

Intel[®] Boot Agent

User's Guide

February 2000

Where to go for more information

Readme Files

For more information about installation topics and product errata, see the readme text files. To view the files, open the README.TXT file with any text editor.

Online Services

You can use the Internet to download software updates, troubleshooting tips, installation notes, and more. Online services are on the World Wide Web at:

<http://support.intel.com>

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Introduction

The Intel® Boot Agent is a software product that allows your networked client computer to boot using a program code image supplied by a remote server. The features offered by this product are:

- Compliant with the Wired for Management Baseline 2.0 (WfM 2.0) specification
- Incorporates the software defined in the Pre-boot eXecution Environment (PXE) version 2.0 and 2.1 specifications
- Some versions of the Boot Agent also include support for Remote Program Load (RPL) runtime and loader software (10/100 adapters only)
- Compatible with legacy boot agent environments that use BOOTP protocol
- Customizable in a pre-execution, stand-alone environment

Product Contents

When you purchase an Intel WfM-compatible adapter, the product package includes the following items related to the Boot Agent:

- A Boot Agent software image integrated into the adapter's flash ROM device
- A CD-ROM containing a set of DOS utilities, an Intel® Boot Agent User's Guide, and a readme file

Intel may occasionally provide Boot Agent software updates. A Boot Agent software update package consists of:

- A Boot Agent software image that can be loaded onto your client network adapter's flash ROM device
- A set of DOS utilities, an Intel® Boot Agent User's Guide, and a readme file

This software and documentation as well as updates are available at the following web site:

<http://support.intel.com>

Then, search for "Boot Agent".

Operating Environment

The Boot Agent operates in a client/server environment. Often, in this environment, one or more servers provide remote boot services to a large number of client computers through a common network.

Boot Services

The Intel® Boot Agent has been tested using the following third-party operating systems/boot services:

- Microsoft® Windows® NT® 4.0 Remote Boot Service
- Microsoft® Windows 2000 Remote Installation Service (RIS)
- Linux® PXE Server
- Novell® NetWare® RPL Module
- IBM® OS/2® RIPL Service

The computer system where the Boot Agent is loaded is considered to be a client with respect to the remote boot capability even if that system acts as a server after the system has finished booting.

Client Computer Hardware Installation

Before you install the Boot Agent, make sure the client computer's hardware is installed properly—a compatible network adapter is installed and the Boot Agent software image resides within the network adapter's flash ROM. The following sections guide you through the hardware installation process:

- Setup for a Known Configuration
- Determining the Client Computer Configuration
- Flash ROM and Intel WfM-Compatible Adapters
- Installing Flash ROM Upgrades

Setup for a Known Configuration

If you have an Intel WfM-compatible adapter (such as the Intel® PRO/100+ Management Adapter) installed in your client computer, the flash ROM device is already available in your adapter, and no further installation steps are necessary. However, you may still wish to configure the Boot Agent software. To do so, see “Configuration Setup”.

If you do not have an Intel WfM-compatible adapter installed on your client computer, but you know the hardware configuration of your client computer, you can perform the steps indicated in Table 1 and then proceed directly to the proper installation section indicated in the table.

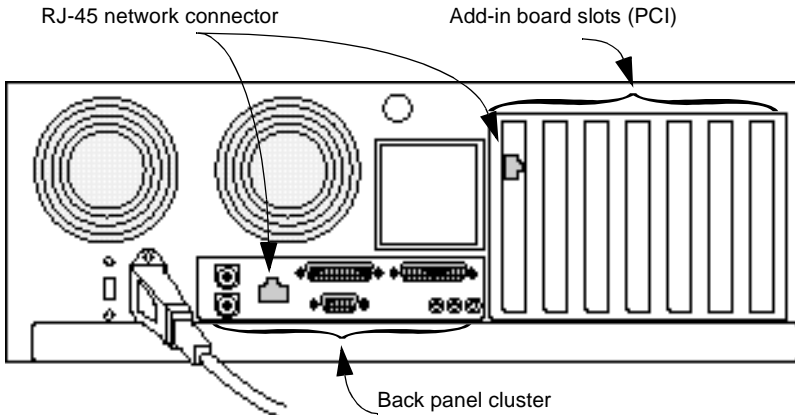
Table 1: Boot Agent Installation Procedures

Client Computer Hardware Configuration	Perform These Steps:
No network adapter is installed in client computer	<ol style="list-style-type: none"> 1 Install a compatible network adapter. The adapter documentation gives installation instructions. (Compatible adapters include the Intel® PRO/100+ Management Adapter and the Intel® PRO/100+ Server Adapter. These adapters include an integrated flash ROM device.) 2 If the adapter has an empty flash ROM socket, install a 64 KB (or larger) flash ROM device. See “Installing Flash ROM Upgrades” for installation instructions.
A network adapter is installed in client computer, but no flash ROM device is installed (or the flash ROM is smaller than 64 KB)	<ol style="list-style-type: none"> 1 Remove the adapter. The adapter documentation gives removal/installation instructions. 2 Install a 64 KB (or larger) flash ROM device containing a Boot Agent software image. See “Installing Flash ROM Upgrades” for installation instructions. 3 Reinstall the adapter. The adapter documentation gives removal/installation instructions.
Client computer motherboard incorporates compatible LAN on motherboard (LOM) hardware	<ol style="list-style-type: none"> 1 Follow the motherboard manufacturer’s update instructions to install the BIOS code that incorporates the Boot Agent software. 2 Alternatively, if the motherboard has a separate ROM socket that accepts a 64 KB (or larger) flash ROM device containing a Boot Agent software image, see “Installing Flash ROM Upgrades” for installation instructions. Contact the motherboard manufacturer to get the code that must be loaded into the flash ROM in this case.

Identifying the Client Computer Configuration

To determine the hardware configuration of your client computer without removing its cover:

- 1 Examine the back panel of the computer to determine if there is a network adapter already installed. The following figure shows the back panel of a typical computer, and indicates the areas you should examine:



- 2 As shown in the figure, the network connector is an RJ-45 connector. If there is a network connector in the back panel cluster only, it is possible that the computer motherboard incorporates compatible LAN on motherboard (LOM) hardware. Contact the motherboard manufacturer to verify this information. If your motherboard is equipped with LOM hardware, perform either of the following:
 - a Follow the motherboard manufacturer's instructions to check if your computer's BIOS already handles Boot Agent capability. Otherwise, ask your manufacturer for a new BIOS upgrade for your system.
 - b Alternatively, if the motherboard has a separate ROM socket that accepts a 64 KB (or larger) flash ROM device containing a Boot Agent software image, see "Installing Flash ROM Upgrades" for installation instructions. Contact the motherboard manufacturer to get the code that must be loaded into the flash ROM in this case.
- 3 If there is no network connector at the back of your computer, you must install a network adapter and possibly a flash ROM device on the adapter. Refer to the installation procedures for the adapter for any setup requirements; then follow the procedures in "Installing Flash ROM Upgrades" before installing the adapter.
- 4 If there is a network connector in one of the add-in board slots, there might be a compatible network adapter already installed in the computer. Perform the following substeps to identify all compatible network adapters already installed in your computer:

- a Boot your computer to DOS (a DOS Command Prompt window will not work).
- b From the drive or directory containing the Boot Agent software, type `fboot` and then press Enter.

If there is no flash ROM device installed, you will get the following type of message:

NIC	Network Address	PWA Number	Flash Memory	Size	Valid
1	xxxx00000000	xxxxxxx-xxx	No Flash	0	No

NOTE: If the flash ROM device installed in the adapter ROM socket is not large enough (64 KB or larger), `fboot` returns a message stating that the flash is too small, and does not allow you to proceed.

At this time, (assuming there is a large enough flash device installed) `fboot` will prompt you to update the flash ROM.

- c Update the flash ROM. See “Installing the Boot Agent Software Image” for instructions.
- d If there is no flash device installed, or if the installed flash device is too small, see “Installing Flash ROM Upgrades” for instructions.

Flash ROM and Intel WfM-Compatible Adapters

All Intel Wired-for-Management-compatible (WfM-compatible) adapters are equipped with an integrated flash ROM device. The Boot Agent software image is pre-programmed into the flash ROM device at the factory; therefore, no software installation is required.

In some cases, such as when upgrading to a newer software version, you may need to update the flash ROM with a new Boot Agent software image. See “Installing the Boot Agent Software Image” for information about installing or updating the flash ROM with a new Boot Agent software image.

Installing Flash ROM Upgrades

If your adapter is not equipped with an integrated flash ROM device, install a flash ROM device in your adapter.

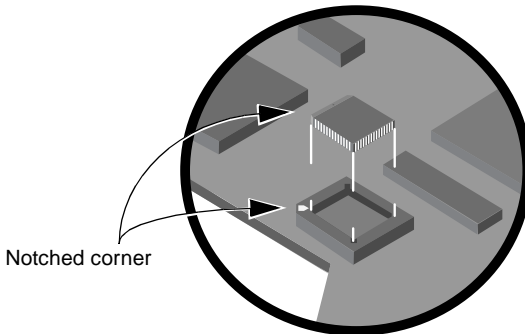
To install a flash ROM device:

- 1 Turn off and unplug your computer. Then, remove its cover.

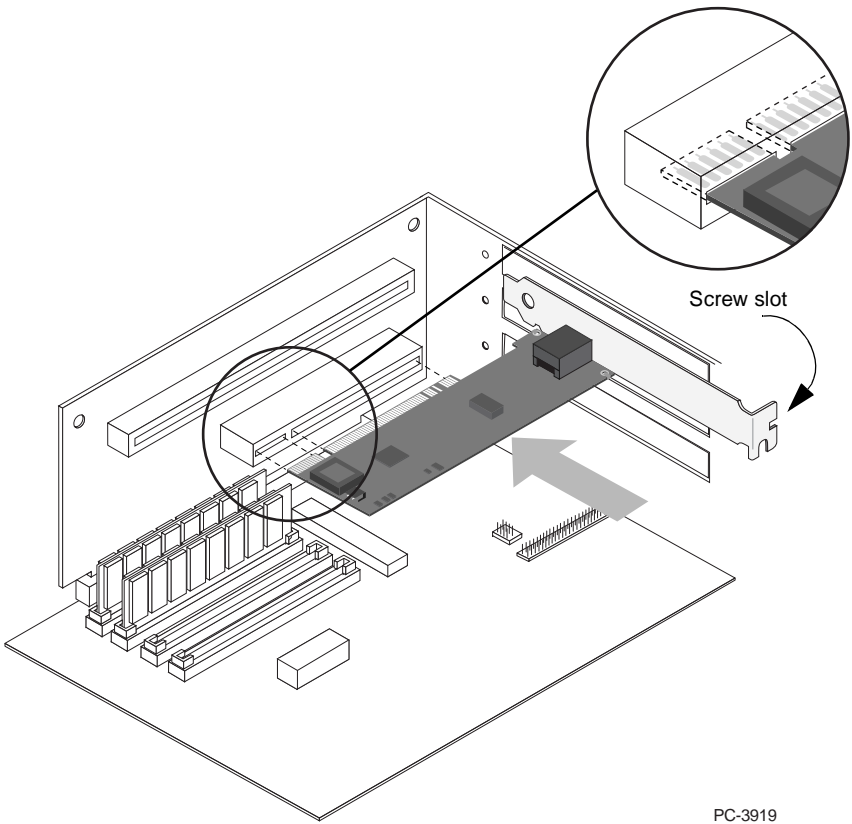


Turn off and unplug the computer before removing the computer cover. Failure to do so could endanger you and might damage the adapter or computer. Observe appropriate static electricity handling precautions when working with components, adapters, and the computer.

- 2 Identify the adapter and the adapter slot in which it is installed. Then, remove the adapter bracket screw.
- 3 Remove the adapter and move it to an area free of static electricity. The following figure shows how to install the flash ROM device in the socket:



- 4 Refer to the figure and install the flash ROM device in the socket of the adapter. Note the location of the notched corner of the flash ROM device and the corresponding notch in the socket. There is only one correct orientation for the flash ROM device.
- 5 Reinstall the adapter in the slot from which you removed it. If you are installing the adapter for the first time, follow the adapter installation instructions and install it in an appropriate PCI expansion slot (refer to the following figure).



PC-3919

- 6 Push the adapter into the slot until the adapter is firmly seated. Then, secure the adapter bracket with a screw.
- 7 Replace the computer cover and plug in the power cord.
- 8 Turn on the power. The computer BIOS automatically assigns resources to a PCI adapter. If you get a configuration error, see the troubleshooting instructions in the adapter's installation guide.

Installing the Boot Agent Software Image

All Intel WfM-compatible adapters, such as the Intel PRO/100+ Management Adapter, have a factory-installed, integrated flash ROM device that has been pre-programmed with a Boot Agent software image. Therefore, no software installation is required.

Installation of the Boot Agent on other Intel adapters requires a flash ROM device (non-volatile storage device) to be present within the client computer system. This flash ROM can take these forms:

- A factory-installed, integrated flash ROM device on the computer motherboard with remote boot enabled LOM (LAN On Motherboard) hardware support
- A field-upgraded, add-on flash ROM device installed into your network adapter

In cases involving hardware upgrades, once a flash ROM device is available within the client computer, a valid Boot Agent software image must be installed onto the flash ROM device. The way in which the Boot Agent software image is installed within the flash ROM depends upon your hardware configuration.

- If your computer includes the network adapter on its motherboard, the Boot Agent software might need to be installed as part of a motherboard BIOS code upgrade. Contact your computer or motherboard manufacturer to upgrade your motherboard BIOS code. Alternatively, it is possible that the motherboard has a ROM socket with a 64 KB (or larger) flash ROM device. In this case, contact the motherboard manufacturer to get the code that must be loaded into the flash ROM.
- If your computer uses a flash ROM-equipped adapter, perform the following steps to install or upgrade the Boot Agent software image:

- 1 The following operation requires use of a DOS bootable floppy disk containing an executable image of the fboot.exe utility as well as the current flash ROM image file, which will have an .FLS extension. If you do not have fboot.exe on your DOS bootable floppy disk, copy it to your system disk from the CD ROM that came with your product under the \BOOTAGNT directory or acquire the most up-to-date version from Intel's website at:

<http://support.intel.com>

- 2 Using your DOS bootable floppy disk, boot your computer to a DOS prompt.



The next several steps require that your computer be booted *only* to DOS, and *not* from a Windows "DOS box". These steps cannot be performed from a DOS Command Prompt window or using a DOS task within Windows.

NOTE: If the flash ROM device installed in the adapter ROM socket is already programmed (not blank), you may need to take steps to enable your computer to boot from the floppy drive. If necessary, disable the network boot function from either the BIOS Setup program or the Boot Agent's configuration setup menu. Then reboot to the DOS bootable floppy disk containing the fboot utility that you just prepared.

3 Type:

fboot

The following message appears showing a list of all compatible network adapters found in your system, assuming both the adapter and the flash ROM device are properly installed:

```
[FBOOT ver x.x] - Intel PCI NIC BOOT FLASH Update Utility  
Copyright (C), 1995 - 2000 Intel Corporation
```

NIC	Network Address	PWA Number	FLASH Memory	Size	Valid
1	00A0C9A4230B	689661-003	SST 29LE512	64	Yes

Select NIC to update or ESC to exit:

- 4 If more than one adapter is installed in your system, you will need to enter the NIC number (from the displayed list) that corresponds to the Ethernet MAC address of the desired adapter. In cases where only one adapter is present, however, press "1" to continue. The next question appears:

Select Option (U)pdate or (R)estore:

- 5 Type U (update) if you want the fboot utility to update the flash ROM device with the current version of Boot Agent software. Type R (restore) if you want the fboot utility to write a previously-stored flash image file onto the flash ROM device.

NOTE: As part of the Update operation, fboot creates a backup file on the floppy disk. Make sure that the write-enable tab on the floppy disk is properly set.

Prior to the Restore operation, make sure that a flash image file is available in the same directory as the fboot utility. This file will have an automatically-generated filename with an .FLS extension.

If you select the U (update) response, this prompt appears:

Create Restore Image (Y)es or (N)o:

- 6 Type Y (yes) to create a flash image file from the current (not yet updated) image of the flash ROM device. Type N (no) to cause fboot to proceed without first saving a copy of the current contents of the flash ROM device.

If you choose not to save a copy of the current contents of the flash ROM device (type N), fboot asks you the following question:

Continue Update Without Restore Image (Y)es or (N)o:

- 7 Type Y (yes) to continue, which will update the flash image. Type N (no) to cancel the update, which will leave the flash contents unchanged.

NOTE: The fboot utility automatically names the flash image file (backup file) as XXXXXXXX.FLS, where XXXXXXXX are the last eight digits of the adapter's Ethernet address. If there is already a flash image file in the fboot directory, delete it first if you want to save a new version of the flash ROM device image. The fboot utility will not overwrite this file.

Once you have answered the questions posed by the fboot utility, it creates the flash image file (if appropriate), and then writes the current version of the Boot Agent image to the flash ROM device used by your network adapter. The Boot Agent image is embedded in the fboot utility itself. This process takes approximately one minute and then fboot exits to the DOS prompt.

Server System Setup

NOTE: When the Boot Agent software is installed as an upgrade for an earlier version boot ROM, the associated server-side software may not be compatible with the updated Boot Agent. Contact your system administrator to determine if any server updates are necessary.

For the Boot Agent software to perform its intended job, there must be a server set up on the same network as the client computer. That server must recognize and respond to the PXE or RPL boot protocols that are used by the Boot Agent software.

The following sections describe the actions you should take to set up various types of servers to work with the Boot Agent. If you have questions concerning the setup of your server system, contact the manufacturer of your server hardware or your server operating system vendor for assistance. The following sections provide pointers to server setup instructions:

- Windows 2000 RIS Server Setup
- Linux* Server Setup
- Other Server Setup Information

Windows 2000* RIS Server Setup

For information about setting up a Windows 2000 RIS Server:

- 1 Consult the following web site:
<http://www.microsoft.com/windows2000>
- 2 Select Technical Library.
- 3 Select How it Works.
- 4 Select Remote Operating System Installation under the Management tab.
- 5 Select Download this document.

Linux* Server Setup

Consult your Linux vendor for information about setting up the Linux Server.

Other Server Setup Information

Various hardware and software manufacturers provide products that support remote boot technology, conforming either to the Wired for Management (WfM) specifications or the PXE/RPL/BOOTP/DHCP protocols. The following web sites provide useful information on setting up your server to such remote boot capabilities:

- <http://www.microsoft.com>
Microsoft produces operating systems that are used by both client and server systems in a remote boot environment. Search this site for technical information and commercial products applying to Intel WfM-compatible systems, PXE and RPL environments, and remote booting.
- <http://www.sco.com>
SCO produces SCO* Unix, an operating system used on many servers. Search this site for technical information and commercial products related to remote boot servers.
- <http://www.bootix.com>
Bootix Technology GmbH produces software for boot management solutions. The available products include a large range of special-purpose tools concentrating on LAN and WAN technology for large internal networks. Search this site for remote boot products supporting BOOTP, RPL, and PXE protocols on a range of client and server types.
- <http://www.weird-solutions.com>
Weird Solutions produces client and server support software for Windows NT or Windows 98 computers. Search this site for support software products supporting BOOTP, TFTP, and DHCP services on computers based on Windows NT or Windows 98.
- <http://www.sun.com>
<http://java.sun.com>
Sun produces both hardware and software that can be used in either a client or a server application. Search these sites for technical information and commercial products applying to WfM-compatible systems, PXE and RPL environments, and remote booting.
- <http://samba.org/samba>
The Samba organization produces and supports software that runs on UNIX servers and clients. The software available through Samba complies with GNU Public License requirements. Search this site for information on implementing remote booting on UNIX servers.

- <http://www.novell.com>
Novell produces network operating systems and related support software. Search this site for technical information and commercial products applying to WfM-compatible systems, PXE and RPL environments, and remote booting.
- <http://www.ibm.com>
IBM produces both hardware and software that can be used in either a client or a server application. Search this site for technical information and commercial products applying to WfM-compatible systems, PXE and RPL environments, and remote booting.
- <http://www.altiris.com>
Altiris, Inc. produces software for boot management solutions. The available products include special-purpose tools concentrating on LAN and WAN technology for internal networks. Search this site for remote boot products supporting a range of client and server types.
- <http://www.xpoint-tech.com>
Xpoint Technologies, Inc. provides disaster recovery applications that use PXE to restore system configurations from servers. Search this site for information about their products that provide instant recovery for your PC.

Configuration Setup

The Boot Agent software provides configuration options that allow you to customize the behavior of the Boot Agent software. Changing the Boot Agent configuration will usually be required only the first time you add a new network adapter to a client computer within your network.

Configuring the Boot Agent in a Pre-Boot Environment

You can customize the behavior of the Boot Agent software through a pre-boot (operating system independent) configuration program contained within the adapter's flash ROM. You can access this pre-boot configuration setup program each time the client computer cycles through the boot process. The boot process is triggered whenever you perform any of the following boot events:

- Power on
- Hard reset (Reset button on system, if available)
- Soft reset (Ctrl+Alt+Del)
- Operating system or application-initiated system restart

When the boot process begins, the screen clears and the computer begins its Power On Self Test (POST) sequence. Shortly after completion of the POST, the Boot Agent software stored in flash ROM executes. The Boot Agent then displays an initialization message, similar to the one below, indicating that the Boot Agent is active.

```
Initializing Intel(R) Boot Agent Version 3.X.XX  
PXE m.m Build nnn (WfM w.w), RPL Vm.mmm
```

```
Press Ctrl+S to enter the Setup Menu.
```

NOTE: This display may be hidden by the manufacturer's splash screen. Consult your manufacturer's documentation for details.

To customize the behavior of the Boot Agent software:

- 1 Press Ctrl+S immediately after the initialization message appears. A configuration setup menu appears allowing you to set configuration values for the Boot Agent.

NOTE: Immediately after the initialization message appears, and before any subsequent messages appear, you have several seconds in which to press Ctrl+S to display the Boot Agent's configuration setup menu. If you do not press Ctrl+S, the Boot Agent software will proceed with the boot process, eventually bringing up the operating system. If you miss your opportunity to press Ctrl+S within the allowed number of seconds, reboot the computer to try again. If the setup message is disabled (Show Setup Prompt: Disable), you will not be prompted to press Ctrl+S, even though you can still enter the configuration setup menu using this key combination.

Intel(R) Boot Agent Version 3.0.00
Setup Menu

Network Boot Protocol	PXE
Boot Order	Try network first , then local drives
Show Setup Prompt	Enable
Setup Menu Wait Time	8 seconds
Legacy OS Wakeup Support	Disable

Select remote boot protocol .

<Esc>	<Space>	<Enter>	<F4>
Cancel Changes	Change Value	Next Option	Save Configuration

The configuration setup menu shows a list of configuration settings on the left and their corresponding values on the right. Key descriptions near the bottom of the menu indicate how to change setting values. For each selected setting, a brief “mini-Help” description of its function also appears near the bottom of the menu.

- 2 Select the setting you want to change by pressing Enter to select among settings.
- 3 Once you have accessed the setting you want to change, press the spacebar until the desired value appears.
- 4 If you want to change additional settings, repeat Steps 2 and 3.
- 5 Once you have completed your changes, press F4 to update the adapter with the new values.

Table 2 provides a list of configuration settings, their possible values, and their detailed descriptions.

Table 2: Boot Agent Configuration Settings

Configuration Setting	Possible Values	Description
Network Boot Protocol	PXE RPL	<p>Select PXE for use with WfM-compatible network management programs, such as Intel® LANDesk® Management Suite, Windows 2000 RIS, and Linux.</p> <p>Select RPL for legacy-style remote booting.</p> <p>NOTE: If your Boot Agent does not support RPL, this setting will be unchangeable.</p>
Boot Order	<p>“Use BIOS Setup Boot Order”</p> <p>“Try network first, then local drives”</p> <p>“Try local drives first, then network”</p> <p>“Try network only”</p> <p>“Try local drives only”</p>	<p>Allows you to select the order in which boot devices are queried when the system boots. If your client computer’s BIOS supports the BIOS Boot Specification (BBS) or allows PnP-compliant selection of the boot order in the BIOS setup program, then this setting will always be “Use BIOS Setup Boot Order” and cannot be changed. In this case, refer to the BIOS setup manual specific to your client computer to set up boot options.</p> <p>If your client computer does not support BBS- or PnP-compliant BIOS, you can select any one of the values listed in the Possible Values column of this table for this setting except for “Use BIOS Setup Boot Order”.</p>
Setup Menu Wait Time	2 seconds 3 seconds 5 seconds 8 seconds	The number of seconds the Boot Agent waits for you to press Ctrl+S during the system boot process.
Show Setup Prompt	Enable Disable	<p>If you select Enable, the Ctrl+S prompt appears during your computer’s POST sequence.</p> <p>If you select Disable, the Ctrl+S prompt does not appear. However, you can still press Ctrl+S to enter the setup program during your computer’s POST sequence.</p>

Configuration Setting	Possible Values	Description
Legacy OS Wakeup Support	Enable Disable	<p>This setting applies only to Intel PRO/100+ WfM-compatible, 82559-based (or later) adapters.</p> <p>Select Disable for this setting when using an ACPI Windows operating system such as Windows 2000 or Windows 98SE.</p> <p>Select Enable to allow non-Windows operating systems (such as DOS or NetWare) to make use of the Intel WfM-compatible adapter's remote wakeup capability.</p> <p>NOTE: Consult your operating system instructions to determine if your operating system supports remote wakeup, as well as how to use this capability.</p>

Auxiliary DOS Utilities

Intel provides a utility called BROW that provides an alternative means for modifying the adapter configuration settings. BROW is available on Intel's web site at:

<http://support.intel.com>

BROW is also located on the CD-ROM in the directory:

`\BOOTAGNT`

BROW Utility

BROW, which stands for Boot ROM / Wake-on-LAN*, is a utility program that changes the default settings of your WfM-compatible adapter. These settings can only be changed with BROW. Once set, these settings cannot be changed from the Boot Agent's configuration setup menu. BROW can be used to enable or disable the Wake-on-LAN and Boot Agent capabilities, as well as enable or disable some settings used by the Boot Agent.

If you disable Wake-on-LAN on an adapter, that adapter is unable to respond to a wake-up packet and remotely power on the computer. Disabling Wake-on-LAN also reduces the amount of current the adapter draws from the standby power supply when the computer is powered off.

Disabling the Boot Agent prevents it from executing during the computer power up/boot sequence.

Running BROW

BROW must be run with the computer booted to DOS only, with no software drivers loaded. This utility cannot be run in a DOS window in any Microsoft Windows product or in DOS compatibility mode in IBM OS/2.

BROW can be run with any of the command line options found in Table 3 using the following syntax:

`BROW [-option]...`

Table 3: BROW Options

Option	Short Form	Description
-ALL		Selects all adapters found in system.
-EXITCODES		Brings up exit code help.
-HELP	-?	Brings up command line help.
-NIC=XX		Selects a specific adapter (1-8). BROW will not interact with any adapters unless you explicitly specify which adapters you wish it to interact with. You can use the -NIC-xx option to select a single adapter, or use the -ALL option to select all of the adapters in your system.
-BOOTENABLE	-BE	Enables Boot ROM.
-BOOTDISABLE	-BD	Disables Boot ROM.
-WOLDISABLE	-WOLD	Disables remote system wake up (WOL).
-WOLENABLE	-WOLE	Enables remote system wake up (WOL).

NOTE: If you run BROW without any command line options, the utility will display a list of all the adapters found in your system.

Examples

Example 1:

To disable WOL on all adapters, call BROW like this:

```
BROW -ALL -WOLDISABLE
```

Example 2:

To enable WOL on the second adapter found in your system, call BROW like this:

```
BROW -NIC=2 -WOLENABLE
```

Example 3:

To disable the Boot ROM on all adapters, call BROW like this:

```
BROW -ALL -BOOTDISABLE
```

Example 4:

To enable the Boot ROM on the first adapter found in your system, call BROW like this:

```
BROW -NIC=1 -BOOTENABLE
```


Boot Agent Messages

The Boot Agent may display one or more of the following messages during initialization:

Information Messages

This option has been locked and cannot be changed.

This message appears when the user tries to change a configuration setting that has been locked by your system administrator with the BROW utility. If you think you should be able to change the configuration setting, consult your system administrator.

Adapter-Related Error Messages

PXE-E05: The LAN adapter's configuration is corrupted or has not been initialized. The Boot Agent cannot continue.

The Boot Agent determined that the adapter EEPROM checksum is incorrect. The agent will return control to the BIOS and not attempt to remote boot. Try to update the flash image. If this does not solve the problem, contact your system administrator or Intel® Customer Support either by telephone or over the World Wide Web. Phone numbers and web sites are listed at the back of this manual.

PXE-E04: The LAN adapter is not functioning correctly or the wrong Boot Agent is installed. The Boot Agent cannot continue.

The Boot Agent was unable to read one or more of the adapter's PCI configuration registers. The adapter may be misconfigured, or the wrong Boot Agent image may be installed on the adapter. The Boot Agent will return control to the BIOS and not attempt to remote boot. Try to update the flash image. If this does not solve the problem, contact your system administrator or Intel® Customer Support either by telephone or over the World Wide Web. Phone numbers and web sites are listed at the back of this manual.

System-Level Error Messages

PXE-E06: This system does not support PCI option ROMs. The Boot Agent cannot continue.

The BIOS does not support the mapping of the PCI expansion ROMs into upper memory as required by the PXE specification. The Boot Agent cannot function in this system. The Boot Agent returns control to the BIOS and does not attempt to remote boot. You may be able to resolve the problem by updating the BIOS on your system. If updating your system's BIOS does not fix the problem, contact your system administrator or your computer vendor's customer support to resolve the problem.

PXE-E00: This system does not have enough free conventional memory. The Boot Agent cannot continue.

The Boot Agent was unable to find enough free base memory (below 640 K) to install the PXE client software. The system cannot boot via PXE in its current configuration. The error returns control to the BIOS and the system does not attempt to remote boot. If this error persists, try updating your system's BIOS to the most-recent version. Contact your system administrator or your computer vendor's customer support to resolve the problem.

Troubleshooting Procedures

The following list of problems and associated solutions covers a representative set of problems that you might encounter while using the Boot Agent.

If you are experiencing a problem that is not listed in this section, contact Intel® Customer Support either by telephone or over the World Wide Web. Phone numbers and web sites are listed at the back of this manual.

Media test failure, check cable

When an error message like this appears, it means the adapter did not detect a viable network connection. Look at the RJ-45 network connector at the back of your computer and verify that a network cable is plugged in. See “Identifying the Client Computer Configuration” for help in identifying the network connector.

If the network cable is installed correctly at the rear of your computer, it is possible that it is not connected to a server, or that the server has not yet been set up correctly. Make sure your computer is properly set up and connected to the network server before trying to set up the Boot Agent.

Flash device wrong size

The full version of Boot Agent software cannot be loaded into a flash ROM device smaller than 64 KB. If a 32 KB (or smaller) flash ROM device is detected in the adapter, the Boot Agent software returns the “Flash device wrong size” message. Assuming the device is socketed, remove the “too small” device and install a blank 64 KB (or larger) flash ROM device. See “Configuration Setup” for more information.

Cannot change boot order

If you are accustomed to redefining your computer’s boot order using the motherboard BIOS setup program, the default settings of the Boot Agent setup program can override that setup. To change the boot sequence, you must first override the Boot Agent setup program defaults. To start the Boot Agent configuration setup program, press Ctrl+S during the time the initialization message appears. A configuration setup menu appears allowing you to set configuration values for the Boot Agent. If you do not press Ctrl+S, the Boot Agent software proceeds with the boot process, eventually bringing up the operating system. To change your computer’s boot order setting, see “Configuration Setup”.

There are configuration/operation problems with the boot process

For some specific configurations and operating conditions, the boot process does not proceed as expected. Contact Intel® Customer Support.

Not getting a prompt to go to Boot Agent setup program

This is actually a feature of the Boot Agent product. As part of the setup program, one of the options allows you to turn off the prompt that says:

```
Press Ctrl+S to enter the Setup Menu.
```

You can still press the Ctrl+S key combination to enter the setup program, but the prompt is not displayed telling you when to do so. Immediately after POST, repeatedly press the Ctrl+S key combination until the Boot Agent setup program starts. While in the setup program, you can restore the prompt message if you want.

My computer does not complete POST

This problem occurs before the Boot Agent software has even begun operating. There is a software or BIOS problem with your computer. Contact your computer manufacturer's customer support group for help in correcting your problem.

After booting, my computer experiences problems

After the Boot Agent product has finished its sole task (remote booting), it no longer has any effect on the client computer operation. Any problems you are having with your computer after it completes the boot process are most likely related to another part of the computer.

If you are having problems with the local (client) or network operating system, contact the operating system manufacturer for assistance. If you are having problems with some application program, contact the application manufacturer for assistance. If you are having problems with any of your computer's hardware or with the BIOS, contact your computer system manufacturer for assistance.

Glossary

The Glossary defines terms, abbreviations, and acronyms that apply directly to the Boot Agent.

BBS	BIOS Boot Specification
BIOS	Basic Input Output System
BIS	Boot Integrity Services
BOOTP	Bootstrap Protocol
DHCP	Dynamic Host Configuration Protocol
ESD	Electro-Static Discharge
NIC	Network Interface Controller (same as adapter)
OS	Operating System
PnP	Plug and Play
PXE	Pre-boot eXecution Environment
RPL	Remote Program Load
URL	Uniform Resource Locator
WfM	Wired for Management

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Web and Internet Sites

- Support: <http://support.intel.com>
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- FTP Host: download.intel.com
- FTP Directory: [/support/etherexpress/](ftp://support.etherexpress/)

Customer Support Technicians

US and Canada: 1-916-377-7000 (7:00 - 17:00 M-F Pacific Time)

Worldwide access: Intel has technical support centers worldwide. Many of the centers are staffed by technicians who speak the local languages. For a list of all Intel support centers, the telephone numbers, and the times they are open, download document 9089 from one of the automated services.