

Firmware Update Instructions

Flexor A264 and Flexor A164 SBC

March 2002

This manual contains instructions for updating system firmware for the Flexor A264 and Flexor A164 SBC. Historical revision information is provided for the Flexor A264, Flexor A164 SBC and SMARTengine/Alpha 21064A PCI/ISA SBC

Revision/Update Information: 1.5



FORCE COMPUTERS, Inc. and its subsidiaries San Jose, CA

First Printing, October 1999

Revised, June 2000, December 2000, May 2001, October 2001, March 2002

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Preface

This document describes how to update firmware on the Flexor A264 (formerly known as the SMARTengine 21264 PCI/ISA SBC) and Flexor A164 (formerly known as the DIGITAL 21164 PICMG SBC). Historical revision information is provided for the SMARTengine/Alpha 21064A PCI/ISA SBC (formerly known as the DIGITAL 21064A PICMG SBC).

Conventions

The following conventions are used in this document.

Convention	Description
>>>	Three angle brackets indicate the Alpha SRM console prompt.
boldface type	Boldface type indicates user input or a menu selection.
{braces, commas}	Braces containing items separated by commas indicate mutually exclusive items.
<i>Italic type</i>	Italic type emphasizes important information and indicates complete titles of manuals.
Note	Notes provide additional information about a topic.
Monospaced type	Monospaced type indicates text that the system displays.
Warning	Warnings indicate potential damage to equipment or loss of data.

Associated Documentation

This document does not describe how to use Alpha SRM Console firmware commands nor does it list SBC error codes. You can find information about these subjects in the documentation listed in the following table. Documents are available from FORCE COMPUTERS.

Table 1 Associated Documentation

Document Title	Order Number
User Information for the 3X-EBM65 and 3X-EBM66	EK-A0949-UG
User Information for the EBM21 and EBM23	EK-A0937-UG
User Information for the EBM43 and EBM44	EK-A0884-UG
DIGITAL 21164 PICMG SBC Technical Reference Information	EK-A0936-TM
DIGITAL 21064A PICMG SBC Technical Reference Information	EK-A0902-TM

For More Information

For more information, refer to the following:

- Your supplier
- A FORCE COMPUTERS Field Applications Engineer
- The World Wide Web page available on the FORCE COMPUTERS site:
<http://www.forcecomputers.com/>
- Email: flexorsupport@fci.com

Release Notes

The Flexor A264 and Flexor A164 SBC Update Utility is used to update the firmware stored on FlashROM. The SBCs are available with either AlphaBIOS for Windows NT customers or SRM Console for OpenVMS and Tru64 UNIX Operating Systems. The Flexor A264 is supplied with both SRM Console and AlphaBIOS. This update utility is able to update both AlphaBIOS and SRM Consoles.

1.1 Firmware Update Utility Components - Revision Information

Table 2 and Table 3 show the compatibility between the firmware revisions and minimum revisions of OpenVMS, Tru64 UNIX and Windows NT. The revisions of AlphaBIOS and SRM Console supplied in this update utility are also shown.

Table 2 Flexor A264 Series (3X-EBM65)

SRM Firmware	AlphaBIOS	Windows NT	Tru64 UNIX	OpenVMS
V5.7-12	V5.70b	4.0	4.0F	7.1-2

Table 3 Flexor A164 Series (EBM2x)

SRM Firmware	AlphaBIOS	Windows NT	Tru64 UNIX	OpenVMS
V5.7-11	V5.70	4.0	4.0B	7.1 1h1, 7.2

1.2 PCI I/O Option Firmware Components - Revision Information

Table 4 lists options supported by the Flexor SBCs that require console loaded firmware when used with the SRM Console. The current version of SRM Console provides the following firmware:

Table 4 Option Card Firmware Revision

Option	Loaded Firmware Revision
KZPBA/KZPSM	V5.57

1.3 System Release Notes

This section lists the changes in the firmware components since the previous release on the V5.6 Firmware Update CDROM.

1.3.1 AlphaBIOS Release Notes

The AlphaBIOS has not been updated from Revision V5.70 on the Flexor A164 SBC. The Flexor A264 AlphaBIOS remains at V5.70b.

1.3.2 SRM Console Release Notes

The SRM Console has been updated from V5.7-10 to V5.7-12 on the Flexor A264.

The SRM Console for the Flexor A164 SBC has been updated from V5.7-9 to V5.7-11.

Changes to both the Flexor A264 SBC and Flexor A164A SBC:

- Added support for Intel 21152 PCI to PCI bridge chip.

CDROM Firmware Update Procedure

This chapter explains how to update Flexor A264 and Flexor A164 SBC firmware. Topics are as follows:

- Upgrading a Tru64 UNIX system or OpenVMS system from a CD.
- Upgrading a Windows NT system from a CD.

2.1 Updating System Firmware

Note:

Always update system firmware before installing a new version of an Operating System.

Flexor A164 SBC systems contains a single FlashROM. This can be programmed with either AlphaBIOS firmware, for the Windows NT operating system, or with SRM console firmware for Tru64 UNIX and OpenVMS operating systems. See Tables 3 and 4 for compatible firmware and operating system versions.

Warning:

On the Flexor A164 SBC it is not possible to store both AlphaBIOS and SRM Consoles at the same time. Each time a console is programmed into the FlashROM it will overwrite the previously installed console image.

The Flexor A264 contains an 8Mb FlashROM. It is therefore possible to program both SRM consoles and AlphaBIOS consoles and to have them both resident on the same system.

2.1.1 Update Utility

Use the update utility to update your AlphaBIOS or SRM firmware. The update utility contains three images: the update utility itself, the SRM image, and the AlphaBIOS image.

2.2 Updating a Tru64 UNIX or OpenVMS System

Update a Tru64 UNIX or OpenVMS system as described in the following sections. The example shown is for the Flexor A264 running the firmware distributed on the V6.1 Firmware CDRROM. The same procedure is used for the other Flexor SBCs.

2.2.1 Step 1: Turn the System On

Press the power switch to the On (|) position. The following information, or similar, is displayed:

```
ff.fe.fd.fc.fb.fa.f9.f8.f7.f6.f5.  
ef.ee.ed.ec.f4.eb....ea.e9.e8.e7.e6.e5.e4.  
FORCE Flexor A264 SBC Console V5.7-10, built XXX YY ZZZZ  
>>>
```

2.2.2 Step 2: Determine the Device ID of the CD-ROM Drive

At the console prompt (>>>), enter the **show device** command.

```
>>>show device  
dka0.0.0.6.0      DKA0                      RZ26L  440C  
dka400.4.0.6.0   DKA400                    RRD45  0436  
dva0.0.0.0.1     DVA0  
ena0.0.0.1.1     ENA0                      08-00-2B-38-67-6B  
pka0.7.0.6.0     PKA0                      SCSI Bus ID 7
```

In the example, the CD-ROM drive has a device ID of DKA400.

2.2.3 Step 3: Load the Firmware Update Utility Compact Disc

1. Remove any compact disc that may already be loaded into the CD drive.
2. Load the Firmware Update compact disc into the drive.

2.2.4 Step 4: Set the auto_action environment variable

The auto_action environment variable allows the system to automatically boot the operating system at power on. This feature must be disabled for the update utility to run properly, that is, set to HALT.

1. Display the variable using command: >>>**show auto_action**.
2. If auto action is not set to HALT, use command: >>>**set auto_action HALT**.

Note:

This must be reset after the update is done to maintain the original power on behavior.

2.2.5 Step 5: Boot the Firmware Utility Disk

Boot the system from the update utility disk, using the device ID determined in Step 2. A prompt will be given for the update file name, for the default bootfile for this system, press return without entering a filename:

```

>>>b dka400
(boot dka400.3.0.19.0 -flags a)
block 0 of dka400.3.0.19.0 is a valid boot block
reading 1147 blocks from dka400.3.0.19.0
bootstrap code read in
base = 1f8000, image_start = 0, image_bytes = 8f600
initializing HWRPB at 2000
initializing page table at 1ea000
initializing machine state
setting affinity to the primary CPU
jumping to bootstrap code
-----
DD-MMM-YYYY
+++++
+          FORCE COMPUTERS FLEXOR A264 SBC Firmware          +
+                               README-First !!!            +
+++++
(READ ME INFO APPEARS HERE)
.
The default bootfile for this platform is
[DMCC21264]DMCC21264_V1_7.EXE
Hit RETURN at the prompt to use the default bootfile.
Bootfile:
ff.fe.fd.fc.fb.fa.f9.f8.f7.f6.f5.
ef.ee.ed.ec.f4.eb.....ea.e9.e8.e7.e6.e5.e4.
*****
***  FORCE FLEXOR A264/500      -          FIRMWARE UPDATE V1.7  ***
*****
To install SRM Console V5.7-12 type:

>>> update -srm

To install AlphaBIOS V5.70b type:

>>> update -abios

```

2.2.6 Step 6: Update the System

Enter **update -abios** to update the system with the AlphaBIOS firmware or **update -srm** to update with the SRM firmware for Tru64 UNIX or OpenVMS -:

```

>>>update -srm
(update -path eigersrm -target console)
Flexor update command, preparing to update flash device.
Please wait...

FLASH UPDATE UTILITY
-----> CAUTION <-----
EXECUTING THIS PROGRAM WILL CHANGE YOUR CURRENT FLASH

Loading update image
Firmware Version = V5.7

```

```
Product = DMCC21264
Firmware = SRM
Do you really want to continue [Y/N] ? :
```

Type Y to start the update procedure.

```
DO NOT ATTEMPT TO INTERRUPT PROGRAM EXECUTION!
DOING SO MAY RESULT IN LOSS OF OPERABLE STATE.
The program will take at most several minutes.
Image checksum: 2d6089ff
Erasing the target flash device before programming
.....
Flash erase complete. Now starting Programming
.....
Flash_write programming completed
Verifying flash programming
.....
update successful
power cycle system to see changes
```

2.2.7 Step 7: Exit from the Firmware Update Utility

Cycle power on the system or hit the reset button.

1. Press the power switch to the Off (O) position.
2. Press the power switch to the On (|) position.

2.3 Updating a Windows NT system

This section describes how to update a system running the Windows NT operating system.

2.3.1 Step 1: Shutdown Windows NT and Power cycle the system

2.3.2 Step 2: Go to the Setup menu

Bring the system to the AlphaBIOS Setup Menu. You may have to press F2 to enter the Setup Menu, if the AlphaBIOS is set to automatically boot the Windows NT operating system.

2.3.3 Step 3: Go to the Install New Firmware selection

Select the "Upgrade AlphaBIOS" option. The AlphaBIOS will read from the CD then execute the update utility.

Versions V5.64 and earlier of the AlphaBIOS may report an informational message when reading in information from the CD. If this occurs pressing **Return** will continue with the installation without affecting operation.

2.3.4 Step 4: Perform Update and System Initialization

The firmware update utility will now start. Follow the prompts to perform the AlphaBIOS Flash update.

Appendix

Historical Release Notes

This chapter lists release notes from previous firmware releases for the Flexor A264, Flexor A164 and SMARTengine/Alpha 21064A PCI/ISA SBC firmware. It is intended as a guide of significant changes related to the Flexor products rather than a definitive record of firmware changes.

A.1 Firmware Release Notes for V6.1 Firmware Update CDROM

Table 5 Revisions for V6.1 Firmware Update CDROM

	Flexor A264	Flexor A164	SMARTengine/Alpha 21064A PCI/ISA SBC
AlphaBIOS	V5.70b	V5.70	V5.70
SRM Console	V5.7-10	V5.7-9	V5.6-6900

A.2.1 AlphaBIOS Release Notes

The AlphaBIOS has not been updated from Revision V5.70 on the Flexor A164 SBC. The Flexor A264 AlphaBIOS remains at V5.70b.

A.2.2 SRM Console Release Notes

The SRM Console has been updated from V5.7-6 to V5.7-10 on the Flexor A264.

The SRM Console for the Flexor A164 SBC has been updated from V5.7-5 to V5.7-9.

Changes to the Flexor A264 SBC only:

- Modify PCI_PARITY environment variable to retain setting after return from Operating Systems.
- If Oxygen Video cards are configured in a system then there must be exactly one Oxygen Video card in a primary PCI bus slot. All other Oxygen Video cards must be in secondary PCI bus slots. No other video card type may be used at the same time as an Oxygen Video card.

Changes to the Flexor A264 SBC and Flexor A164:

- Added support for Intel 21154 PCI to PCI bridge chip.
- Added PCI descriptions for Oxygen Video, ENSONIQ and Soundblaster Audio cards.

A.2 Firmware Release Notes for V6.0 Firmware Update CDROM

Table 6 Revisions for V6.0 Firmware Update CDROM

	Flexor A264	Flexor A164	SMARTengine/Alpha 21064A PCI/ISA SBC
AlphaBIOS	V5.70b	V5.70	V5.70
SRM Console	V5.7-6	V5.7-5	V5.6-6900

A.2.1 AlphaBIOS Release Notes

The AlphaBIOS has not been updated from Revision V5.70 on the Flexor A164 SBC. The Flexor A264 AlphaBIOS remains at V5.70b.

A.2.2 SRM Console Release Notes

The SRM Console has been updated from V5.7-4 to V5.7-6 on the Flexor A264.

The SRM Console for the Flexor A164 SBC has not been updated.

Changes to the Flexor A264 SBC:

- Fixed OCP display text on Flexor 8 digit alphanumeric OCP to show 6/ instead of the incorrect 5/
- Add support for Flexor 4 digit alphanumeric OCP display.

A.3 Firmware Release Notes for V5.9 Firmware Update CDROM

Table 7 Revisions for V5.9 Firmware Update CDROM

	Flexor A264	Flexor A164	SMARTengine/Alpha 21064A PCI/ISA SBC
AlphaBIOS	V5.70b	V5.70	V5.70
SRM Console	V5.7-4	V5.7-5	V5.6-6900

A.3.1 AlphaBIOS Release Notes

The AlphaBIOS has not been updated from Revision V5.70 on both the Flexor A164 and SMARTengine/Alpha 21064A PCI/ISA SBC. The Flexor A264 AlphaBIOS remains at V5.70b.

A.3.2 SRM Console Release Notes

The SRM Console has been updated from on both the Flexor A264 and Flexor A164.

The SRM Console for the SMARTengine/Alpha 21064A PCI/ISA SBC has not been updated.

Changes common to both Flexor A264 SBC and Flexor A164 SBC:

- Support differential mode on Symbios 895A SCSI controllers via new environment variable called "pkx0_dif", where x differentiates between controllers. If this is set to 1 then the controller will be switched into differential mode. It will cease to function in single ended mode.
- Add support for Flexor 4 digit alphanumeric OCP display.

Changes for Flexor A264 SBC **only**:

- Sound function on the I/O card is disabled if it is not present.
- Turn off Flash ROM memory space mapping in Cypress 82C693 when Flash ROM driver is closed.
- Added descriptions of CPU revisions to 'show config' Processor and Core Logic section.
- Changed default ISACFG table to correctly show USB and EIDE devices at all times. Previously USB in slot 0 device 7 was not always shown.
- Enabled sensing of power supply status bits if the "psu_sense" environment variable is enabled. This is only required for dual redundant power supplies.

Changes for Flexor A164 SBC **only**:

- OpenVMS PALCode updated to V1.21-8 to fix incorrect reporting of system correctable machine checks.
- DEFPA-AC FDDI cards correctly identified in 'show config' and driver started.
- Restriction for Elsa Gloria Synergy (PBXGK-BB) video cards. BIOS emulation will take longer to initialise the card than other supported video cards.

A.4 Firmware Release Notes for V5.8 Firmware Update CDROM

Table 8 Revisions for V5.8 Firmware Update CDROM

	Flexor A264	Flexor A164	SMARTengine/Alpha 21064A PCI/ISA SBC
AlphaBIOS	V5.70b	V5.70	V5.70
SRM Console	V5.7-2	V5.7-3	V5.6-6900

A.4.1 AlphaBIOS Release Notes

The AlphaBIOS has not been updated for Flexor A164 and SMARTengine/Alpha 21064A PCI/ISA SBC. The AlphaBIOS remains at Revision V5.70b for the Flexor A264.

A.4.2 SRM Console Release Notes

The SRM Console has been updated from V5.6 to V5.7 on both the Flexor A264 and Flexor A164.

The SRM Console for the SMARTengine/Alpha 21064A PCI/ISA SBC has not been updated.

Changes common to both Flexor A264 SBC and Flexor A164 SBC:

- Support has been added for Compaq DE600 network cards
- Support has been added for Symbios 895 (3X-KZPDA-AA) SCSI controller
- Added `halt_reset` environment variable so that on an Operating System Halt the system can automatically perform a hard power cycle:

```
>>> set halt_reset on    ( will restart the system on an O.S. halt )
```

```
>>> set halt_reset off  ( returns to the '>>>' prompt on an O.S. halt )
```

Changes for Flexor A264 SBC **only**:

- Product Identification string in DSRDB changed to Force Alpha PCI/ISA
- Console banner changed to identify system as Force Alpha PCI/ISA
- Title line in '`show config`' changed to 'Force Computers'
- Fixed DMA Channel 0 cascade register setup
- OpenVMS PALCode updated to V1.78
- UNIX PALCode updated to V1.66
- Reserved memory for UNIX PALCode expanded to 0xc000 bytes
- Enhanced exerciser script (test) for diagnostics
- Exerciser environment variables stored as persistent values in NVRAM
- USB device displayed in ISA configuration table

Changes for Flexor A164 SBC **only**:

- Console banner changed to identify system as Force FLEXOR system.
- Title line in '`show config`' changed to 'Force Computers FLEXOR'
- Change to HWRPB to prevent "Kernel Stack not Valid" halts from OpenVMS under severe graphical stress
- Added flag so that the ISA table can now be set to either the new layout or the old layout.

For the new layout type '`>>> isacfg -init`' this will configure the ISA table in the following order:

<u>Device No.</u>	<u>Device Name</u>
1	Mouse
2	Keyboard
3	Floppy
4	Com 1
5	Com 2
6	LPT 1

For the old ISA layout type '`>>> isacfg -old_init`' this will configure the ISA table in the following order:

<u>Device No.</u>	<u>Device Name</u>
1	Mouse
2	Keyboard
3	Com 1
4	Com 2
5	LPT 1
6	Floppy

- Restriction for Elsa Gloria Synergy (PBXGK-BB) video cards. BIOS emulation will take longer to initialise the card than other supported video cards.
- Restriction for DEFPA-AC FDDI cards. This version of the card is not correctly identified in 'show config' and DEFPA driver does not start. DEFPA-BA is unaffected.

A.5 Firmware Release Notes for V5.6 Firmware Update CDROM

Table 9 Revisions for V5.6 Firmware Update CDROM

	Flexor A264	Flexor A164	SMARTengine/Alpha 21064A PCI/ISA SBC
AlphaBIOS	V5.70b	V5.70	V5.70
SRM Console	V5.6-6903	V5.6-6901	V5.6-6900

A.4.1 AlphaBIOS Release Notes

The AlphaBIOS has been updated from V5.69 to Revision V5.70 for Flexor A164 and SMARTengine/Alpha 21064A PCI/ISA SBC. The AlphaBIOS is Revision V5.70b for the Flexor A264.

A.4.2 SRM Console Release Notes

The SRM Console has been updated from X5.5 to V5.6 on both the Flexor A164 and SMARTengine/Alpha 21064A PCI/ISA SBC. Flexor A264 has a new version of V5.6 Console. This is a list of changes common to all three systems:

- Console banner changed to identify system as SMARTengine/Alpha PCI/ISA.
- Title line in '`show config`' changed to 'SMART Modular Technologies'.
- '`>>>srvmgr -shutdown`' command added to console to provide means of hard resetting system.

When a capable system power supply is connected to the 'Remote Shutdown' connector on the system backplane (refer to the Backplane User Information Manual) the command "`srvmgr -shutdown`" will result in the power supply shutting down.

If the power supply does not support this feature or it is not connected to the backplane correctly then the message "PSU shutdown not supported, please power cycle" will be displayed on the console.

- Support added for OpenVMS shutdown option 'POWER_OFF' in SRM Console.
- HALT is now able to return control to the graphics SRM console from the Motif desktop environment under OpenVMS with a Powerstorm 3D30 (PBXGB-AA) or an Elsa Gloria Synergy (PBXGK-BB) card as the system's primary video card.

To continue with the Motif or CDE desktop under OpenVMS it is necessary to press CTRL+F2 twice to reinitialise the display. If multiple Powerstorm 3D30s are in use then all will be returned from the Motif display to the mode utilised by the SRM Console. In which case it may only be possible to restore the primary display to the graphical desktop.

If the SRM console is set to work on the serial device then the SRM console will be active only on the serial line and not on the graphics device.

Changes to the SRM Console for SMARTengine/Alpha 21064A PCI/ISA SBC and Flexor A164 **ONLY** since the previous release:

- Support has been added for Elsa Gloria Synergy (PBXGK-BB) video card on primary PCI buses. BIOS emulation will take longer to initialise the card than other supported video cards.

Changes to the SRM Console for Flexor A264 **ONLY** since the previous release V5.6-4300:

- Slot dependant PCI allocation error for bridged option cards in the primary PCI bus on backplanes with no secondary PCI bus corrected.
- Support has been added for Elsa Gloria Synergy (PBXGK-BB) video card on both primary and secondary PCI buses.
- Floppy disk device renamed 'dva0.0.0.1000.0'.
- Product name in DSRDB and 'show config' command changed to SMARTengine/Alpha 21264 PCI/ISA SBC.
- Built-in 'test' script added to support user diagnostics.
- Support for HALT button and environmental interrupts added.

A.6 Firmware Release Notes for V5.5 Firmware Update CDROM

Table 10 Revisions for V5.5 Firmware Update CDROM

	Flexor A264	Flexor A164	SMARTengine/Alpha 21064A PCI/ISA SBC
AlphaBIOS	N/A	V5.69	V5.69
SRM Console	N/A	X5.5-5690	X5.5-5688

A.6.1 AlphaBIOS Release Notes

The AlphaBIOS has been updated from V5.64 to Revision V5.69 on both the SMARTengine/Alpha 21064A PCI/ISA SBC and Flexor A164

- Provides additional BIOS emulation support
- Improve handling of Firmware CDROM updates under 'Update AlphaBIOS' menu command

A.6.2 SRM Console Release Notes

The AlphaBIOS has been updated from X5.4 to X5.5 on both the for SMARTengine/Alpha 21064A PCI/ISA SBC and Flexor A164.

- ELSA Gloria support from SRM Console
- KZPBA/KZPSM adapter firmware updated from V5.53 to V5.57
- '`>>>srvmgr -cycle`' command added to console to provide means of hard resetting system.

Note:

The `srvmgr` command has been extended to provide a limited power cycling function. When the CPU jumper J2 is set to enable both Watchdog and Reset (refer to the SBC User Information Manual) the command "`srvmgr -cycle`" will result in a power cycle of the system.

If the jumpers are incorrectly set then the message "system is not configured to perform hard reset" will be displayed on the console. Note: With the J2 jumper set to enable Watchdog and Reset pressing the Halt button will result in a power cycle.

- No support for OpenVMS shutdown option 'POWER_OFF' in SRM Console

A.7 Firmware Release Notes for V5.4 Firmware Update CDROM

Table 11 Revisions for V5.4 Firmware Update CDROM

	Flexor A264	Flexor A164	SMARTengine/Alpha 21064A PCI/ISA SBC
AlphaBIOS	N/A	V5.64	V5.64
SRM Console	N/A	X5.4-6383	X5.4-6378

A.7.2 AlphaBIOS Notes

The AlphaBIOS version in this release has not been updated.

A.7.1 SRM Console Notes

The AlphaBIOS has been updated from X5.3 to X5.4 on both the for SMARTengine/Alpha 21064A PCI/ISA SBC and Flexor A164.

- Support has been included for the 21154 PCI to PCI bridge chip.

A.8 Firmware Release Notes for V5.3 Firmware Update CDROM

Table 12 Revisions for V5.3 Firmware Update CDROM

	Flexor A264	Flexor A164	SMARTengine/Alpha 21064A PCI/ISA SBC
AlphaBIOS	N/A	V5.64	V5.64
SRM Console	N/A	X5.2-2486	X5.2-3323

A.8.2 AlphaBIOS Notes

The AlphaBIOS version in this release has not been updated.

A.8.1 SRM Console Notes

The AlphaBIOS has been updated from X5.3 to X5.4 on both the for SMARTengine/Alpha 21064A PCI/ISA SBC and Flexor A164.

The following changes have been made for the SMARTengine/Alpha 21064A PCI/ISA SBC and Flexor A164:

- KZPBA/KZPCA UltraSCSI controllers (QLogic ISP1040) require the following changes to be made to a console environment.
Type `show pci` at the SRM console prompt. If a device is listed as "ISP1020 controller" or "IPS1040B SCSI Controller" then the `pci_prefetch` environment variable must be modified to the setting SMS:

```
>>>set pci_prefetch SMS
>>>init
```

For the changes to take effect, the system must be initialized or power cycled.

- It is possible to disable the use of Control+P to halt the booting of an operating system via the 'controlp' environment variable.