand is an ABLE tool which will return zero (success) if the primary NAND device in a system has 2048 byte pages. It will return one (failure) if the NAND device has 512 byte pages, and two (error) if some issue prevents the tool from detecting the NAND properly. Possible errors encountered by the tool include being unable to detect a NAND chip, being unable to identify the hardware type, or being too old a version of detect-large-nand to recognise a particular NAND device.

The latest version is usually available either from the ABLE support page or the specific board support page on the Simtec Electronics website.

Example 19.11. Using detect-large-nand from the command line

```
>detect-large-nand
NAND: Boot configuration 1
NAND: Scan found ID ec,da
NAND: Scan found ID 00,00
NAND: Chip is unknown
NAND: Scan found ID 00,00
NAND: Chip is unknown
SUCCESS Found large page NAND
>echo $?
0
>
```

Part IV. Creating external commands

ABLE has the ability to execute commands which are not built-in. Simtec Electronics use this capability to add functionality which is not essential within the core of ABLE.

The provision for adding additional external commands is available to any user. This provision is purely a courtesy and Simtec Electronics offer no guaranties or warranty for fitness for purpose to any program generated with the tools and library code provided.

It should be noted ABLE is *not* an operating system and provides only basic support for external programs.

Chapter 20. Tools and libraries

To create ABLE commands it is assumed they will be written in the C language and be compiled and linked to object code with a compiler.

It is *not* possible to self host the tools for creating ABLE commands on the target platform. Development is done on a host Linux® system and the output built for the target.

It is possible to create working ABLE commands without using the tools and libraries provided by Simtec Electronics but this is not directly supported.

20.1. Obtaining a suitable toolchain

Simtec Electronics provide a precompiled GNU toolchain suitable for use with several Linux® distributions. There is currently no support for the Windows® environment. The host systems are assumed to be either 32 or 64bit X86 instruction set machines and the appropriate binary package should be installed.

The currently supported compiler is GCC 4.2.4 with binutils 2.17. Other versions may be provided but these have not yet been verified.

The toolchains are installed in `/opt/simtec/tools/` and are available in several packaging formats. The toolchain packages may be downloaded from the Simtec Electronics website [http://download.simtec.co.uk/] or obtained on DVD by request.

The toolchains are generated with the crosstool-ng [http://ymorin.is-a-geek.org/dokuwiki/projects/crosstool] program. The appropriate source package and configuration files used to generate the compilers have been provided to ensure compliance with the licences of the software.

The packages for and systems are installed using the **dpkg** command. e.g.

dpkg `-i simtec-cross-gcc42-armel_4.2.4-1_amd64.deb`

The tar files should be unpacked in the root directory as a super user.

tar `-zxf simtec-cross-gcc42-armel_4.2.4.i386.tar.gz -C /`

20.2. Obtaining development libraries and headers

The ABLE C library, GCC support library and the base libraries packages should be installed. These are available from the ABLE resources web page [http://www.simtec.co.uk/products/SWABLE/resources.html#libraries].

These packages will install, in `/opt/simtec/able/`, the necessary binary libraries, headers and scripts to build ABLE commands.

Chapter 21. ABLE C Library

The C language does not have core support for simple operations such as input/output or string handling. This is instead provided by a “standard C library”, the ABLE implementation of this standard is referred to as the ABLE C Library (or just the C library).

The ABLE C library is a collection of headers and binary library components which provide not only the ISO “standard C library” but also additional elements for some POSIX functions. The library is not however completely conformant to a specific standard.

The ABLE implementations of some of this functionality may be limited or missing. These limits or omissions are primarily due to the limited environment which a bootloader can reasonably be expected to provide. The ABLE C library documentation packages contain a set of files describing each provided function in detail.

Table 21.1. ISO headers provided in ABLE C library

Header	Contents
assert.h	Contains the assert macro, used to assist with detecting logical errors and other types of bug in debugging versions of a program.
ctype.h	Contains functions used to classify characters by their types or to convert between upper and lower case in a way that is independent of the used character set.
errno.h	For testing error codes reported by library functions.
float.h	Contains defined constants specifying the implementation-specific properties of the floating-point library.
inttypes.h	For precise conversion between integer types.
limits.h	Contains defined constants specifying the implementation-specific properties of the integer types.
locale.h	For setlocale() and related constants. This is used to choose an appropriate locale.
math.h	For computing common mathematical functions
setjmp.h	Declares the macros setjmp and longjmp, which are used for non-local exits
signal.h	For controlling various exceptional conditions
stdarg.h	For accessing a varying number of arguments passed to functions.
stdbool.h	For a boolean data type.
stdint.h	For defining various integer types.
stdio.h	Provides the core input and output capabilities of the C language.
stdlib.h	For performing a variety of operations, including conversion, pseudo-random numbers, memory allocation, process control, environment, signalling, searching, and sorting.
string.h	For manipulating several kinds of strings.
time.h	For converting between various time and date formats.
wchar.h	For manipulating strings using wide characters. Support within ABLE is extremely limited.
wctype.h	For classifying wide characters.

ABLE also supports a variety of non standard additional interfaces. These include a GNU compatible `getopt` implementation, a simple `readline` implementation and a basic TCP/IP sockets interface.

Table 21.2. Additional headers available in ABLE libc

Header	Contents
alloca.h	The alloca function allows memory to be allocated from the stack.
fcntl.h	Routines to manipulate file descriptors.
libintl.h	Internationalisation support for text strings, this is a stub and only supports the ASCII english representation.

Header	Contents
netdb.h	Definitions and structures for using DNS nam eresolution.
poll.h	Definitions and structures for the `poll` call.
strings.h	BSD style string manipulation.
dirent.h	Directory entry manipulation.
getopt.h	Provide access to the long format `getopt` calls.
regex.h	Functions and sructures for regular expression handling.
err.h	Non standard BSD error display routines, implementations may be incomplete.
iconv.h	character set conversions, limited support for ASCII, UTF-8, ISO88591 and CP437 character sets.
malloc.h	Dynamic memory allocation and manipulation routines.
unistd.h	Access to UNIX® standard routines.

Additional packages provide a set of “core” libraries which include zlib for compression support, libpng for png image support and libjpeg for using jpeg images.

Chapter 22. A new ABLE command

The sections of this chapter will discuss the toolchain and libraries required, the environment in which external programs are executed and the construction of an example command.

22.1. Execution environment

Only a single external program may be executed at any time, there is no memory protection and the program may alter any part of the system it chooses (intentionally or otherwise). Because of this errors in programs are generally immediately fatal so care must be taken to handle error situations appropriately.

External commands are executed as a separate ABLE task with their own stack and heap distinct from that of ABLE itself. This ensures that ABLE should continue executing correctly even if an external command causes an abort. A simple abort handler is provided which should return execution to ABLE in the event of an uncaught exception.

Programs are executed with the MMU (where available) running. A logical memory mapping of all physical memory is presented starting at address 0. Programs are loaded at address 0x8000 and execution starts at an offset of four bytes (0x8004). To be automatically recognised as an external program a magic value (0xAB1E0001) is used as the first four bytes of the file.

Apart from the magic number programs are a flat statically linked executable. If the tools and libraries provided by Simtec Electronics are used, generating appropriate output from standard C and assembler is straightforward.

Programs are entered with register 0 containing the argument count, register 1 containing the argument string vector and register 2 containing the environment pointer. The link register contains the address to return to. This calling convention is effectively the result of an function call to the program using the Arm Procedure Call Standard (APCS).

Calls to ABLE functions are performed using a SoftWare Interrupt (SWI) interface the parameters to these called functions are in the APCS format. The available functions and their interfaces are covered in the ABLE libc documentation.

If more details are required than provided here please contact Simtec Electronics support to discuss your requirements.

22.2. How the libraries fit together

The final executable is produced by linking the object files of the program, the C library, the compiler support library and the crt0 stub object. The scripts provided in the ABLE C library package perform this linkage and final object copying to obtain the final binary file which ABLE can execute.

The program objects are obviously generated by the application, standard ELF format intermediate objects are used for this. Indeed the whole process generates a normal ARM ELF object (with specific properties) which is then flattened.

The C library provides generic support functionality to every C program and wrappers the calls to ABLE functionality in a standard API.

The compiler support library is required to provide functions which the compiler itself emits.

The crt0 stub object is the code which sets up the execution environment from that passed by ABLE in a manner suitable for use by the compiled C program.

22.3. A “hello world” command

The creation of a simple command written in C is straightforward. The user needs the appropriate toolchain and library packages installed and a source file containing, at a minimum, a `main` function.

Example 22.1. Hello World command

The classic minimal example is the “hello world” program which simply outputs a simple test message.

```
#include <stdio.h>>
```

```
int
main(int argc, char**argv)
{
  printf("hello world\n");
}
```

This is may be compiled directly as: **/opt/simtec/able/bin/arm-able-gcc** `-o hello hello.c`

The **hello** program may now be copied to a location accessible by ABLE (for example a http or tftp server) and executed. It will produce the expected result.

```
>hello
hello world
>
```

22.4. A simple command built with two objects

The hello world program presented in the previous section is a simple program merely serves to demonstrate the basics of compiling a program. A more complex program with multiple objects, it is generally accepted, would require a make file to manage dependancies.

Example 22.2. Example using a makefile

The hellogoodbye program is a trivial program which uses two objects and displays some simple messages.

```
/* hello.c */
#include <stdio.h>>

extern void goodbye(void);

void hello(void)
{
  printf("hello world\n");
}

int
main(int argc, char**argv)
{
  hello();
  goodbye();
}
```

```
/* goodbye.c */
#include <stdio.h>>

void goodbye(void)
{
  printf("goodbye world\n");
}
```

A simple example makefile which builds the hellogoodbye program from two objects (`hello.o` and `goodbye.o`). This takes advantage of a provided makefile fragment which sets up the correct compiler variables (CC LD etc.).

```
# hellogoodbye/Makefile
#
```

```
# ABLE hellogoodbye command

APP_VERSION=1.00

CFLAGS=-O2 -Wall -DAPP_VERSION=\"$(APP_VERSION)\"
LDFLAGS=

# default location for install
INSTALL_PATH ?= $(shell pwd)

# default location for clib
ABLE_CLIB ?= /opt/simtec/able

# Standard ABLE application makefile support
include $(ABLE_CLIB)/app-Makefile

.PHONY: all clean install
all: hellogoodbye

hellogoobye: hello.o goodbye.o

clean:
        $(RM) hello.o goodbye.o hellogoodbye

install:
        cp hellogoodbye $(INSTALL_PATH)/hellogoodbye-$(APP_VERSION)
```

This example can be compiled with **make**. When executed it should produce the result:

```
>hellogoodbye
hello world
goodbye world
>
```

22.5. A simple command using floating point maths

Programs which require access to the ISO 9899:1999 math functions must link the math library using the `-lm` option to the linker.

Example 22.3. Command using math functions

This is a simple program which performs operations on floating point numbers.

```
#include <stdio.h>
#include <stdlib.h>
#include <fcntl.h>
#include <sys/types.h>
#include <unistd.h>
#include <math.h>

int
main(int argc, char **argv)
{
    int loop;
    double test_a;
    double test;
    double test_power;
    double test_sqrt;
```

```
    test_a = 2.01;
    test = 1.01;

    for (loop = 0; loop < 10; loop++) {
 test = test + 0.5;
        test_power = test_power + pow(test_a, test);
        test_sqrt = test_sqrt + sqrt(test_power);
    }

    printf("Should be 2.01   : %g\n", test_a);
    printf("Should be 6.01   : %g\n", test);
    printf("Should be 218.5  : %g\n", test_power);
    printf("Should be 71.027 : %g\n", test_sqrt);

    return 0;
}
```

This is may be compiled directly as: **/opt/simtec/able/bin/arm-able-gcc** `-lm -o floattset floattest.c`

The **floattest** program may now be copied to a location accessible by ABLE (http or tftp server) and executed. The output should be:

```
>hello
Should be 2.01   : 2.01
Should be 6.01   : 6.01
Should be 218.5  : 218.5
Should be 71.027 : 71.027
>
```

Appendix A. Non-Volatile Variables Reference

These nvram variables are available and usable in ABLE version 2.20 or later. Any variables which are not available on all platforms will be marked as such in their description section.

Each variable is documented in a format similar to the UNIX® manual page layout. The page is separated into several parts:

Name - The name of the variable and its purpose.
Description - Describes the variable in detail.
Platforms - This optional section describes the platforms which use the variable is present, if not present the variable is available on *all* platforms.
See also - This optional section gives references to other variables which may be relevant.

Table A.1. Alphabetical list of non-volatile variables

Variable	Purpose
boot.auto	Enable auto boot
boot.cmd	Command line to use for auto boot
boot.timeout	Time to wait before auto boot
boot.fs	The filesystems to be scanned by the autoboot command.
console.write	Default Console output stream
console.read	Default Console input stream
console.level	Console logging level
console.password	Interactive console password.
fb.enable	Framebuffer driver - enable output
fb.output	Framebuffer driver - output target
fb.x	Framebuffer driver - Display X size (width)
fb.y	Framebuffer driver - Display Y size (height)
fb.refresh	Framebuffer driver - Display refresh frequency
ide.multi-limit	IDE multiple sector read limit
shell.hist	Shell history depth
sys.autoshadow	Whether able will automatically moved into RAM at system start
sys.speed	System speed set at start time
usb.enable	USB system enable
usb.hubdepth	USB system depth hubs should be searched for devices to

boot.auto

boot.auto — Enable auto boot

Description

If this variable is unset the default action is the same as if it were set to true. The automatic boot process is discussed in Section 6.8, “Starting an Operating System Automatically”.

boot.cmd

boot.cmd — Command line to use for auto boot

Description

This variable is used as a command line to be automatically executed when the boot.auto variable is set to true and the boot.timeout is set to non zero. If unset defaults to autoboot. The complete autoboot process is discussed in Section 6.8, “Starting an Operating System Automatically”.

boot.timeout

boot.timeout — Time to wait before auto boot

Description

This variable is used to configure the number of seconds to wait for the user to abort the auto boot sequence when the boot.auto variable is on. The complete autoboot process is discussed in Section 6.8, “Starting an Operating System Automatically”.

boot.fs

boot.fs — The filesystems to be scanned by the autoboot command.

Description

This variable is used to configure the names and ordering of the filesystems to be automatically scanned by the autoboot command. If unset it defaults to "cd,hd,rom,tftpboot" e.g. try the CDROM, hard discs, NOR flash and then the network.

console.write

console.write — Default Console output stream

Description

Determines where console output will be sent. See console.read for details on setting the read stream. Note the read and write sources do not have to be "balanced" and may be mixed as required e.g. write set to vga and read set to serial.

There are three console drivers available on every platform, the *`null`* driver which redirects all ABLE output nowhere so it is not seen, the *`all-wr`* driver which sends all console output to any console driver capable of displaying it and the *`serial`* driver which sends output to the console serial port (typically the first serial port on a system).

Full details on controlling the console system can be found in Chapter 5, *ABLE Console*.

The default, where no nvram variable is set, on all platforms since ABLE version 1.79 is the *`all-wr`* target.

Warning

This Variable has been renamed in ABLE versions 2.20 and later. In previous versions the variable was was called "cons_write".

Platforms

EB2410ITX additional valid value is *`s3c2410x-video`*
EB110ATX additional valid value is *`vga`*
EB7500ATX additional valid value is *`vidc`*

console.read

console.read — Default Console input stream

Description

Determines where console input will come from. See console.write for details on setting the write stream.

There are three console drivers available on every platform, the *null* driver which produces no input so no buttons can be pressed, the *all-rd* driver which accepts input from any console driver capable of producing it and the *serial* driver which accepts input from the console serial port (typically the first serial port on a system).

The default, where no nvram variable is set, on all platforms since ABLE version 1.79 is the *all-rd* target.

Warning

This Variable has been renamed in ABLE versions 2.20 and later. In previous versions the variable was called "cons_read".

Platforms

EB2410ITX additional valid value is *usbkbd*.
IM2440D20 additional valid value is *usbkbd*.
EB110ATX additional valid value is *ps2kbd*
EB7500ATX additional valid value is *ps2kbd*

console.level

console.level — Console logging level

Description

Sets the default console logging level. This can be altered after boot with console command.

console.password

console.password — Console password for interactive use

Description

The DES hash of the current password which allows for interactive access.

fb.enable

fb.enable — Framebuffer driver - enable output

Description

If set, the framebuffer device driver will be enabled and added to the list of selectable consoles. If clear, then the framebuffer driver will not be initialised, and video console will not be selectable.

Platforms

EB2410ITX default is on i.e. framebuffer will be enabled
EB7500ATX default is on i.e. framebuffer will be enabled

fb.output

fb.output — Framebuffer driver - output target

Description

Determines the output device for framebuffers with multiple output ports.

Platforms

EB2410ITX default is vga i.e. output will be sent to vga socket

fb.x

fb.x — Framebuffer driver - Display X size (width)

Description

This determines how many pixels wide the video display console will be. See fb.y for the y resolution.

Platforms

EB2410ITX default is 640

fb.y

fb.y — Framebuffer driver - Display Y size (height)

Description

This determines how many pixels high the video display console will be. See fb.x for the x resolution.

Platforms

EB2410ITX default is 480

fb.refresh

fb.refresh — Framebuffer driver - Display refresh frequency

Description

This determines the framebuffer refresh rate.

Platforms

EB2410ITX default is 60

ide.multi-limit

ide.multi-limit — IDE multiple sector read limit

Description

If set, the value is used to limit the number of sectors read from an IDE drive in a single operation. With most drives this can be left unset. Some drives have firmware which incorrectly report the number of sectors they can transfer (Quantum Fireball TM series seem especially susceptible). This parameter allows the user to force ABLE to read a smaller number of sectors than the drives reported capability. The smaller of this parameter and the drives reported maximum number of sectors is used.

Platforms

All Platforms with IDE ports

shell.hist

shell.hist — Shell history depth

Description

How many commands to remember in the shell history. The shell is the ABLE module which provides the command line. The command line editor can remember several previous commands accessed by using the up arrow. This variable controls how many previous commands are remembered. The Chapter 3, *Command Line Interface* covers the use of ABLE shell in more detail.

sys.autoshadow

sys.autoshadow — Determines if ABLE will automatically moved into RAM at system start

Description

Set to on to shadow ABLE into memory at start time. See the shadow command for more details. If this is unset, then the value will be determined by the amount of memory available, if more than 32Mbyte of memory is fitted the shadow will be performed. This parameter is only available on platforms where ABLE can be directly executed from flash.

Platforms

EB2410ITX
EB7500ATX
EB675001DIP

sys.speed

sys.speed — System speed set at start time

Description

If set, the value is passed to the command sysspeed at system startup. If unset, the value is dependant on the type of board. See the sysspeed command for more details.

Platforms

EB2410ITX numerous settings possible the default is 203MHz for the S3C2410-A20 and 266MHz for the S3C2410-A26.
IM2440D20 numerous settings possible the default is 400MHz for the S3C2440-A40.

usb.enable

usb.enable — USB system enable

Description

This determines if the USB subsystem is enabled. This allows USB devices to be used, required for the USB hid keyboard driver.

Platforms

EB2410ITX default is on

IM2440D20 default is on

usb.hubdepth

usb.hubdepth — USB system depth hubs should be searched for devices to

Description

This determines how many hubs the USB system will scan looking for usable peripherals.

Platforms

EB2410ITX

IM2440D20

Appendix B. Changelog

Revision History

Revision 1.00	24th January 2003	VRS

Initial Release.

Revision 1.40	3rd February 2003	VRS

Updates to non volatile commands, addition of version command.

Revision 1.55	25th April	VRS

Improved command references in Chapter 9, *Core Commands*.
Added nvram chapter to clarify non volatile usage.

Revision 1.73	17th September	VRS

Improved Chapter 8, *Upgrading*.

Revision 1.80	18th November	VRS

Updated commands .
Updated Appendix A, *Non-Volatile Variables Reference*.
Updated FAQ.

Revision 1.82	27th November	VRS

Updated commands .
Updated Appendix A, *Non-Volatile Variables Reference*.
Updated FAQ.

Revision 1.95	10th March 2004	VRS

Updated devls command.
Updated Appendix A, *Non-Volatile Variables Reference*.
Removed FAQ future versions are online [http://www.simtec.co.uk/products/SWABLE/faq.html].

Revision 1.99	2nd August 2004	VRS

Added echo.
Updated Appendix A, *Non-Volatile Variables Reference*.

Revision 2.01	11th October 2004	VRS

Updated netif command.
Added ifconfig.
Updated Section 6.7, “Starting an Operating System”

Revision 2.08	13th April 2005	VRS

Added Chapter 2, *Getting Started*, Section 6.8, “Starting an Operating System Automatically”, Chapter 7, *Networking*
Updated Chapter 1, *Overview*, Chapter 3, *Command Line Interface*, Section 6.7, “Starting an Operating System”
Added boot.fs

Revision 2.20	17th January 2006	VRS

The ABLE 2.20 release is a significant milestone release which represents a greater expansion in capabilities than many previous releases.

Updated to refer to ABLE version 2.20
Updated Chapter 2, *Getting Started*
Updated Chapter 3, *Command Line Interface*
Created Chapter 5, *ABLE Console*
Removed separate script chapter and moved contents into Chapter 3, *Command Line Interface*
Updated Part II, “Built-in Command Reference”
Updated Appendix A, *Non-Volatile Variables Reference*.
Created Appendix B, *Changelog*.

Revision 2.21	23rd February 2006	VRS

Minor editorial changes

Revision 2.22	21st March 2006	VRS

Updated to refer to ABLE version 2.21
Updated Section 6.7, “Starting an Operating System”
Updated Appendix A, *Non-Volatile Variables Reference*
Updated Part II, “Built-in Command Reference”

Revision 2.23	30th April 2006	VRS

Updated to refer to ABLE version 2.22
Updated Chapter 3, *Command Line Interface*

Revision 2.24	3rd June 2006	VRS

This version is the first edition of the printed book.

Updated to refer to ABLE version 2.24
Updated Section 6.7, “Starting an Operating System”
Updated Section 6.8, “Starting an Operating System Automatically”
Revision 3.00 11th Febuary 2009 VRS
The ABLE 2.50 release is a significant milestone release which represents a greater expansion in capabilities than many previous releases.

- Updated to refer to ABLE version 2.50
- Complete reorganisation of parts, chapters and reference sections
- Removal of numerous obsolete command references.
- New builtin and external command references added. This removes the seperate documentation for the FIS tool, ROM writing application and the I^2C® tools.

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Colophon

This Document was prepared in Docbook XML [http://www.docbook.org/] using the GNU emacs text editor. The source was combined with DocBook XSL Stylesheets [http://docbook.sourceforge.net/projects/xsl/] using an XSLT processor to produce output in various formats.

For web output the Saxon XSLT processor [http://saxon.sourceforge.net/] was used to convert the docbook XML directly to HTML.

For print output the Saxon XSLT processor [http://saxon.sourceforge.net/] was used to convert the docbook XML to Formatting Objects (FO) XML.

For general print documents the FO XML is converted to PDF and Postscript with the Apache project FOP [http://xmlgraphics.apache.org/fop/] utility.

For six by nine inch book output the Render X XEP digital typography tool was used to convert the FO XML to print ready PDF output.

The cover designs were developed in the GNU Image Manipulation Program [http://www.gimp.org/] (GIMP).