Sun OpenBoot PROM
Quick Reference Card

(Last Revised 03/01/2002)

OBP Primary tasks:

1) Test and initialize the system hardware
2) Determine the hardware configuration
3) Boot the operating system from either a mass storage device or the network
4) Provide interactive debugging facilities for testing hardware and software

Prompts

>	Restricted Monitor Prompt. Limited options.
ok	OpenBoot PROM command prompt. All OBP command access is available in this mode.

Devices

Devices are represented in device tree format similar to the following:

/sbus @1f,0/SUNW,fas @e,8800000/sd@3,0:a

driver-name	Case sensitive string consisting of 1-31 letters, digiet and punctuation characters from the set ".,_+"
@	Must precede the address parameter
unit-address	Text string representing the physical address of the device.
:	Must precede the arguments parameter
device-arguments	Text string to pass additional information to the device's software

The devalias command can be used to display the default device aliases on your system, the nvalias command will show the aliases defined in the NVRAM and the show-devs command will show all the aliases in the OpenBoot device tree.

devalias	Display all current device aliases.
devalias alias	Display the device path name corresponding to the alias.
devalias alias device-path	Define an alias representing the device path. If an alias with the same name already exists, the new value supersedes the old. This alias is not persistent across reboots, so if you reset or reboot, this alias is lost. Use nvalias to preserv your alias.
nvalias alias device-path	Store the command "devalias alias device-path" in NVRAMRC. The alias persists until the nvunalias or set-defaults commands are executed. Turns on use-nvramrc?.
nvunalias alias	Delete the corresponding alias from NVRAMRC.
show-disks	Command particularly useful to get a list of known disk paths from the system in a format ready to be pasted into devalias or nvalias command string.

Running show-disks produces output similar to the following:
```
a) /pci@1f,4000/scsi@3/disk
b) /pci@1f,4000/ebus @1/fdthree@14,3023f0
c) /pci@1f,6000/scsi@3/disk
q) NO SELECTION
Enter Selection, q to quit:
```
(Here you would enter the letter of the disk you want to use. The system will put this into a paste buffer and output the following:)
Type ^Y (Control-Y) to insert it in the command line.
(Now you don't have to retype all of the device path when setting an alias. You can use Control-y for most of the device path.)

Example using the path defined by letter c in the previous sample:
nvalias newdisk (Control-y)@2,0
Would setup an nvalias for newdisk which would use the device path /pci@1f,6000/scsi@3/disk@2,0. The trailing @2,0 adds the unit address 2,0 so the system knows which unit address to boot from on that device path. The device paths and unit address will vary, so this shortcut saves some typing, but it will not do everything for you.

Help

Help is available from the ok prompt. The format is as follows:

help	List main help categories
help category	Show help for all commands in the category
help command	Show help for individual command (when available)

Testing and Diagnostics

Several diagnostic routines and tests are available in the OpenBoot PROM. The system can be put into diagnostic mode by setting the diag-switch? configuration variable to true, setting the machines diagnostic switch (if available) or by a system dependant request. The level of diagnostic output is controlled by the configuration setting diag-level (max is the default). The default diag-device is net and this will look for a network boot server to boot from. Booting with diag-switch? set to true will pretty much reinstall the OS if the diag-device is set to net and there is a

jumpstart server available and configured for the machine. (There may be another purpose, but information is hard to come by on the true benefits of this process.) There are tests available for the system from the OpenBoot PROM, but not all tests are available from all machines, Following are some of the more common tests.

probe-scsi	Identify devices attached to a SCSI bus (will not work for PCI devices – use show-devs instead)
probe-scsi-all	Identify devices attached to all SCSI buses (will not work for PCI devices – use show-devs instead)
test device-specifier	Test the device in device-specifier
test floppy	Test the floppy drive (requires a formatted floppy be in the drive for this to work)
test net	Test the primary network controller
test scsi	Test the primary SCSI controller
test-all	Test all devices available with the self test capability
test /memory	Test memory (Not all OpenBoot systems have this test)
watch-clock	Shows ticks of the real time clock, one per second
watch-net	Monitors network broadcast packets for default interface ("." for a good packet, "X" for a bad packet)
watch-net-all	Monitors network broadcast packets for all interfaces
obdiag	Invokes an optional interactive menu tool which lists all self-test methods available on a system; provides commands to run self tests. (More for servers and very machine specific. Reference the specific hardware manual for your machine to get additional information on running obdiag.)

Booting

There are numerous methods for booting your system. The boot process relies on device aliases, input parameters and configuration options to determine where to boot from and what options are to be used. Examples:

boot [device-specifier] [arguments]

boot	Boots the system from the default boot device as specified by the boot-device configuration setting (seen with the printenv command).
boot cdrom	CDROM boot. Boots off the CDROM device as specified by the cdrom device alias (seen with the devalias command).
boot disk	Boots the system from the device as specified by the disk device alias (seen with the devalias command).
boot disk2	Boots the system from the device as specified by the disk2 device alias if it exists.
boot device-path	Boots from the device specified by it's full device path.
boot floppy	Floppy boot. Boot off a floppy disk if applicable.
boot net	Network boot. Boots from a TFTP boot server or jumpstart server.
boot net – install	Jumpstart boot. Boot off the network jumpstart server and install/upgrade the operating system. (NOTE: There is a space both before and after the - . The – serves as a placeholder argument for the command.)
boot tape	Tape boot. Boots off a SCSI tape if available.
boot –a	Ask me. Interactive mode prompts for the names of the boot files. (Helpful if you need to boot off an alternate /etc/system file after kernel t unable modifications.)
boot –D default-file	Boot from default -file.
boot –f	When booting an Autoclient system, forces boot program to bypass client's local cache and read all files over the network from the file server.
boot –h	Boot halted. Boot into a halted state (ok prompt). Interesting, for troubleshooting boot at the lowest level.
boot –r	Reconfigure boot. Boot and search for all attached devices, then build device entries for anything which does not already exist. Useful when new devices are added to the system.
boot –s	Single user. Boots the system to run level 1.
boot –v	Verbose boot. Show good debugging information.
boot –V	Verbose boot. Show a little debugging information.
boot kernel/unix	32-bit boot. Boots off the 32-bit kernel explicitly.
boot kernel/sparcv9/unix	64-bit boot. Boots off the 64-bit kernel explicitly.
boot disk2 kernel/sparcv9/unix –asv	Boot single-user, interactive, 64-bit off the device defined as disk2.

Displaying System Information

Commands to display additional system related information. Not all commands work on all platforms.

.enet-addr	Display current Ethernet address
.idprom	Display ID PROM contents
.traps	Display a list of processor-dependent trap types
.version	Display version and date of the boot PROM (You can use prtconf –V in a shell when booted.)
.speed	Display processor and bus speeds
banner	Display power-on banner

firmware-version	Displays major/minor CPU firmware version.
show -sbus	Display list of installed and probed Sbus devices
show -devs	Display list of installed and probed devices
show -pci-devs	Display all PCI devices.
show -disks	Display a list of known disks in format for use in creating device alias.

Miscellaneous Commands and Resets

Not all commands work on all platforms.

eject floppy	Eject the floppy. (May also be eject-floppy)
eject cdrom	Eject the CDROM.
sync	Call the operating system to write information to hard disk.
reset	Reset entire system (similar to performing a power cycle)
reset-all	Reset entire system (similar to performing a power cycle)
set-defaults	Reset all the PROM settings to the factory defaults

Emergency Keyboard Commands

These are key sequences recognized by the system to perform predetermined actions at boot time or during normal operation.

Stop	Bypass POST. This command does not depend on security-mode.
Stop-A	Abort. (This will also stop a running system. You can resume normal operations if you enter go at the prompt. Enter anything else and you will stay halted.)
Stop-D	Enter diagnostic mode (set diag-switch? to true)
Stop-F	Enter Forth on TTYA instead of probing. Use fxedit to continue with the initialization sequence.
Stop-N	Reset NVRAM contents to default values.

NVRAMRC Commands

The NVRAMRC can be accessed with some simple editing commands. Following are a basic set of these commands for entering and manipulating information in the NVRAMRC.

nvalias alias device-path	Store the command "devalias alias device-path" in NVRAMRC. The alias persists until the nvunalias or set-defaults commands are executed. Turns on use-nvramrc?.
nvedit	Enter the NVRAMRC editor. If data remains in the temporary buffer from a previous nvedit session, resume editing those previous contents. If not, read the contents of NVRAMRC into the temporary buffer and begin editing it.
nvquit	Discard the contents of the temporary buffer without writing it to NVRAMRC.
nvrecover	Recover the contents of NVRAMRC if they have been lost as a result of the execution of set -defaults, then enter the editor with nvedit.
nvrun	Execute the contents of the temporary buffer.
nvstore	Copy the contents of the temporary buffer to NVRAMRC then discard the contents of the temporary buffer.
nvunalias alias	Delete the corresponding alias from NVRAMRC.
setenv use-nvramrc? true	Enable the NVRAMRC.

NVRAMRC Editor Commands

Control-b	Moves backward one character.
Escape b	Moves backward one word.
Control-f	Moves forward one character.
Escape f	Moves forward one word.
Control-a	Moves backward to beginning of line.
Control-e	Moves forward to the end of the line.
Control-n	Moves to the next line of the script edit buffer.
Control-p	Moves to the previous line of the script edit buffer.
Return (Enter)	Inserts a new line at the cursor position and advances to the next line.
Control-o	Inserts a newline at the cursor position and stays on the current line.
Control-k	Erases from the cursor position to the end of the line, storing the erased characters in a save buffer. If at the end of the line joins the next line to the current.
Delete	Erases the previous character.
Backspace	Erases the previous character.
Control-h	Erases the previous character.
Escape h	Erases from beginning of word to just before the cursor, storing erased characters in the save buffer.
Control-w	Erases from beginning of word to just before the cursor, storing erased characters in a save buffer.
Control-d	Erases the next character.
Escape d	Erases from the cursor to the end of the word, storing the erased characters in a save buffer.
Control-u	Erases the entire line, storing the erased characters in a save

	buffer.
Control-y	Inserts the contents of the save buffer before the cursor.
Control-q	Quotes the next character (allows you to insert control chars)
Control-r	Retypes the line.
Control-l	Displays the entire contents of the editing buffer.
Control-c	Exits the script editor, returning to the OpenBoot command interpreter. The temporary buffer is preserved, but is not written back to the script. (Use nvstore to write it back.)

Setting Security Variables

The NVRAM security variables control the set of operations users are allowed to perform from the OpenBoot PROM user interface and can be set with the following:

setenv security -password password	Sets the PROM security password to what is specified in the password field. This password must be between zero and eight characters (any characters after the eight are ignored) and the password takes affect immediately – no reset is required. Once set, if you enter an incorrect password there is a delay of around 10 seconds before you are able to try again and the security-#badlogins counter is incremented. The password is never shown as you type it or with printenv .
printenv security-mode	Display the current mode for the PROM security.
setenv security -mode mode	Where mode can be none, command, or full.

	none	No password required (default).
	command	All commands except for boot and go require the password.
	full	All commands except for go require the password.

?? CAUTION: You must set your security password before setting the security mode. (The password is blank by default, but if already set by someone, you won't know what it is and will not be able to disable it.) If you forget the security password, you may not be able to use your system and must call the vendor for a replacement PROM.

printenv security-#badlogins	Display the number of failed security password attempts (since any reset of the counter).
setenv security -#badlogins number	Reset the security -#badlogins counter. This counter keeps track of the number of failed security password attempts.

Changing the Power-on Banner

The banner information seen from power-on can be modified with the oem-banner and oem-banner? configuration settings. By default the banner shows information like processor type and speed, PROM revision, memory, hostid and Ethernet address.

banner	Display the power-on banner.
setenv oem-banner string	Set the power-on banner to string.
setenv oem-banner? true	Activate the custom banner.
setenv oem-banner? false	Restore the original system power-on banner.

Setting and Checking NVRAM Configuration Variables

These variables determine startup and communication characteristics. They are set and checked with the Cshell-style setenv and printenv commands. Following is a list of commands which are available from the OpenBoot PROM ok command prompt (as opposed to the OpenBoot PROM Restricted mode prompt >):

printenv	Display current variables and current default values.
printenv variable	Shows the current value of the named variable.
setenv variable value	Set variable to the given decimal or text value.
set-default variable	Reset the value of variable to the factory default.
set-defaults	Reset variable values to the factory defaults.
password	Set security-password

Some variables can be checked or set while the system is up and running by using the eeprom command (/usr/sbin/eeprom in Solaris 8). Not all variables can be modified from the eeprom command and EEPROM contents may only be altered by super user.

eeprom	Display current variables and values from the EEPROM.
eeprom variable=value	Set variable to the given decimal or text value. Note: If the variable has special characters like # or ?, you should enclose the variable in double quotes. (Example: eeprom "auto-boot?"=true)

You will notice more variables and information is available from the ok prompt than the eeprom command displays. Also, not all device information will be displayed from the eeprom command. You may see "data not available" for those settings which can not be viewed from the booted/running state via eeprom. You may need to shut down to be able to change or view this information.

OBP Variables

(Following is a partial list of OBP configuration variables. These vary based on machine types and PROM versions.)

Variable	Typical Default	Description
asr-disable	(no default)	Auto System Recovery "hard" disable subsystem component. Options are available from the list generated by running *asr-disable* with no arguments.
asr-disable-list	(no default)	Auto System Recovery list of device tree paths separated by spaces which will be ignored at boot due to a failed or disabled status. (Soft deconfigure)
asr-enable	(no default)	Auto System Recovery "hard" enable subsystem component. Options are available from the list generated by running *asr-enable* with no arguments.
auto-boot?	true	If true, boot automatically after power on or reset.
auto-boot-on-error?	true	Controls whether the system will attempt a degraded boot when a subsystem failure is detected. Both the *auto-boot?* and *auto-boot-on-error?* switches must be set to true to enable a degraded boot.
ansi-terminal?	true	Configuration variable used to control the behavior of the terminal emulator. The value *false* makes the terminal emulator stop interpreting ANSI escape sequences, instead just echoing them to the output device.
boot-command	boot	Command executed if *auto-boot?* Is true.
boot-device	disk net	Device from which to boot.
boot-file	(empty string)	Arguments passed to booted program.
comX-noprobe	(no default)	Where X is the number of the serial port, prevents device probe on serial port X.
diag-continue?	false	If true, run all subtests even if an error occurs. If false, stop diagnostics at the first error.
diag-device	net	Diagnostic boot source device.
diag-file	(empty string)	Arguments passwd to booted program in diagnostic mode.
diag-level	max	Level of diagnostic information. (options: off, min, med or max)
diag-passes	1	Repeats each test the number of times specified by n. Works with the test, except, and test-all commands.
diag-switch?	false	If true, run in diagnostic mode.
diag-targets	none	*none*-Runs internal tests only, no I/O testing. *iopath*-Extends testing to external device interfaces (connectors/cables). *media*-Extends testing to external devices and media, if present. *device*-Invokes built-in self-test (BIST) on PCI cards and external devices. *loopback*-Runs external loopback tests on the parallel, serial, keyboard, mouse and TPE ports. *loopback2*-Runs an external loopback test on MII port. *loopbacks*-Runs external loopback tests on the parallel, serial, keyboard, mouse, TPE, and MII ports. *nomem*-Performs tests without testing system memory.
diag-trigger	power-reset	*power-reset*-Runs diagnostics only on power-on resets. *error-reset*-Runs diagnostics only on power-on resets, fatal hardware errors, and watchdog reset events. *soft-reset*-Runs diagnostics on all resets (except XIR).
diag-verbosity	0	0-Prints one line that indicates the device being tested and its pass/fail status. 1-Prints more detailed test status, which varies in content from test to test. 2-Prints subtest names. 4-Prints debug messages. 8-Prints back trace of callers on error.
disk-led-assoc	0	Disk slot association setting which can be used to set up the proper associations between disk slot numbers and the physical and logical device names used to identify the disk drives installed in each slot. Ex: setenv disk-led-assoc 0 x y where: *x* is an integer identifying the rear panel PCI slot number where the lower UltraSCSI controller is installed and *y* is an integer identifying the rear panel PCI slot number where the upper UltraSCSI controller is installed.
env-monitor	enabled	*enabled*-In response to an over temperature condit ion or a fan failure in either the CPU or disk fan tray, OBP issues a warning and automatically shuts down the system after 30 seconds. *advise*- OBP issues a warning only, without shutting down the system. *disable*- OBP takes no action at all; environmental monitoring at the OBP level is disabled.
error-reset-recovery	boot	Recovery action after an error reset CPU trap (options: none, sync, or boot)
fcode-debug?	false	If true, include name fields for plug-in Fcodes.
hardware-revision	(no default)	Variable t o store hardware revision info.
input-device	keyboard	Console input device (usually *keyboard*, *ttya*, or *ttyb*).
keyboard-click?	false	If true, enable keyboard click.
keymap	(no default)	Keymap for custom keyboard.
last-hardware-update	(no default)	System update information.
load-base	16384	Default load address for client programs.
local-mac-address?	false	If true, network devices use their own MAC addresses.
memory-interleave	auto	*auto*-Determines best memory interleaving based on number of slots and memory types in those slots. *max-size-max-interleave*-Enables the maximum level of interleaving for a given memory configuration, but some memory capacity remains unused if DIMMs of different capacities are installed. 1-Disables interleaving; uses all of the available memory capacity. 2-Forces two-way interleaving. 4-Forces four-way interleaving.
mfg-mode	off	Manufacturing mode argument for POST. Possible values include off or chamber. The value is passed as an argument to POST.
mfg-switch?	false	If true, repeat system self-test until interrupted with STOP -A.
nvramrc	(empty)	Contents of NVRAMRC.
oem-banner	(empty string)	Custom OEM banner (enabled by *oem-banner? true*).
oem-banner?	false	If true, use custom OEM banner.
oem-logo	(no default)	Byte array custom OEM logo (else use Sun logo).
oem-logo?	false	If true, use custom OEM logo (enabled by *oem-logo? true*).
output-device	screen	Console output device (usually *screen*, *ttya*, or *ttyb*).
pci0-probe-list	1,3,2,4	0-UPA-PCI bus bridge (not probed) 1-EBus/Ethernet interface (always probed, never included in probe list) 2- On-board SCSI controller for removable media devices and external SCSI port 3- On-board SCSI controller for 4-slot UltraSCSI backplane 4- Back panel PCI slot 10
pci-slot-skip-list	none	Used to exclude back panel slots from the PCI probe list. Values are slot numbers separated by commas or none.
pcia-probe-list	1, 2, 3, 4	Controls probe order of plug-in devices under pcia.
pcib-probe-list	1, 2, 3	Controls probe order of plug-in devices under pcib.
#power-cycles	(no default)	Counter for number of system power cycles performed.
redmode-reboot?	true	Specify true to reboot after a redmode reset trap. (Enterprise 10000 only)
redmode-sync?	false	Specify true to invoke OpenBoot PROM's sync word after a redmode reset trap. (Enterprise 10000 only)
sbus-probe-list	0123	Which Sbus slots to probe and in what order.
screen-#columns	80	Number of on-screen columns (characters/line).
screen-#rows	34	Number of on-screen rows (lines).
scsi-initiator-id	7	SCSI bus address of host adapter, range 0-f.
sd-targets	31204567	Map SCSI disk units which means that unit 0 maps to target 3, unit 1 maps to target 1, and so on. (OBP 1.x only).
security-#badlogins	(no default)	Number of incorrect security password attempts.
security-mode	none	Firmware security level (options are *none*, *command*, or *full*)
security-password	(no default)	Firmware security password (never displayed)
selftest-#megs	1	Megabytes of RAM to test. Ignored if diag-switch? is true.
sir-sync?	false	Specify true to invoke OpenBoot PROM's sync word after a software-initiated reset (SIR) trap. Defaults to false. (Sun Enterprise 10000 only.)
skip-vme-loopback?	false	If true, POST does not do VMEbus loopback tests.
sunmon-compat?	false	If true, display Restricted Monitor prompt (>).
system-board-date	(no default)	Variable for system board date information.
system-board-serial#	(no default)	Variable for system board serial number information.
testarea	0	One-byte scratch field, available for read/write test.
tpe-link-test?	true	Enable10baseT link test for built-in twisted pair Ethernet.
ttya-mode	9600,8,n,1,-	TTYA (baud,#bits,parity,#stop,handshake). Options are: baud – 110,300,1200,2400,4800,9600,38400 #bits – 5,6,7,8 parity – n (none), e (even), o (odd) #stop – 1 (1), . (1.5), 2 (2) handshake -> - (none), h(hardware:rts/cts), s(software:xon/xoff)
ttyb-mode	9600,8,n,1,-	TTYB (baud,#bits,parity,#stop,handshake). Options are: baud – 110,300,1200,2400,4800,9600,38400 #bits – 5,6,7,8 parity – n (none), e (even), o (odd) #stop – 1 (1), . (1.5), 2 (2) handshake -> - (none), h(hardware:rts/cts), s(software:xon/xoff)
ttya-ignore-cd	true	If true, OS ignores TTYA carrier-detect.
ttyb-ignore-cd	true	If true, OS ignores TTYB carrier-detect.
ttya-rts-dtr-off	false	If true, OS does not assert DTR and RTS on TTYA.
ttyb-rts-dtr-off	false	If true, OS does not assert DTR and RTS on TTYB.
upa-port -skip -list	(no default)	CPU=0 -3=Four plug-in slots UPA-PCI bridge=4,6,1f=Soldered on motherboard UPA graphics frame buffer=1d, 1e=Two plug-in slots Ex: setenv upa-port-skip-list 4,1d
use-nvramrc?	false	If true, execute commands in NVRAMRC during system start-up.
watchdog-reboot?	false	If true, reboot after watchdog reset.
watchdog-sync?	false	Specify true to invoke OpenBoot PROM's sync word after a watchdog reset trap. (Sun Enterprise 10000 only.)

Troubleshooting

Symptom	Possible Cause	Recommended Action
Blank screen	Hardware failure	Check for power indicator lights on monitor. If yellow, there is no sync. Try a new monitor or a different cable if possible.
	Keyboard not attached	If the keyboard is not attached, output goes to TTYA instead. Power down, plug in or reseat keyboard, power back on. Try new keyboard.
	output -device is set to TTYA or TTYB	NVRAM parameter *output-device* is set to ttya or ttyb instead of screen. Connect terminal to TTYA and reset the system. After getting to the ok prompt on the terminal, type: **screen** output to send output to the frame buffer. Use setenv to change the default display device, if needed.
	System has multiple frame buffers	Wrong frame buffer is being used as the console device. Connect to any other frame buffer/graphics cards and see if signal is going there. Defined by *output-device* variable.
System boots from net instead of disk	*diag-switch?* NVRAM param is set to *true*	Interrupt the booting process with Stop-A and run: **setenv diag-switch? false** then boot.
	boot-device NVRAM param set to *net* not *disk*	Interrupt the booting process with Stop-A and run: **setenv boot-device disk** and boot Ensure *disk* alias is set correctly.
System will not boot from disk	Fails with the message: The file just loaded does not appear to be executable	The boot block is missing or corrupted. Install a new boot block **or** Older SPARC systems don't like root partition over 2 gig. Reload system with root partition of 1.8 gig or smaller size.
	Fails with the message: Can't open boot device	Disk may be powered down or unavailable/failed. Listen to see if disk is spinning. Check cabling or connection, reseat disk, or try another disk **or** older SPARC systems don't like root partitions over 2 gig. Reload system with root partition of 1.8 gig or smaller size.
SCSI problems or errors	Duplicate SCSI target number settings or device hardware problems	Unplug all but one disk. Run **probe-scsi** and note target number and unit number. Repeat steps for remaining disks looking for errors or ID conflicts. On ID conflict, change the target number of the offending disk to be one of the unused target numbers or remove/replace if hardware problem.

Helpful Web Links
http://docs.sun.com - Sun Microsystems Online Documentation Site
http://sunsolve.sun.com - Sun Microsystems Online Help Resource Site
http://searchsolaris.com - Sun Oriented Website
and of course there's always http://google.com - Great Web Search Site