Product Supplement Document for the Intel® Desktop Board D845GRG

A companion document to the *Technical Product Specification for Intel® Desktop Boards using the Intel® 845G Chipset*

April 2002

Order Number: A85837-001

Intel® Desktop Boards using the Intel® 845G Chipset may contain design defects or errors known as errata that may cause the product to deviate from published specifications. Current characterized errata are documented in the Specification Update for Intel Desktop Boards using the Intel 845G Chipset.

Revision History

Revision	Revision History	Date
-001	First release of the Product Supplement Document for the Intel® Desktop Board D845GRG.	April 2002

This document applies to only the standard Intel Desktop Board D845GRG with BIOS identifier RG84510.86A.

Changes to this specification will be published in the *Specification Update for Intel Desktop Boards using the Intel® 845G Chipset* before being incorporated into a revision of this document.

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Preface

This Product Supplement Document specifies the major components, layout, connectors, and environmental requirements for the Intel Desktop Board D845GRG.

Intended Audience

The document is intended to provide detailed, technical information about the Intel Desktop Board D845GRG and its components to the vendors, system integrators, and other engineers and technicians who need this level of information. It is specifically *not* intended for general audiences.

What This Document Contains

As stated on the cover, this is a companion document to the *Technical Product Specification for Intel Desktop Boards using the Intel 845G Chipset*. The Technical Product Specification (order number: A81229-001) is more general in nature, describing features common to multiple Desktop Boards that use the Intel 845G chipset. This document describes features specific (though not necessarily exclusive) to the Intel Desktop Board D845GRG.

Chapter	Description
1	An overview of the features of the Intel Desktop Board D845GRG.
2	A description of the features specific to this product. This chapter also includes drawings of the Desktop Board showing the locations of connectors.
3	Describes the regulatory compliance information specific to the Intel Desktop Board D845GRG.

Typographical Conventions

This section contains information about the conventions used in this specification. Not all of these symbols and abbreviations appear in all specifications of this type.

Notes, Cautions, and Warnings

NOTE

Notes call attention to important information.

INTEGRATOR'S NOTES

Integrator's notes are used to call attention to information that may be useful to system integrators.

CAUTION

Cautions are included to help you avoid damaging hardware or losing data.

WARNING

Warnings indicate conditions, which if not observed, can cause personal injury.

Other Common Notation

#	Used after a signal name to identify an active-low signal (such as USBP0#)
(NxnX)	When used in the description of a component, N indicates component type, xn are the relative coordinates of its location on the Desktop Board, and X is the instance of the particular part at that general location. For example, J5J1 is a connector, located at 5J. It is the first connector in the 5J area.
GB	Gigabyte (1,073,741,824 bytes)
GB/sec	Gigabytes per second
KB	Kilobyte (1024 bytes)
Kbit	Kilobit (1024 bits)
kbits/sec	1000 bits per second
MB	Megabyte (1,048,576 bytes)
MB/sec	Megabytes per second
Mbit	Megabit (1,048,576 bits)
Mbit/sec	Megabits per second
xxh	An address or data value ending with a lowercase h indicates a hexadecimal value.
x.x V	Volts. Voltages are DC unless otherwise specified.
†	This symbol is used to indicate third-party brands and names that are the property of their respective owners.

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1 Overview

1.1 Feature Summary

Table 1 summarizes the major features of the Intel® Desktop Board D845GRG.

Table 1. Feature Summary

Form Factor	microATX (9.60 inches by 8.20 inches)
Processor	• Support for an Intel® Pentium® 4 processor in a µPGA478 socket with a 400/533 MHz system bus • Support for an Intel® Celeron® processor in a µPGA478 socket with a 400 MHz system bus
Memory	• Two 184-pin Double Data Rate (DDR) SDRAM Dual Inline Memory Module (DIMM) sockets • Support for single-sided or double-sided DIMMs (DDR 200 and DDR 266) • Support for up to 2 GB system memory ***NOTE:*** *Desktop Boards using the Intel® 845G Chipset Desktop Board have been designed to support DIMMs based on 512 Mbit technology for a maximum onboard capacity of up to 2 GB, but this technology has not been validated. Please refer to the following Intel web site for the latest list of tested memory:* http://developer.intel.com/design/motherbd/rg/rg_mem.htm
Chipset	Intel® 845G Chipset, consisting of: • Intel® 82845G Graphics and Memory Controller Hub (GMCH) • Intel® 82801DB I/O Controller Hub (ICH4) • 4 Mbit Firmware Hub (FWH)
Audio	Audio subsystem for AC '97 processing using the Analog Devices AD1981A codec
Video	• Intel® Extreme Graphics controller • AGP connector supporting 1x, 2x, and 4x AGP cards (1.5 V only) or an AGP Digital Display (ADD) card • Integrated retention mechanism
I/O Control	LPC Bus I/O controller (SMSC LPC47M172 or National Semiconductor PC87372)
Peripheral Interfaces	• Up to six USB ports • One serial port • One parallel port • Two IDE interfaces with UDMA 33, ATA-66/100 support • One diskette drive interface • PS/2† keyboard and mouse ports • Three fan connectors
Expansion Capabilities	Three PCI bus add-in card connectors (SMBus routed to PCI bus connector 2)

continued

Table 1. Feature Summary (continued)

Hardware Monitor Subsystem	• Voltage sense to detect out of range power supply voltages • Thermal sense to detect out of range thermal values • Two fan sense inputs used to monitor fan activity • Fan speed control • Hardware management ASIC
BIOS	• Intel/AMI BIOS (resident in the 4 Mbit FWH) • Support for Advanced Configuration and Power Interface (ACPI), Plug and Play, and SMBIOS
Instantly Available PC Technology	• Support for PCI Local Bus Specification Revision 2.2 • Suspend to RAM support • Wake on PCI, CNR, RS-232, front panel, PS/2 devices, and USB ports
CNR	One Communication and Networking Riser (CNR) connector (slot shared with PCI bus connector 3)
LAN	Intel® 82562ET 10/100 Mbit/sec Platform LAN Connect (PLC) device

NOTE

The LAN subsystem and the CNR connector are mutually exclusive features.

1.2 Online Support

To find information about…	Visit this World Wide Web site:
The Intel Desktop Board D845GRG under "Product Info" or "Customer Support"	http://www.intel.com/design/motherbd http://support.intel.com/support/motherboards/desktop
Available configurations for the Intel Desktop Board D845GRG	http://developer.intel.com/design/motherbd/rg/rg_available.htm

1.3 Footnote Cross Reference

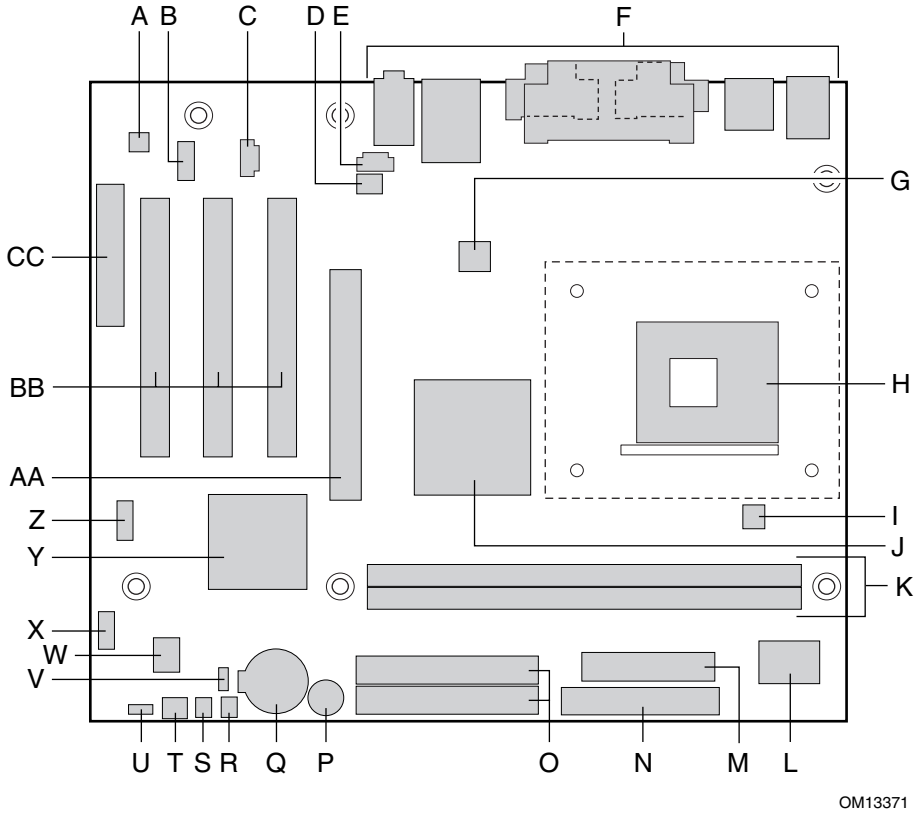
This document is a companion document to the *Technical Product Specification for Intel Desktop Boards using the Intel 845G Chipset.* The Technical Product Specification (order number: A81229-001) contains footnotes that refer you to this document for information specific to this Desktop Board. Table 2 lists all of the footnotes in the Technical Product Specification that refer to this document.

Table 2. Cross Reference of Footnotes from the Technical Product Specification

Footnote Number	Footnote Text	Cross Reference
1	Form factors are product-dependent.	The Desktop Board D845GRG uses the microATX form-factor. See Section 2.5 on page 27 for more information on the form factor.
2	Memory support (DDR SDRAM or SDR SDRAM) is product-dependent.	The Desktop Board D845GRG supports DDR SDRAM.
6	Some Desktop Boards may use a different BIOS core.	The D845GRG Desktop Board uses an Intel/AMI BIOS core.
7	Memory support (DDR SDRAM or SDR SDRAM) is product-dependent.	The Desktop Board D845GRG supports DDR SDRAM.
8	Memory support (DDR SDRAM or SDR SDRAM) is product-dependent.	The Desktop Board D845GRG supports DDR SDRAM.
9	Processor support is product-dependent.	Supported processors are listed in Section 2.1 on page 11.
10	Memory support (DDR SDRAM or SDR SDRAM) is product-dependent.	The Desktop Board D845GRG supports DDR SDRAM.
12	The front panel audio connector can also be used as a jumper block for routing audio signals.	Figure 3 on page 15 shows the location of the front panel audio connector. Table 4 on page 16 lists the signal names when this connector is used as a front panel audio connector. Section 2.3.1 on page 24 describes the jumper settings when this connector is used as a jumper block.
17	Standby current requirements are product dependent.	Power usage and standby current requirements are described in Section 2.6.3 on page 29.
19	Standby current requirements are product dependent.	Power usage and standby current requirements are described in Section 2.6.3 on page 29.
20	Standby current requirements are product dependent.	Power usage and standby current requirements are described in Section 2.6.3 on page 29.
21	The location of the standby power indicator LED is product dependent.	Figure 9 on page 31 shows the location of the standby power indicator LED.
22	Some Desktop Boards may use a different BIOS core.	The Desktop Board D845GRG uses an Intel/AMI BIOS core.

1.4 Board Layout

Figure 1 shows the location of the major components on the Desktop Board D845GRG.



A	Audio codec	P	Speaker
B	Front panel audio connector	Q	Battery
C	Auxiliary line-in connector	R	SCSI LED connector
D	Rear chassis fan connector	S	Chassis intrusion connector
E	ATAPI CD-ROM connector	T	Front chassis fan connector
F	Back panel connectors	U	BIOS Setup configuration jumper block
G	+12V power connector (ATX12V)	V	Auxiliary front panel power LED connector
H	µPGA478 processor socket	W	4 Mbit Firmware Hub (FWH)
I	Processor fan connector	X	Front panel connector
J	Intel 82845G Graphics and Memory Controller Hub (GMCH)	Y	Intel 82801DB I/O Controller Hub (ICH4)
K	DIMM sockets	Z	Front panel USB connector
L	I/O Controller	AA	AGP connector
M	Power connector	BB	PCI bus add-in card connectors
N	Diskette drive connector	CC	CNR connector (optional)
O	IDE connectors		

Figure 1. Desktop Board D845GRG Components

2 Product-Specific Features

2.1 Processor Support

⚠ CAUTION

Use only the processors listed below. Use of unsupported processors can damage the Desktop Board, the processor, and the power supply. See the Specification Update for Intel® Desktop Boards using the Intel 845G Chipset *for the most up-to-date list of supported processors for these boards.*

The Desktop Boards provide a µPGA478 processor socket. Table 3 lists the supported processors. All supported onboard memory can be cached. See the processor's data sheet for cachability limits.

Table 3. Supported Processors

Type	Designation	System Bus	L2 Cache Size
Celeron processor	1.7, 1.8, and 1.9 GHz	400 MHz	128 KB
Pentium 4 processor	1.4, 1.5, 1.6, 1.7, 1.8, 1.9, and 2.0 GHz	400 MHz	256 KB
Pentium 4 processor	1.6A, 1.8A, 2.0A, 2.2, and 2.4 GHz	400 MHz	512 KB
Pentium 4 processor	2.26 and 2.4B GHz	533 MHz	512 KB

INTEGRATOR'S NOTES

- *Use only ATX12V- or SFX12V-compliant power supplies with this Desktop Board. ATX12V and SFX12V power supplies have an additional power lead that provides required supplemental power for the processor. Always connect the 20-pin and 4-pin leads of ATX12V and SFX12V power supplies to the corresponding connectors on the Desktop Board, otherwise the Desktop Board will not boot.*
- *Do not use a standard ATX power supply. The Desktop Board will not boot with a standard ATX power supply.*

2.2 Connectors

⚠ CAUTION

Only the back panel USB, front panel USB, VGA, and PS/2 connectors have overcurrent protection. The Desktop Boards' internal connectors are not overcurrent protected and should connect only to devices inside the computer's chassis, such as fans and internal peripherals. Do not use these connectors to power devices external to the computer's chassis. A fault in the load presented by the external devices could cause damage to the computer, the interconnecting cable, and the external devices themselves.

This section describes the Desktop Board's connectors. The connectors can be divided into the following groups:

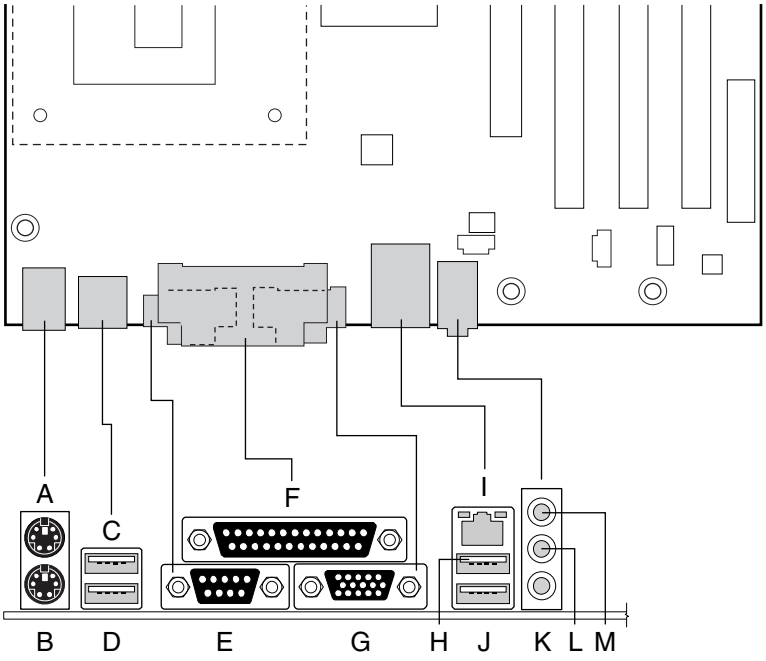
- Back panel I/O connectors (see page 13)
  - PS/2 keyboard and mouse
  - USB
  - Parallel port
  - Serial port
  - VGA
  - LAN (optional)
  - Audio (line out, line in, and mic in)
- Internal I/O connectors (see page 14)
  - Audio (auxiliary line input, ATAPI CD-ROM, and front panel audio)
  - Fans
  - Power
  - Add-in boards (PCI and AGP)
  - CNR (optional)
  - IDE
  - Diskette drive
  - SCSI LED
  - Chassis intrusion
- External I/O connectors (see page 21)
  - Front panel USB
  - Front panel (power/sleep/message-waiting LED, power switch, hard drive activity LED, reset switch, and auxiliary front panel power LED)
  - Auxiliary front panel power/sleep/message-waiting LED

INTEGRATOR'S NOTE

When installing the Desktop Board in a microATX chassis, make sure that peripheral devices are installed at least 1.5 inches above the main power connector, the diskette drive connector, the IDE connector, and the DIMM sockets.

2.2.1 Back Panel Connectors

Figure 2 shows the location of the back panel connectors. The back panel connectors are color-coded in compliance with PC 99 recommendations. The figure legend below lists the colors used.



Item	Description	Color
A	PS/2 mouse port	Green
B	PS/2 keyboard port	Purple
C	USB port (optional)	Black
D	USB port (optional)	Black
E	Serial port A	Teal
F	Parallel port	Burgundy
G	VGA	Dark blue
H	USB port	Black
I	LAN (optional)	Black
J	USB port	Black
K	Mic in	Pink
L	Audio line out	Lime green
M	Audio line in	Light blue

Figure 2. Back Panel Connectors

INTEGRATOR'S NOTE

The back panel audio line out connector is designed to power headphones or amplified speakers only. Poor audio quality occurs if passive (non-amplified) speakers are connected to this output.

2.2.2 Internal I/O Connectors

The internal I/O connectors are divided into the following functional groups:

- Audio, power, and hardware control (see page 15)
  - Auxiliary line in
  - ATAPI CD-ROM
  - Front panel audio
  - Fans
  - ATX12V power
  - Main power
- Add-in boards and peripheral interfaces (see page 19)
  - CNR (optional)
  - PCI bus
  - AGP
  - IDE
  - Diskette drive
  - SCSI LED

2.2.2.1 Expansion Slots

The Desktop Board has the following expansion slots:

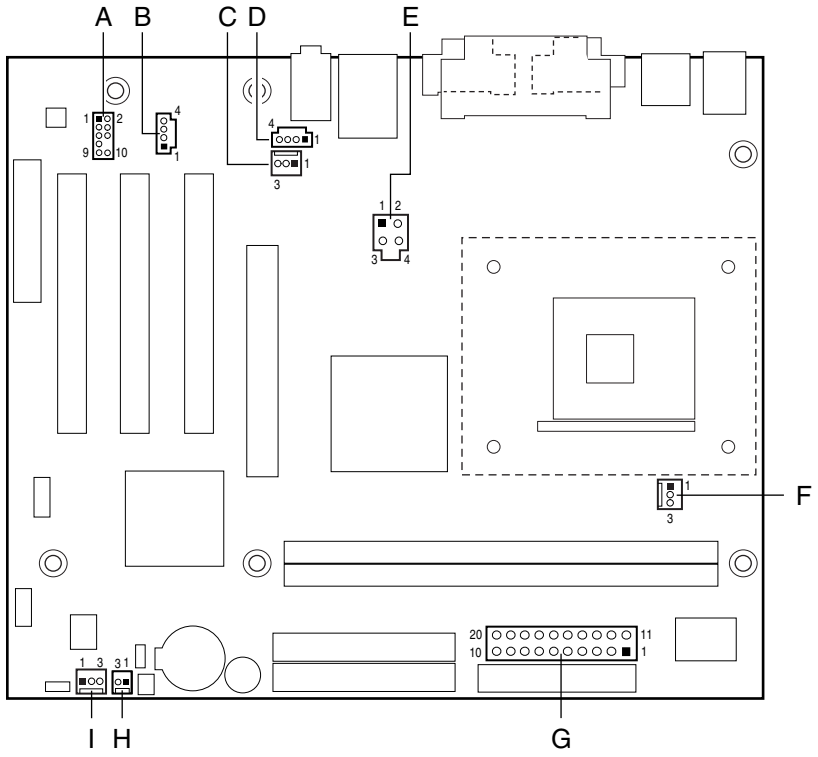
- One AGP connector. The AGP connector is keyed for 1.5 V AGP cards only. Do not install a legacy 3.3 V AGP card. The AGP connector is not mechanically compatible with legacy 3.3 V AGP cards.
- Three PCI rev 2.2 compliant local bus slots. The SMBus is routed to PCI bus connector 2.
- One CNR (optional), shared with PCI bus connector 3 (ATX expansion slot 1).

INTEGRATOR'S NOTE

This document references back-panel slot numbering with respect to processor location on the Desktop Board. The AGP slot is not numbered. PCI slots are identified as PCI slot #x, starting with the slot closest to the processor. The CNR slot shares an ATX expansion slot 3. The ATX/microATX specifications identify expansion slot locations with respect to the far edge of a full-sized ATX chassis. The ATX specification and the Desktop Board's silkscreen are opposite and could cause confusion. The ATX numbering convention is made without respect to slot type (PCI vs. AGP), but refers to an actual slot location on a chassis. Figure 4 on page 19 illustrates the Desktop Board's PCI slot numbering.

2.2.2.2 Audio, Power, and Hardware Control Connectors

Figure 3 shows the location of the audio, power, and hardware control connectors.



Item	Description	For more information see:
A	Front panel audio	Table 4
B	Auxiliary line in, ATAPI style (white)	Table 5
C	Rear chassis fan	Table 6
D	ATAPI CD-ROM (black)	Table 7
E	+12 V power connector (ATX12V)	Table 8
F	Processor fan	Table 9
G	Main power	Table 10
H	Chassis intrusion	Table 11
I	Front chassis fan	Table 12

Figure 3. Audio, Power, and Hardware Control Connectors

Table 4. Front Panel Audio Connector

Pin	Signal Name	Pin	Signal Name
1	MIC_IN	2	Ground
3	MIC_BIAS	4	+5 V
5	RIGHT_OUT	6	RIGHT_IN
7	Ground	8	Key
9	LEFT_OUT	10	LEFT_IN

INTEGRATOR'S NOTE

The front panel audio connector is alternately used as a jumper block for routing audio signals. Refer to Section 2.3.1 on page 24 for more information.

Table 5. Auxiliary Line In Connector

Pin	Signal Name
1	Left auxiliary line in
2	Ground
3	Ground
4	Right auxiliary line in

Table 6. Rear Chassis Fan Connector

Pin	Signal Name
1	(Note)
2	+12 V
3	REAR_TACH_OUT

Note: Pin 1 is *Control* if the Desktop Board uses the hardware monitoring and fan control ASIC.
Pin 1 is *Ground* if the Desktop Board uses the hardware monitoring ASIC.

Table 7. ATAPI CD-ROM Connector

Pin	Signal Name
1	Left audio input from CD-ROM
2	CD audio differential ground
3	CD audio differential ground
4	Right audio input from CD-ROM

INTEGRATOR'S NOTES

- *Use only ATX12V- or SFX12V-compliant power supplies with the Desktop Board D845GRG. ATX12V and SFX12V power supplies have an additional power lead that provides required supplemental power for the processor. Always connect the 20-pin and 4-pin leads of ATX12V and SFX12V power supplies to the corresponding connectors on the Desktop Board, otherwise the Desktop Board will not boot.*
- *Do not use a standard ATX power supply. The Desktop Board will not boot with a standard ATX power supply.*

Table 8. ATX12V Power Connector

Pin	Signal Name	Pin	Signal Name
1	Ground	2	Ground
3	+12 V	4	+12 V

Table 9. Processor Fan Connector

Pin	Signal Name
1	(Note)
2	+12 V
3	CPU_FAN_TACH

Note: Pin 1 is *Control* if the Desktop Board uses the hardware monitoring and fan control ASIC.
Pin 1 is *Ground* if the Desktop Board uses the hardware monitoring ASIC.

Table 10. Main Power Connector

Pin	Signal Name	Pin	Signal Name
1	+3.3 V	11	+3.3 V
2	+3.3 V	12	-12 V
3	Ground	13	Ground
4	+5 V	14	PS-ON# (power supply remote on/off)
5	Ground	15	Ground
6	+5 V	16	Ground
7	Ground	17	Ground
8	PWRGD (Power Good)	18	No connect
9	+5 V (Standby)	19	+5 V
10	+12 V	20	+5 V

Table 11. Chassis Intrusion Connector

Pin	Signal Name
1	Intruder
2	Ground

Table 12. Front Chassis Fan Connector

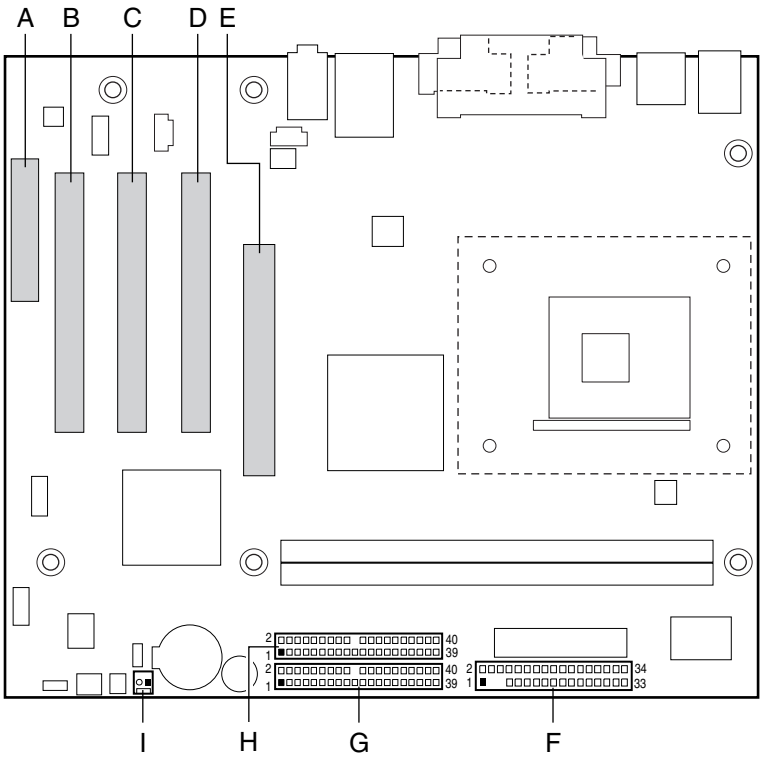
Pin	Signal Name
1	(Note 1)
2	+12 V
3	(Note 2)

Notes:
1. Pin 1 is *Control* if the Desktop Board uses the hardware monitoring and fan control ASIC.
   Pin 1 is *Ground* if the Desktop Board uses the hardware monitoring ASIC.
2. Pin 3 is *FRONT_TACH_OUT* if the Desktop Board uses the hardware monitoring and fan control ASIC.
   Pin 3 is *No connect* if the Desktop Board uses the hardware monitoring ASIC.

2.2.2.3 Add-in Board and Peripheral Interface Connectors

Figure 4 shows the location of the add-in board connector and peripheral connectors for the Desktop Board D845GRG. Note the following considerations for the PCI bus connectors:

- All of the PCI bus connectors are bus master capable.
- SMBus signals are routed to PCI bus connector 2. This enables PCI bus add-in boards with SMBus support to access sensor data on the Desktop Board. The specific SMBus signals are as follows:
  - The SMBus clock line is connected to pin A40.
  - The SMBus data line is connected to pin A41.



Item	Description
A	CNR (optional)
B	PCI bus connector 3
C	PCI bus connector 2
D	PCI bus connector 1
E	AGP connector
F	Diskette drive
G	Primary IDE
H	Secondary IDE
I	SCSI LED

Figure 4. Add-in Board and Peripheral Interface Connectors

INTEGRATOR'S NOTE

The AGP connector is keyed for 1.5 V AGP cards only. Do not attempt to install a legacy 3.3 V AGP card. The AGP connector is not mechanically compatible with legacy 3.3 V AGP cards.

Table 13. SCSI LED Connector

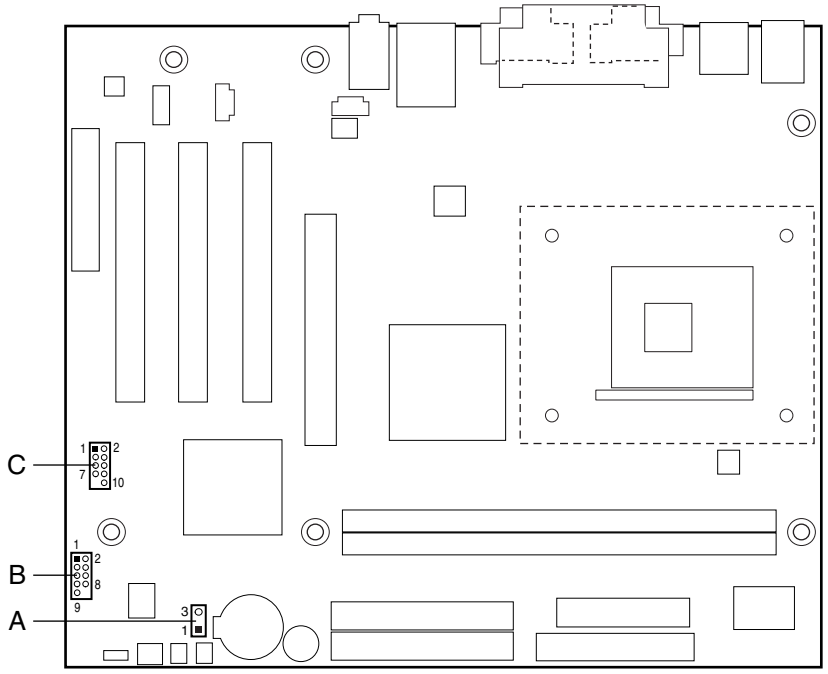
Pin	Signal Name
1	SCSI_ACT#
2	No connect

INTEGRATOR'S NOTE

Not all PCI video cards can be used in PCI bus connectors 1 and 2 (the PCI bus connectors closest to the processor). To avoid clearance problems, install PCI video cards in PCI bus connector 3.

2.2.3 External I/O Connectors

Figure 5 shows the locations of the external I/O connectors.



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Item	Description	For more information see:
A	Auxiliary front panel power/sleep/message-waiting LED	Table 18
B	Front panel	Table 15
C	Front panel USB	Table 14

Figure 5. External I/O Connectors

Table 14. Front Panel USB Connector

Pin	Signal Name	Pin	Signal Name
1	USB_FNT_PWR	2	USB_FNT_PWR
3	USB_FNTA#	4	USB_FNTB#
5	USB_FNTA	6	USB_FNTB
7	Ground	8	Ground
9	Not connected	10	Not connected

INTEGRATOR'S NOTE

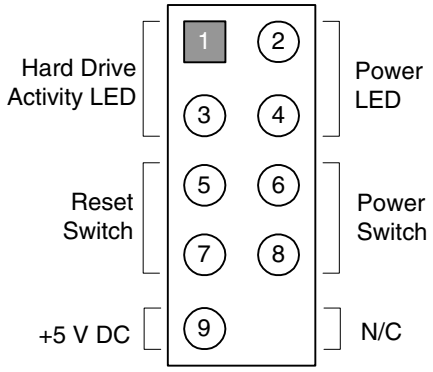
Use only a front panel USB connector that conforms to the USB 2.0 specification for high-speed USB devices.

2.2.3.1 Front Panel Connector

This section describes the functions of the front panel connector. Table 15 lists the signal names of the front panel connector.

Table 15. Front Panel Connector

Pin	Signal	In/Out	Description	Pin	Signal	In/Out	Description
Hard Drive Activity LED				**Power LED**			
1	HD_PWR	Out	Hard disk LED pull-up (330 Ω) to +5 V	2	HDR_BLNK_ GRN	Out	Front panel green LED
3	HAD#	Out	Hard disk active LED	4	HDR_BLNK_ YEL	Out	Front panel yellow LED
Reset Switch				**On/Off Switch**			
5	Ground		Ground	6	SWITCH_ON#	In	Power switch
7	FP_RESET#	In	Reset switch	8	Ground		Ground
9	+5 V	Out	Power	10	N/C		Not connected



2.2.3.1.1 Hard Drive Activity LED Connector

Pins 1 and 3 can be connected to an LED to provide a visual indicator that data is being read from or written to a hard drive. For the LED to function properly, an IDE drive must be connected to the onboard IDE interface. The LED will also show activity for devices connected to the SCSI hard drive activity LED connector.

For information about	Refer to
The SCSI hard drive activity LED connector	Section 2.2.2.3 page 19

2.2.3.1.2 Reset Switch Connector

Pins 5 and 7 can be connected to a momentary SPST type switch that is normally open. When the switch is closed, the Desktop Board resets and runs the POST.

2.2.3.1.3 Power/Sleep/Message Waiting LED Connector

Pins 2 and 4 can be connected to a one- or two-color LED. Table 16 shows the possible states for a one-color LED. Table 17 shows the possible states for a two-color LED.

Table 16. States for a One-Color Power LED

LED State	Description
Off	Power off/sleeping
Steady Green	Running
Blinking Green	Running/message waiting

Table 17. States for a Two-Color Power LED

LED State	Description
Off	Power off
Steady Green	Running
Blinking Green	Running/message waiting
Steady Yellow	Sleeping
Blinking Yellow	Sleeping/message waiting

INTEGRATOR'S NOTE

To use the message waiting function, ACPI must be enabled in the operating system and a message-capturing application must be invoked.

2.2.3.1.4 Power Switch Connector

Pins 6 and 8 can be connected to a front panel momentary-contact power switch. The switch must pull the SW_ON# pin to ground for at least 50 ms to signal the power supply to switch on or off. (The time requirement is due to internal debounce circuitry on the Desktop Board D845GRG.) At least two seconds must pass before the power supply will recognize another on/off signal.

2.2.3.2 Auxiliary Front Panel Power/Sleep/Message-Waiting LED Connector

Pins 1 and 3 of this connector duplicate the signals on pins 2 and 4 of the front panel connector. Table 18 lists the signal names of the Auxiliary Front Panel Power/Sleep/Message-Waiting LED Connector.

Table 18. Auxiliary Front Panel Power/Sleep/Message-Waiting LED Connector

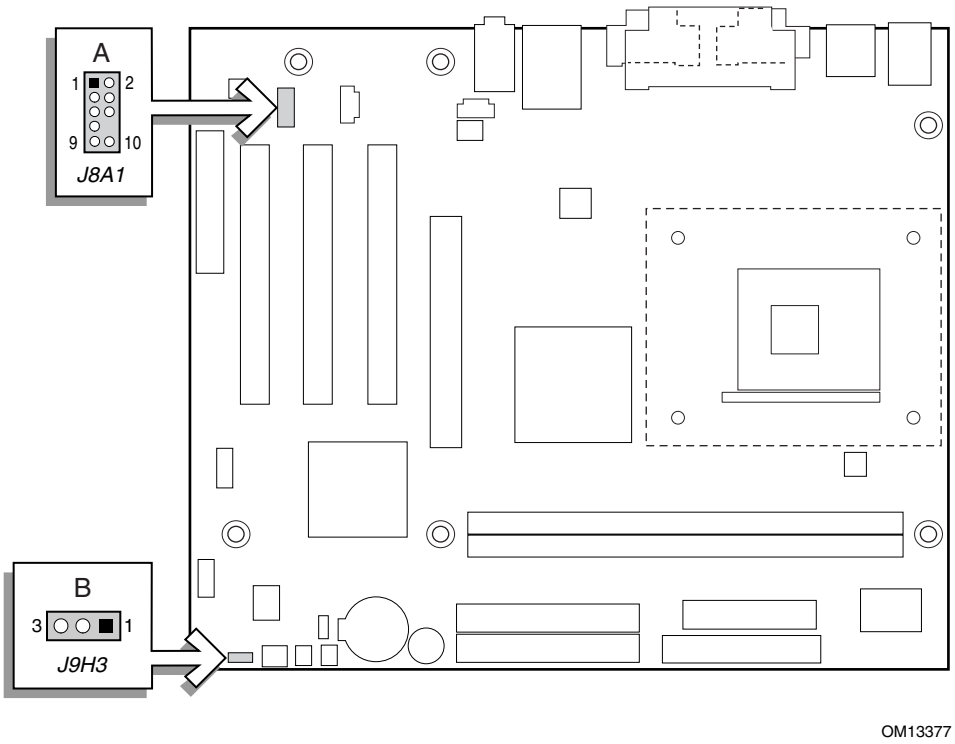
Pin	Signal Name	In/Out	Description
1	HDR_BLNK_GRN	Out	Front panel green LED
2	Not connected		
3	HDR_BLNK_YEL	Out	Front panel yellow LED

2.3 Jumper Blocks

CAUTION

Do not move any jumpers with the power on. Always turn off the power and unplug the power cord from the computer before changing a jumper setting. Otherwise, the Desktop Board could be damaged.

Figure 6 shows the location of the jumper blocks.



Item	Description	Reference Designator
A	Front panel audio connector/jumper block	J8A1
B	BIOS Setup configuration jumper block	J9H2

Figure 6. Location of the Jumper Blocks

2.3.1 Front Panel Audio Connector/Jumper Block

This connector has two functions:

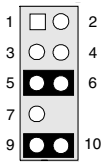
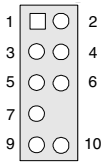
- With jumpers installed, the audio line out signals are routed to the back panel audio line out connector.
- With jumpers removed, the connector provides audio line out and mic in signals for front panel audio connectors.

Table 19 describes the two configurations of this connector/jumper block.

CAUTION

Do not place jumpers on this block in any configuration other than the one described in Table 19. Other jumper configurations are not supported and could damage the Desktop Board.

Table 19. Front Panel Audio Connector/Jumper Block

Jumper Setting		Configuration
	5 and 6 9 and 10	Audio line out signals are routed to the back panel audio line out connector. The back panel audio line out connector is shown in Figure 2 on page 13.
	No jumpers installed	Audio line out and mic in signals are available for front panel audio connectors. Table 4 on page 16 lists the names of the signals available on this connector when no jumpers are installed.

INTEGRATOR'S NOTE

When the jumpers are removed and this connector is used for front panel audio, the back panel audio line out and mic in connectors are disabled.

2.3.2 BIOS Setup Configuration Jumper Block

The 3-pin jumper block determines the BIOS Setup program's mode. Table 20 describes the jumper settings for the three modes: normal, configure, and recovery. When the jumper is set to configuration mode and the computer is powered-up, the BIOS compares the processor version and the microcode version in the BIOS and reports if the two match.

Table 20. BIOS Setup Configuration Jumper Settings

Function/Mode	Jumper Setting		Configuration
Normal	1-2		The BIOS uses current configuration information and passwords for booting.
Configure	2-3		After the POST runs, Setup runs automatically. The maintenance menu is displayed.
Recovery	None		The BIOS attempts to recover the BIOS configuration. A recovery diskette is required.

2.4 I/O Shield

The back panel I/O shield for the Desktop Board D845GRG must meet specific dimension and material requirements. Systems based on this Desktop Board need the back panel I/O shield to pass emissions (EMI) certification testing. Figure 7 shows the critical dimensions of the I/O shield. Dimensions are given in inches [millimeters], to a tolerance of ±0.020 inches [0.508 millimeters].

The figure also indicates the position of each cutout. Design considerations for I/O shields relative to chassis requirements are described in the ATX specification.

For information about	Refer to
Obtaining the ATX specification	*Technical Product Specification for Intel Desktop Boards using the Intel 845G Chipset*.

INTEGRATOR'S NOTE

An I/O shield compliant with the ATX chassis specification 2.03 is available from Intel.

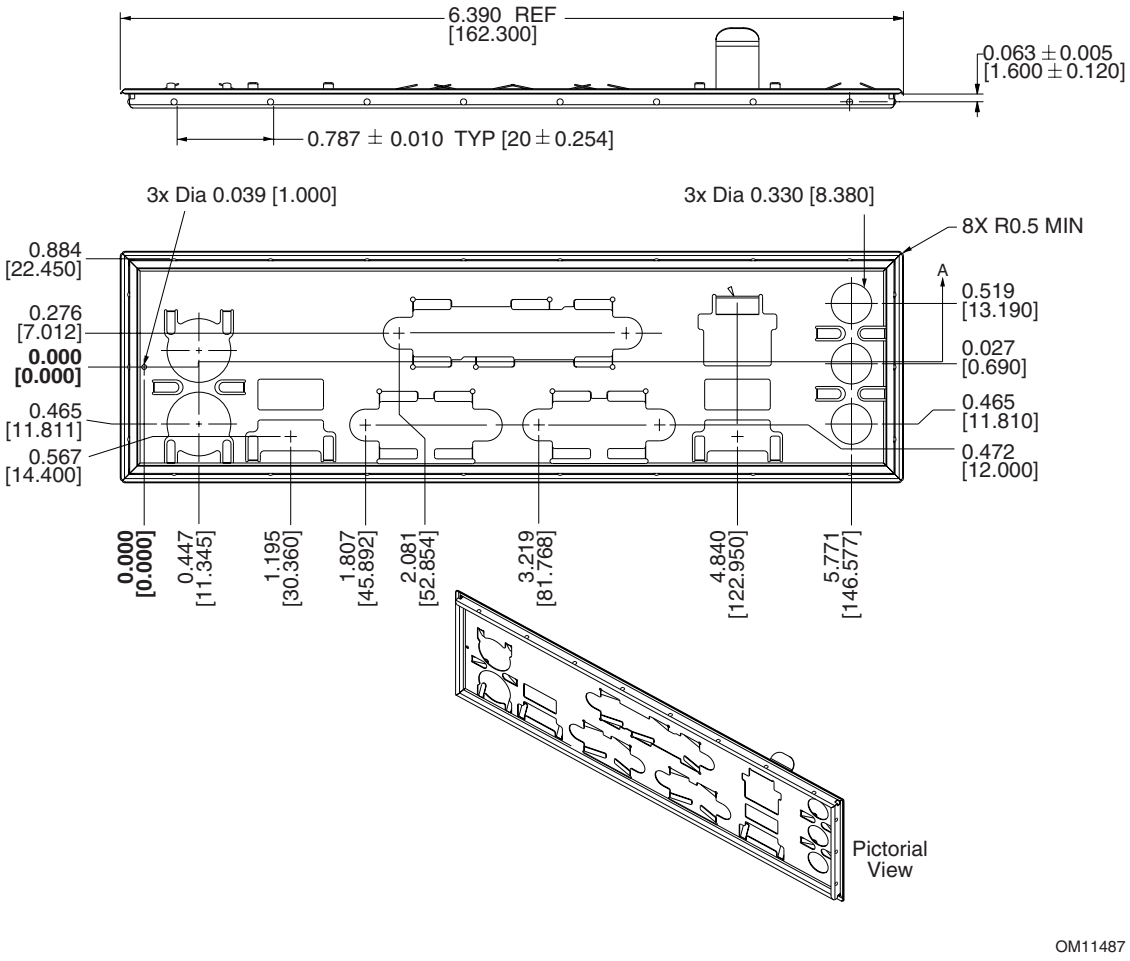


Figure 7. I/O Shield Dimensions

2.5 Mechanical Considerations

The Desktop Board D845GRG is designed to fit into either a microATX or an ATX-form-factor chassis. Figure 8 illustrates the mechanical form factor for the Desktop Board. Dimensions are given in inches [millimeters]. The outer dimensions are 9.60 inches by 8.20 inches [243.84 millimeters by 208.28 millimeters]. Location of the I/O connectors and mounting holes are in compliance with the ATX specification.

INTEGRATOR'S NOTE

When installing the Desktop Board in a microATX chassis, make sure that peripheral devices are installed at least 1.5 inches above the main power connector, the diskette drive connector, the IDE connector, and the DIMM sockets.

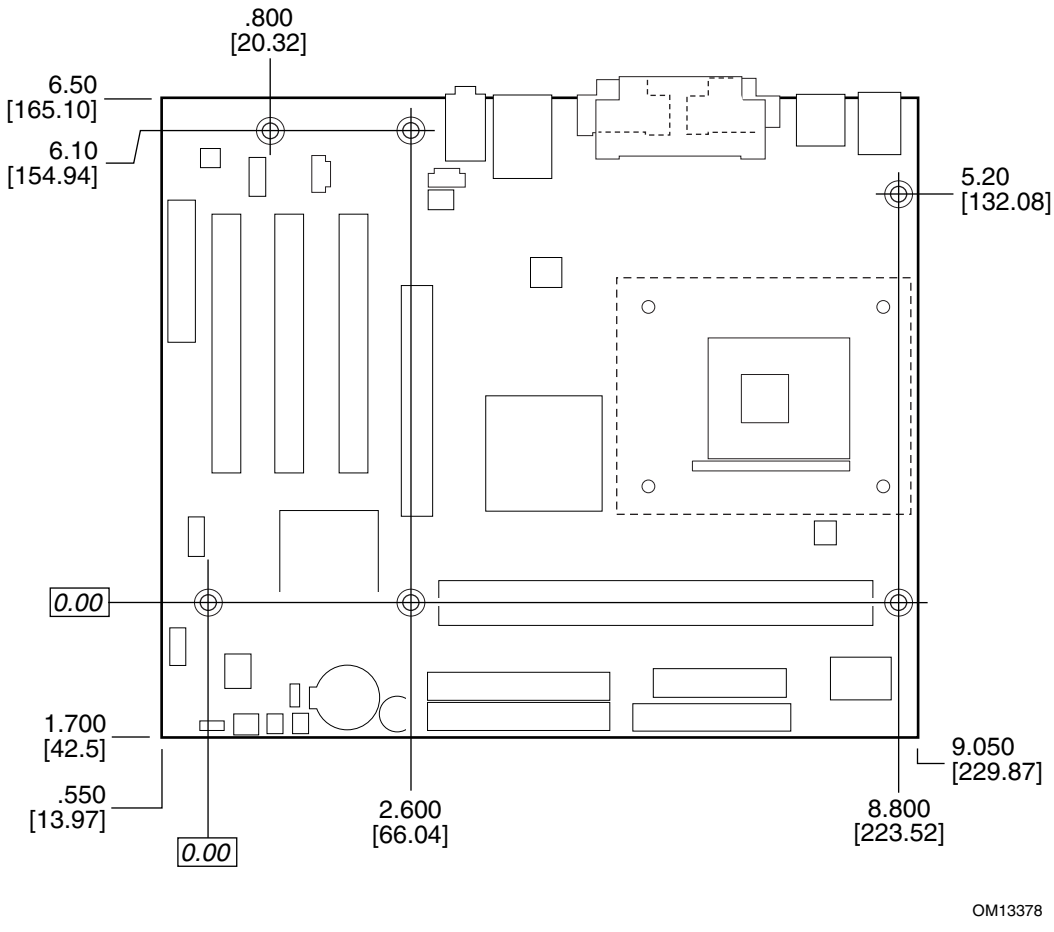


Figure 8. Desktop Board Dimensions

2.6 Electrical Considerations

2.6.1 Power Consumption

Table 21 lists voltage and current measurements for a computer that contains the Desktop Board D845GRG and the following:

- 2.0 GHz Intel Pentium 4 processor with a 512 KB cache
- 512 MB DDR SDRAM
- 3.5-inch diskette drive
- 10 GB IDE hard disk drive
- 40X IDE CD-ROM drive

This information is provided only as a guide for calculating approximate power usage with additional resources added.

Values for the Windows† XP desktop mode are measured at 640 x 480 x 256 colors and 60 Hz refresh rate. AC watts are measured with the computer is connected to a 300 W power supply, at nominal input voltage and frequency, with a true RMS wattmeter at the line input.

NOTE

Actual system power consumption depends upon system configuration. The power supply should comply with the recommendations found in the ATX/ATX12V Power Supply Design Guide, Version 1.1.

Table 21. Power Usage

Mode	AC Power	DC Current at:				
		+3.3 V	+5 V	+12 V	-12 V	+5 VSB
ACPI S0	61.0 W	3.02 A	0.12 A	0.99 A	0.014 A	0.22A
ACPI S1	53.9 W	2.91 A	0.11 A	0.68 A	0.014 A	0.16 A
ACPI S3	4.3 W	0.0 A	0.0 A	0.0 A	0.0 A	0.45 A

2.6.2 Add-in Board Considerations

The Desktop Board D845GRG is designed to provide 2 A (average) of +5 V current for each add-in board. For a fully loaded Desktop Board D845GRG (all four expansion slots filled), the total +5 V current draw must not exceed 8 A.

2.6.3 Standby Current Requirements

⚠ CAUTION

If the standby current necessary to support multiple wake events from the PCI and/or USB buses exceeds power supply capacity, the Desktop Board D845GRG may lose register settings stored in memory, etc. Calculate the standby current requirements using the steps described below.

Power supplies used with the Desktop Board D845GRG must be able to provide enough standby current to support the Instantly Available PC (ACPI S3 sleep state) configuration as outlined in Table 22 below.

Values are determined by specifications such as PCI 2.2. Actual measured values may vary.

To estimate the amount of standby current required for a particular system configuration, standby current requirements of all installed components must be added to determine the total standby current requirement. Refer to the descriptions in Table 22 and review the following steps.

1. Note the total D845GRG standby current requirement.
2. Add to that the total PS/2 port standby current requirement if a wake-enabled device is connected.
3. Add, from the PCI 2.2 slots (wake enabled) row, the total number of wake-enabled devices installed (PCI and AGP) and multiply by the standby current requirement.
4. Add, from the PCI 2.2 slots (nonwake enabled) row, the total number of wake-enabled devices installed (PCI and AGP) and multiply by the standby current requirement.
5. Add all additional wake-enabled devices' and nonwake-enabled devices' standby current requirements as applicable.
6. Add all the required current totals from steps 1 through 5 to determine the total estimated standby current power supply requirement.

Table 22. Standby Current Requirements

Instantly Available PC Current Support (Estimated for Integrated Board Components)	Description	Standby Current Requirements (mA)
	Total for Desktop Board D845GRG	395
Instantly Available PC Stand-by Current Support • **Estimated for add-on components** • **Add to Instantly Available PC total current requirement** **(See instructions above)**	PS/2 ports (Note)	345
	PCI 2.2 slots (wake enabled)	375
	PCI 2.2 slots (nonwake enabled)	20
	CNR (Note)	375
	USB ports (Note)	500

Note: Dependent upon system configuration

NOTE

IBM PS/2 Port Specification (Sept 1991) states:

- *275 mA for keyboard*
- *70 mA for the mouse (nonwake-enable device)*

PCI/AGP requirements are calculated by totaling the following:

- *One wake-enabled device @ 375 mA, plus*
- *Five nonwake-enabled devices @ 20 mA each, plus*

USB requirements are calculated as:

- *One wake-enabled device @ 500 mA*
- *USB hub @ 100 mA*
- *Three USB nonwake-enabled devices connected @ 2.5 mA each*

NOTE

Both USB ports are capable of providing up to 500 mA during normal G0/S0 operation. Only one USB port will support up to 500 mA of stand-by-current (wake-enabled device) during G1/S3 suspended operation. The other port may provide up to 7.5 mA (three nonwake-enabled devices.) during G1/S3 suspended operation.

2.6.4 Fan Connector Current Capability

Table 23 lists the current capability of the fan connectors on the Desktop Board D845GRG.

Table 23. Fan Connector Current Capability

Fan Connector	Maximum Available Current
Processor fan	1.00 A
Front chassis fan	0.50 A
Rear chassis fan	0.35 A

2.6.5 Power Supply Considerations

CAUTION

The +5 V standby line for the power supply must be capable of providing adequate +5 V standby current. Failure to do so can damage the power supply. The total amount of standby current required depends on the wake devices supported and manufacturing options. Refer to Section 2.6.3 on page 29 for additional information.

System integrators should refer to the power usage values listed in Table 21 when selecting a power supply for use with the Desktop Board D845GRG.

Measurements account only for current sourced by the Desktop Board D845GRG while running in idle modes of the started operating systems.

Additional power required will depend on configurations chosen by the integrator.

The power supply must comply with the following recommendations found in the indicated sections of the ATX form factor specification.

- The potential relation between 3.3 VDC and +5 VDC power rails (Section 4.2)
- The current capability of the +5 VSB line (Section 4.2.1.2)
- All timing parameters (Section 4.2.1.3)
- All voltage tolerances (Section 4.2.2)

2.6.6 Standby Power Indicator LED

The standby power indicator LED shows that power is still present even when the computer appears to be off. Figure 9 shows the location of the standby power indicator LED.

⚠ CAUTION

If AC power has been switched off and the standby power indicator is still lit, disconnect the power cord before installing or removing any devices connected to the Desktop Board. Failure to do so could damage the Desktop Board and any attached devices.

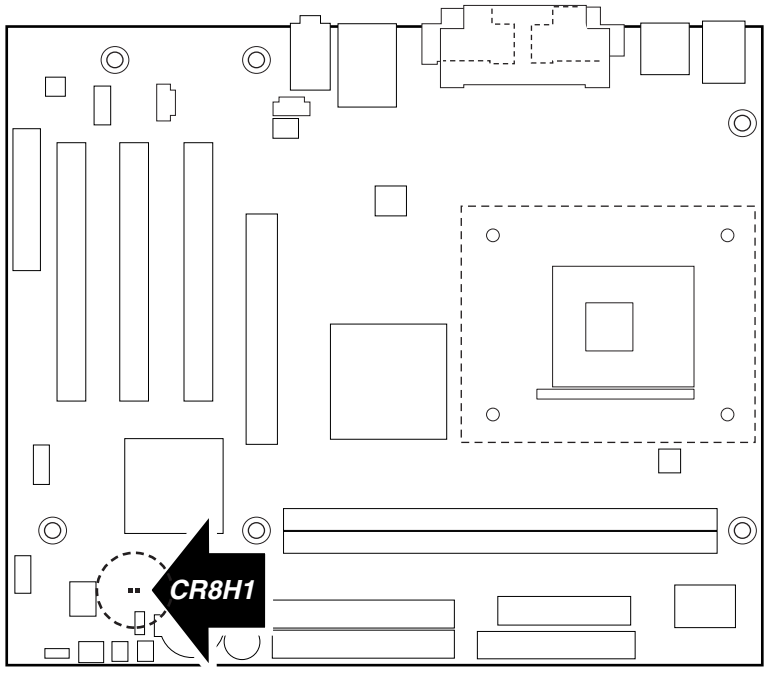


Figure 9. Location of the Standby Power Indicator LED

2.7 Reliability

The mean time between failures (MTBF) prediction is calculated using component and subassembly random failure rates. The calculation is based on the Bellcore Reliability Prediction Procedure, TR-NWT-000332, Issue 4, September 1991. The MTBF prediction is used to estimate repair rates and spare parts requirements.

The MTBF data is calculated from predicted data at 55 ºC. The Desktop Board D845GRG MTBF is 112,977.7547 hours.

2.8 Thermal Considerations

2.8.1 High Temperature Zones

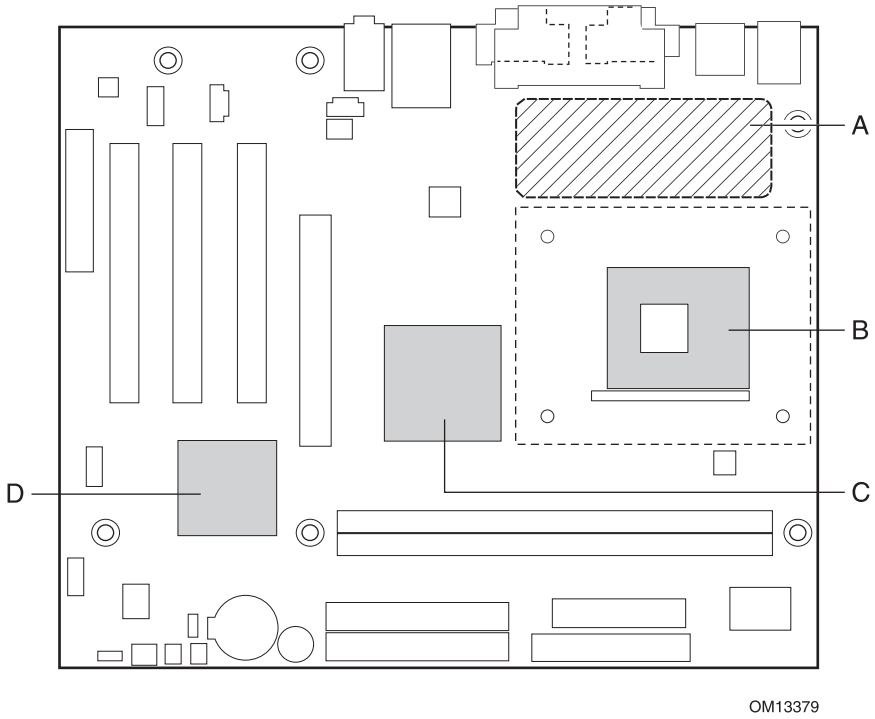
⚠ CAUTION

Ensure that the ambient temperature does not exceed the Desktop Board's maximum operating temperature. Failure to do so could cause components to exceed their maximum case temperature and malfunction. For information about the maximum operating temperature, see the Environmental specifications section in the Technical Product Specification for Intel Desktop Boards using the Intel 845G Chipset.

⚠ CAUTION

Ensure that proper airflow is maintained in the processor voltage regulator circuit. Failure to do so may result in damage to the voltage regulator circuit. The processor voltage regulator area (item A in Figure 10) can reach a temperature of up to 85 °C in an open chassis.

Figure 10 shows the locations of the localized high temperature zones.



A Processor voltage regulator area
B Processor
C Intel 82845G GMCH
D Intel 82801DB ICH4

Figure 10. Localized High Temperature Zones

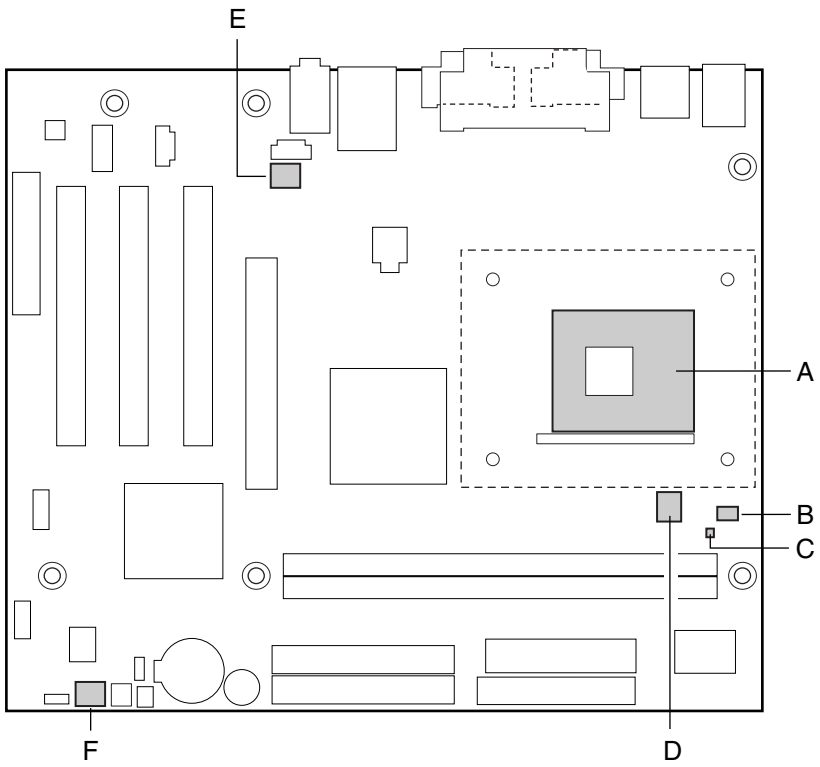
Table 24 provides maximum case temperatures for Desktop Board D845GRG components that are sensitive to thermal changes. The operating temperature, current load, or operating frequency could affect case temperatures. Maximum case temperatures are important when considering proper airflow to cool the Desktop Board D845GRG.

Table 24. Thermal Considerations for Components

Component	Maximum Case Temperature
Intel Pentium 4 processor	For processor case temperature, see processor datasheets and processor specification updates
Intel 82845G GMCH	92 °C (under bias)
Intel 82801DB ICH4	110 °C (under bias)

2.8.2 Thermal Monitoring

Figure 11 shows the location of the sensors and fan connectors.



Item	Description
A	Thermal diode, located on processor die
B	Ambient temperature sensor, internal to both hardware monitoring ASIC options
C	Remote ambient temperature sensor (Note)
D	Processor fan
E	Rear chassis fan
F	Front chassis fan

Note: This sensor is present only on Desktop Boards with the hardware monitoring and fan control ASIC.

Figure 11. Thermal Monitoring

3 Regulatory Compliance Information

3.1 Regulatory Compliance

This section describes the Desktop Boards' compliance with U.S. and international safety and electromagnetic compatibility (EMC) regulations.

3.1.1 Safety Regulations

Table 25 lists the safety regulations the Desktop Board complies with when correctly installed in a compatible host system.

Table 25. Safety Regulations

Regulation	Title
CSA C22.2 No. 60950/ UL 60950, 3rd Edition, 2000	Bi-National Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (USA and Canada)
EN 60950, 2nd Edition, 1992 (with Amendments 1, 2, 3, and 4)	The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (European Union)
IEC 60950, 2nd Edition, 1991 (with Amendments 1, 2, 3, and 4)	The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (International)
EMKO-TSE (74-SEC) 207/94	Summary of Nordic deviations to EN 60950. (Norway, Sweden, Denmark, and Finland)

3.1.2 EMC Regulations

Table 26 lists the EMC regulations the Desktop Boards comply with when correctly installed in a compatible host system.

Table 26. EMC Regulations

Regulation	Title
FCC (Class B)	Title 47 of the Code of Federal Regulations, Parts 2 and 15, Subpart B, Radio Frequency devices. (USA)
ICES-003 (Class B)	Interference-Causing Equipment Standard, Digital Apparatus. (Canada)
EN55022: 1998 (Class B)	Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (European Union)
EN55024: 1998	Information Technology Equipment – Immunity Characteristics Limits and methods of measurement. (European Union)
AS/NZS 3548 (Class B)	Australian Communications Authority, Standard for Electromagnetic Compatibility. (Australia and New Zealand)
CISPR 22, 3rd Edition (Class B)	Limits and methods of measurement of Radio Disturbance Characteristics of Information Technology Equipment. (International)
CISPR 24: 1997	Information Technology Equipment – Immunity Characteristics – Limits and Methods of Measurements. (International)

3.1.3 Product Certification Markings (Board Level)

The Desktop Boards have the following product certification markings:

- UL joint US/Canada Recognized Component mark: Consists of lower case c followed by a stylized backward UR and followed by a small US. Includes adjacent UL file number for Intel desktop boards: E210882 (component side).
- FCC Declaration of Conformity logo mark for Class B equipment; to include Intel name and product model designation (solder side).
- CE mark: Declaring compliance to European Union (EU) EMC directive (89/336/EEC) and Low Voltage directive (73/23/EEC) (component side). The CE mark should also be on the shipping container.
- Australian Communications Authority (ACA) C-Tick mark: consists of a stylized C overlaid with a check (tick) mark (component side), followed by Intel supplier code number, N-232. The C-tick mark should also be on the shipping container.
- Korean EMC certification logo mark: consists of MIC lettering within a stylized elliptical outline.
- Printed wiring board manufacturer's recognition mark: consists of a unique UL recognized manufacturer's logo, along with a flammability rating (94V-0) (solder side).
- PB part number: Intel bare circuit board part number (solder side). Also includes SKU number starting with AA followed by additional alphanumeric characters. For the Desktop Board D845GRG, the PB number A78580-002.
- Battery "+ Side Up" marking: located on the component side of the Desktop Board in close proximity to the battery holder.