

SUPERMICRO®

AOC-PG-i2+ Add-on Card



User's Guide

Revision 1.0a

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Introduction

About this Manual

This manual is written for system integrators, PC technicians and knowledgeable PC users who intend to integrate SuperMicro's AOC-PG-i2+ add-on card add-on card to their system.

Product Features

The AOC-PG-i2+ add-on card offers the following features:

- Intel 82576 LAN chip
- PCI-e x8 interface
- Low-profile, half-length PCI-e x8 proprietary form factor card
- Two RJ-45 connectors
- Jumbo frames support up to 9.5-KB packets
- VMDq for virtualized environments
- Next generation VMDq with loopback functionality
- Support Pre-boot Execution Environment (PXE)
- RoHS 6/6
- Intel PROSet Utility for Windows supported network teaming
- Low latency interrupts
- Direct Cache Access (DCA)
- iSCSI remote boot
- Height of end bracket 8.0 cm (3.15")
- Dimensions: 9.6 cm (5.78") x 6.2 cm (2.44") length/width
- Supports Category-5 cable up to 100 meters



NOTE: The AOC-PG-i2+ add-on card requires the RSC-R1UU-E8PR riser card for mounting in systems.



NOTE: The AOC-PG-i2+ add-on card is designed for certain Supermicro motherboards and server systems. Please go to www.supermicro.com for the latest list of supported platforms.

Operating Systems Supported

The AOC-PG-i2+ add-on card supports the following Operating Systems (OS):

- Windows 2000/Windows XP/Windows 2003/Windows 2008/Windows Vista
- Linux
- VMWare

An Important Note to Users

All images and layouts shown in this user's guide are based upon the latest revision available at the time of publishing. The card you have received may or may not look exactly the same as the graphics shown in this manual.

Returning Merchandise for Service

A receipt or copy of your invoice marked with the date of purchase is required before any warranty service will be rendered. You can obtain service by calling your vendor for a Returned Merchandise Authorization (RMA) number. When returning to the manufacturer, the RMA number should be prominently displayed on the outside of the shipping carton, and mailed prepaid or hand-carried. Shipping and handling charges will be applied for all orders that must be mailed when service is complete.

For faster service, RMA authorizations may be requested online at:

<http://www.supermicro.com/support/rma/>

Whenever possible, repack the add-on card in the original Supermicro box, using the original packaging materials. If these are no longer available, be sure to pack the add-on card in an anti-static bag and inside the box. Make sure that there is enough packaging material surrounding the add-on card so that it does not become damaged during shipping.

This warranty only covers normal consumer use and does not cover damages incurred in shipping or from failure due to the alteration, misuse, abuse or improper maintenance of products.

During the warranty period, contact your distributor first for any product problems.

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Notes

Chapter 1

Safety Guidelines

To avoid personal injury and property damage, carefully follow all the safety steps listed below when accessing your system or handling the components.

1-1 ESD Safety Guidelines

Electric Static Discharge (ESD) can damage electronic components. To prevent damage to your system, it is important to handle it very carefully. The following measures are generally sufficient to protect your equipment from ESD.

- Use a grounded wrist strap designed to prevent static discharge.
- Touch a grounded metal object before removing a component from the antistatic bag.
- Handle the add-on card by its edges only; do not touch its components, peripheral chips, memory modules or gold contacts.
- When handling chips or modules, avoid touching their pins.
- Put the card and peripherals back into their antistatic bags when not in use.

1-2 General Safety Guidelines

- Always disconnect power cables before installing or removing any components from the computer.
- Disconnect the power cable before installing or removing any cables from the system.
- Make sure that the add-on card is securely and properly installed on the motherboard to prevent damage to the system due to power shortage.

1-3 An Important Note to Users

All images and layouts shown in this user's guide are based upon the latest PCB Revision available at the time of publishing. The card you have received may or may not look exactly the same as the graphics shown in this manual.

Notes

Chapter 2

Card Components

2-1 Front Components

Figure 2-1 shows the front components of the AOC-PG-i2+ add-on card.

Figure 2-1. AOC-PG-i2+ Add-on Card Front Connectors and Jumpers

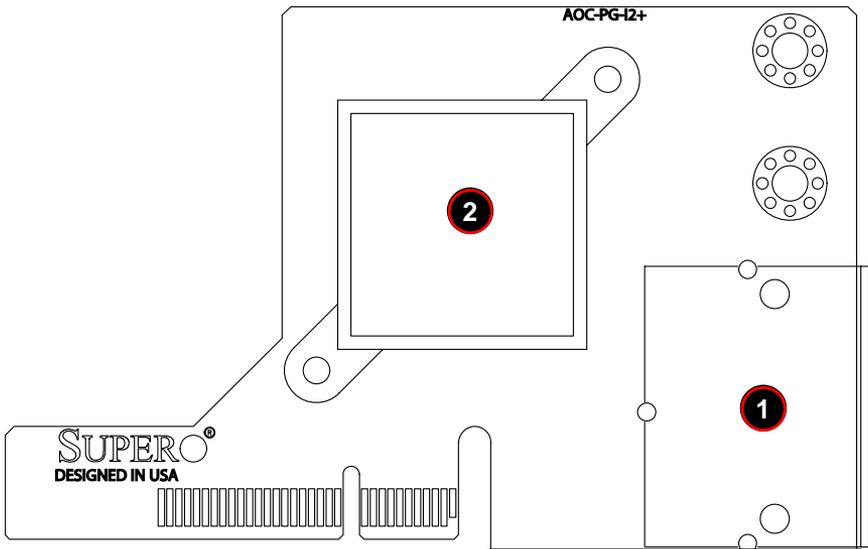


Table 2-1 lists the add-on card's front components and their description.

Table 2-1. Front Connectors and Pin Definitions

Number	Name	Description
1	LAN Connector Ports (2)	Housing with two RJ-45 connectors.
2	Intel 82576 chip	Intel LAN chip

2-2 Front Connectors, Jumpers and LEDs

This section describes the front connectors, jumpers and LEDs found on the AOC-PG-i2+ add-on card.

LAN Ports

LAN ports allow the add-on card to connect to a maximum of two network cables. These are RJ-45 connectors. Each LAN port provides up to one gigabit per second connection speed which require CAT6 cables for maximum throughput.

The ports are designated LAN1 and LAN2.

LAN Port LEDs

Each LAN port includes two LEDs. The LEDs indicate connection speed and activity. See [Table 2-2](#) and [Table 2-3](#) for definitions of these LEDs.



NOTE: Different manufacture of RJ45 Connectors after February 2010 has led to changes in the type and characteristics of LED's used for this add-on card. See the tables below for these differences.

Table 2-2. LAN Port LEDs Before January 2010

LED	Color	Definition
Activity	Amber (blinking)	LAN Activity
Link	Orange	Link speed in 1000-Mb/s
	Green	Link speed in 100-Mb/s
	Off	No connection or link speed at 10-Mb/s

Table 2-3. LAN Port LEDs After February 2010

LED	Color	Definition
Activity	Green (blinking)	LAN Activity
Link	Green	Link speed in 1000-Mb/s
	Off	Link speed in 10/100-Mb/s

2-3 Riser Card

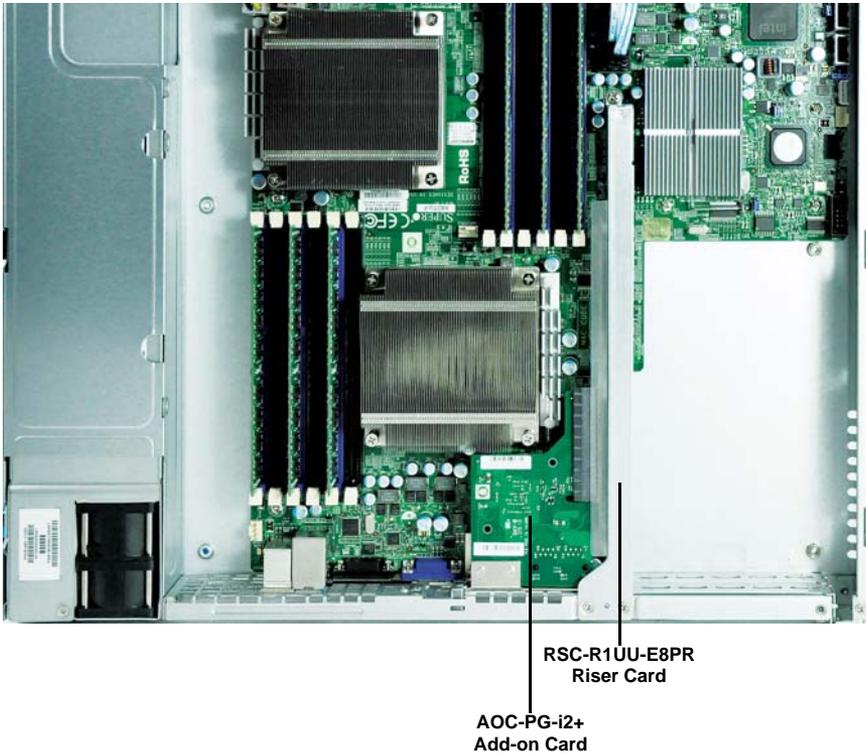
Figure 2-2. RSC-R1UU-E8PR Riser Card



The AOC-PG-i2+ add-on card requires a RSC-R1UU-E8PR riser card for connection to supported systems ([Figure 2-2](#)).

2-4 System Installation

Figure 2-3. Add-on and Riser Cards in System



The AOC-PG-i2+ add-on card and RSC-R1UU-E8PR riser card are installed in a PCI-E slot on the mainboard of the system. Simply connect the AOC-PG-i2+ add-on card to the RSC-R1UU-E8PR riser card and install the riser card into the PCI-E slot on the mainboard (Figure 2-3).

Once installed in the PCI-E slot, simply connect your LAN cables to the ports provided on the side of the chassis (see Figure 2-4).

Figure 2-4. Side View of Add-on Card in System



AOC-PG-i2+
Add-on Card
LAN Ports

Chapter 3

Installing the Drivers

3-1 Installing the Drivers in Microsoft Windows

These instructions apply to all versions of Microsoft™ Windows™ 2000, Windows XP (including Windows XP x64 and Windows XP 64-bit Edition), Windows Vista™ (including Windows Vista x64), and Windows Server™ 2003 (including Windows Server 2003 x64 and Windows Server 2003 64-Bit Edition).

This driver installation updates the drivers for all supported Intel® PRO network adapters in your system.

Before installing or updating the drivers, insert your adapter(s) in the computer and plug in the network cable. When Windows discovers the new adapter, it attempts to find an acceptable Windows driver already installed with the operating system. If found, the driver is installed without any user intervention. If Windows cannot find the driver, the Found New Hardware Wizard window is displayed.

Regardless of whether or not Windows finds the driver, it is recommended that you follow the procedure below to install the driver. The controller comes with driver on the CD-ROM CDR-NIC.

Installing the Drivers

1. If you are installing drivers from the Product CD, insert the CDR-NIC.
If you do not have the Product CD, download drivers from the support web site and transfer them to the system.
2. If the FOUND NEW HARDWARE WIZARD screen is displayed, click CANCEL.
3. SUPERMICRO window appears on the screen.
Click on the computer button next to AOC-PG-i2+.
4. Click on INSTALL DRIVERS AND SOFTWARE.
5. Follow the prompts on screen to complete the installation.

3-2 Intel PROSet for Windows Device Manager

Intel® PROSet for Windows™ Device Manager is an extension to the Windows Device Manager. When you install the Intel PROSet software, additional tabs are automatically added to Device Manager. You can install Intel PROSet on computers running Microsoft Windows 2000, Windows XP, Windows Vista, and Windows Server* 2003, including 64-bit and x64 versions.



NOTE: You must have administrator rights to install or use Intel PROSet for Windows Device Manager.

Installing Intel PROSet for Windows Device Manager

Intel PROSet for Windows Device Manager is installed from the Product CD with the same process used to install drivers. You can select Intel PROSet for Windows Device Manager and Advanced Network Services from the Install Options dialog.

Tips for PROSet Users

If you have used prior versions of Intel PROSet, you should be aware of the following changes with Intel PROSet for Windows Device Manager:

With PROSet:

- There is no system tray icon.
- The configuration utility is not accessible from the CONTROL PANEL or the START menu.
- All Intel PROSet features are now accessed from DEVICE MANAGER. To access features, simply open the DEVICE MANAGER and double-click the Intel adapter you would like to configure.

Removing Intel PROSet for Windows Device Manager

Use ADD/REMOVE PROGRAMS from the CONTROL PANEL to uninstall Intel PROSet for Windows Device Manager.

Receive Side Scaling

RSS must be enabled for Intel® I/O Acceleration Technology to function. You must also install Microsoft's Scalable Networking Pack (SNP) for RSS to function. Intel® PROSet will not display the RSS setting if SNP is not installed.



NOTE: The Scalable Networking Pack is part of Microsoft Windows Server 2003 Service Pack 2. It is not part of Service Pack 1, therefore it requires a separate download. See <http://www.microsoft.com> for more information.

RSS Configuration

RSS is enabled on the Advanced tab of the adapter property sheet. If your adapter does not support RSS, or if the SNP is not installed, the RSS setting will not be displayed.

Teaming

Some RSS teaming considerations are as follows:

- If RSS is not enabled for all adapters in a team, RSS will be disabled for the team.
- If an adapter that does not support RSS is added to a team, RSS will be disabled for the team.
- If a non-Intel adapter is added to a team, RSS will be disabled for the team.
- Non-Intel adapters with RSS enabled cannot be added to a team.

3-3 Installing the Base Driver and Intel PROSet via the Command Line

Installation Methods

The base driver install utility (*SetupBD.exe*) allows unattended install of base drivers from a command line.

Intel® PROSet for Windows™ Device Manager is supported on Microsoft™ Windows™ 2000, Windows XP, Windows Vista, and Microsoft Windows Server* 2003. Use *DxSetup.exe* to Install PROSet for Windows Device Manager.



NOTE: Windows XP x64 and Windows Server 2003 x64 do not support unattended driver installation.

Base Driver Installation

Driver installation is started by running the *SetupBD.exe* file.

Command Line Options

SetupBD.exe supports the following command line switches and options as shown in [Table 3-1](#) and [Table 3-2](#).

Table 3-1. SetupBD.exe Switches

Switch	Description
/s	Silent install with no boot
/r	Force reboot (must be used with the /s switch)
/nr	No reboot (must be used with the /s switch) This switch is ignored if it is included with the /r switch
/u	Uninstall
/infdir directory_name	Search for INF and driver files only in the specified directory

Table 3-2. SetupBD.exe Options

Option	Description
SetupBD	Installs and/or updates the driver(s) and displays the GUI.
SetupBD /s	Installs and/or updates the driver(s) silently.
SetupBD /s /r	Installs and/or updates the driver(s) silently and forces a reboot.
SetupBD /s /r /nr	Installs and/or updates the driver(s) silently and forces a reboot (/nr is ignored).
SetupBD /u	Uninstalls all drivers from the system.
SetupBD /infdir x:\infdir	Installs and/or updates the driver(s), looks for INF and driver files only in the specified directory



NOTE: You must include a space between switches.

In addition, the following considerations should be noted when running *SetupBD.exe* for the driver installation:

- If you uninstall an adapter's driver from Windows Device Manager, you must reboot before using *SetupBD.exe* to install a new driver.
- If you install drivers on a system based on the Intel® 5000 Series Chipset, the /s switch (silent install) forces a reboot without the /r switch. If you do not want the system to reboot, use the /nr switch.
- For Intel® I/O Acceleration Technology to function properly, you must reboot after driver installation.
- You can use the /r and /nr switches only with a silent install (such as with the "/s" option).

Intel PROSet for Windows Device Manager Installation

This section describes how to install Intel PROSet for Windows Device Manager from the command line.



NOTE: Intel PROSet can be installed with *DxSetup.exe* or *msiexec.exe*. Intel recommends using *DxSetup.exe*. *DxSetup.exe* detects the system's language, searches for the appropriate transform file, and applies it to MSI package. The transform file translates the installation instructions to the language associated with your operating system.

Using the DxSetup.exe Utility

DxSetup.exe is a setup utility used for installing Intel PROSet. It detects the system language, searches for the appropriate transform file in the same folder, and then launches *PROSETDX.msi* in the language specific to the operating system. The transform file translates the installation instructions to the language associated with your operating system.

Table 3-3 displays and describes *DxSetup.exe* switches, while Table 3-4 describes its public properties.

Table 3-3. DxSetup.exe Switches

Switch	Description
/q[r n]	Silent install options: <ul style="list-style-type: none"> • r - Reduced GUI install • n - Silent install
/l[! w e a]	Log file options: <ul style="list-style-type: none"> • i - Log status messages • w - Log non-fatal warnings • e - Log error messages • a - Log the start of all actions

Table 3-4. DxSetup.exe Public Properties

Switch	Description
BD	Property settings are: <ul style="list-style-type: none"> • 0 - Deselect / do not execute SetupBD • 1 - Execute SetupBD to install the drivers (default setting) <p>NOTE: BD should only be set to 0 if the Base Drivers have already been installed prior to running <i>DxSetup.exe</i>.</p>
ANS ¹	Property settings are: <ul style="list-style-type: none"> • 0 - Deselect / hide ANS • 1 - Select ANS (default setting)
DMIX	Property settings are: <ul style="list-style-type: none"> • 0 - Deselect / hide Intel PROSet feature • 1 - Select Intel PROSet feature (default setting)

1. The ANS property should only be set to ANS=1 if DMIX=1 is set. If DMIX=0 and ANS=1, the ANS=1 is ignored and only the base driver will be installed.

DxSetup.exe also takes the install options from the command line and applies them to the *PROSETDX.msi* command line installation.



NOTE: Public properties are case sensitive. All characters are uppercase with no white space between characters. For example:

```
DxSetup.exe /qn ANS=1
```

Any white space in “ANS=1” makes the setting invalid. “ans=1” is not a valid setting.

Command Line Examples

You can modify the paths for different operating systems and CD layouts and apply the following command line examples:

Launches a Typical Install Silently:

- `DxSetup.exe /qn /liw`
- `C:\install.log`



NOTE: BD, ANS and DMIX are selected by default.

Installing Components but Deselecting ANS, Setting ANS=0:

- `DxSetup.exe /qn ANS=0 /liw`
- `C:\install.log`

msiexec.exe Command Line Options

Refer to Microsoft's web site (<http://msdn.microsoft.com/library>) for the most current information on *msiexec.exe* command line options.

Please note though that:

- Not all command line options Microsoft provides with *msiexec.exe* have been tested or are necessarily supported for Intel PROSet installation.
- *Msiexec* also sets an error level on return that corresponds to system error codes. For further details, see: <http://msdn.microsoft.com/library> on the Microsoft web site.

Command Line Switches

Table 3-5. Command Line Switches

Switch	Description
/i	Install
/x	Uninstall
/q[r n]	Silent install options: <ul style="list-style-type: none"> • r - Reduced GUI Install • n - Silent install
/l[i w e a]	Log file options: <ul style="list-style-type: none"> • i - Log status messages. • w - Log non-fatal warnings. • e - Log error messages. • a - Log the start of all actions.
Transforms	A property used to apply transforms (a *.mst file) to an MSI package. The following example applies a Chinese language transform to MSI package, so the installer displays Chinese strings during installation: TRANSFORMS=2052.mst

This section describes how to install Intel PROSet using *PROSETDX.msi* and *msiexec.exe* from the command line. For more information on *msiexec.exe* command line parameters, refer to the *msiexec.exe* command line options section.

Windows Installer Service is installed by default in Windows 2000, XP32 and XP64. *msiexec.exe* is under System32 folder. When System32 is not in the current PATH, the full path to *msiexec.exe* should be specified in the command line. For example:

- C:\WINNT\System32\msiexec.exe /i
- PROSETDX.msi /qn /liew
- c:\temp\install.log

Most commonly used *msiexec.exe* command line options are *silent install/upgrade command line syntax* and *Silent Uninstall Command Line Syntax*.

Silent Install/upgrade Command Line Syntax

The following launches a typical installation of *PROSETDX.msi*.

```
<Full path to msiexec.exe> /i <Full path to PROSETDX.msi> /qn /liew <Full path to install.log>
```

Silent Uninstall Command Line Syntax

The following uninstalls all the Intel PROSet components. It can be used when the path to *PROSETDX.msi* is available.

```
<path to msiexec.exe> /x <path to PROSETDX.msi> /qn /liew <path to uninstall.log>
```

Table 3-6. Property Settings

Property	Description
BD	Property settings are: <ul style="list-style-type: none"> • 0 - Deselect / do not execute SetupBD. • 1 - Execute SetupBD to install the drivers. NOTE: In this release, it is set to “1” by default. It is always installed by default in this release. BD should only be set to 0 if the Base Drivers have already been installed prior to running <i>PROSETDX.msi</i> .
ANS	Property Settings are: <ul style="list-style-type: none"> • 0 - Deselect / hide ANS. • 1 - Select ANS. NOTE: In this release, it is set to “1” by default. It is always installed by default in this release.

The following uninstalls all the Intel PROSet components. It can be used when the path to *PROSETDX.msi* is not available but the *ProductCode* of MSI package is known.

```
<path to msiexec.exe> /x <ProductCode of PROSETDX.msi> /qn /
  liew <path to uninstall.log>
```

Command Line Options Supported by PROSETDX.msi

PROSETDX.msi provides public properties that can be used to change Intel PROSet install selections from the command line.

By setting the properties in the command line, you can disable and hide some features in *PROSETDX.msi*, or force some feature to be selected/displayed. This provides the flexibility to install different components/features in Intel PROSet.

Following is the list of public properties provided by *PROSETDX.msi*:

- The ANS property should only be set to ANS=1 if DMIX=1 is set. If DMIX=0 and ANS=1, only the base driver will be installed.
- Public properties are case sensitive. All characters are uppercase with no white space between characters. For example:

```
msiexec.exe /i PROSETDX.msi /qn ANS=1
```

Any white space in “ANS=1” makes the setting invalid. “ans=1” is not a valid setting.

Command Line Install Examples

Assume that *C:\WINNT\System32* is in the system32 folder and *PROSETDX.msi* is under the *D:\Apps\PROSETDX\Win32* folder. You can modify the paths for different operating systems and CD layouts and apply the command line examples.

Command Line Examples

Installing Intel PROSet Silently on Windows XP:

```
C:\WINNT\System32\msiexec.exe /i
  D:\Apps\PROSETDX\Win32\PROSETDX.msi /qn /liew C:\ install.log
```

Installing Intel PROSet Silently on Windows Server 2003 for Itanium®-Based Systems:

```
C:\WINNT\System32\msiexec.exe /i
D:\Apps\PROSETDX\Win64\PROSETDX.msi /qn /liew C:\ install.log
```

Installing Components but Deselecting ANS:

Set the ANS=0 in the command line, for example:

```
C:\WINNT\System32\msiexec.exe /i
D:\Apps\PROSETDX\Win32\PROSETDX.msi /qn ANS=0 /liew C:\
install.log
```

Applying a Transform File to MSI Using msiexec.exe:

Set the TRANSFORMS=filename.mst in the command line. For example:

```
C:\WINNT\System32\msiexec.exe /i
D:\Apps\PROSETDX\Win32\PROSETDX.msi /qn TRANSFORMS=2052.mst /
liew C:\ install.log
```



NOTE: Intel recommends using *DxSetup.exe* to install Intel PROSet since it detects the system's language, searches for the appropriate transform file, and applies it to MSI package.

Command Line Uninstall Example



NOTE: Do not use the "ANS" option when uninstalling Intel PROSet from a command line.

First get the path of *PROSETDX.msi* in the local system or any other image path when you installed Intel PROSet, then use *msiexec.exe* to uninstall Intel PROSet.

For example, assume System folder is *C:\Windows\System*, and *PROSETDX.msi* is in *d:\unattend*, then the command line will be:

```
C:\Windows\System\msiexec.exe /x d:\unattend\ PROSETDX.msi /
qn /liew d:\unattend\uninst.log
```

Command Line Reinstall/Repair

If you need to repair an Intel PROSet installation, uninstall the application and then reinstall it. See the uninstall and install examples above for more information.

Notes

Chapter 4

Linux Base Driver for the PRO/1000 Family of Adapters

4-1 Overview

This chapter describes the Linux* Base Driver for the Intel® PRO/1000 Family of Adapters. This driver supports the 2.4.x and 2.6.x kernels. This driver includes support for Itanium® 2-based systems.

This driver is only supported as a loadable module. Intel is not supplying patches against the kernel source to allow for static linking of the driver. For questions related to hardware requirements, refer to the documentation supplied with your Intel PRO/1000 adapter. All hardware requirements listed apply to use with Linux.

This release includes support for Intel I/O Acceleration Technology, Intel I/OAT. This is supported on systems using the Intel 5000 Series Chipsets Integrated Device - 1A38. You can find additional information on Intel I/OAT at:

<http://www.intel.com/technology/ioacceleration/index.htm>

The following features are now available in supported kernels:

- Native VLANs
- Channel Bonding (teaming)
- SNMP

Channel Bonding documentation can be found in the Linux kernel source:

/documentation/networking/bonding.txt

The driver information previously displayed in the */proc* file system is not supported in this release. Alternatively, you can use *ethtool* (version 1.6 or later), *lspci*, and *ifconfig* to obtain the same information. Instructions on updating *ethtool* can be found in the [Section 4-5: "Additional Configurations"](#) on page 4-9.

4-2 Identifying Your Adapter

For more information on how to identify your adapter, go to the *Adapter & Driver ID Guide* at:

<http://support.intel.com/support/network/adapter/pro100/21397.htm>

For the latest Intel network drivers for Linux, refer to the following website. In the search field, enter your adapter name or type, or use the networking link on the left to search for your adapter:

http://downloadfinder.intel.com/scripts-df/support_intel.asp

4-3 Building and Installation

To build a binary RPM* package of this driver, run

```
rpmbuild -tb <filename.tar.gz>
```

Replace *<filename.tar.gz>* with the specific file name of the driver.



NOTE: For the build to work properly, the currently running kernel **MUST** match the version and configuration of the installed kernel sources. If you have just recompiled the kernel reboot the system now.



NOTE: PM functionality has only been tested in Red Hat distributions.

Building a Binary RPM Package

1. Move the base driver tar file to the directory of your choice. For example, use */home/username/e1000* or */usr/local/src/e1000*.
2. Untar/unzip the archive, where *<x.x.x>* is the version number for the driver tar file:

```
tar xzf e1000-<x.x.x>.tar.gz
```

3. Change to the driver src directory, where *<x.x.x>* is the version number for the driver tar:

```
cd e1000-<x.x.x>/src/
```

4. Compile the driver module:

```
make install
```

The binary will be installed as:

```
/lib/modules/<KERNEL VERSION>/kernel/drivers/net/e1000/  
e1000.[k]o
```

The install location listed above is the default location. This may differ for various Linux distributions. For more information, go to ldistrib.htm.

5. Load the module using either the *insmod* or *modprobe* command:

```
modprobe e1000
```

```
insmod e1000
```

Note that for 2.6 kernels the *insmod* command can be used if the full path to the driver module is specified. For example:

```
insmod /lib/modules/<KERNEL VERSION>/kernel/drivers/net/  
e1000/e1000.ko
```

With 2.6 based kernels also make sure that older e1000 drivers are removed from the kernel, before loading the new module:

```
rmmod e1000; modprobe e1000
```

6. Assign an IP address to the interface by entering the following, where <x> is the interface number:

```
ifconfig eth<x> <IP_address>
```

7. Verify that the interface works. Enter the following, where <IP_address> is the IP address for another machine on the same subnet as the interface that is being tested:

```
ping <IP_address>
```

4-4 Command Line Parameters

If the driver is built as a module, the following optional parameters are used by entering them on the command line with the *modprobe* command using this syntax:

```
modprobe e1000 [<option>=<VAL1>,<VAL2>,...]
```

For example, with two PRO/1000 PCI adapters, entering:

```
modprobe e1000 TxDescriptors=80,128
```

loads the e1000 driver with 80 TX descriptors for the first adapter and 128 TX descriptors for the second adapter.

The default value for each parameter is generally the recommended setting, unless otherwise noted.



NOTE: For more information about the *AutoNeg*, *Duplex*, and *Speed* parameters, see the Speed and Duplex Configuration section in this document.

For more information about the *InterruptThrottleRate*, *RxIntDelay*, *TxIntDelay*, *RxAbsIntDelay* and *TxAbsIntDelay* parameters, see the application note at:

<http://www.intel.com/design/network/aplnots/ap450.htm>

A descriptor describes a data buffer and attributes related to the data buffer. This information is accessed by the hardware.

Table 4-1. Command Line Parameter Settings

Parameter Name	Valid Range/ Settings	Default	Description
AutoNeg	0x01-0x0F, 0x20-0x2F	0x2F	<p>This parameter is a bit mask that specifies which speed and duplex settings the board advertises. When this parameter is used, the <i>Speed</i> and <i>Duplex</i> parameters must not be specified.</p> <p>This parameter is supported only on adapters using copper connections.</p> <p>NOTE: Refer to the Speed and Duplex section of this readme for more information on the <i>AutoNeg</i> parameter.</p>
Duplex	0-2 (0=auto-negotiate, 1=half, 2=full)	0	<p>Defines the direction in which data is allowed to flow. Can be either one or two-directional. If both <i>Duplex</i> and the link partner are set to auto-negotiate, the board auto-detects the correct duplex. If the link partner is forced (either full or half), <i>Duplex</i> defaults to half-duplex.</p> <p>This parameter is supported only on adapters using copper connections.</p>
FlowControl	0-3 (0=none, 1=Rx only, 2=Tx only, 3=Rx&Tx)	Read flow control settings from the EEPROM	<p>This parameter controls the automatic generation(Tx) and response(Rx) to Ethernet PAUSE frames.</p>
Interrupt - ThrottleRate	<p>(not supported on Intel(R) 82542, 82543 or 82544-based adapters)</p> <p>Valid Range: 0,1,3,100-100000 (0=off, 1=dynamic, 3=dynamic conservative)</p>	3	<p>Since 7.3.x, the driver has two adaptive modes (setting 1 or 3) in which it dynamically adjusts the <i>InterruptThrottleRate</i> value based on the traffic that it receives. After determining the type of incoming traffic in the last timeframe, it will adjust the <i>InterruptThrottleRate</i> to an appropriate value for that traffic.</p> <p>The algorithm classifies the incoming traffic every interval into classes. Once the class is determined, the <i>InterruptThrottleRate</i> value is adjusted to suit that traffic type the best.</p> <p>There are three classes defined:</p> <ul style="list-style-type: none"> • Bulk traffic – for large amounts of packets of normal size • Low latency – for small amounts of traffic and/ or a significant percentage of small packets • Lowest latency – for almost completely small packets or minimal traffic <p>In dynamic conservative mode, the <i>InterruptThrottleRate</i> value is set to 4000 for traffic that falls in class "Bulk traffic". If traffic falls in the "Low latency" or "Lowest latency" class, the <i>InterruptThrottleRate</i> is increased stepwise to 20000. This default mode is suitable for most applications.</p> <p>See the Footnote¹ at the end of this table for more information.</p>

Table 4-1. Command Line Parameter Settings (Continued)

Parameter Name	Valid Range/Settings	Default	Description
RxDescriptors	80-256 for 82542 and 82543-based adapters 80-4096 for all other supported adapters	256	<p>This value specifies the number of receive buffer descriptors allocated by the driver. Increasing this value allows the driver to buffer more incoming packets, at the expense of increased system memory utilization.</p> <p>Each descriptor is 16 bytes. A receive buffer is also allocated for each descriptor and can be either 2048, 4096, 8192, or 16384 bytes, depending on the MTU setting. The maximum MTU size is 16110.</p> <p>NOTE: MTU designates the frame size, and it only needs to be set for Jumbo Frames. Depending on the available system resources, the request for a higher number of receive descriptors may be denied. In this case, use a lower number.</p>
RxIntDelay	0-65535 (0=off)	0	<p>This value delays the generation of receive interrupts in units of 1.024 microseconds. Receive interrupt reduction can improve CPU efficiency if properly tuned for specific network traffic. Increasing this value adds extra latency to frame reception and can end up decreasing the throughput of TCP traffic. If the system is reporting dropped receives, this value may be set too high, causing the driver to run out of available receive descriptors.</p> <p>WARNING: When setting <i>RxIntDelay</i> to a value other than 0, adapters may hang (stop transmitting) under certain network conditions. If this occurs a NETDEV WATCHDOG message is logged in the system event log. In addition, the controller is automatically reset, restoring the network connection. To eliminate the potential for the hang ensure that <i>RxIntDelay</i> is set to zero.</p>
RxAbsIntDelay	0-65535 (0=off)	128	<p>This value, in units of 1.024 microseconds, limits the delay in which a receive interrupt is generated. Useful only if <i>RxIntDelay</i> is non-zero, this value ensures that an interrupt is generated after the initial packet is received within the set amount of time. Proper tuning, along with <i>RxIntDelay</i>, may improve traffic throughput in specific network conditions.</p> <p>This parameter is supported only on 82540, 82545 and later adapters.</p>
Speed	0, 10, 100, 1000	0	<p><i>Speed</i> forces the line speed to the specified value in megabits per second (Mbps). If this parameter is not specified or is set to 0 and the link partner is set to auto-negotiate, the board will auto-detect the correct speed. <i>Duplex</i> must also be set when Speed is set to either 10 or 100.</p> <p>This parameter is supported only on adapters using copper connections.</p>

Table 4-1. Command Line Parameter Settings (Continued)

Parameter Name	Valid Range/Settings	Default	Description
TxDescriptors	80-256 for 82542 and 82543-based adapters 80-4096 for all other supported adapters	256	This value is the number of transmit descriptors allocated by the driver. Increasing this value allows the driver to queue more transmits. Each descriptor is 16 bytes.
TxIntDelay	0-65535 (0=off)	64	This value delays the generation of transmit interrupts in units of 1.024 microseconds. Transmit interrupt reduction can improve CPU efficiency if properly tuned for specific network traffic. If the system is reporting dropped transmits, this value may be set too high causing the driver to run out of available transmit descriptors.
TxAbsIntDelay	0-65535 (0=off)	64	This value, in units of 1.024 microseconds, limits the delay in which a transmit interrupt is generated. Useful only if <i>TxIntDelay</i> is non-zero, this value ensures that an interrupt is generated after the initial packet is sent on the wire within the set amount of time. Proper tuning, along with <i>TxIntDelay</i> , may improve traffic throughput in specific network conditions. This parameter is supported only on 82540, 82545 and later adapters.
XsumRX	0-1	1	A value of '1' indicates that the driver should enable IP checksum offload for received packets (both UDP and TCP) to the adapter hardware. This parameter is not supported on the 82542-based adapter.

1. *InterruptThrottleRate* takes precedence over the *TxAbsIntDelay* and *RxAbsIntDelay* parameters. In other words, minimizing the receive and/or transmit absolute delays does not force the controller to generate more interrupts than what the Interrupt Throttle Rate allows.

Notes on InterruptThrottleRate

Since 7.3.x, the driver has two adaptive modes (setting 1 or 3) in which it dynamically adjusts the *InterruptThrottleRate* value based on the traffic that it receives. After determining the type of incoming traffic in the last time frame, it will adjust the *InterruptThrottleRate* to an appropriate value for that traffic.

The algorithm classifies the incoming traffic every interval into classes. Once the class is determined, the *InterruptThrottleRate* value is adjusted to suit that traffic type the best. There are three classes defined: "Bulk traffic", for large amounts of packets of normal size; "Low latency", for small amounts of traffic and/or a significant percentage of small packets; and "Lowest latency", for almost completely small packets or minimal traffic.

In dynamic conservative mode, the *InterruptThrottleRate* value is set to 4000 for traffic that falls in class “Bulk traffic”. If traffic falls in the “Low latency” or “Lowest latency” class, the *InterruptThrottleRate* is increased stepwise to 20000. This default mode is suitable for most applications.

For situations where low latency is vital such as cluster or grid computing, the algorithm can reduce latency even more when *InterruptThrottleRate* is set to mode 1. In this mode, which operates the same as mode 3, the *InterruptThrottleRate* will be increased stepwise to 70000 for traffic in class “Lowest latency”.

Setting *InterruptThrottleRate* to 0 turns off any interrupt moderation and may improve small packet latency, but is generally not suitable for bulk throughput traffic.



WARNING: If you are using the Intel(R) PRO/1000 CT Network Connection (controller 82547), setting *InterruptThrottleRate* to a value greater than 75,000, may hang (stop transmitting) adapters under certain network conditions. If this occurs a NETDEV WATCHDOG message is logged in the system event log.

In addition, the controller is automatically reset, restoring the network connection. To eliminate the potential for the hang, ensure that *InterruptThrottleRate* is set no greater than 75,000 and is not set to 0.



NOTE: When e1000 is loaded with default settings and multiple adapters are in use simultaneously, the CPU utilization may increase non-linearly. In order to limit the CPU utilization without impacting the overall throughput, we recommend that you load the driver as follows:

```
modprobe e1000 InterruptThrottleRate=3000,3000,3000
```

This sets the *InterruptThrottleRate* to 3000 interrupts/sec for the first, second, and third instances of the driver. The range of 2000 to 3000 interrupts per second works on a majority of systems and is a good starting point, but the optimal value will be platform-specific. If CPU utilization is not a concern, use RX_POLLING (NAPI) and default driver settings.

Speed and Duplex Configuration

Three keywords are used to control the speed and duplex configuration. These keywords are *Speed*, *Duplex*, and *AutoNeg*.

If the board uses a fiber interface, these keywords are ignored, and the fiber interface board only links at 1000 Mbps full-duplex.

For copper-based boards, the keywords interact as follows:

The default operation is auto-negotiate. The board advertises all supported speed and duplex combinations, and it links at the highest common speed and duplex mode IF the link partner is set to auto-negotiate.

If *Speed* = 1000, limited auto-negotiation is enabled and only 1000 Mbps is advertised (The 1000BaseT spec requires auto-negotiation.)

If Speed = 10 or 100, then both Speed and Duplex should be set. Auto-negotiation is disabled, and the AutoNeg parameter is ignored. Partner SHOULD also be forced.

The *AutoNeg* parameter is used when more control is required over the auto-negotiation process. It should be used when you wish to control which speed and duplex combinations are advertised during the auto-negotiation process. The parameter may be specified as either a decimal or hexadecimal value as determined by [Table 4-2](#) below.

Table 4-2. AutoNeg Parameter Values

Bit Position	Decimal Value	Hex Value	Speed (Mbps)	Duplex
7	128	80	N/A	–
6	64	40	N/A	–
5	32	20	1000	Full
4	16	10	N/A	–
3	8	8	100	Full
2	4	4	100	Half
1	2	1	10	Full
0	1	1	10	Half

Some examples of using *AutoNeg*:

- modprobe e1000 AutoNeg=0x01 (Restricts autonegotiation to 10 Half)
- modprobe e1000 AutoNeg=1 (Same as above)
- modprobe e1000 AutoNeg=0x02 (Restricts autonegotiation to 10 Full)
- modprobe e1000 AutoNeg=0x03 (Restricts autonegotiation to 10 Half or 10 Full)
- modprobe e1000 AutoNeg=0x04 (Restricts autonegotiation to 100 Half)
- modprobe e1000 AutoNeg=0x05 (Restricts autonegotiation to 10 Half or 100 Half)
- modprobe e1000 AutoNeg=0x020 (Restricts autonegotiation to 1000 Full)
- modprobe e1000 AutoNeg=32 (Same as above)

Note that when this parameter is used, *Speed* and *Duplex* must not be specified.

If the link partner is forced to a specific speed and duplex, then this parameter should not be used. Instead, use the *Speed* and *Duplex* parameters previously mentioned to force the adapter to the same speed and duplex.

4-5 Additional Configurations

Configuring the Driver on Different Distributions

Configuring a network driver to load properly when the system is started is distribution dependent. Typically, the configuration process involves adding an alias line to `/etc/modules.conf` or `/etc/modprobe.conf` as well as editing other system startup scripts and/or configuration files. Many popular Linux distributions ship with tools to make these changes for you. To learn the proper way to configure a network device for your system, refer to your distribution documentation. If during this process you are asked for the driver or module name, the name for the Linux Base Driver for the Intel® PRO/1000 family of adapters is `e1000`.

As an example, if you install the `e1000` driver for two PRO/1000 adapters (`eth0` and `eth1`) and set the speed and duplex to `10full` and `100half`, add the following to `modules.conf` or `/etc/modprobe.conf`:

```
alias eth0 e1000
alias eth1 e1000
options e1000 Speed=10,100 Duplex=2,1
```

Viewing Link Messages

Link messages will not be displayed to the console if the distribution is restricting system messages. In order to see network driver link messages on your console, set `dmesg` to eight by entering the following:

```
dmesg -n 8
```



NOTE: This setting is not saved across reboots.

Jumbo Frames

Jumbo Frames support is enabled by changing the Maximum Transmission Unit (MTU) to a value larger than the default value of 1500. Use the `ifconfig` command to increase the MTU size. For example:

```
ifconfig eth<x> mtu 9000 up
```

This setting is not saved across reboots. The setting change can be made permanent by adding `MTU=9000` to the file: `/etc/sysconfig/network-scripts/ifcfg-eth-<x>` (Red Hat distributions). Other distributions may store this setting in a different location.



NOTE: To enable Jumbo Frames, increase the MTU size on the interface beyond 1500.



NOTE: The maximum MTU setting for Jumbo Frames is 16110. This value coincides with the maximum Jumbo Frames size of 16128.

Some Intel gigabit adapters that support Jumbo Frames have a frame size limit of 9238 bytes, with a corresponding MTU size limit of 9216 bytes. The adapters with this limitation are based on the Intel® 82571EB, 82572EI, 82573L and 80003ES2LAN controllers. These correspond to the following product names:

- Intel® PRO/1000 PT Server Adapter
- Intel® PRO/1000 PT Desktop Adapter
- Intel® PRO/1000 PT Network Connection
- Intel® PRO/1000 PT Dual Port Server Adapter
- Intel® PRO/1000 PT Dual Port Network Connection
- Intel® PRO/1000 PF Server Adapter
- Intel® PRO/1000 PF Network Connection
- Intel® PRO/1000 PF Dual Port Server Adapter
- Intel® PRO/1000 PB Server Connection
- Intel® PRO/1000 PL Network Connection
- Intel® PRO/1000 EB Network Connection with I/O Acceleration
- Intel® PRO/1000 EB Backplane Connection with I/O Acceleration
- Intel® PRO/1000 PT Quad Port Server Adapter



WARNING: Using Jumbo Frames at 10 or 100 Mbps may result in poor performance or loss of link.

Adapters based on the Intel® 82542 and 82573V/E controller do not support Jumbo Frames. These correspond to the following product names:

- Intel® PRO/1000 Gigabit Server Adapter
- Intel® PRO/1000 PM Network Connection

The following adapters do not support Jumbo Frames:

- Intel® 82562V 10/100 Network Connection
- Intel® 82566DM Gigabit Network Connection
- Intel® 82566DC Gigabit Network Connection
- Intel® 82566MM Gigabit Network Connection
- Intel® 82566MC Gigabit Network Connection
- Intel® 82562GT 10/100 Network Connection
- Intel® 82562G 10/100 Network Connection

Ethtool

The driver utilizes the *Ethtool* interface for driver configuration and diagnostics, as well as displaying statistical information. *Ethtool* version 1.6 or later is required for this functionality.

The latest release of *Ethtool* can be found at: <http://sourceforge.net/projects/gkernel>.



NOTE: *Ethtool* 1.6 only supports a limited set of *ethtool* options. Support for a more complete *Ethtool* feature set can be enabled by upgrading *Ethtool* to *Ethtool*-1.8.1.

Enabling Wake on LAN* (WoL)

WoL is configured through the *Ethtool* utility. *Ethtool* is included with all versions of Red Hat after Red Hat 7.2. For other Linux distributions, download and install *Ethtool* from the following website: <http://sourceforge.net/projects/gkernel>.

For instructions on enabling *WoL* with *Ethtool*, refer to the website listed above.

WoL will be enabled on the system during the next shut down or reboot. For this driver version, in order to enable *WoL*, the *e1000* driver must be loaded prior to shutting down or suspending the system.



NOTE: Wake On LAN is only supported on port A for the following devices:

- * Intel® PRO/1000 PT Dual Port Network Connection
- * Intel® PRO/1000 PT Dual Port Server Connection
- * Intel® PRO/1000 PT Dual Port Server Adapter
- * Intel® PRO/1000 PF Dual Port Server Adapter
- * Intel® PRO/1000 PT Quad Port Server Adapter

NAPI

NAPI (Rx polling mode) is supported in the *e1000* driver. *NAPI* is enabled or disabled based on the configuration of the kernel. To override the default, use the following compile-time flags.

To enable *NAPI*, compile the driver module, passing in a configuration option:

```
make CFLAGS_EXTRA=-DE1000_NAPI install
```

To disable *NAPI*, compile the driver module, passing in a configuration option:

```
make CFLAGS_EXTRA=-DE1000_NO_NAPI install
```

See <http://www.cyberus.ca/~hadi/usenix-paper.tgz> for more information on *NAPI*.

Notes

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Notes