Embedded Intel® Atom™ Processor N2800 with Intel® NM10 Express Chipset

Development Kit User's Manual

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Revision History

Revision	Revision History	Date
001	First release of the Intel® Atom™ Processor N2800 with Intel® NM10 Express Chipset Development Kit User Guide	January 2012
002	Updated link in Section 7	February 2012

Disclaimer

This product specification applies to only the standard Intel® Embedded Board N2800 with BIOS identifier MTCDT10N.86A.

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Component Information

The Intel® Atom™ Processor N2800 and Intel® NM10 Express Chipset used on the Intel® Embedded Board N2800 include the following component steppings, identifiable by associated S-Spec numbers:

Device	**Stepping**	**S-Spec Number**
N2800	B2	SR0DA
NM10	B0	SLGXX

Ordering Information

The name of this Development Kit is the ***Intel® Atom™ Processor N2800 with Intel® NM10 Express Chipset Development Kit***. This document is the user guide for this Kit.

For ordering purposes, the ***Part Number*** of this Kit is ***EMBCDTNMMTDVK*** and the Kit's product code is ***MM# 920354.***

The product brief and other collaterals for the platform can be downloaded at: http://www.intel.com/p/en_US/embedded/hwsw/hardware/atom-n2000-d2000/hardware

This kit comprises a chassis, peripherals, cables, and an Intel mini-ITX sized N2800 Embedded Board which includes the two Intel devices which comprise the platform - the Intel® Atom™ processor N2800 and Intel® NM10 Express chipset. In addition, this kit includes several adapter boards and a Solid State Disk (SSD) for the Operating System Image, and a USB Stick for additional components, and tools.

Preface

This User's Manual describes the typical hardware set-up procedures, features, and use of the evaluation board and other components included in the Intel® Atom™ Processor N2800 with Intel® NM10 Express Development Kit. The Intel® Embedded Board N2800 is mounted inside the Development Kit and functions as the mainboard for the entire mini-ITX chassis.

Intended Audience

This manual is written for OEMs, system evaluators, and embedded system developers. The manual is intended to provide detailed, technical information about the development kit and its components. It is not intended for general audiences and assumes the reader has basic familiarity with the fundamental concepts involved with installing and configuring hardware for a personal computer system.

What This Document Contains

Chapter	Description
1	Development kit contents
2	Embedded Board hardware and contents
3	A map of the resources of the Intel Embedded Board
4	The features supported by the BIOS
5	A description of the BIOS error messages, beep codes, and POST codes
6	Disassembling/Assembling the development kit
7	Operating System references
8	Battery disposal information

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.

CAUTION

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

Other Common Notation

#	Used after a signal name to identify an active-low signal (such as USBP0#)
GB	Gigabyte (1,073,741,824 bytes)
GB/s	Gigabytes per second
Gb/s	Gigabits per second
KB	Kilobyte (1024 bytes)
Kbit	Kilobit (1024 bits)
kbits/s	1000 bits per second
MB	Megabyte (1,048,576 bytes)
MB/s	Megabytes per second
Mbit	Megabit (1,048,576 bits)
Mbits/s	Megabits per second
TDP	Thermal Design Power
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.

Contents

Figures

Tables

1 Development Kit Contents

1.1 Included Hardware and Documentation

- Each development kit ships as a complete system in a mini-ITX chassis (Size: 192 x 210 x 62mm.)

- Intel Embedded Board N2800 with Intel® Atom™ Processor N2800 with Intel® NM10 Express Chipset

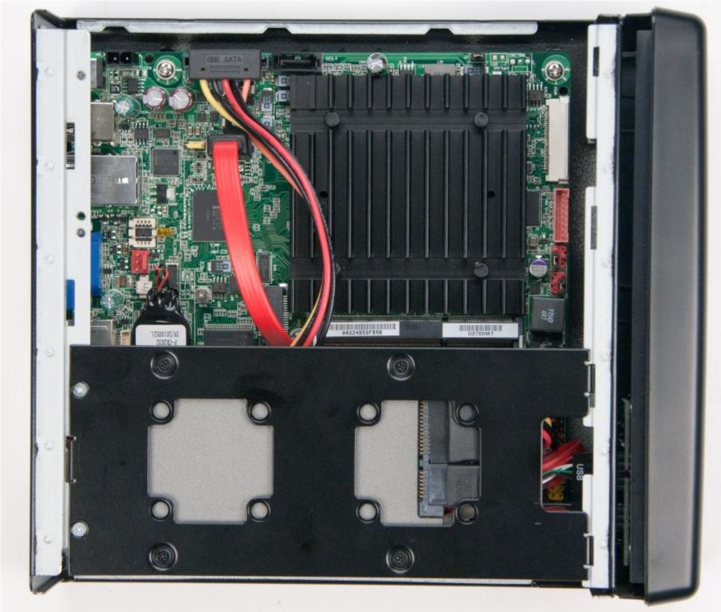
- 2GB DDR3- 1066 MT/s non-ECC memory SODIMM
- SSD (Solid State Disk), with a Yocto Project* based Linux Operating System pre-installed, with power and SATA extension cable
- Power supply-60W Desktop type AC/DC switching mode power supply

- USB Stick with documentation and software

1.2 Development Kit Preview

1.2.1.1 Front

1.2.1.2 Inside



1.2.1.3 Back

2 Intel® Embedded Board N2800 Overview

2.1 Overview

2.1.1 Feature Summary

Table 1 summarizes the major features of the development kit.

Table 1. Feature Summary

Form Factor of 2800 Embedded Board	Mini-ITX (6.7 inches by 6.7 inches [170.18 millimeters by 170.18 millimeters])
Processor	Fanlessly-cooled, soldered-down Dual-Core Intel® Atom™ Processor N2800 with integrated graphics and integrated memory controller
Memory	• Two 204-pin DDR3 SDRAM Small Outline Dual Inline Memory Module (SO-DIMM) sockets • Non-ECC memory • Support for DDR3 800 MHz and DDR3 1066 MHz SO-DIMMs Note: Higher speed SO-DIMMs such as DDR3 1600 MHz memory will work but will run at 1066 MHz • Support for up to 4 GB of system memory on a single SO-DIMM (or two 2 GB SO-DIMMs)
Chipset	Intel® NM10 Express Chipset
Graphics	• Integrated graphics: — Digital displays (High Definition Multimedia Interface* (HDMI*)) — Analog displays (VGA) — Flat panel displays: ▪ LVDS ▪ eDP (Embedded DisplayPort*) • External graphics: — One PCI Express 1.0a x1 graphics add-in card connector
Audio	• 2+2 Intel® High Definition (Intel® HD) audio via the Realtek* ALC888S audio codec (with multi-streaming) — Analog stereo line-out (back panel jack) — In-chassis stereo speakers support (3 W/3 Ω via internal header) — S/PDIF digital audio output (internal header) — DMIC digital microphone input (internal header) — Analog line-in (back panel jack) — Front panel Intel HD Audio/AC'97 headphones/mic support (internal header) • 8-channel (7.1) Intel High Definition Audio via the HDMI interface

continued

Table 1. Feature Summary (continued)

Legacy I/O Control	Nuvoton* Legacy I/O Controller (Nuvoton* W83677DHG) that provides: • Hardware management support • Multiple serial ports via onboard headers • One parallel port via an onboard header
Peripheral Interfaces	• Ten USB 2.0 ports: — Four front panel ports (via two internal headers; one header supports an Intel® Z-U130 USB Solid-State Drive (or compatible SSD)) — Two ports are implemented with stacked back panel connectors (black) — Two high-current/fast-charging ports implemented through stacked back panel connectors (yellow) — One port implemented in the PCI Express Half-Mini Card slot — One port implemented in the PCI Express Full-/Half-Mini Card slot • Two SATA ports: — One internal SATA connector (black) — One internal SATA connector (multiplexed with mSATA port , routed to PCI Express Full-/Half-Mini Card slot) (gray)
LAN Support	Intel® 82579L Gigabit (10/100/1000 Mb/s) Ethernet LAN controller including an RJ-45 back panel connector
BIOS	• Intel® BIOS resident in the Serial Peripheral Interface (SPI) Flash device • Support for Advanced Configuration and Power Interface (ACPI), Plug and Play, and System Management BIOS (SMBIOS)
Instantly Available PC Technology	• Suspend to RAM support • Wake on PCI Express, LAN, front panel, serial, and USB ports
Expansion Capabilities	• One PCI Express 1.0a x1 add-in card connector • One PCI Express Half-Mini Card slot • One PCI Express Full-/Half-Mini Card slot
Hardware Monitor Subsystem	Nuvoton* W83677DHG based subsystem, including: • Hardware monitoring through the Nuvoton I/O controller • Voltage sense to detect out of range power supply voltages • Thermal sense to detect out of range thermal values • One 3-wire system fan header • One fan sense input used to monitor fan activity • Fan speed control • Support for Platform Environmental Control Interface (PECI)

2.1.2 Embedded Board Layout (Top)

Figure 1 shows the location of the major components on the top-side of the Intel N2800 Embedded Board.

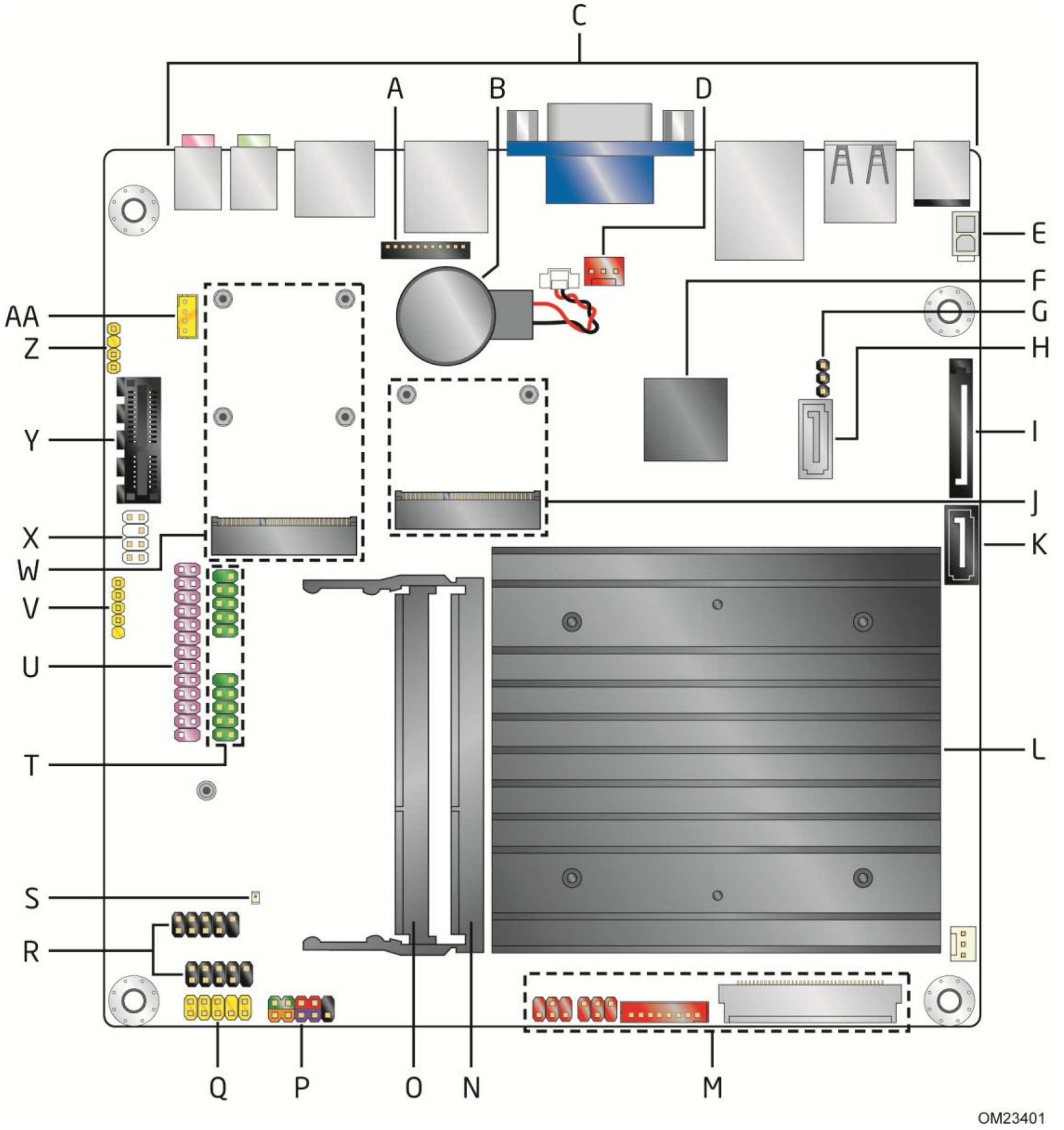


Figure 1. Major Board Components (Top)

Table 2 lists the components identified in Figure 1.

Table 2. Components Shown in Figure 1

Item/callout from Figure 1	Description
A	Debug connector
B	Battery
C	Back panel connectors (refer to Section 3.2.1)
D	System fan header
E	Internal power connector
F	Intel NM10 Express Chipset
G	BIOS Setup configuration jumper block
H	SATA data connector
I	SATA power connector
J	PCI Express Half-Mini card slot
K	SATA data connector
L	Intel Atom™ processor N2800 and heatsink
M	Flat panel display connectors
N	DDR3 SO-DIMM 0 socket
O	DDR3 SO-DIMM 1 socket (Populate DIMM 1 when using a single SO-DIMM)
P	Front panel header
Q	Front panel audio header
R	Front panel dual-port USB headers
S	Standby power LED
T	Serial port headers
U	Parallel port header
V	DMIC header
W	PCI Express Full-/Half-Mini Card slot
X	Custom Solutions header
Y	PCI Express 1.0a x1 connector
Z	S/PDIF header
AA	Internal stereo speakers connector
Not marked in diagram	Intel Z-U130 USB Solid-State Drive or compatible SSD

2.1.3 Embedded Board Layout (Bottom)

Figure 2 shows the location of the major components on the bottom-side of the Intel Embedded Board N2800.

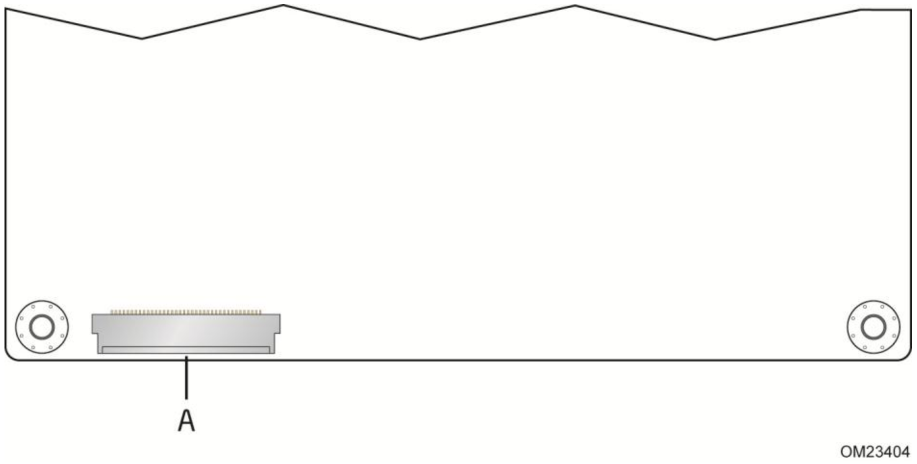


Figure 2. Major Board Components (Bottom)

Table 3. Components Shown in Figure 2

Item/callout from Figure 2	Description
A	Embedded DisplayPort (eDP) connector

2.1.4 Block Diagram

Figure 3 is a block diagram of the major functional areas of the Intel® Embedded Board N2800.

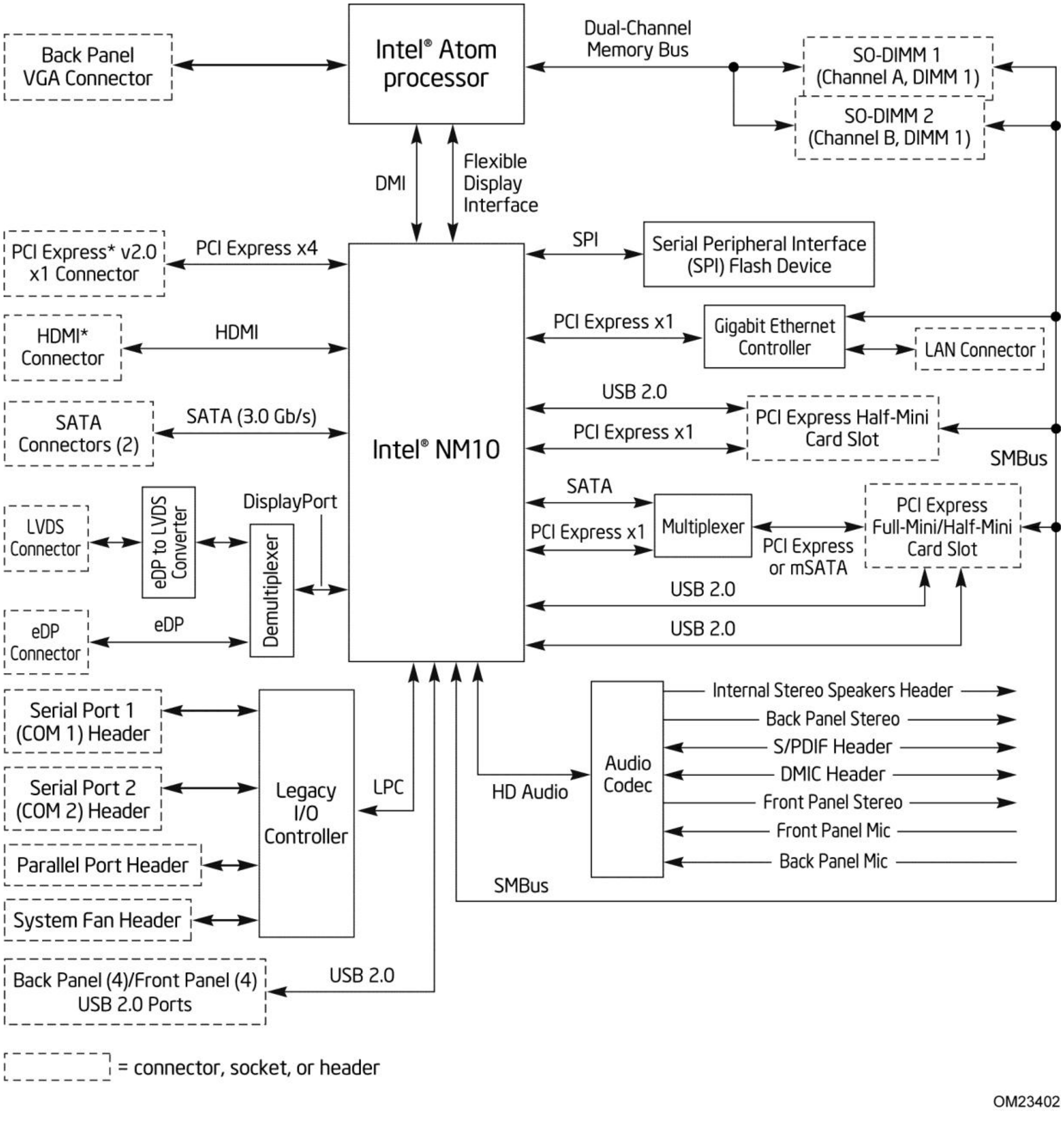


Figure 3. Block Diagram of Development Kit

2.2 Online Support

For information about…	Visit this web site:
Intel® Atom™ Processor N2800 and NM10 Express Chipset Platform Overview	http://www.intel.com/p/en_US/embedded/hwsw/hardware/atom-n2000-d2000/overview
Chipset information	http://www.intel.com/products/desktop/chipsets/index.htm (Search for NM10 Express Chipset)
BIOS and driver updates	http://downloadcenter.intel.com (Search for 'NM10 Express Chipset' & 'N2800') http://www.intel.com/p/en_US/embedded/hwsw/hardware/atom-n2000-d2000/software
Tested memory	http://www.intel.com/support/motherboards/desktop/sb/CS-025414.htm (Search for NM10)
Solid State Drives (SSD)	http://ark.intel.com/ (Click on SOLID STATE DRIVES link on the left)
Integration information	http://www.intel.com/support/go/buildit
Roadmap information, tools, software, technical documents	Intel Embedded Design Center: http://www.intel.com/p/en_US/embedded/hwsw/hardware/atom-n2000-d2000/hardware

2.3 Supported Operating Systems

The following independent operating systems are supported for this platform:

Operating System - Driver Support
Microsoft Windows* 7 - Intel provides drivers
Microsoft Windows* Embedded Standard 7- Intel provides drivers
Microsoft Windows* XP - Intel provides drivers
Microsoft Windows* Embedded CE 7 - Intel provides drivers
MeeGo* 1.2 - Intel provides drivers
Yocto Project* - Intel provides drivers
Wind River* VxWorks* – Wind River provides drivers

Intel strives to provide customers with a complete development environment supporting customer applications and operating systems. Any software provided in these development kits is subject to change without notice.

For the latest information on operating system and BIOS support refer to the Intel Embedded Design Center: http://www.intel.com/p/en_US/embedded/hwsw/hardware/atom-n2000-d2000/software

2.4 BIOS vendors

The BIOS vendors are:

BIOS vendors
American Megatrends*
Insyde Software*
Phoenix Technologies
Byosoft*

Intel strives to provide customers with a complete development environment supporting customer applications and operating systems. Any software provided in development kits is subject to change without notice.

For the latest information on operating system support refer to the Intel Embedded Design Center: http://www.intel.com/p/en_US/embedded/hwsw/hardware/atom-n2000-d2000/software.

2.5 Processor

The embedded board in the Development Kit has a fanlessly-cooled, soldered-down dual-core Intel® Atom™ processor N2800 with integrated graphics and integrated memory controller.

NOTE

The board is designed to be passively cooled in a properly ventilated chassis. Chassis venting locations are recommended above and next to the processor area for maximum heat dissipation effectiveness.

For information about	Refer to
Power supply connectors	Section 3.2.3.3

2.5.1 Intel® Embedded Board N2800 Graphics Subsystem

2.5.1.1 Intel® Graphics Media Accelerator 3600 Graphics Controller (Intel® GMA)

The Intel® Atom™ Processor N2800 contains an integrated graphics core, the Intel® GMA 3600 graphics controller, which features the following functionalities:

- High quality texture engine
  - DirectX* 9.0c and OpenGL* 3.0 compliant
  - Hardware Pixel Shader 4.1
  - Vertex Shader Model 4.1
- 640 MHz graphic core frequency
- 200 MHz render clock frequency
- Seven display planes, Display Plane A, B, Display Sprite C (can be connected to either pipe), Display OV (can be connected to either pipe), Cursor A, Cursor B, and VGA
- Two display pipes, Pipe A and B support the dual independent displays
- Max Pixel Clock: SC LVDS: 112 MHz, 18bpp (N2000 series); DDI: 2x 4, 1.62GHz, 2.7GHz; VGA: up to 350MHz
- Display
  - Supports VGA displays up to 1920 x 1200 at 60 Hz refresh (WUXGA)
  - Supports HDMI digital displays up to 1900 x 1200 at 60 Hz refresh rate and analog (VGA) displays via a converter
  - Supports LVDS flat panel displays up to 1366 x 768 at 60Hz refresh
  - Supports Embedded DisplayPort (eDP) flat panel displays up to 1366 x 768 at 60Hz refresh
- Display Ports: eDP/DP x4, HDMI, LVDS (single channel), CRT/DAC Embedded panel: eDP1.1 or LVDS
  - *External panel: DP1.1, HDMI1.3a, LVDS, CRT/DAC*
- Supports HDCP 1.3 & PAVP1.1c (N2800 processor) for Bluray playback
  - — PAVP: Collection of HW-based security mechanisms designed to provide a secure path for content from a media player application to the graphics hardware
  - — HDCP: Specification developed by Intel Corporation to protect digital entertainment content across the DVI interface
  - — Subsequently ported to HDMI and Display Port
- Supports HDMI 1.3a through SW lip-sync
- Supports DX*9
- Supports NV12 data format
- 3x3 Panel Fitter shared by two pipes
- Support Intel® HD Audio Codec
- Support Intel® Display Power Saving Technology (Intel® DPST) 4.0
- No Frame Buffer Compensation (FBC)
- No TVOut

Table 4. Maximum Resolutions Supported by the Intel® Atom™ Processor N2800 with Intel® NM10 Express Chipset Graphic interfaces

Interfaces	Max resolution	Remark
LVDS (Dual channel)	1366 x 768	60 Hz; 18bpps
eDP	1366 x 768	60 Hz
VGA (CRT/DAC)	1920 x 1200	60 Hz at 267 Mhz Max
HDMI	1920 x 1200	60 Hz; up to 165 MHz

2.5.1.2 Video

The Intel® Atom™ Processor N2800 supports the following video output functionalities over its display interfaces:

- The Intel® Atom™ Processor N2000 series supports full MPEG2 (VLD/ iDCT/MC), WMV, Fast video Composing, HW decode/ acceleration for MPEG4 Part 10 (AVC/H.264) & VC-1; 720p60, 1080i60, 1080p@24 up to 20 Mps
- MPEG4 part2 does not utilize Next Generation Intel® Atom™ Processor based Platform H/W
- No hardware assist for Flash Decode from Adobe 11.0 and onwards
- D2700 processor supports Blu-Ray* 2.0 playback (Windows* only) - 1 x HD and 1 x SD streaming
- Video image Enhancement: Hue, Saturation, Brightness, Contrast (HSBC) adjust, Bob De-Interlacing

2.6 System Memory

The board has two 204-pin SO-DIMM sockets and supports the following memory features:

- 1.5V DDR3-800 and DDR3-1066 SO-DIMMs with gold-plated contacts
- Unbuffered, non-ECC, Raw Card B (1Rx8) and Raw Card-F (2Rx8) SO-DIMMs only
- Single-sided or double-sided modules
- 4 GB maximum total system memory
- Serial Presence Detect
- DDR3 800 MHz and DDR3 1066 MHz SO-DIMMs (Higher speed SO-DIMMs supported at 1066 MHz if supported by the memory module.)
- When only using one SO-DIMM, DIMM 1 must be used

NOTE

Due to passively-cooled thermal constraints, system memory must have an operating temperature rating of 85^{o}C.

The board is designed to be passively cooled in a properly ventilated chassis. Chassis venting locations are recommended above the system memory area for maximum heat dissipation effectiveness.

NOTE

To be fully compliant with all applicable DDR3 SDRAM memory specifications, the board should be populated with SO-DIMMs that support the Serial Presence Detect (SPD) data structure. This allows the BIOS to read the SPD data and program the chipset to accurately configure memory settings for optimum performance. If non-SPD memory is installed, the BIOS will attempt to correctly configure the memory settings, but performance and reliability may be impacted or the SO-DIMMs may not function under the determined frequency.

Table 5 lists the supported SO-DIMM configurations.

Table 5. Supported Memory Configurations

Raw Card Version	SO-DIMM Capacity	DRAM Device Technology	DRAM Organization	# of DRAM Devices
B	1 GB	1 Gb	128 M x 8	8
	2 GB	2 Gb	256 M x 8	8
F	2 GB	1 Gb	128 M x 8	16
	4 GB	2 Gb	256 M x 8	16

Notes:

1. System memory configurations are based on availability and are subject to change.
2. Support for one 4 GB SO-DIMM installed in slot 1. Slot 0 must be left empty.

Figure 4 illustrates the SO-DIMM locations.

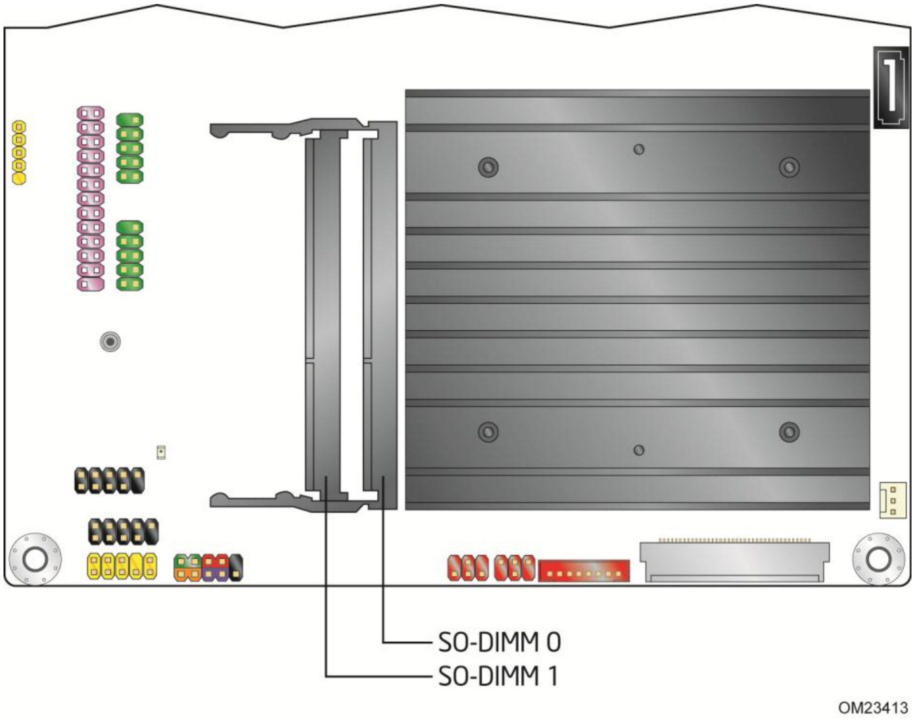


Figure 4. SO-DIMM Configuration

2.7 Intel® NM10 Express Chipset

The Intel® NM10 Express Chipset with Direct Media Interface (DMI) interconnect provides interfaces to the processor and the USB, SATA, LPC, LAN, and PCI Express interfaces. The Intel NM10 Express Chipset is a centralized controller for the board's I/O paths.

For information about	Refer to
The Intel NM10 chipset	http://www.intel.com/products/desktop/chipsets/index.htm In *Find Content* field, enter "NM10"
Resources used by the chipset	Section 2.1.4

2.8 Graphics Subsystem

The board supports graphics through Intel Graphics Technology.

2.8.1 Integrated Graphics

The board supports integrated graphics through the Intel® Flexible Display Interface (Intel® FDI) for processors with Intel Graphics Technology.

NOTE

The board can simultaneously support up to two of these three integrated graphics interfaces: VGA, HDMI, and Flat Panel Display.

Flat Panel Display is supported by eDP and LVDS interfaces, however only one can be used at a time.

2.8.1.1 Video Memory Allocation

Intel® Dynamic Video Memory Technology (DVMT) is a method for dynamically allocating system memory for use as graphics memory to balance 2D/3D graphics and system performance. If your computer is configured to use DVMT, graphics memory is allocated based on system requirements and application demands (up to the configured maximum amount). When memory is no longer needed by an application, the dynamically allocated portion of memory is returned to the operating system for other uses.

Dynamic allocation of system memory to video memory is as follows:

- 256 MB total RAM results in 32 MB video RAM
- 512 MB total RAM results in 64 MB video RAM
- 1 GB total RAM results in 128 MB video RAM
- 2 GB total RAM results in 224 MB video RAM

2.8.1.2 High Definition Multimedia Interface* (HDMI*)

The HDMI port supports standard, enhanced, or high definition video, plus multi-channel digital audio on a single cable. It is compatible with all ATSC and DVB HDTV standards and supports eight full range channels at 24-bit/96 kHz audio. The maximum supported resolution is 1920 x 1200 (WUXGA). The HDMI port is compliant with the HDMI 1.3a specification.

Depending on the type of add-in card installed in the PCI Express x1 connector, the HDMI port will behave as described in Table 6.

Table 6. HDMI Port Status Conditions

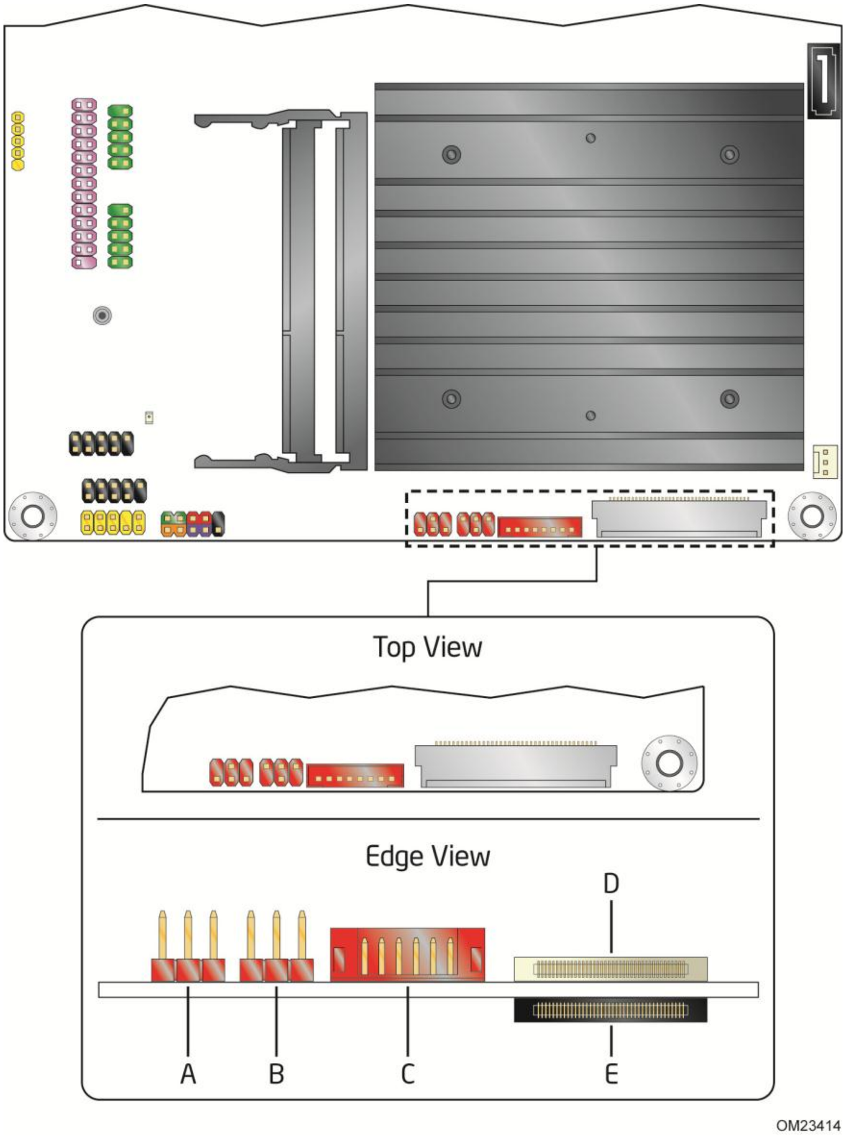
PCI Express x1 Connector Status	HDMI Port Status
No add-in card installed	Enabled
Non-video PCI Express x1 add-in card installed	Enabled
Video PCI Express x1 add-in card installed	Disabled

2.8.1.3 Analog Display (VGA)

The VGA port supports analog displays. The maximum supported resolution is 1920 x 1200 (WUXGA) at a 60 Hz refresh rate.

2.8.2 Flat Panel Display Interfaces

The Kit supports flat panel display via the LVDS and Embedded DisplayPort interfaces. Figure 5 shows the flat panel connectors.



Item	Description
A	Backlight inverter voltage selection header
B	Flat panel voltage selection header
C	FPD brightness connector
D	LVDS connector
E	Embedded DisplayPort connector

Figure 5. Flat Panel Connectors

2.8.2.1 LVDS Interface

The LVDS flat panel display interface supports the following:

- 1366 x 768 @ 60 Hz resolution
- Single-channel and dual-channel interface, up to 135 MHz clock rate 18 bpp and 24 bpp (VESA* and JEIDA mappings) color depth support
- Multiple EDID data source capability (panel, predefined, and custom payloads)
- 3.3 V, 5 V, and 12 V flat panel display voltage flexibility, with up to 3 A current
- 5V, 12 V and Vin backlight inverter voltage flexibility, with up to 3 A current
- Backlight inverter signal redundancy on dedicated header as well as on LVDS connector (for discrete inverter or panel-integrated inverter support using a single cable)
- Flat panel brightness control via front panel button input as well as Windows* 7 “Screen brightness” adjustment slider
- Spread-spectrum control

NOTE

Backlight inverter voltage option “Vin” refers to board input voltage as provided to board power input connector.

NOTE

Support for flat panel display configuration complies with the following:

1. *Internal flat panel display settings are not exposed through Intel® Integrator Toolkit or Intel® Integrator Assistant GUIs.*
2. *Internal flat panel display settings will not be overwritten by loading BIOS setup defaults.*
3. *Internal flat panel display settings will be preserved across BIOS updates.*

2.8.2.2 Embedded DisplayPort (eDP) Interface

The eDP (Embedded DisplayPort) flat panel display interface supports the following:

- 1366 x 768 @ 60 Hz resolution
- 1-lane, 2-lane, and 4-lane bandwidth at 1.62 Gb/s or 2.7 Gb/s
- Multiple EDID data source capability (panel, predefined, and custom payloads)
- 3.3 V, 5 V, and 12 V flat panel display voltage flexibility, with up to 3 A current
- 5V, 12 V and Vin backlight inverter voltage flexibility, with up to 3 A current
- Backlight inverter signal redundancy on a dedicated header as well as on eDP connector (for discrete inverter or panel-integrated inverter support using a single cable)
- Flat panel brightness control via front panel button input as well as Windows 7 “Screen brightness” adjustment slider

NOTE

Backlight inverter voltage option "Vin" refers to board input voltage as provided to board power input connector.

2.8.2.3 Configuration Modes

Video mode configuration for eDP/LVDS displays is supported as follows:

- Automatic panel identification via Extended Display Identification Data (EDID) for panels with onboard EDID support
- Panel selection from common predefined panel types (without onboard EDID)
- Custom EDID payload installation for ultimate parameter flexibility, allowing custom definition of EDID data on panels without onboard EDID

In addition, BIOS setup provides the following configuration parameters for internal flat panel displays:

- Screen Brightness: allows the end user to set the screen brightness for the display effective through the Power-On Self Test stage (such as while showing the splash screen image and BIOS setup). Windows 7 ignores this setting in favor of the native "screen brightness" control provided by the operating system.
- Flat Panel Configuration Changes Lock: allows the system integrator to "lock" critical settings of the LVDS configuration to avoid end users potentially rendering the display unusable.
- Brightness Steps: allows the system integrator to configure the brightness steps for the operating system's "screen brightness" control (such as the "Screen brightness" adjustment slider under the Windows 7 "Power Options" control panel).
- LVDS Interface Type: allows the system integrator to select whether the LVDS panel is a single-channel or dual-channel display.
- Swap LVDS Channels 0/1: allows the system integrator to swap the EVEN/ODD LVDS channel assignments shall the cable be wired opposite the panel pinout.
- Color Depth: allows the system integrator to select whether the panel is 24 bpp with VESA color mapping (eDP and LVDS), 24 bpp with JEIDA color mapping (LVDS only), or 18 bpp (eDP and LVDS).
- eDP Interface Type: allows the system integrator to select whether the eDP panel is a 1-lane, 2-lane, or 4-lane display.
- eDP Data Rate: allows the system integrator to select whether the eDP panel runs at 1.62 Gb/s or 2.7 Gb/s.
- Inverter Frequency and Polarity: allows the system integrator to set the operating frequency and polarity of the panel inverter board.
- Maximum and Minimum Inverter Current Limit (%): allows the system integrator to set maximum PWM%, as appropriate, according to the power requirements of the internal flat panel display and the selected inverter board.
- Panel Power Sequencing: allows the system integrator to adjust panel sequencing parameters, if necessary.
- LVDS Spread Spectrum Control: allows the system integrator to adjust spread spectrum for the LVDS interface.

NOTE

Support for flat panel display configuration complies with the following:

1. *Internal flat panel display connectivity is disabled (and all parameters hidden) by default.*
2. *Internal flat panel display settings are not exposed through Intel® Integrator Toolkit or Intel® Integrator Assistant GUIs.*
3. *Internal flat panel display settings will not be overwritten by loading BIOS setup defaults.*
4. *Internal flat panel display settings will be preserved across BIOS updates.*

2.8.2.4 Multiple Display Configurations under Microsoft* Windows* 7

Microsoft* Windows* 7 operating systems support multi-monitor display. Since the Intel® Atom™ Processor N2000 series has several display ports available for its two pipes, it can support up to two different images on different display devices.

Timings and resolutions for these two images may be different. The Intel® Atom™ Processor N2000 series supports Dual Display Clone and Extended Desktop.

Dual Display Clone uses both display pipes to drive the same content, at the same resolution and color depth to two different displays. This configuration allows for different refresh rates on each display.

Extended Desktop uses both display pipes to drive different content, at potentially different resolutions, refresh rates, and color depths to two different displays. This configuration allows for a larger Windows Desktop by utilizing both displays as a work surface.

2.8.3 USB

The Kit supports up to ten USB ports. The port arrangement is as follows:

- Four front panel ports (via two internal headers; one header supports an Intel® Z-U130 USB Solid-State Drive (or compatible SSD))
- Two ports are implemented with stacked back panel connectors (black)
- Two high-current/fast-charging ports are implemented through stacked back panel connectors (yellow)
- One port implemented in the PCI Express Half–Mini Card slot
- One port implemented in the PCI Express Full-/Half-Mini Card slot

The USB controller on the Intel NM10 Express Chipset provides a direct logical connection to the USB ports on the back panel as well as on the PCI Express Mini Card slots, and an indirect connection (through onboard USB hub) to the internal USB headers. All ten USB ports are high-speed, full-speed, and low-speed capable.

NOTE

Computer systems that have an unshielded cable attached to a USB port may not meet FCC Class B requirements, even if no device is attached to the cable. Use a shielded cable that meets the requirements for full-speed devices.

For information about	Refer to
The location of the USB connectors on the back panel	Figure 12
The location of the front panel USB headers	Figure 13

2.9 SATA Interfaces

The Kit provides two SATA ports through the Intel® NM10 Express Chipset PCH (Platform Controller Hub), which supports one device per port:

- One internal SATA connector (black)
- One internal SATA connector (multiplexed with mSATA port, routed to PCI Express Full-/Half-Mini Card slot) (gray)

The PCH provides independent SATA ports with a theoretical maximum transfer rate of 3 Gb/s. A point-to-point interface is used for host to device connections.

The underlying SATA functionality is transparent to the operating system. The SATA controller can operate in both legacy and native modes. In legacy mode, standard IDE I/O and IRQ resources are assigned (IRQ 14 and 15). In Native mode, standard PCI Conventional bus resource steering is used. Native mode is the preferred mode for configurations using Windows operating systems.

The board has an internal SATA power connector and ships with a power cable for powering internal SATA storage devices. The power cable includes:

- Right-angled 15-pin SATA female connector (for motherboard connectivity)
- 1 x 4 Molex female connector (for slim optical drive adapter connectivity)
- 15-pin SATA female connector (for storage connectivity)
- Vertical 15-pin SATA female connector (for storage connectivity)

NOTE

Board power supplied through the SATA power connector is rated at a maximum of:

- *1.0 A from 12 V rail*
- *2.5 A from 5 V rail*
- *0.5 A from 3.3 V rail*

For information about	Refer to
The location of the SATA connectors	Figure 13

2.9.1 AHCI Mode

The board supports AHCI storage mode via the Intel NM10 Express Chipset.

NOTE

In order to use AHCI mode, AHCI must be enabled in the BIOS. Microsoft Windows 7 includes the necessary AHCI drivers without the need to install separate AHCI drivers during the operating system installation process, however, it is always good practice to update the AHCI drivers to the latest available release.

2.10 Real-Time Clock Subsystem

A coin-cell battery (CR2032) powers the real-time clock and CMOS memory. When the computer is not plugged into a wall socket, the battery has an estimated life of three years. When the computer is plugged in, the standby current from the power supply extends the life of the battery. The clock is accurate to ± 13 minutes/year at 25 ºC with 3.3 VSB applied via the power supply 5 V STBY rail.

NOTE

If the battery and AC power fail, date and time values will be reset and the user will be notified during the POST.

When the voltage drops below a certain level, the BIOS Setup program settings stored in CMOS RAM (for example, the date and time) might not be accurate. Replace the battery with an equivalent one. Figure 1 shows the location of the battery.

2.11 Legacy I/O Controller

The I/O controller provides the following features:

- Two serial port headers
- One parallel port header with output only, bi-directional and Enhanced Parallel Port (EPP) support
- Serial IRQ interface compatible with serialized IRQ support for PCI systems
- Intelligent power management, including a programmable wake-up event interface PS/2-style keyboard and mouse interfaces
  - PS/2 ports are NOT exposed by the N2800-based Development Kit
- Conventional PCI bus power management support

The BIOS Setup program provides configuration options for the I/O controller.

2.11.1 Serial Ports

The serial ports, are implemented as two 10-pin headers on the board. The serial ports support data transfers at speeds up to 115.2 kbits/sec with BIOS support.

For information about	Refer to
The location of the serial port headers	Figure 13

2.11.2 Parallel Port

The parallel port is implemented as a 26-pin header on the board. Use the BIOS Setup program to set the parallel port mode.

For information about	Refer to
The location of the parallel port header	Figure 13

2.12 Audio Subsystem

The board supports Intel® High Definition Audio (Intel® HD Audio) subsystem via the Realtek ALC888S audio codec and the HDMI interface. The audio subsystem supports the following features:

- Analog line-out (back panel jack)
- Analog line-in (back panel jack)
- In-chassis stereo speakers support (3 W/3 Ω via internal header)
- Signal-to-noise ratios (SNR) of 97 dB for the DACs and 90 dB for the ADCs
- Support for 44.1 kHz/48 kHz/96 kHz/192 kHz sample rates on all analog outputs
- Support for 44.1 kHz/48 kHz/96 kHz sample rates on all analog inputs
- S/PDIF digital audio output (internal header)
- Support for 44.1 kHz/48 kHz/88.2 kHz/96 kHz/192 kHz sample rates at 16-bit, 20-bit or 24-bit resolution on SPDIF outputs
- DMIC interface (internal header), with support for mono and stereo digital microphones
- Front panel HD Audio/AC'97 headphones/microphone support (internal header)
- Advanced jack sense for the back panel line-out jack that enables the audio codec to recognize the connected device. The back panel audio jacks are capable of retasking according to the user's definition, or can be automatically switched depending on the recognized device type.
- Microphone input jack that supports a single dynamic, condenser, or electret microphone
- Windows 7 Ultimate certification

Table 7 lists the supported functions of the front panel and back panel audio jacks.

Table 7. Audio Jack Support

Audio Jack	Microphone	Headphones	Line Out	Line In
FP Green Jack	Default			
FP Pink Jack		Default		
Rear Green Jack			Jack detect	
Rear Pink Jack				Default
Internal Stereo Speaker			Default	

2.12.1 Audio Subsystem Software

The latest audio software and drivers are available from Intel's World Wide Web site.

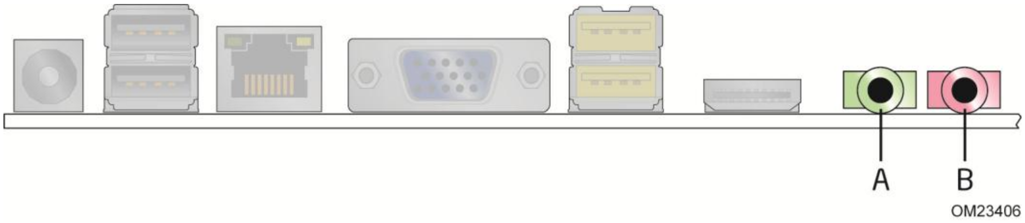
For information about	Refer to
Obtaining audio software and drivers	Section 2.2

2.12.2 Audio Subsystem Components

The audio subsystem includes the following components:

- Intel NM10 Express Chipset
- Realtek ALC888S audio codec
- Two ports for analog line-in and analog line-out on the back panel
- Front panel audio header that supports Intel HD audio and AC'97 audio (a 2 x 5-pin header that provides microphone in and headphones signals for front panel audio connectors)
- Internal S/PDIF header (1 x 4-pin header)
- Internal DMIC header (1 x 5-pin header)
- Internal stereo speakers connector (1 x 4-pin, shrouded)

The back panel audio connectors are configurable through the audio device drivers. The available configurable back panel audio connectors are shown in Figure 6.



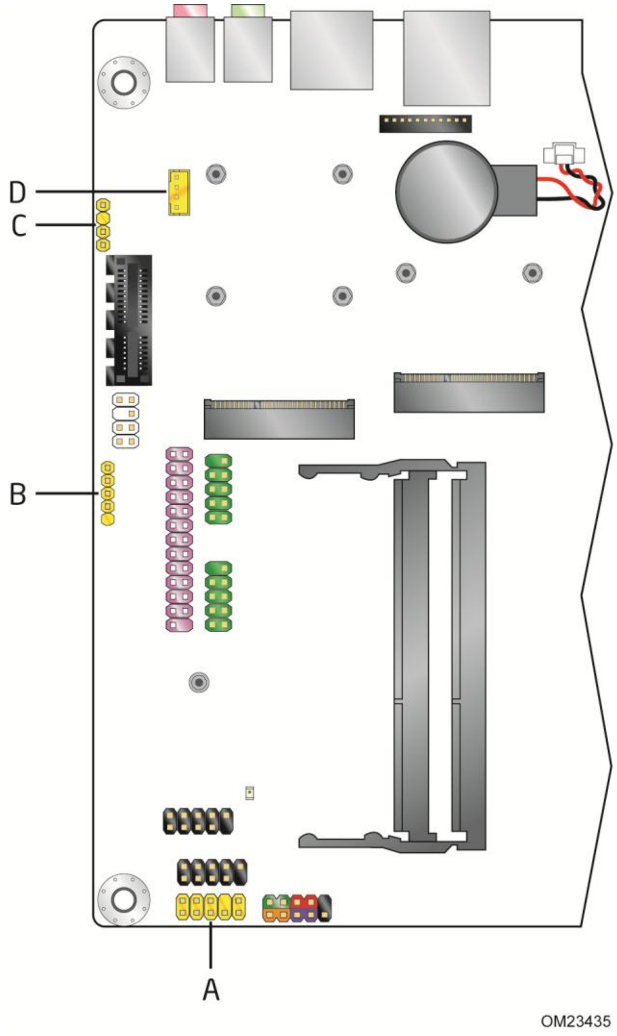
Item	Description
A	Analog line out
B	Analog line-in

Figure 6. Back Panel Audio Connectors

NOTE

The analog circuit of 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.

Figure 7 shows the location of the internal audio headers.



Item	Description
A	Front panel audio header
B	DMIC header
C	S/PDIF header
D	Internal stereo speakers connector

Figure 7. Internal Audio Headers

For information about	Refer to
The signal names of the audio headers	Section 3.2.3.1

2.13 LAN Subsystem

The LAN subsystem consists of the following:

- Intel 82574L Gigabit Ethernet Controller (10/100/1000 Mbits/s)
- Intel NM10 Express Chipset
- RJ-45 LAN connector with integrated status LEDs

Additional features of the LAN subsystem include:

- CSMA/CD protocol engine
- LAN connect interface that supports the Ethernet controller
- Conventional PCI bus power management
  - – Supports ACPI technology
  - – Supports LAN wake capabilities

For information about	Refer to
LAN software and drivers	http://downloadcenter.intel.com

2.13.1 Intel® 82574L Gigabit Ethernet Controller

The Intel 82574L Gigabit Ethernet Controller supports the following features:

- 10/100/1000 BASE-T (IEEE 802.3, 802.3u and 802.3ab) compliant
- IEEE 802.3ab auto negotiation support
- IEEE 802.3x flow control and Auto MDI, MDI-X crossover at all speeds
- Full wake-up support (APM and ACPI 2.0) (Magic Packet* wake-up capable)
- Smart power down at S0 no link and Sx no link
- Jumbo (9kB) frame support
- PCI Express power management support
- TimeSync offload (IEEE1588 and 802.1as) compliant
- Quality of Service (QoS) (802.1p) compliant
- VLAN (802.1q) compliant
- TCP, IP, and UDP checksum offload (for IPv4 and IPv6)
- Transmit TCP segmentation
- Full device driver compatibility

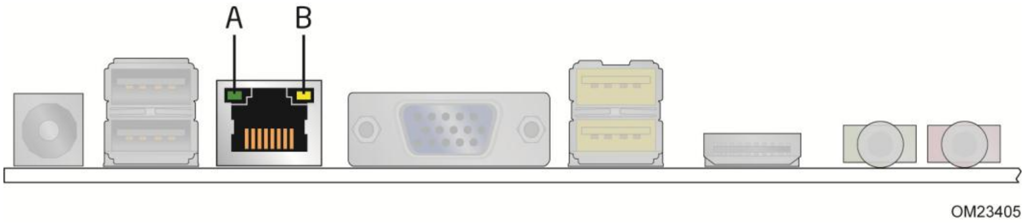
2.13.2 LAN Subsystem Software & Drivers

LAN software and drivers are available from Intel's web site.

For information about	Refer to
Obtaining LAN software and drivers	http://downloadcenter.intel.com

2.13.3 RJ-45 LAN Connector with Integrated LEDs

Two LEDs are built into the RJ-45 LAN connector (shown in Figure 8).



Item	Description
A	Link LED (Green)
B	Data Rate LED (Green/Yellow)

Figure 8. LAN Connector LED Locations

Table 8 describes the LED states when the board is powered up and the LAN subsystem is operating.

Table 8. LAN Connector LED States

LED	LED Color	LED State	Condition
Link	Green	Off	LAN link is not established.
		On	LAN link is established.
		Blinking	LAN activity is occurring.
Data Rate	Green/Yellow	Off	10 Mbits/s data rate is selected.
		Green	100 Mbits/s data rate is selected.
		Yellow	1000 Mbits/s data rate is selected.

2.14 Hardware Management Subsystem

The hardware management features enable the board to be compatible with the Wired for Management (WfM) specification. The board has several hardware management features, including thermal and voltage monitoring.

For information about	Refer to
Wired for Management (WfM) Specification	www.intel.com/design/archives/wfm/

2.14.1 Hardware Monitoring

The hardware monitoring and fan control subsystem is based on the Nuvoton W83627DHG device, which supports the following:

- Processor and system ambient temperature monitoring
- System fan speed monitoring
- Voltage monitoring of +12 V, +5 V, +3.3 V, PCH Vcc, Memory Vcc, Processor Vcc and +3.3V Standby
- SMBus interface

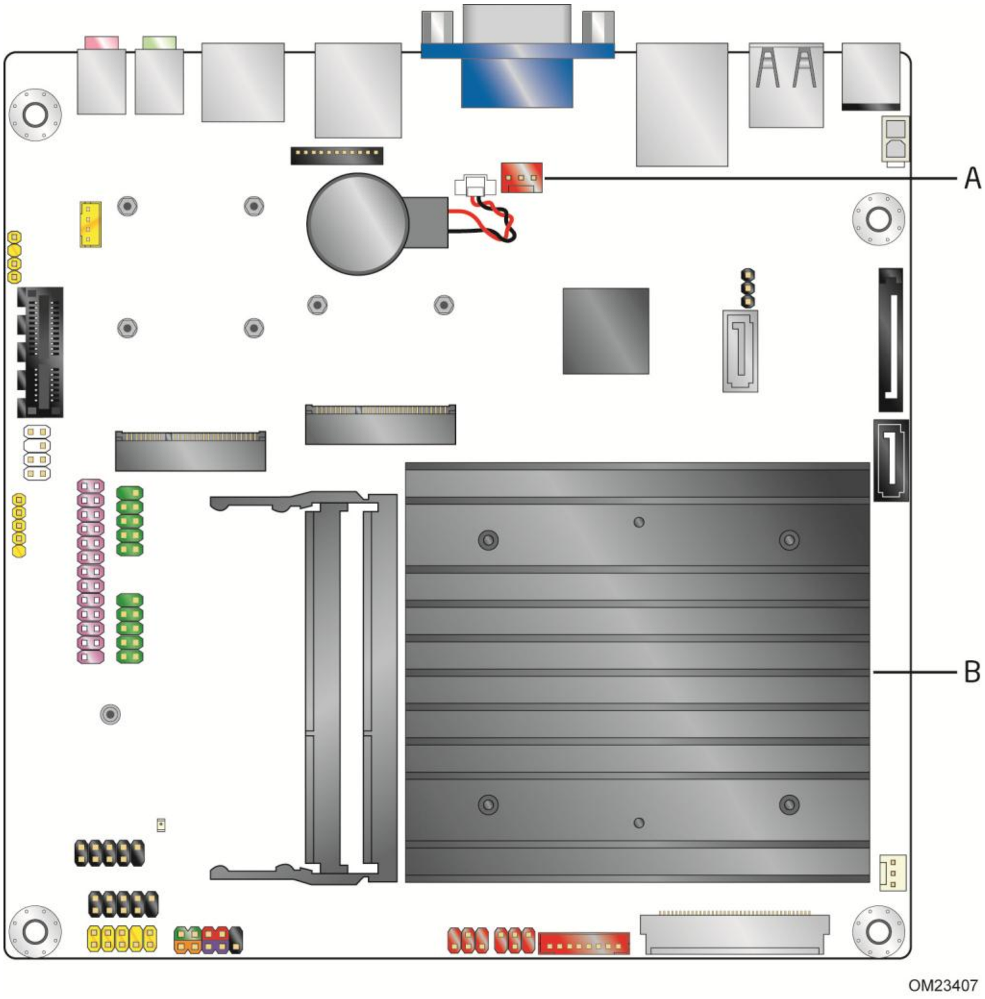
2.14.2 Fan Monitoring

Fan monitoring can be implemented using Intel® Desktop Utilities or third-party software.

For information about	Refer to
The functions of the fan header	Section 2.15.2.2

2.14.3 Thermal Monitoring

Figure 9 shows the locations of the thermal sensor and fan header.



Item	Description
A	System fan header
B	Thermal diode, located on the processor die

Figure 9. Thermal Sensor and Fan Header

2.15 Power Management

Power management is implemented at several levels, including:

- Software support through Advanced Configuration and Power Interface (ACPI)
- Hardware support:
    - Power connector
    - Fan header
    - LAN wake capabilities
    - Instantly Available PC technology
    - Wake from USB
    - Wake from serial port
    - PCI Express WAKE# signal support

2.15.1 ACPI

ACPI gives the operating system direct control over the power management and Plug and Play functions of a computer. The use of ACPI with this board requires an operating system that provides full ACPI support. ACPI features include:

- Plug and Play (including bus and device enumeration)
- Power management control of individual devices, add-in boards (some add-in boards may require an ACPI-aware driver), video displays, and hard disk drives
- Methods for achieving less than 15-watt system operation in the power-on/standby sleeping state
- A Soft-off feature that enables the operating system to power-off the computer
- Support for multiple wake-up events (see Table 11)
- Support for a front panel power and sleep mode switch

Table 9 lists the system states based on how long the power switch is pressed, depending on how ACPI is configured with an ACPI-aware operating system.

Table 9. Effects of Pressing the Power Switch

If the system is in this state…	…and the power switch is pressed for	…the system enters this state
Off (ACPI G2/G5 – Soft off)	Less than four seconds	Power-on (ACPI G0 – working state)
On (ACPI G0 – working state)	Less than four seconds	Soft-off/Standby (ACPI G1 – sleeping state) Note
On (ACPI G0 – working state)	More than six seconds	Fail safe power-off (ACPI G2/G5 – Soft off)
Sleep (ACPI G1 – sleeping state)	Less than four seconds	Wake-up (ACPI G0 – working state)
Sleep (ACPI G1 – sleeping state)	More than six seconds	Power-off (ACPI G2/G5 – Soft off)

Note: Depending on power management settings in the operating system.

2.15.1.1 System States and Power States

Under ACPI, the operating system directs all system and device power state transitions. The operating system puts devices in and out of low-power states based on user preferences and knowledge of how devices are being used by applications. Devices that are not being used can be turned off. The operating system uses information from applications and user settings to put the system as a whole into a low-power state.

Table 10 lists the power states supported by the board along with the associated system power targets. See the ACPI specification for a complete description of the various system and power states.

Table 10. Power States and Targeted System Power

Global States	Sleeping States	Processor States	Device States	Targeted System Power (Note 1)
G0 – working state	S0 – working	C0 – working	D0 – working state.	Full power > 30 W
G1 – sleeping state	S3 – Suspend to RAM. Context saved to RAM.	No power	D3 – no power except for wake-up logic.	Power < 5 W (Note 2)
G1 – sleeping state	S4 – Suspend to disk. Context saved to disk.	No power	D3 – no power except for wake-up logic.	Power < 5 W (Note 2)
G2/S5	S5 – Soft off. Context not saved. Cold boot is required.	No power	D3 – no power except for wake-up logic.	Power < 5 W (Note 2)
G3 – mechanical off AC power is disconnected from the computer.	No power to the system.	No power	D3 – no power for wake-up logic, except when provided by battery or external source.	No power to the system. Service can be performed safely.

Notes:

1. Total system power is dependent on the system configuration, including add-in boards and peripherals powered by the system chassis' power supply.
2. Dependent on the standby power consumption of wake-up devices used in the system.

2.15.1.2 Wake-up Devices and Events

Table 11 lists the devices or specific events that can wake the development kit from specific states.

Table 11. Wake-up Devices and Events

Devices/events that wake up the system…	…from this sleep state	…from this global state
Power switch	S3, S4, S5 (Note 1)	G1, G2, G3
RTC alarm	S3, S4, S5 (Note 1)	G1, G2 (Note 3)
LAN	S3, S4, S5 (Note 1)	G1, G2 (Note 3)
USB	S3	G1
WAKE#	S3, S4, S5 (Note 1)	G1, G2 (Note 3)
Serial port	S3	G1

Notes:

1. S4 implies operating system support only.
2. Wake from S4 and S5 is recommended by Microsoft.
3. Wake from device/event not supported immediately upon return from AC loss.

NOTE

The use of these wake-up events from an ACPI state requires an operating system that provides full ACPI support. In addition, software, drivers, and peripherals must fully support ACPI wake events.

2.15.2 Hardware Support

The board provides several power management hardware features, including:

- Instantly Available PC technology
- Fan headers
- LAN wake capabilities
- Wake from USB
- WAKE# signal wake-up support
- Wake from serial port
- Wake from Power Button signal
- Standby Power Indicator LED

NOTE

The use of Wake from USB from an ACPI state requires an operating system that provides full ACPI support.

2.15.2.1 Power Input

When resuming from an AC power failure, the computer returns to the power state it was in before power was interrupted (on or off). The computer's response can be set using the Last Power State feature in the BIOS Setup program's Boot menu.

For information about	Refer to
The location of the internal power connector	Figure 13
The signal names of the internal power connector	Table 34

2.15.2.2 Fan Header

The function/operation of the fan header is as follows:

- The fan is on when the board is in the S0 state
- The fan is off when the board is off or in the S3, S4, or S5 state.
- The fan header is wired to a fan tachometer input of the hardware monitoring and fan control ASIC.
- The fan header supports closed-loop fan control that can adjust the fan speed as needed.
- The fan header has a +12 V DC connection.
- The fan header supports 3-wire (voltage controlled) fans.

For information about	Refer to
The location of the fan header	Figure 13
The location of the fan header and sensor for thermal monitoring	Figure 9

2.15.2.3 LAN Wake Capabilities

LAN wake capabilities enable remote wake-up of the computer through a network. The LAN subsystem monitors network traffic at the Media Independent Interface. Upon detecting a Magic Packet* frame, the LAN subsystem asserts a wake-up signal that powers up the development kit.

2.15.2.4 Instantly Available PC Technology

Instantly Available PC technology enables the board to enter the ACPI S3 (Suspend-to-RAM) sleep-state. While in the S3 sleep-state, the computer will appear to be off (the power supply is off, and the front panel LED is amber if dual colored, or off if single colored.) When signaled by a wake-up device or event, the system quickly returns to its last known wake state. Table 11 lists the devices and events that can wake the computer from the S3 state.

The use of Instantly Available PC technology requires operating system support and drivers for any installed PCI Express add-in card.

2.15.2.5 Wake from USB

USB bus activity wakes the computer from an ACPI S3 state.

NOTE

Wake from USB requires the use of a USB peripheral that supports Wake from USB.

2.15.2.6 WAKE# Signal Wake-up Support

When the WAKE# signal on the PCI Express bus is asserted, the computer wakes from an ACPI S3, S4, or S5 state.

2.15.2.7 Wake from Serial Port

Serial Port activity wakes the computer from an ACPI S3 state.

2.15.2.8 Wake from S5

When the RTC Date and Time is set in the BIOS, the computer will automatically wake from an ACPI S5 state.

2.15.2.9 Standby Power Indicator LED

The standby power indicator LED shows that power is still present even when the computer appears to be off. Figure 10 shows the location of the standby power 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 board. Failure to do so could damage the board and any attached devices.

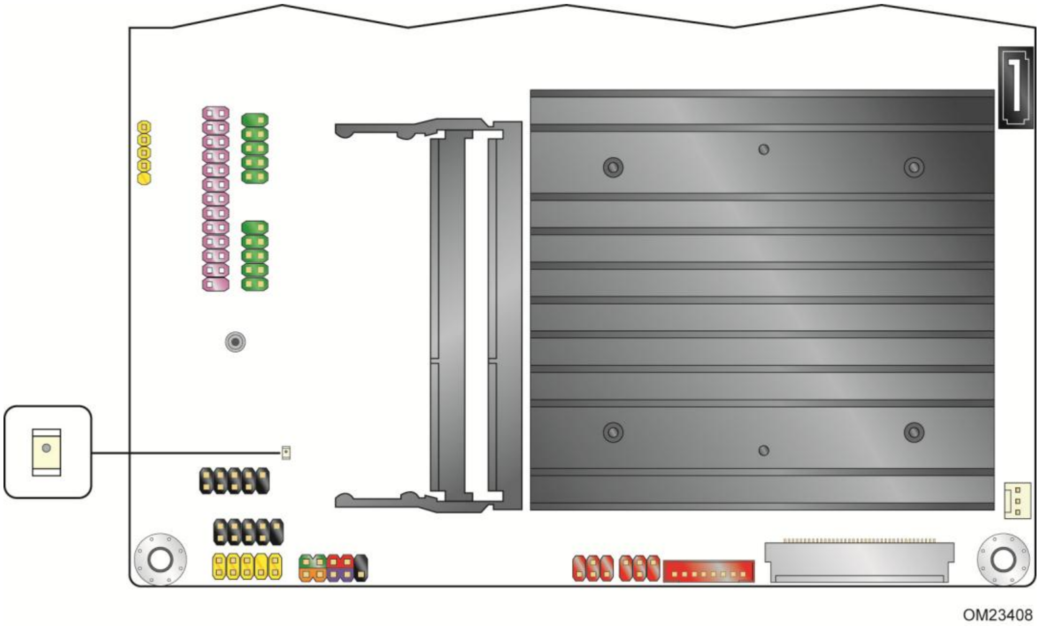


Figure 10. Location of the Standby Power LED

2.16 Debug Interfaces

The following debug support is provided on the Intel Embedded Board N2800:

- XDP (Extended Debug Port) connector supporting 3.3V JTAG is provided at J20 (on the reverse side of the board) for processor run control debug support.
- The 10-pin serial ports provide UART connectivity (see Section 2.8.1)

3 Technical Reference

3.1 Memory Resources

3.1.1 Addressable Memory

The board utilizes 4 GB of addressable system memory. Typically the address space that is allocated for PCI Conventional bus add-in cards, PCI Express configuration space, BIOS (SPI Flash device), and chipset overhead resides above the top of DRAM (total system memory). On a system that has 4 GB of system memory installed, it is not possible to use all of the installed memory due to system address space being allocated for other system critical functions. These functions include the following:

- BIOS/SPI Flash device (2 Mbit)
- Local APIC (19 MB)
- Direct Media Interface (40 MB)
- PCI Express configuration space (256 MB)
- PCH base address registers
- PCI Express ports (up to 256 MB)
- Memory-mapped I/O that is dynamically allocated for PCI Express add-in cards (256 MB)

The board provides the capability to reclaim the physical memory overlapped by the memory mapped I/O logical address space. The board remaps physical memory from the top of usable DRAM boundary to the 4 GB boundary to an equivalent sized logical address range located just above the 4 GB boundary. Figure 11 shows a schematic of the system memory map. All installed system memory can be used when there is no overlap of system addresses.

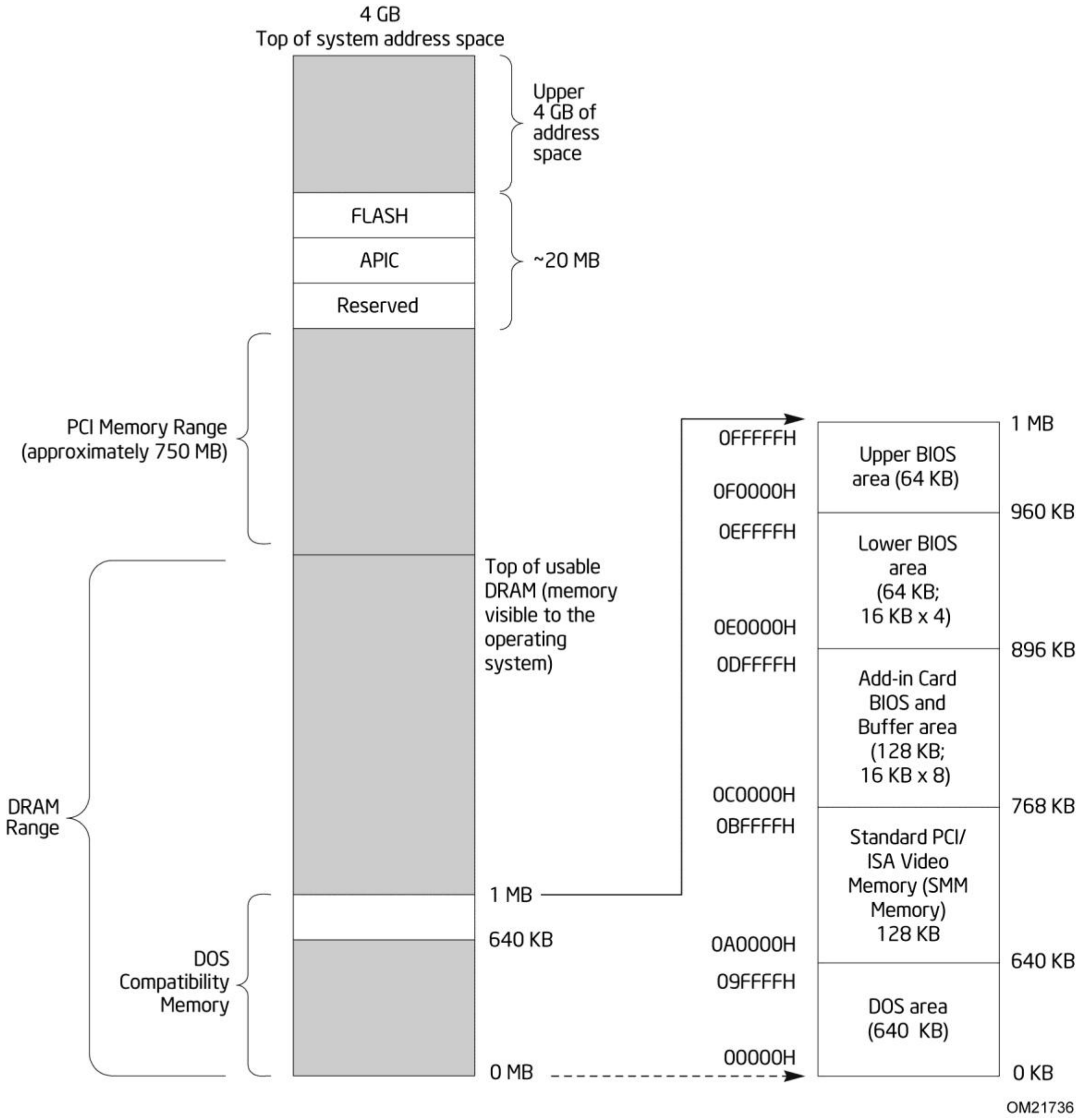


Figure 11. Detailed System Memory Address Map

3.1.2 Memory Map

Table 12 lists the system memory map.

Table 12. System Memory Map

Address Range (decimal)	Address Range (hex)	Size	Description
1024 K - 4194304 K	100000 - FFFFFFFF	4095 MB	Extended memory
960 K - 1024 K	F0000 - FFFFF	64 KB	Runtime BIOS
896 K - 960 K	E0000 - EFFFF	64 KB	Reserved
800 K - 896 K	C8000 - DFFFF	96 KB	Potential available high DOS memory (open to the PCI bus). Dependent on video adapter used.
640 K - 800 K	A0000 - C7FFF	160 KB	Video memory and BIOS
639 K - 640 K	9FC00 - 9FFFF	1 KB	Extended BIOS data (movable by memory manager software)
512 K - 639 K	80000 - 9FBFF	127 KB	Extended conventional memory
0 K - 512 K	00000 - 7FFFF	512 KB	Conventional memory

3.2 Connectors and Headers

CAUTION

Only the following connectors and headers have overcurrent protection: back panel and front panel USB.

The other internal connectors and headers 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 or headers 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 power cable, and the external devices themselves.

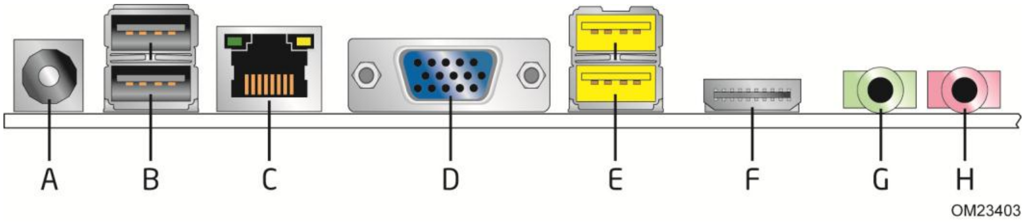
Furthermore, improper connection of USB header single wire connectors may eventually overload the overcurrent protection and cause damage to the board.

This section describes the board's connectors and headers. The connectors and headers can be divided into these groups:

- Back panel I/O connectors
- On-board I/O connectors and headers

3.2.1 Back Panel Connectors

Figure 12 shows the location of the back panel connectors for the board.



Item	Description
A	DC input jack
B	USB ports
C	LAN connector
D	VGA connector
E	High-current/fast charging USB ports
F	HDMI connector
G	Analog line out
H	Microphone in

Figure 12. Back Panel Connectors

3.2.2 Connectors and Headers (Top)

Figure 13 shows the locations of the connectors and headers on the top-side of the board.

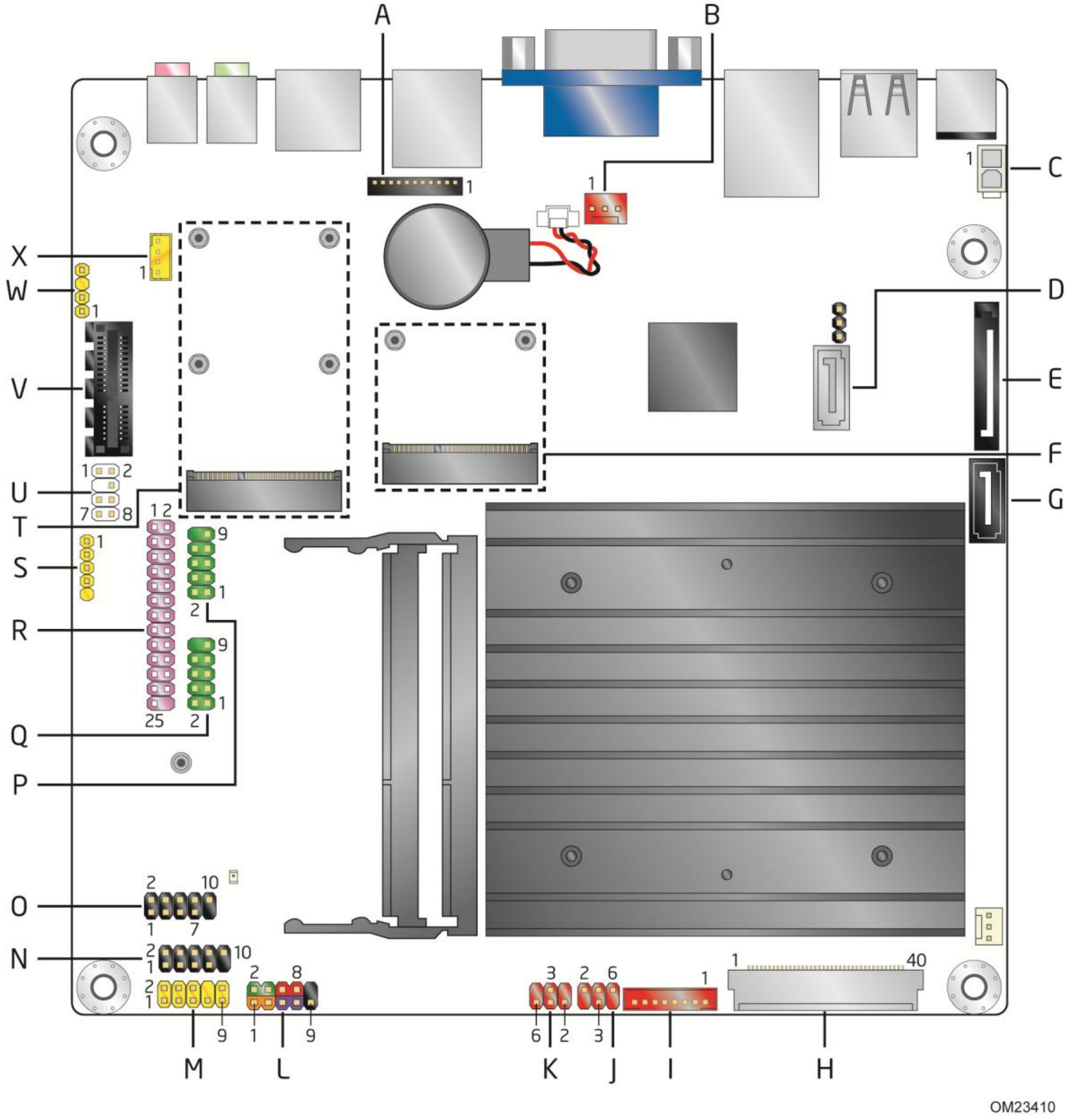


Figure 13. Connectors and Headers (Top)

Table 13 lists the connectors and headers identified in Figure 13.

Table 13. Connectors and Headers Shown in Figure 13

Item/callout from Figure 13	Description	Connector Information	
		Board Connector	Mating Plug
A	Debug connector	1x11, 1.25mm-pitch	
B	System fan header	3-wire fan	
C	Internal power connector	Molex* 5566-2	Molex 5557-02R
D	SATA data connector	7-pin SATA (male)	7-pin SATA (female)
E	SATA power connector	15-pin SATA (male)	15-pin SATA (female)
F	PCI Express Half-Mini Card slot	▨	▨
G	SATA data connector	7-pin SATA (male)	7-pin SATA (female)
H	LVDS connector	ACES* 88341-40	ACES 88441-40 Starconn* 107F40
I	FPD brightness connector	Foxconn* HF5508	JWT* A2001H02-8P
J	Flat panel voltage selection header	2x3, 2.54mm-pitch	Jumper
K	Backlight inverter voltage selection header	2x3, 2.54mm-pitch	Jumper
L	Front panel header	2x5, 2.54mm-pitch	
M	Front panel audio header	2x5, 2.54mm-pitch	
N	Front panel dual-port USB header	2x5, 2.54mm-pitch	
O	Front panel dual-port USB header	2x5, 2.54mm-pitch	
P	Serial port header	2x5, 2.54mm-pitch	
Q	Serial port header	2x5, 2.54mm-pitch	
R	Parallel port header	2x13, 2.54mm-pitch	
S	DMIC header	1x5, 2.54mm-pitch	
T	PCI Express Full-/Half-Mini Card slot	▨	▨
U	Custom Solutions header	2x4, 2.00mm-pitch	
V	PCI Express 1.0a x1 connector	▨	▨
W	S/PDIF header	1x4, 2.54mm-pitch	
X	Internal stereo speakers header	JS*-1125-04	JWT* A2001H02-4P

3.2.3 Connectors and Headers (Bottom)

Figure 14 shows the locations of the connectors and headers on the bottom-side of the board.

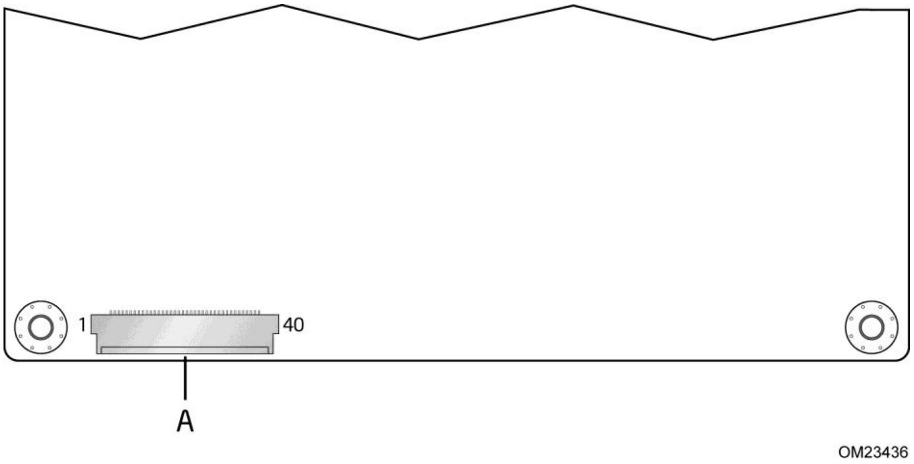


Figure 14. Connectors and Headers (Bottom)

Table 14 lists the connectors and headers identified in Figure 14.

Table 14. Connectors and Headers Shown in Figure 14

Item/callout from Figure 14	Description	Connector Information	
		Board Connector	Mating Plug
A	eDP connector	ACES 50203-040	ACES 88441-40 Starconn 107F40

3.2.3.1 Signal Tables for the Connectors and Headers

Table 15. Front Panel Audio Header for Intel HD Audio

Pin	Signal Name	Description
1	PORT_1L	Analog Port 1 – Left channel (Microphone)
2	GND	Ground
3	PORT_1R	Analog Port 1 – Right channel (Microphone)
4	PRESENCE#	Active low signal that signals BIOS that an Intel HD Audio dongle is connected to the analog header. PRESENCE#=0 when an Intel HD Audio dongle is connected
5	PORT_2R	Analog Port 2 – Right channel (Headphone)
6	SENSE1_RETURN	Jack detection return for front panel (JACK1)
7	SENSE_SEND	Jack detection sense line from the Intel HD Audio CODEC jack detection resistor network
8	KEY	No pin
9	PORT_2L	Analog Port 2 – Left channel (Headphone)
10	SENSE2_RETURN	Jack detection return for front panel (JACK2)

Table 16. Front Panel Audio Header for AC'97 Audio

Pin	Signal Name	Description
1	MIC	Front panel microphone input signal (biased when supporting stereo microphone)
2	AUD_GND	Ground used by analog audio circuits
3	MIC_BIAS	Microphone power / additional MIC input for stereo microphone support
4	PRESENCE#	Active low signal that signals BIOS that an Intel HD Audio dongle is connected to the analog header. PRESENCE#=0 when an Intel HD Audio dongle is connected
5	FP_OUT_R	Right channel audio signal to front panel (headphone drive capable)
6	AUD_GND	Ground used by analog audio circuits
7	RESERVED	Reserved
8	KEY	No pin
9	FP_OUT_L	Left channel audio signal to front panel (headphone drive capable)
10	AUD_GND	Ground used by analog audio circuits

Table 17. Internal Stereo Speakers Header

Pin	Signal Name	Description
1	Front_L−	Analog front left (differential negative)
2	Front_L+	Analog front left (differential positive)
3	Front_R+	Analog front right (differential positive)
4	Front_R−	Analog front right (differential negative)

Table 18. Internal S/PDIF Header

Pin	Signal Name	Description
1	GND	Ground
2	SPDIF_OUT	SPDIF signal from the codec
3	Key (no pin)	Key (no pin)
4	+5V_DC	5 V power (for optical/TOSLINK module)

Table 19. Internal DMIC Header

Pin	Signal Name	Description
1	+3.3 V	3.3 V power (for DMIC module)
2	DMIC_DATA	DMIC data signal
3	GND	Ground
4	DMIC_CLK	DMIC clock signal
5	Key (no pin)	Key (no pin)

Table 20. Front Panel USB Dual-Port Header

Pin	Signal Name	Pin	Signal Name
1	+5 V DC	2	+5 V DC
3	D−	4	D−
5	D+	6	D+
7	Ground	8	Ground
9	KEY (no pin)	10	No Connect

Table 21. Front Panel USB Dual-Port Header (with support for Intel Z-U130 USB Solid-State Drive or compatible SSD)

Pin	Signal Name	Pin	Signal Name
1	+5 V DC	2	+5 V DC
3	D−	4	D−
5	D+	6	D+
7	Ground	8	Ground
9	KEY (no pin)	10	LED#

Table 22. Serial Port Headers

Pin	Signal Name	Pin	Signal Name
1	DCD (Data Carrier Detect)	2	RXD# (Receive Data)
3	TXD# (Transmit Data)	4	DTR (Data Terminal Ready)
5	Ground	6	DSR (Data Set Ready)
7	RTS (Request To Send)	8	CTS (Clear To Send)
9	RI (Ring Indicator)	10	Key (no pin)

Table 23. Parallel Port Header

Pin	Standard Signal Name	EPP Signal Name
1	STROBE#	WRITE#
2	AUTOFD#	DATASTB#
3	PD0	PD0
4	FAULT#	FAULT#
5	PD1	PD1
6	INT#	RESET#
7	PD2	PD2
8	SLCTIN#	ADDRSTB#
9	PD3	PD3
10	GROUND	GROUND
11	PD4	PD4
12	GROUND	GROUND
13	PD5	PD5
14	GROUND	GROUND
15	PD6	PD6
16	GROUND	GROUND
17	PD7	PD7
18	GROUND	GROUND
19	ACK#	INTR
20	GROUND	GROUND
21	BUSY	WAIT#
22	GROUND	GROUND
23	PERROR	PE
24	GROUND	GROUND
25	SELECT	SELECT
26	KEY (no pin)	KEY (no pin)

Table 24. SATA Connectors

Pin	Signal Name
1	Ground
2	TXP
3	TXN
4	Ground
5	RXN
6	RXP
7	Ground

Table 25. SATA Power Connector

Pin	Signal Name
1	3.3 V DC
2	3.3 V DC
3	3.3 V DC
4	Ground
5	Ground
6	Ground
7	5 V DC
8	5 V DC
9	5 V DC
10	Ground
11	Ground
12	Ground
13	12 V DC
14	12 V DC
15	12 V DC

Table 26. Custom Solutions Header

Pin	Signal Name
1	Watch Dog Timer
2	Ground
3	Key (no pin)
4	SMB_CLK_RESUME
5	3.3 V standby
6	SMB_DATA_RESUME
7	PWRBT#
8	HDMI CEC

Table 27. System Fan Header

Pin	Signal Name
1	Ground
2	+12 V (PWM controlled pulses)
3	Tach

Table 28. Flat Panel Voltage Selection Header

Pin	Signal Name	Description
1	Key	No pin
2	3.3 V	3.3 V option (default)
3	12 V	12 V option
4	LCD_VCC	Send voltage to connector
5	Key	No pin
6	5 V	5 V option

Table 29. Backlight Inverter Voltage Selection Header

Pin	Signal Name	Description
1	Key	No pin
2	5 V	5 V option
3	Vin	Board input voltage option
4	BKLT_PWR	Send voltage to connector
5	Key	No pin
6	12 V	12 V option

Table 30. 40-Pin LVDS Connector

Pin	Signal Name	Pin	Signal Name
1	ODD_Lane3_P	21	N/C
2	ODD_Lane3_N	22	EDID_3.3 V
3	ODD_Lane2_P	23	LCD_GND
4	ODD_Lane2_N	24	LCD_GND
5	ODD_Lane1_P	25	LCD_GND
6	ODD_Lane1_N	26	ODD_CLK_P
7	ODD_Lane0_P	27	ODD_CLK_N
8	ODD_Lane0_N	28	BKLT_GND
9	EVEN_Lane3_P	29	BKLT_GND
10	EVEN_Lane3_N	30	BKLT_GND
11	EVEN_Lane2_P	31	EDID_CLK
12	EVEN_Lane2_N	32	BKLT_ENABLE
13	EVEN_Lane1_P	33	BKLT_PWM_DIM
14	EVEN_Lane1_N	34	EVEN_CLK_P
15	EVEN_Lane0_P	35	EVEN_CLK_N
16	EVEN_Lane0_N	36	BKLT_PWR
17	EDID_GND	37	BKLT_PWR
18	LCD_VCC	38	BKLT_PWR
19	LCD_VCC	39	N/C
20	LCD_VCC	40	EDID_DATA

NOTE

LVDS single-channel output is driven from the EVEN signals.

Table 31. 40-Pin eDP Connector

Pin	Signal Name	Pin	Signal Name
1	NC_Reserved	21	LCD_VCC
2	High-speed_GND	22	LCD_Self_Test-or-NC
3	Lane3_N (DDPD_[3]N)	23	LCD_GND
4	Lane3_P (DDPD_[3]P)	24	LCD_GND
5	High-speed_GND	25	LCD_GND
6	Lane2_N (DDPD_[2]N)	26	LCD_GND
7	Lane2_P (DDPD_[2]P)	27	HPD (DDPD_HPD)
8	High-speed_GND	28	BKLT_GND
9	Lane1_N (DDPD_[1]N)	29	BKLT_GND
10	Lane1_P (DDPD_[1]P)	30	BKLT_GND
11	High-speed_GND	31	BKLT_GND
12	Lane0_N (DDPD_[0]N)	32	BKLT_ENABLE
13	Lane0_P (DDPD_[0]P)	33	BKLT_PWM_DIM
14	High-speed_GND	34	NC_Reserved
15	AUX_CH_P (DDPD_AUXP)	35	NC_Reserved
16	AUX_CH_N (DDPD_AUXN)	36	BKLT_PWR
17	High-speed_GND	37	BKLT_PWR
18	LCD_VCC	38	BKLT_PWR
19	LCD_VCC	39	BKLT_PWR
20	LCD_VCC	40	NC_Reserved

Table 32. 8-Pin FPD Brightness Connector

Pin	Signal Name	Description
1	BKLT_EN	Backlight enable
2	BKLT_PWM	Backlight control
3	BKLT_PWR	Backlight inverter power
4	BKLT_PWR	Backlight inverter power
5	BKLT_GND/Brightness_GND	Ground (shared)
6	BKLT_GND/Brightness_GND	Ground (shared)
7	Brightness_Up	Panel brightness increase
8	Brightness_Down	Panel brightness decrease

Table 33. PCI Express Full-/Half-Mini Card Connector

Pin	Signal Name	Additional Signal Name
1	WAKE#	
2	+3.3 V aux	
3	Reserved	
4	GND	
5	Reserved	
6	1.5 V	
7	CLKREQ#	
8	Reserved	
9	GND	
10	Reserved	
11	REFCLK-	
12	Reserved	
13	REFCLK+	
14	Reserved	
15	GND	
16	Reserved	
17	Reserved	
18	GND	
19	Reserved	
20	Reserved	
21	GND	
22	PERST#	
23	PERn0	
24	+3.3 V aux	
25	PERp0	
26	GND	
27	GND	
28	+1.5 V	
29	GND	
30	SMB_CLK	
31	PETn0	
32	SMB_DATA	
33	PETp0	
34	GND	
35	GND	
36	USB_D-	
37	GND	(mSATA) GND
38	USB_D+	

continued

Table 33. PCI Express Full-/Half-Mini Card Connector (continued)

Pin	Signal Name	Additional Signal Name
39	+3.3 V aux	(mSATA) 3.3 V
40	GND	
41	+3.3 V aux	(mSATA) 3.3 V
42	LED_WWAN#	
43	Reserved	NC (mSATA indicator)
44	LED_WLAN#	
45	Reserved	(mSATA) Vendor
46	LED_WPAN#	
47	Reserved	(mSATA) Vendor
48	+1.5V	
49	Reserved	(mSATA) DA/DSS
50	GND	
51	Reserved	(mSATA) Presence Detection
52	+3.3 V aux	

3.2.3.2 Add-in Card Connectors

The board has the following add-in card connectors:

- One PCI Express 1.0a x1 connector. The x1 interface supports simultaneous transfer speeds up to 250 MB/s of peak bandwidth per lane, per direction, for up to 500 MB/s concurrent and bi-directional bandwidth.
- One PCI Express Half-Mini Card slot
- One PCI Express Full-/Half-Mini Card slot (removable stand-offs in full-length keep out zone allows repurposing of Full-Mini Card slot into Half-Mini Card slot)

3.2.3.3 Power Supply Connectors

This development kit is shipped with a 60W AC/DC switching mode power supply. It is recommended to use this power supply.

The kit supports a wide-range voltage input that can also be driven by either of the following alternate power supply types:

- **External Power Supply** – the board can be powered with an 8 - 19 VDC external power supply though the DC jack on the back panel. This connector accepts dual-barrel plugs with an inner diameter (ID) of 2.5 mm and an outer diameter (OD) of 5.5 mm, where the inner contact is +8 (±10%) through +19 (±10%) VDC and the shell is GND. The maximum current rating for this connector is 8 A.
- **Internal Power Supply** – the board can alternatively be powered via the internal 1 x 2 power connector, where pin 1 is GND and pin 2 is +8 (±10%) through +19 (±10%) VDC. The maximum current rating for this connector is 10 A.

Table 34. Internal Power Supply Connector Pinout

Pin	Signal Name
1	Ground
2	DC input: +8 (±10%) through +19 (±10%) VDC

For information about	Refer to
Power supply considerations	Section 3.6.1

3.2.3.4 Front Panel Header

This section describes the functions of the front panel header. Table 35 lists the signal names of the front panel header. Figure 15 is a connection diagram for the front panel header.

Table 35. Front Panel Header

Pin	Signal Name	Description	Pin	Signal Name	Description
1	HDD_POWER_LED	Pull-up resistor (750 Ω) to +5V	2	POWER_LED_MAIN	[Out] Front panel LED (main color)
3	HDD_LED#	[Out] Hard disk activity LED	4	POWER_LED_ALT	[Out] Front panel LED (alt color)
5	GROUND	Ground	6	POWER_SWITCH#	[In] Power switch
7	RESET_SWITCH#	[In] Reset switch	8	GROUND	Ground
9	+5V_DC	Power	10	Key	No pin

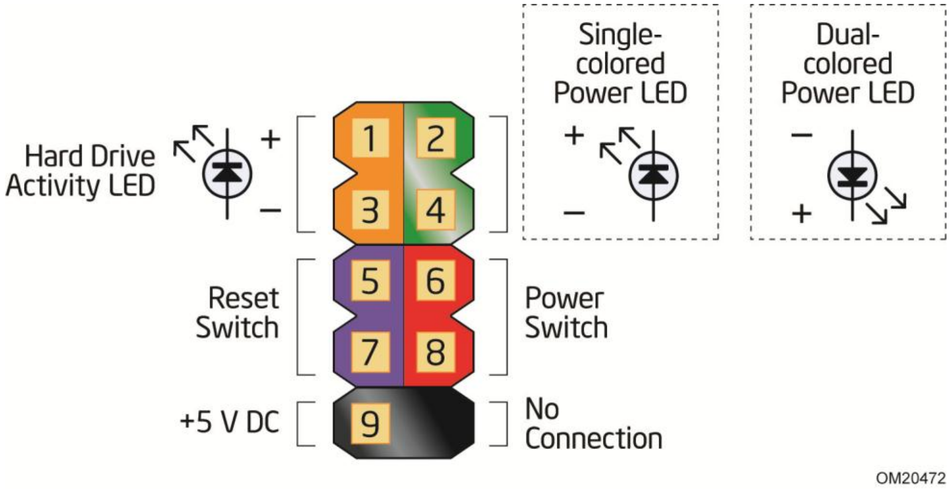


Figure 15. Connection Diagram for Front Panel Header

3.2.3.4.1 Hard Drive Activity LED Header

Pins 1 and 3 of the Front Panel Header can be connected to an LED to provide a visual indicator that data is being read from or written to a hard drive. Proper LED function requires a SATA hard drive or optical drive connected to an onboard SATA connector.

3.2.3.4.2 Reset Switch Header

Pins 5 and 7 of the Front Panel Header can be connected to a momentary single pole, single throw (SPST) type switch that is normally open. When the switch is closed, the board resets and runs the POST.

3.2.3.4.3 Power/Sleep LED Header

Pins 2 and 4 of the Front Panel Header can be connected to a one- or two-color LED. Table 36 shows the possible LED states.

Table 36. States for a One-Color Power LED

LED State	Description
Off	Power off
Blinking	Standby
Steady	Normal operation

NOTE

The LED behavior shown in Table 36 is default – other patterns may be set via BIOS setup.

3.2.3.4.4 Power Switch Header

Pins 6 and 8 of the Front Panel Header 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 switch on or off. (The time requirement is due to internal debounce circuitry on the board.) At least two seconds must pass before the board will recognize another on/off signal.

3.2.3.5 Front Panel USB Headers

Figure 16 is a connection diagram for the front panel USB headers.

NOTE

- *The +5 V DC power on the USB headers is fused.*
- *Use only a front panel USB connector that conforms to the USB 2.0 specification for high-speed USB devices.*

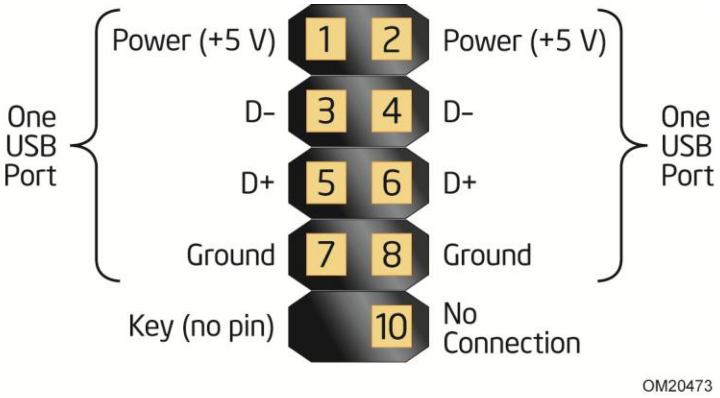


Figure 16. Connection Diagram for Front Panel USB Dual-Port Header

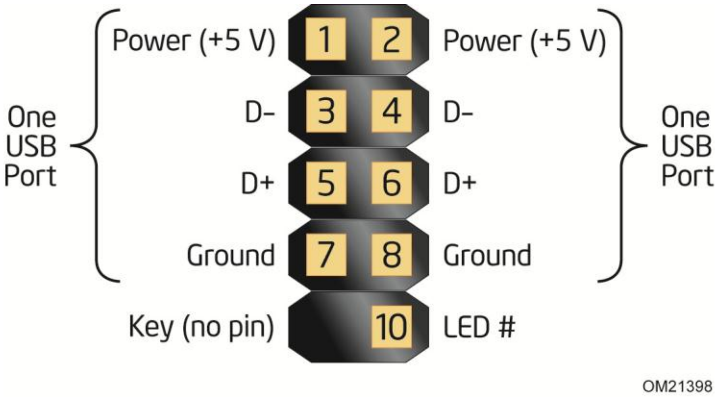


Figure 17. Connection Diagram for Front Panel USB Dual-Port Header (with Intel Z-U130 USB Solid-State Drive, or Compatible SSD, Support)

3.2.3.6 Debug Header

During the POST, the BIOS generates diagnostic progress codes (POST codes) to I/O port 80h. If the POST fails, execution stops and the last POST code generated is left at port 80h. This code is useful for determining the point where an error occurred.

Displaying the POST codes requires a POST card that can interface with the Debug header. The POST card can decode the port and display the contents on a medium such as a seven-segment display.

Table 37. Debug Header

Pin	Signal Name
1	VCC3
2	VCC3
3	PLTRST#
4	LPC_CLK
5	LAD0/FWH0
6	LAD1/FWH1
7	LAD2/FWH2
8	LAD3/FWH3
9	LFRAME/FWH4#
10	GND
11	GND

3.3 I/O Shields

When installed in the chassis, the I/O shield blocks radio frequency transmissions, protects internal components from dust and foreign objects, and promotes correct airflow within the chassis.

Two I/O shields are provided inside the chassis to house the embedded board:

- Half-height I/O shield
- Standard-height I/O shield

The half-height I/O shield allows access to all back panel connectors while being specifically designed for thin mini-ITX chassis, compliant with version 2.0 of the *Mini-ITX Addendum to the microATX Motherboard Interface Specification*.

The standard-height I/O shield provides access to all the same connectors as the half-height I/O shield while being compatible with standard mini-ITX and microATX chassis. In addition to the F-type pre-cut hole, the standard-height I/O shield also provides pre-cut holes for user installation of two external wireless antennas for system configurations with wireless PCI Express Mini Card solutions.

Figure 18 and Figure 19 are I/O shield reference diagrams.

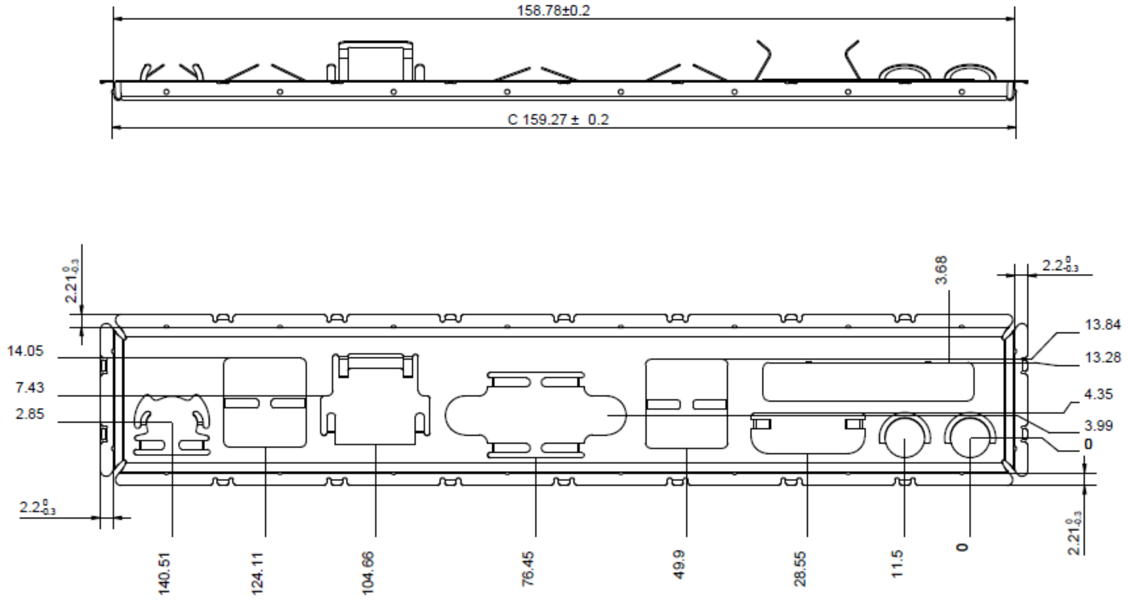


Figure 18. Half-Height Back Panel I/O Shield

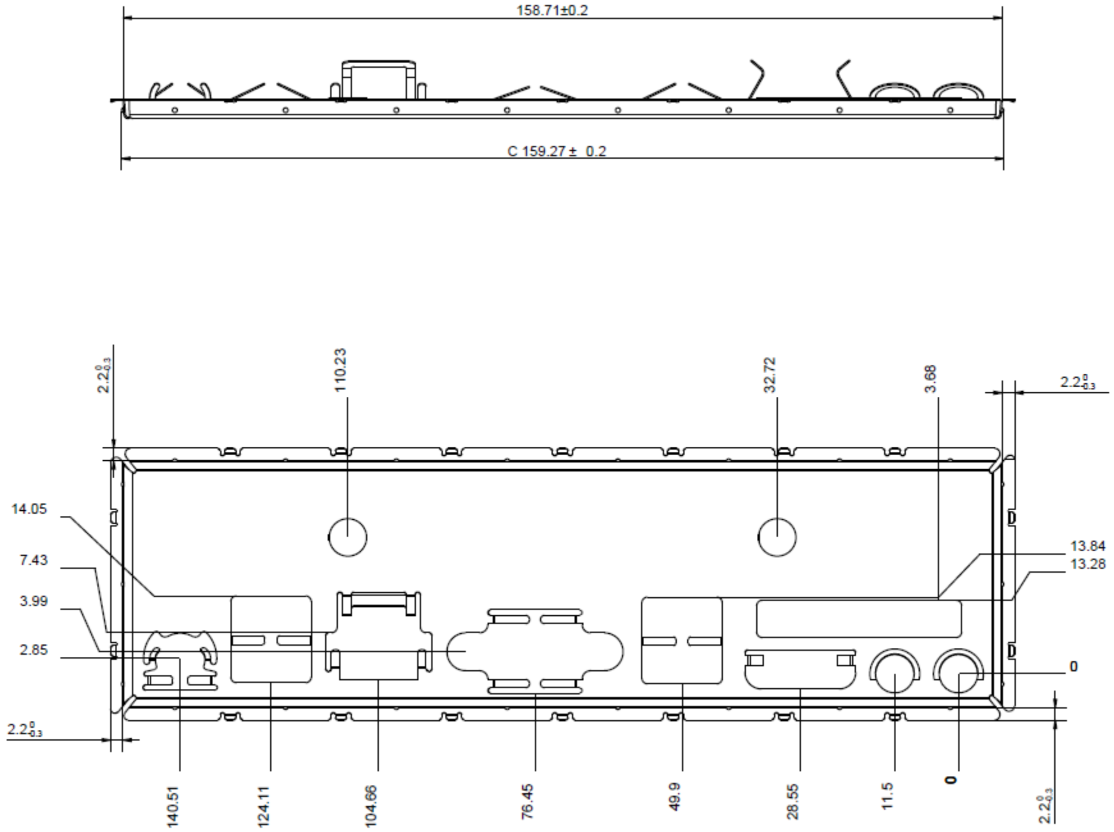


Figure 19. Standard-Height Back Panel I/O Shield

For more information about	Refer to
Thin mini-ITX form factor	http://www.formfactors.org/developer%5Cspecs%5CMini_ITX_Spec_V2_0.pdf

3.4 Jumper Block

CAUTION

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

Figure 20 shows the location of the jumper block. The 3-pin jumper block determines the BIOS Setup program’s mode. Table 38 describes the jumper settings for the three modes: Normal, Configure, and Recovery. When the jumper is set to Configure 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.

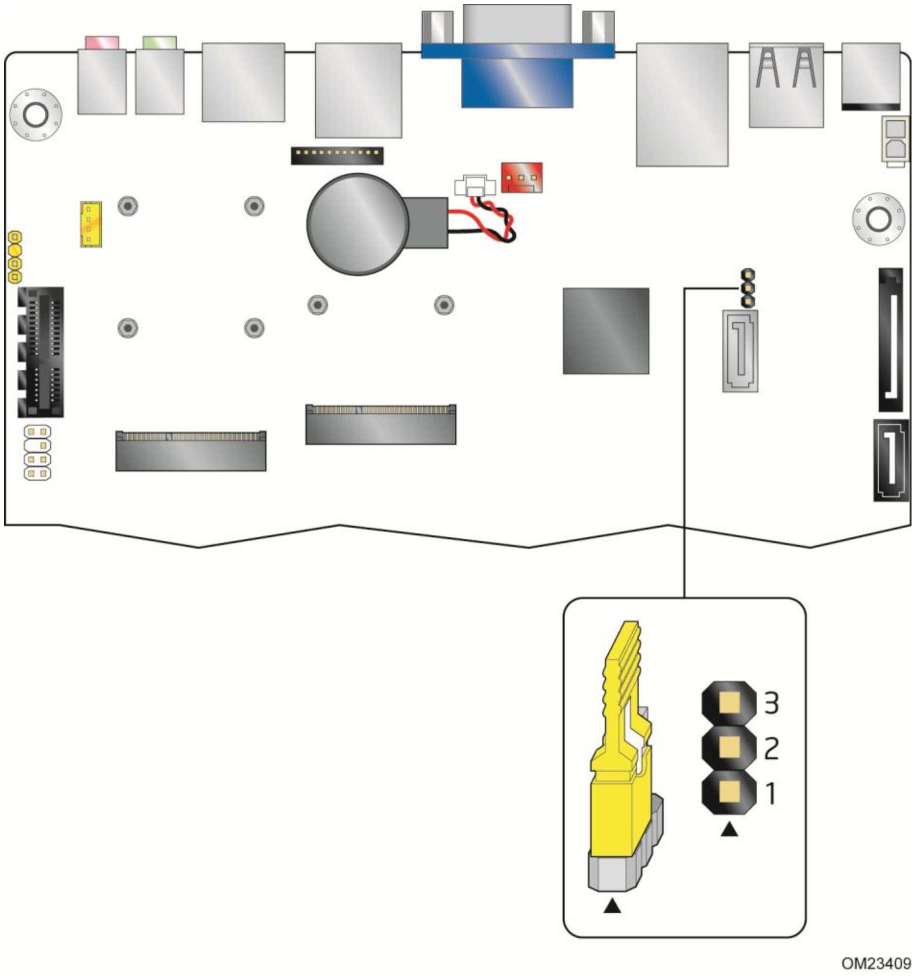


Figure 20. Location of the Jumper Block

Table 38. 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. Note that this Configure mode is the only way to clear the BIOS/CMOS settings. Press F9 (restore defaults) while in Configure mode to restore the BIOS/CMOS settings to their default values.
Recovery	None	The BIOS attempts to recover the BIOS configuration. A recovery CD or flash drive is required.

3.5 Mechanical Considerations

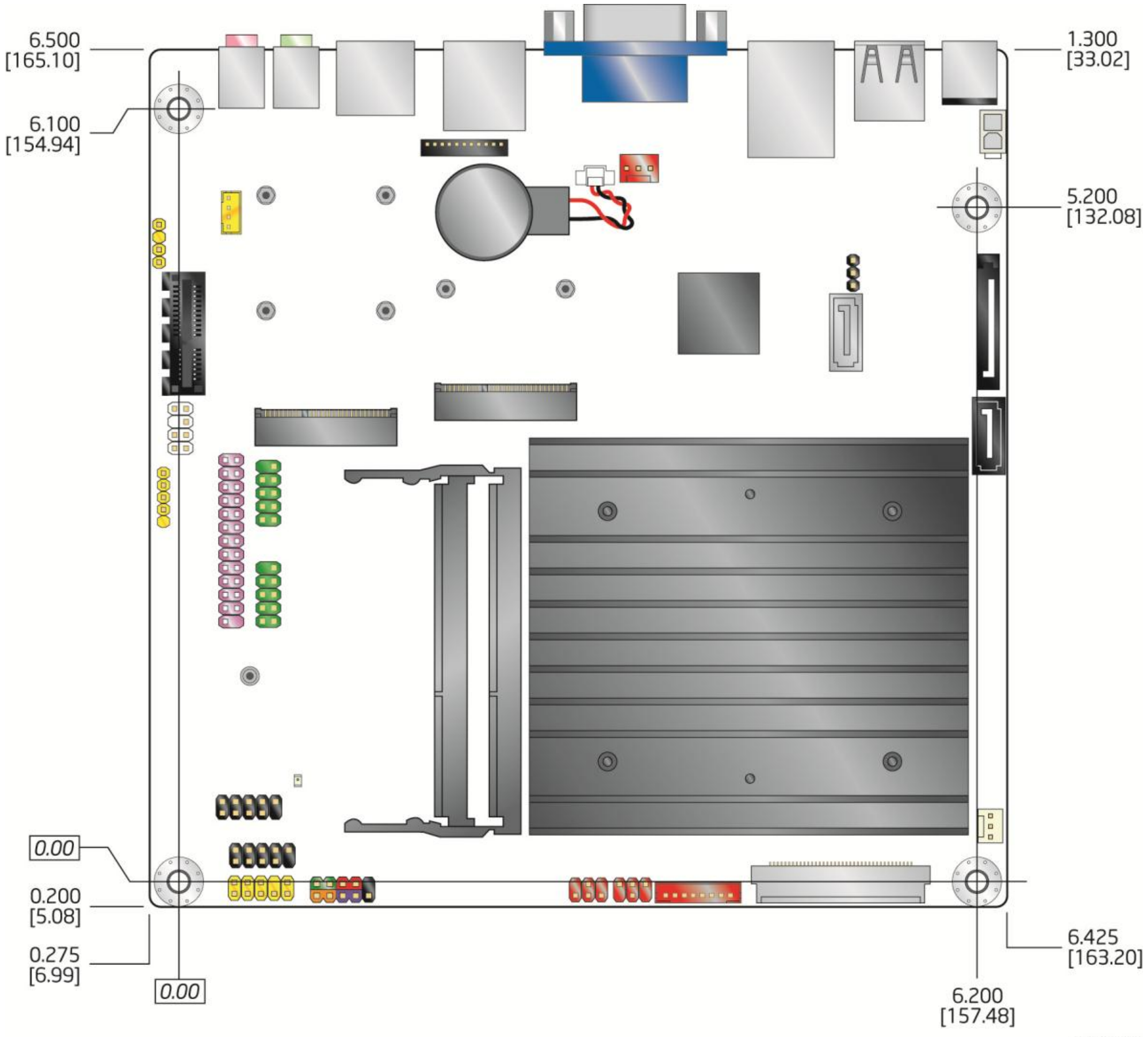
3.5.1 Form Factor

The N2800 embedded board is installed into the Development Kit's Mini-ITX form-factor chassis. Figure 21 illustrates the mechanical form factor of the inside of the chassis. Dimensions are given in inches [millimeters]. The outer dimensions are 6.7 inches by 6.7 inches [170.18 millimeters by 170.18 millimeters]. Location of the I/O connectors and mounting holes are in compliance with the ATX specification.

NOTE

The embedded board is designed to have a total height of less than 20 mm from the underside of the board to the top of its tallest components, including all back panel I/O ports, internal connectors, installed system memory, and factory-installed thermal solutions, in compliance with thin mini-ITX requirements per version 2 of the Mini-ITX Addendum to the microATX Motherboard Interface Specification*.*

For more information about	Refer to
Thin mini-ITX form factor	http://www.formfactors.org/developer%5Cspecs%5CMini_ITX_Spec_V2_0.pdf



Units expressed in inches [millimeters]

Figure 21. Board Dimensions

3.6 Electrical Considerations

3.6.1 Power Supply Considerations

CAUTION

The external DC jack is the primary power input connector of Intel Embedded Board N2800. However, the Embedded Board also provides an internal 1 x 2 power connector that can be used in custom-developed systems that have an internal power supply.

There is no isolation circuitry between the external DC jack and the internal 1 x 2 power connector. It is the system integrator's responsibility to ensure no more than one power supply unit is or can be attached to the board at any time and to ensure the external DC jack is covered if the internal 1 x 2 power connector is to be used. A plastic lid for the external DC jack is provided in the accessories box shall it be useful to the system integrator for this purpose.

Simultaneous connection of both external and internal power supply units could result in potential damage to the Embedded Board, power supplies, or other hardware.

System power requirements will depend on actual system configurations chosen by the integrator, as well as end user expansion preferences. It is the system integrator's responsibility to ensure an appropriate power budget for the system configuration is properly assessed based on the system-level components chosen.

3.6.2 Connecting a System Fan & Fan Header Current Capability

Table 39 lists the current capability of the fan header.

Table 39. Fan Header Current Capability

Fan Header	Maximum Available Current
System fan	1.5 A

You can connect a 3-wire system fan cable to the system fan header on the N2800 Embedded Board. Use Figure 22 for guidance.

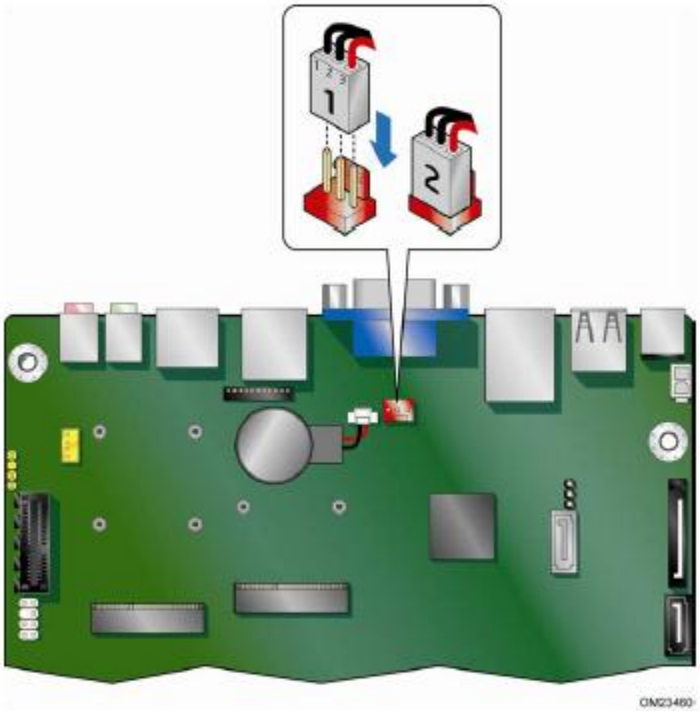


Figure 22. Location of the Chassis Fan Header

3.6.3 PCI Express* Add-in Card Considerations

The motherboard is designed to provide up to 10 W to the PCI Express x1 slot. The total power consumption from add-in boards on this slot must not exceed this rating.

3.6.3.1 Installing a PCI Express Mini & Full Card in the PCI Express Full-/Half-Mini Card Slot

A PCI Express Full-Mini or Half-Mini Card can be installed in the Embedded Board's PCI Express Full and/or Half-Mini Card slot.

To install a PCI Express Full-Mini Card in this slot, see Figure 23 and follow these steps:

1. Observe common sense ESD precautions
2. Locate the PCI Express Full-/Half-Mini Card slot
3. Insert the card into the PCI Express Mini Card connector (see Figure 23 → A) at a slightly upward angle.
4. Align the mounting holes and secure the card in place (see Figure 23 → B).

To install a PCI Express Half-Mini Card in this slot, see Figure 23 and follow these steps:

1. Observe the precautions in "Before You Begin" on page 15.
2. Locate the PCI Express Full-/Half-Mini Card slot
3. If necessary, move the mounting standoffs to the location shown in Figure 23 → C.
4. Insert the card into the PCI Express Mini Card connector (see Figure 23→ D) at a slightly upward angle.
5. Align the mounting holes and secure the card in place (see Figure 23 → E).

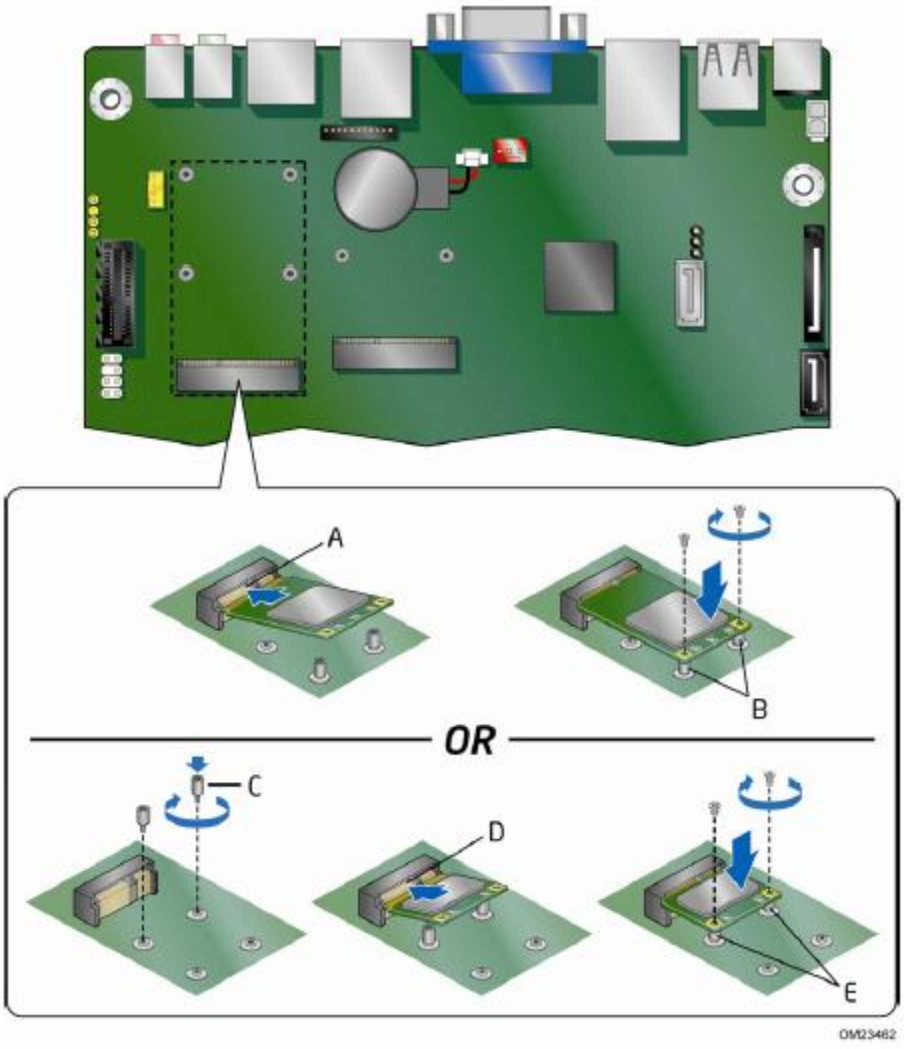


Figure 23. Installing a PCI Express Mini Card in the Full-/Half-Mini Card Slot

A PCI Express Half-Mini Card can be installed in the Embedded Board’s PCI Express Half-Mini Card slot.

To install a PCI Express card in this slot, see Figure 24 and follow these steps:

1. Observe common sense ESD precautions
2. Locate the PCI Express Half-Mini Card slot
3. Insert the card into the PCI Express Mini Card connector (see Figure 24 → A) at a slightly upward angle.
4. Align the mounting holes and secure the card in place (see Figure 24 → B).

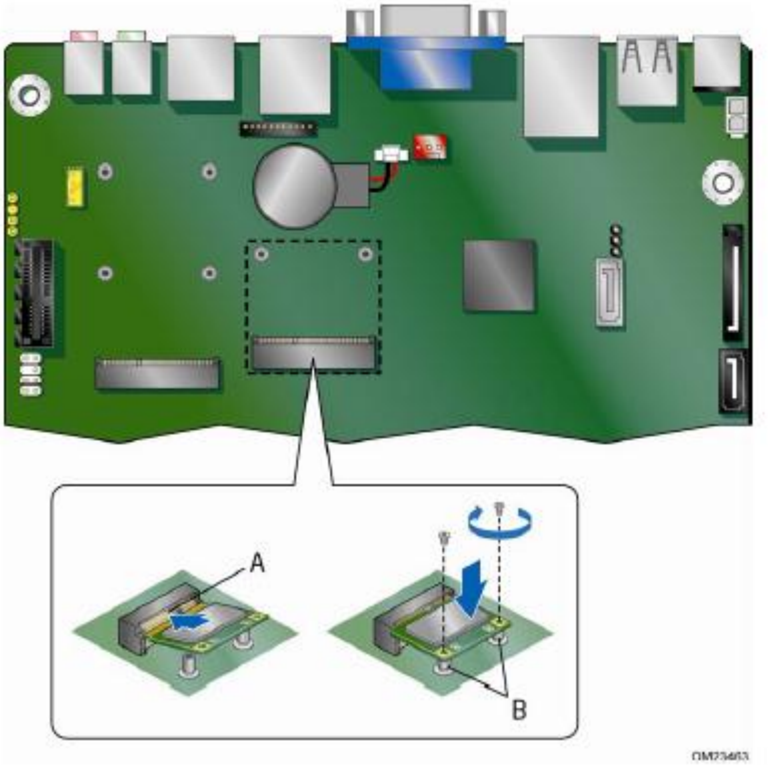


Figure 24. Installing a PCI Express Mini Card in the Half-Mini Card Slot

3.6.4 Connecting to SATA Drive Considerations

This Development Kit supports two SATA drives with two data connectors and one power connector. To enable low-profile connectivity, the board ships with two SATA data cables with right-angled connectors and an in-line power cable that provides:

- a right-angled female-gender 15-pin SATA power connector for low-profile board connectivity
- a female-gender 1 x 4 Molex-type power connector for system component power flexibility
- a 15-pin female-gender SATA power connector for SATA drive power
- a vertical 15-pin female-gender SATA power connector for SATA drive power

NOTE:

If you install an mSATA drive in the board's PCI Express Full-/Half-Mini Card slot, SATA port 1 (gray) will be disabled.

To connect a SATA drive to the Embedded Board N2800:

1. Observe common sense ESD precautions
2. Attach the right angled connector on the SATA data cable to one of the SATA connectors on the board (see Figure 25 → A).
3. Attach the other end of the SATA data cable to the SATA drive (see Figure 25 → B).
4. Attach the right-angled 15-pin SATA power connector on the power cable to the 15-pin SATA power connector on the Desktop Board (see Figure 25 → C).
5. Attach the 15-pin SATA power connector (see Figure 25 → D)

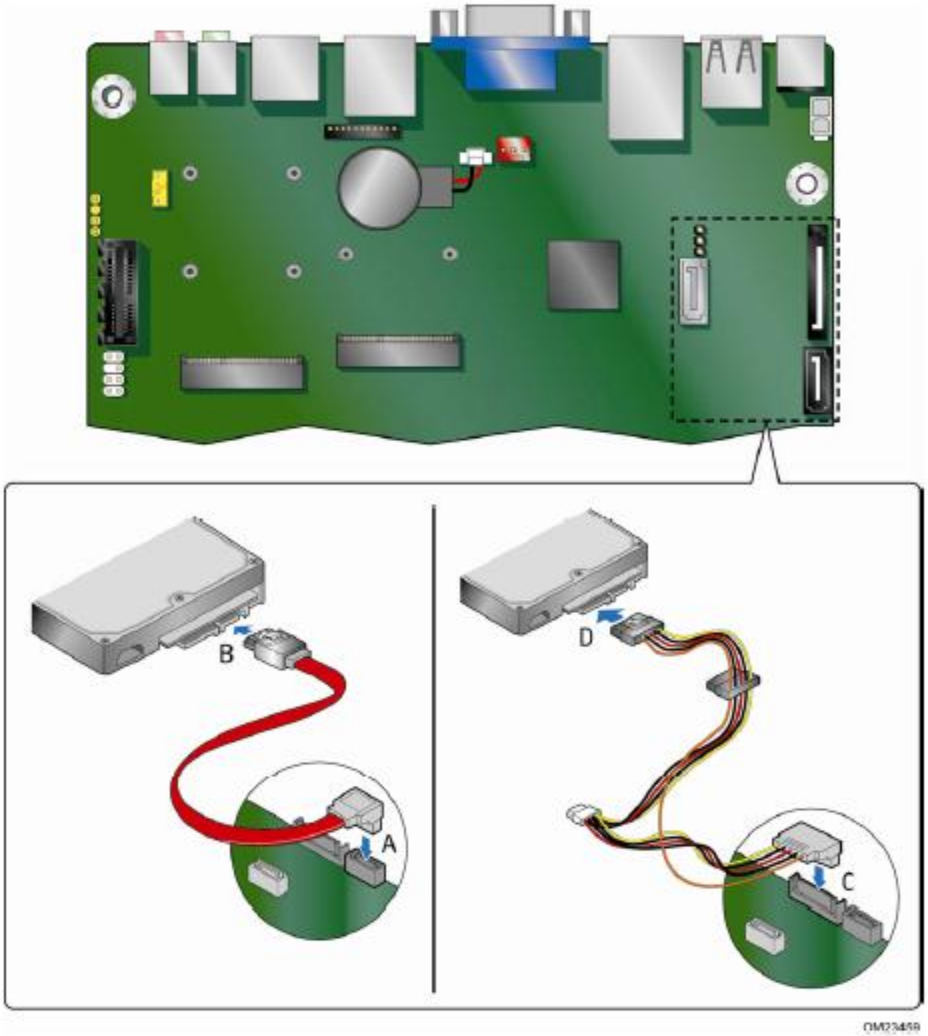


Figure 25. Connecting the SATA Data and Power Cables

3.7 Reliability

The Mean Time Between Failures (MTBF) prediction is calculated using component and subassembly random failure rates. The calculation is based on the Telcordia SR-332 Issue 2, Method I, Case 3, 55 ºC ambient. The MTBF prediction is used to estimate repair rates and spare parts requirements. The MTBF for the board is 319,009 hours.

3.8 Environmental

Table 40 lists the environmental specifications for the N2800 Embedded Board that contains the Intel® Atom™ Processor N2800 and Intel® NM10 Express Chipset.

Table 40. Embedded Board Environmental Specifications

Parameter	Specification		
Temperature			
Non-Operating	-20 °C to +70 °C		
Operating (ambient, outside chassis)	0 °C to +35 °C		
Operating (inside chassis)	0 °C to +55 °C		
Shock			
Unpackaged	50 g trapezoidal waveform		
	Velocity change of 170 inches/s^2		
Packaged	Half sine 2 millisecond		
	Product Weight (pounds)	Free Fall (inches)	Velocity Change (inches/s^2)
	<20	36	167
	21-40	30	152
	41-80	24	136
	81-100	18	118
Vibration			
Unpackaged	5 Hz to 20 Hz: 0.01 g^2 Hz sloping up to 0.02 g^2 Hz		
	20 Hz to 500 Hz: 0.02 g^2 Hz (flat)		
Packaged	5 Hz to 40 Hz: 0.015 g^2 Hz (flat)		
	40 Hz to 500 Hz: 0.015 g^2 Hz sloping down to 0.00015 g^2 Hz		

NOTE

Maximum operating temperatures based on fanless chassis configuration (tests performed with Morex T-1620 thin-mITX chassis).*

4 Overview of BIOS Features

4.1 Introduction

This chapter describes the BIOS features of the Development Kit. Several subsections also tell you how to update the BIOS by either using the Intel Express BIOS Update utility or the Intel® Flash Memory Update Utility, and how to recover the BIOS if an update fails.

The board uses an Intel BIOS that is stored in the Serial Peripheral Interface Flash Memory (SPI Flash) and can be updated using a disk-based program. The SPI Flash contains the BIOS Setup program, POST, the PCI auto-configuration utility, LAN EEPROM information, and Plug and Play support.

The BIOS displays a message during POST identifying the type of BIOS and a revision code.

When the BIOS Setup configuration jumper is set to configure mode and the computer is powered-up, the BIOS compares the CPU version and the microcode version in the BIOS and reports if the two match.

The BIOS Setup program can be used to view and change the BIOS settings for the computer. The BIOS Setup program is accessed by pressing the <F2> key after the Power-On Self-Test (POST) memory test begins and before the operating system boot begins. The menu bar is shown below.

Maintenance	**Main**	**Configuration**	**Security**	**Power**	**Boot**	**Exit**

NOTE

The maintenance menu is displayed only when the board is in configure mode. Section 3.4 shows how to put the board in configure mode.

Table 41 lists the BIOS Setup program menu features.

Table 41. BIOS Setup Program Menu Bar

Maintenance	Main	Configuration	Security	Power	Boot	Exit
Clears passwords and displays processor information	Displays processor and memory configuration	Configures advanced features available through the chipset	Sets passwords and security features	Configures power management features and power supply controls	Selects boot options	Saves or discards changes to Setup program options

Table 42 lists the function keys available for menu screens.

Table 42. BIOS Setup Program Function Keys

BIOS Setup Program Function Key	Description
<←> or <→>	Selects a different menu screen (Moves the cursor left or right)
<↑> or <↓>	Selects an item (Moves the cursor up or down)
<Tab>	Selects a field (Not implemented)
<Enter>	Executes command or selects the submenu
<F9>	Load the default configuration values for the current menu
<F10>	Save the current values and exits the BIOS Setup program
<Esc>	Exits the menu

4.2 BIOS Flash Memory Organization

The Serial Peripheral Interface Flash Memory (SPI Flash) includes a 32 Mbit (4096 KB) flash memory device.

4.3 System Management BIOS (SMBIOS)

SMBIOS is a Desktop Management Interface (DMI) compliant method for managing computers in a managed network.

The main component of SMBIOS is the Management Information Format (MIF) database, which contains information about the computing system and its components. Using SMBIOS, a system administrator can obtain the system types, capabilities, operational status, and installation dates for system components. The MIF database defines the data and provides the method for accessing this information. The BIOS enables applications such as third-party management software to use SMBIOS. The BIOS stores and reports the following SMBIOS information:

- BIOS data, such as the BIOS revision level
- Fixed-system data, such as peripherals, serial numbers, and asset tags
- Resource data, such as memory size, cache size, and processor speed
- Dynamic data, such as event detection and error logging

Non-Plug and Play operating systems require an additional interface for obtaining the SMBIOS information. The BIOS supports an SMBIOS table interface for such operating systems. Using this support, an SMBIOS service-level application running on a non-Plug and Play operating system can obtain the SMBIOS information. Additional board information can be found in the BIOS under the Additional Information header under the Main BIOS page.

4.4 Legacy USB Support

Legacy USB support enables USB devices to be used even when the operating system’s USB drivers are not yet available. Legacy USB support is used to access the BIOS Setup program, and to install an operating system that supports USB. By default, Legacy USB support is set to Enabled.

Legacy USB support operates as follows:

1. When you apply power to the computer, legacy support is disabled.
2. POST begins.
3. Legacy USB support is enabled by the BIOS allowing you to use a USB keyboard to enter and configure the BIOS Setup program and the maintenance menu.
4. POST completes.
5. The operating system loads. While the operating system is loading, USB keyboards and mice are recognized and may be used to configure the operating system. (Keyboards and mice are not recognized during this period if Legacy USB support was set to Disabled in the BIOS Setup program.)
6. After the operating system loads the USB drivers, all legacy and non-legacy USB devices are recognized by the operating system, and Legacy USB support from the BIOS is no longer used.
7. Additional USB legacy feature options can be accessed by using the Intel® Integrator Toolkit.

To install an operating system that supports USB, verify that Legacy USB support in the BIOS Setup program is set to Enabled and follow the operating system's installation instructions.

4.5 BIOS Updates

The BIOS can be updated using either of the following utilities, which are available on the Intel World Wide Web site:

- Intel® Express BIOS Update utility, which enables automated updating while in the Windows environment. Using this utility, the BIOS can be updated from a file on a hard disk, a USB drive (a flash drive or a USB hard drive), a CD-ROM, or from the file location on the Web.
- Intel® F7 switch during POST allows a user to select where the BIOS .bio file is located and perform the update from that location/device. Similar to performing a BIOS Recovery without removing the BIOS configuration jumper.
- Intel® Flash Memory Update Utility, which requires booting from DOS. Using this utility, the BIOS can be updated from a file on a hard disk, a USB drive (a flash drive or a USB hard drive), or a CD-ROM.

Both utilities verify that the updated BIOS matches the target system to prevent accidentally installing an incompatible BIOS.

4.5.1 Updating the BIOS with the Intel® Express BIOS Update Utility

With the Intel Express BIOS Update utility you can update the system BIOS while in the Windows environment. The BIOS file is included in an automated update utility that combines the functionality of the Intel Flash Memory Update Utility and the ease of use of Windows-based installation wizards.

To update the BIOS with the Intel Express BIOS Update utility:

1. Go to the Intel World Wide Web site Download Center at http://downloadcenter.intel.com/
2. Navigate to the DN2800MT page. Click on the "BIOS Update" link and then select the Express BIOS Update file.
3. Download the file to your hard drive. (You can also save this file to a removable USB device. This is useful if you are updating the BIOS for multiple identical systems.)
4. Close all other applications. This step is required. Your system will be rebooted at the last Express BIOS Update window.
5. Double-click the executable file from the location on your hard drive where it was saved. This runs the update program. Follow the instructions provided in the dialog boxes to complete the BIOS update

4.5.2 Updating the BIOS Using the F7 Function Key

To use this BIOS update method:

1. Download and save the Recovery BIOS (.BIO) file to a temporary directory.
2. Copy the .BIO file to a USB thumb drive.
3. Plug the thumb drive into a USB port of the target computer.
4. Shut down the target computer.
5. Enable the F7 prompt display:
    a. Power the computer on.
    b. Enter the BIOS Setup by pressing the F2 key during boot.
    c. Go to the Advanced > Boot Configuration menu.
    d. Enable Display F7 to Update BIOS
    e. Press the F10 key to save and exit.
6. During boot, when the F7 prompt is displayed, press the F7 key to enter the BIOS Flash Update tool.
7. Select the USB thumb drive and press Enter.
8. Select the .BIO file and press Enter
9. Confirm you want to update the BIOS by pressing Enter.
10. Wait 2-5 minutes for the update to complete.
11. Remove the thumb drive.
12. Restart the computer.

4.5.3 Updating the BIOS with the Intel® Flash Memory Update Utility

You can use the information in this section to update the BIOS using the Intel® Flash Memory Update Utility. With the Intel Flash Memory Update Utility you can update the system BIOS from a bootable CD-ROM, bootable USB flash drive, or other bootable USB media.

You can update to a new version of the BIOS by using the Intel Flash Memory BIOS update file. The Intel Flash Memory BIOS update file is a compressed file that contains the files you need to update the BIOS. The BIOS update file contains:

- New BIOS file (including the Intel® Management Engine (Intel® ME) Firmware Image)
- Intel® Integrator Toolkit Configuration File (optional)
- Intel Flash Memory Update Utility

You can obtain this file on http://downloadcenter.intel.com (the Intel Download Center homepage) by typing in "DN2800MT" or "N2800" in the Search Downloads area and then navigating to the Intel Embedded Board N2800 page.

Once on the N2800 page, click on the "BIOS" selection in the Download type section and then select the flash BIOS Update file.

NOTE

Review the instructions distributed with the upgrade utility before attempting a BIOS update.

For information about	Refer to
BIOS update utilities	http://support.intel.com/support/motherboards/desktop/sb/CS-022312.htm.

CAUTION

Do not interrupt the process or the system may not function properly.

1. Uncompress the BIOS update file and copy the .BIO file, IFLASH2.EXE, and .ITK file (optional) to a bootable USB flash drive or other bootable USB media.
2. Configure the BIOS or use the F10 key option during POST to boot to the USB device.
3. Manually run the IFLASH2.EXE file from the USB device and manually update the BIOS.

DO NOT POWER DOWN YOUR COMPUTER before the update is complete. The update may take up to 5 minutes.

4.5.4 Language Support

The BIOS Setup program and help messages are supported in US English. Check the Intel web site for support.

4.5.5 Custom Splash Screen

During POST, an Intel® splash screen is displayed by default. This splash screen can be augmented with a custom splash screen. The Intel Integrator’s Toolkit that is available from Intel can be used to create a custom splash screen.

NOTE

If you add a custom splash screen, it will share space with the Intel branded logo.

For information about	Refer to
Intel Integrator Toolkit	http://developer.intel.com/design/motherbd/software/itk/
Additional Intel® software tools	http://developer.intel.com/design/motherbd/software.htm

4.6 BIOS Recovery

It is unlikely that anything will interrupt a BIOS update; however, if an interruption occurs, the BIOS could be damaged. Table 43 lists the drives and media types that can and cannot be used for BIOS recovery. The BIOS recovery media does not need to be made bootable.

For more information about updating the Intel Desktop Board BIOS or recovering from a BIOS update failure, go to http://support.intel.com/support/motherboards/desktop/sb/CS-022312.htm.

Table 43. Acceptable Drives/Media Types for BIOS Recovery

Media Type (Note)	Can be used for BIOS recovery?
Hard disk drive (connected to SATA or USB)	Yes
CD/DVD drive (connected to SATA or USB)	Yes
USB flash drive	Yes
USB diskette drive (with a 1.4 MB diskette)	No (BIOS update file is bigger than 1.4 MB size limit)

NOTE

Supported file systems for BIOS recovery:

- *NTFS (sparse, compressed, or encrypted files are not supported)*
- *FAT32*
- *FAT16*
- *FAT12*
- *ISO 9660*

For information about	Refer to
BIOS recovery	http://www.intel.com/support/motherboards/desktop/sb/cs-023360.htm

4.7 Boot Options

In the BIOS Setup program, the user can choose to boot from a hard drive, optical drive, removable drive, or the network. The default setting is for the optical drive to be the first boot device, the hard drive second, removable drive third, and the network fourth.

4.7.1 Optical Drive Boot

Booting from the optical drive is supported in compliance to the El Torito bootable CD-ROM format specification. Under the Boot menu in the BIOS Setup program, the optical drive is listed as a boot device. Boot devices are defined in priority order. Accordingly, if there is not a bootable CD in the optical drive, the system will attempt to boot from the next defined drive.

4.7.2 Network Boot

The network can be selected as a boot device. This selection allows booting from the onboard LAN or a network add-in card with a remote boot ROM installed.

Pressing the <F12> key during POST automatically forces booting from the LAN. To use this key during POST, the User Access Level in the BIOS Setup program's Security menu must be set to Full.

4.7.3 Booting Without Attached Devices

For use in embedded applications, the BIOS has been designed so that after passing the POST, the operating system loader is invoked even if the following devices are not present:

- Video adapter
- Keyboard
- Mouse

4.7.4 Changing the Default Boot Device During POST

Pressing the <F10> key during POST causes a boot device menu to be displayed. This menu displays the list of available boot devices. Table 44 lists the boot device menu options.

Table 44. Boot Device Menu Options

Boot Device Menu Function Keys	Description
<↑> or <↓>	Selects a default boot device
<Enter>	Exits the menu, and boots from the selected device
<Esc>	Exits the menu and boots according to the boot priority defined through BIOS setup

4.8 Adjusting Boot Speed

These factors affect system boot speed:

- Selecting and configuring peripherals properly
- Optimized BIOS boot parameters
- Enabling the new Fast Boot feature

4.8.1 Peripheral Selection and Configuration

The following techniques help improve system boot speed:

- Choose a hard drive with parameters such as "power-up to data ready" in less than eight seconds that minimizes hard drive startup delays.
- Select a CD-ROM drive with a fast initialization rate. This rate can influence POST execution time.
- Eliminate unnecessary add-in adapter features, such as logo displays, screen repaints, or mode changes in POST. These features may add time to the boot process.
- Try different monitors. Some monitors initialize and communicate with the BIOS more quickly, which enables the system to boot more quickly.

4.9 Hard Disk Drive Password Security Feature

The Hard Disk Drive Password Security feature blocks read and write accesses to the hard disk drive until the correct password is given. Hard Disk Drive Passwords are set in BIOS SETUP and are prompted for during BIOS POST. For convenient support of S3 resume, the system BIOS will automatically unlock drives on resume from S3.

The User hard disk drive password, when installed, will be required upon each power-cycle until the Master Key or User hard disk drive password is submitted.

The Master Key hard disk drive password, when installed, will not lock the drive. The Master Key hard disk drive password exists as an unlock override in the event that the User hard disk drive password is forgotten. Only the installation of the User hard disk drive password will cause a hard disk to be locked upon a system power-cycle.

Table 45 shows the effects of setting the Hard Disk Drive Passwords.

Table 45. Master Key and User Hard Drive Password Functions

Password Set	Password During Boot
Neither	None
Master only	None
User only	User only
Master and User Set	Master or User

During every POST, if a User hard disk drive password is set, POST execution will pause with the following prompt to force the user to enter the Master Key or User hard disk drive password:

```
Enter Hard Disk Drive Password:
```

Upon successful entry of the Master Key or User hard disk drive password, the system will continue with normal POST.

If the hard disk drive password is not correctly entered, the system will go back to the above prompt. The user will have three attempts to correctly enter the hard disk drive password. After the third unsuccessful hard disk drive password attempt, the system will halt with the message:

```
Hard Disk Drive Password Entry Error
```

A manual power cycle will be required to resume system operation.

NOTE

As implemented on the N2800 Embedded Board, Hard Disk Drive Password Security is only supported on SATA port 0. The passwords are stored on the hard disk drive so if the drive is relocated to another SATA port or computer that does not support Hard Disk Drive Password Security feature, the drive will not be accessible.

4.10 BIOS Security Features

The BIOS includes security features that restrict access to the BIOS Setup program and who can boot the computer. A supervisor password and a user password can be set for the BIOS Setup program and for booting the computer, with the following restrictions:

- The supervisor password gives unrestricted access to view and change all the Setup options in the BIOS Setup program. This is the supervisor mode.
- The user password gives restricted access to view and change Setup options in the BIOS Setup program. This is the user mode.
- If only the supervisor password is set, pressing the <Enter> key at the password prompt of the BIOS Setup program allows the user restricted access to Setup.
- If both the supervisor and user passwords are set, users can enter either the supervisor password or the user password to access Setup. Users have access to Setup respective to which password is entered.
- Setting the user password restricts who can boot the computer. The password prompt will be displayed before the computer is booted. If only the supervisor password is set, the computer boots without asking for a password. If both passwords are set, the user can enter either password to boot the computer.
- For enhanced security, use different passwords for the supervisor and user passwords.
- Valid password characters are A-Z, a-z, and 0-9. Passwords may be up to 16 characters in length.

Table 46 shows the effects of setting the supervisor password and user password. This table is for reference only and is not displayed on the screen.

Table 46. Supervisor and User Password Functions

Password Set	Supervisor Mode	User Mode	Setup Options	Password to Enter Setup	Password During Boot
Neither	Can change all options (Note)	Can change all options (Note)	None	None	None
Supervisor only	Can change all options	Can change a limited number of options	Supervisor Password	Supervisor	None
User only	N/A	Can change all options	Enter Password Clear User Password	User	User
Supervisor and user set	Can change all options	Can change a limited number of options	Supervisor Password Enter Password	Supervisor or user	Supervisor or user

Note: If no password is set, any user can change all Setup options.

5 Error Messages and Beep Codes

This chapter describes error messages generated by the Development Kit's BIOS. The BIOS indicates these error messages with LED blink codes, speaker beep codes, and by text displayed on the PC monitor.

5.1 Speaker

Audible error code (beep code) information during POST is routed to the audio codec and can be heard through attached speakers.

5.2 BIOS Beep Codes

Whenever a recoverable error occurs during POST, the BIOS causes the board's speaker to beep an error message describing the problem (see Table 47).

Table 47. BIOS Beep Codes

Type	Pattern	Frequency
BIOS update in progress	None	
Video error (Note)	On-off (1.0 second each) two times, then 2.5-second pause (off), entire pattern repeats (beeps and pause) once and the BIOS will continue to boot.	932 Hz When no VGA option ROM is found.
Memory error	On-off (1.0 second each) three times, then 2.5-second pause (off), entire pattern repeats (beeps and pause) until the system is powered off.	932 Hz
Thermal trip warning	Alternate high and low beeps (1.0 second each) for eight beeps, followed by system shut down.	High beep 2000 Hz Low beep 1500 Hz

Note: Disabled per default BIOS setup option.

5.3 Front-panel Power LED Blink Codes

Whenever a recoverable error occurs during POST, the BIOS causes the board's front panel power LED to blink an error message describing the problem (see Table 48).

Table 48. Front-panel Power LED Blink Codes

Type	Pattern	Note
BIOS update in progress	Off when the update begins, then on for 0.5 seconds, then off for 0.5 seconds. The pattern repeats until the BIOS update is complete.	
Video error (Note)	On-off (1.0 second each) two times, then 2.5-second pause (off), entire pattern repeats (blink and pause) until the system is powered off.	When no VGA option ROM is found.
Memory error	On-off (1.0 second each) three times, then 2.5-second pause (off), entire pattern repeats (blinks and pause) until the system is powered off.	
Thermal trip warning	Each beep will be accompanied by the following blink pattern: .25 seconds on, .25 seconds off, .25 seconds on, .25 seconds off. This will result in a total of 16 blinks.	

Note: Disabled per default BIOS setup option.

5.4 BIOS Error Messages

Table 49 lists the error messages and provides a brief description of each.

Table 49. BIOS Error Messages

Error Message	Explanation
CMOS Battery Low	The battery may be losing power. Replace the battery soon.
CMOS Checksum Bad	The CMOS checksum is incorrect. CMOS memory may have been corrupted. Run Setup to reset values.
Memory Size Decreased	Memory size has decreased since the last boot. If no memory was removed, then memory may be bad.
No Boot Device Available	System did not find a device to boot.

5.5 Port 80h POST Codes

During the POST, the BIOS generates diagnostic progress codes (POST codes) to I/O port 80h. If the POST fails, execution stops and the last POST code generated is left at port 80h. This code is useful for determining the point where an error occurred.

Displaying the POST codes requires a POST card that can interface with the Debug header. The POST card can decode the port and display the contents on a medium such as a seven-segment display. Refer to the location of the Debug header in Figure 1.

The following tables provide information about the POST codes generated by the BIOS:

- Table 50 lists the Port 80h POST code ranges
- Table 51 lists the Port 80h POST codes themselves
- Table 52 lists the Port 80h POST sequence

NOTE

In the tables listed above, all POST codes and range values are listed in hexadecimal.

Table 50. Port 80h POST Code Ranges

Range	Subsystem
0x00 – 0x05	Entering SX states S0 to S5.
0x10, 0x20, 0x30	Resuming from SX states (0x10 –0x20 – S2, 0x30 – S3, etc.)
0x11 – 0x1F	PEI phase pre MRC execution
0x21 – 0x29	MRC memory detection
0x2A – 0x2F	PEI phase post MRC execution
0x31 – 0x35	Recovery
0x36 – 0x3F	Platform DXE driver
0x41 – 0x4F	CPU Initialization (PEI, DXE, SMM)
0x50 – 0x5F	I/O Buses: PCI, USB, ATA etc. 0x5F is an unrecoverable error. Start with PCI.
0x60 – 0x6F	BDS
0x70 – 0x7F	Output devices: All output consoles.
0x80 – 0x8F	For future use
0x90 – 0x9F	Input devices: Keyboard/Mouse.
0xA0 – 0xAF	For future use
0xB0 – 0xBF	Boot Devices: Includes fixed media and removable media. Not that critical since consoles should be up at this point.
0xC0 – 0xCF	For future use
0xD0 – 0xDF	For future use

Table 51. Port 80h POST Codes

Port 80 Code	Progress Code Enumeration
	ACPI S States
0x00,0x01,0x02,0x03,0x04,0x05	Entering S0, S2, S3, S4, or S5 state
0x10,0x20,0x30	Resuming from S2, S3, S4, or S5 state
	PEI Platform driver
0x11	Set boot mode, GPIO init
0x12	Early chipset register programming
0x13	Basic chipset init
0x14	LAN init
0x15	Exit early platform init driver
	PEI SMBUS
0x16	SMBUS driver init
0x17	Entry to SMBUS execute read/write
0x18	Exit SMBUS execute read/write
	Memory
0x21	MRC entry point
0x24	Detecting presence of memory DIMMs
0x25	Override Detected DIMM settings
0x27	Configuring memory
0x28	Testing memory
	PEIMs/Recovery
0x31	Crisis Recovery has initiated
0x33	Loading recovery capsule
0x34	Start recovery capsule / valid capsule is found
	CPU PEI Phase
0x41	Begin CPU PEI Init
0x42	XMM instruction enabling
0x43	End CPU PEI Init
	CPU PEI SMM Phase
0x44	Begin CPU SMM Init smm relocate bases
0x45	Smm relocate bases for APs
0x46	End CPU SMM Init
	CPU DXE Phase
0x47	CPU DXE Phase begin
0x48	Refresh memory space attributes according to MTRRs
0x49	Load the microcode if needed
0x4A	Initialize strings to HII database
0x4B	Initialize MP support
0x4C	CPU DXE Phase End

continued

Table 51. Port 80h POST Codes (continued)

Port 80 Code	Progress Code Enumeration
	CPU DXE SMM Phase
0x4D	CPU DXE SMM Phase begin
0x4E	Relocate SM bases for all APs
0x4F	CPU DXE SMM Phase end
	I/O BUSES
0x50	Enumerating PCI buses
0x51	Allocating resources to PCI bus
0x52	Hot Plug PCI controller initialization
	USB
0x58	Resetting USB bus
0x59	Reserved for USB
	ATA/ATAPI/SATA
0x5A	Resetting PATA/SATA bus and all devices
0x5B	Reserved for ATA
	BDS
0x60	BDS driver entry point initialize
0x61	BDS service routine entry point (can be called multiple times)
0x62	BDS Step2
0x63	BDS Step3
0x64	BDS Step4
0x65	BDS Step5
0x66	BDS Step6
0x67	BDS Step7
0x68	BDS Step8
0x69	BDS Step9
0x6A	BDS Step10
0x6B	BDS Step11
0x6C	BDS Step12
0x6D	BDS Step13
0x6E	BDS Step14
0x6F	BDS return to DXE core (should not get here)
	Keyboard (PS/2 or USB)
0x90	Resetting keyboard
0x91	Disabling the keyboard
0x92	Detecting the presence of the keyboard
0x93	Enabling the keyboard
0x94	Clearing keyboard input buffer
0x95	Instructing keyboard controller to run Self Test (PS/2 only)

continued

Table 51. Port 80h POST Codes (continued)

Port 80 Code	Progress Code Enumeration
	Mouse (PS/2 or USB)
0x98	Resetting mouse
0x99	Detecting mouse
0x9A	Detecting presence of mouse
0x9B	Enabling mouse
	Fixed Media
0xB0	Resetting fixed media
0xB1	Disabling fixed media
0xB2	Detecting presence of a fixed media (IDE hard drive detection etc.)
0xB3	Enabling/configuring a fixed media
	Removable Media
0xB8	Resetting removable media
0xB9	Disabling removable media
0xBA	Detecting presence of a removable media (IDE, CDROM detection etc.)
0xBC	Enabling/configuring a removable media
	DXE Core
0xE4	Entered DXE phase
	BDS
0xE7	Waiting for user input
0xE8	Checking password
0xE9	Entering BIOS setup
0xEB	Calling Legacy Option ROMs
	Runtime Phase/EFI OS Boot
0xF8	EFI boot service ExitBootServices ( ) has been called
0xF9	EFI runtime service SetVirtualAddressMap ( ) has been called

Table 52. Typical Port 80h POST Sequence

POST Code	Description
24	Detecting presence of memory DIMMs
27	Configuring memory
28	Testing memory
33	Loading recovery capsule
E4	Entered DXE phase
50	Enumerating PCI busses
51	Allocating resources to PCI bus
92	Detecting the presence of the keyboard
90	Resetting keyboard
94	Clearing keyboard input buffer
95	Keyboard Self Test
EB	Calling Video BIOS
58	Resetting USB bus
5A	Resetting PATA/SATA bus and all devices
92	Detecting the presence of the keyboard
90	Resetting keyboard
94	Clearing keyboard input buffer
5A	Resetting PATA/SATA bus and all devices
28	Testing memory
90	Resetting keyboard
94	Clearing keyboard input buffer
E7	Waiting for user input
00	Ready to boot

6 Assembly/Disassembly Guide

6.1 Introduction

Please take a moment and read this manual before you start assembling or disassembling this enclosure. Often times, rushing into unit installation can result in damage to your enclosure, motherboard, and power supply.

6.2 Required tools

- Phillips screwdriver

6.3 Board Installation Steps

1. To remove the top lid, remove the screw (encircled in red) from the back, in the right corner, see Figure 26. Push back the top lid ½ inches and after this, gently pull it up.

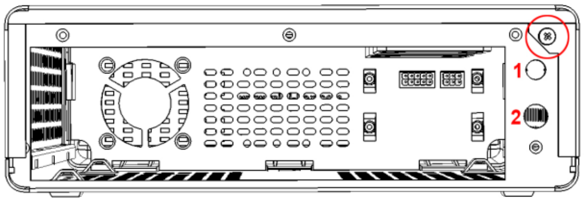


Figure 26. Removing the top lid

1 - WiFi antenna hole, 2 - DC Power jack hole

2. Install I/O motherboard shield on the back of the enclosure.
3. Install the motherboard on the base plate using four screws as shown in Figure 27.

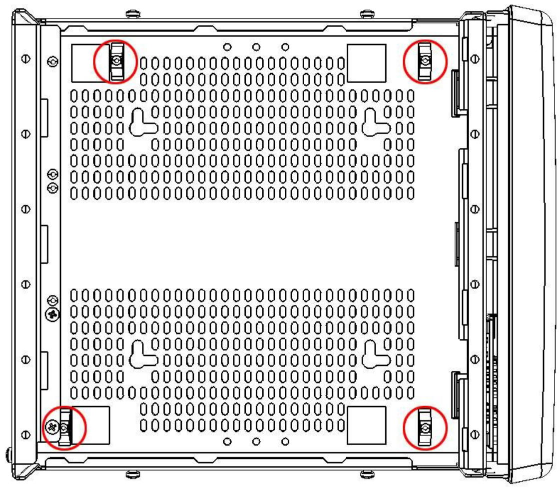


Figure 27. Install Motherboard

4. Connect the ON/OFF and Power LED cables (J3 in Figure 28) to the motherboard using the cable harness provided with the enclosure, see Figure 28. Also, you can connect the USB header (J2 in Figure 28), if needed. Connect the ON/OFF and Power LED cables (J3 in Figure 28) to the motherboard using the cable harness provided with the enclosure. Also, you can connect the USB header, if needed.

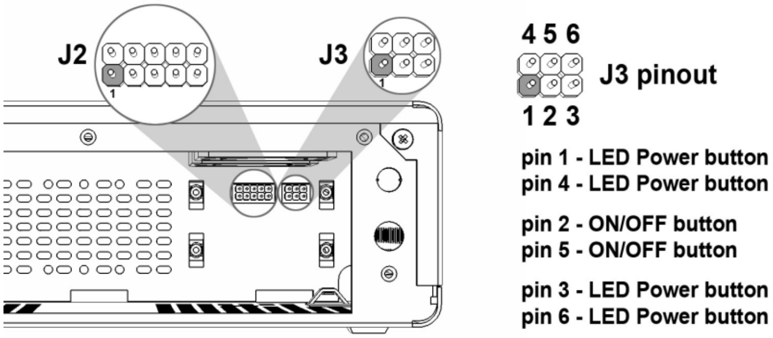


Figure 28. J2 (USB Header) and J3 (2x3) pin header, view from the back of Enclosure

6.4 Installing USB devices under the front plate

The front plate is designed to conceal USB flash drives, Bluetooth, USB WIFI modules or other USB devices. To add a USB device under the front plate, remove it by carefully pressing outwards and gently pushing, one by one, the plastic lids from the sides (see Figure 29).

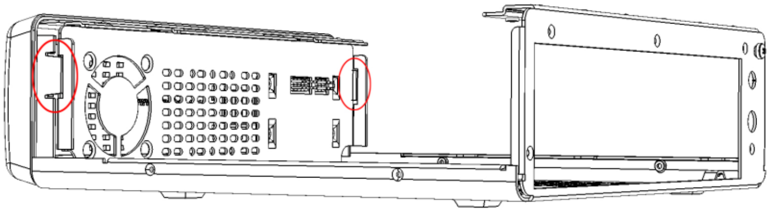


Figure 29. Removing the front plate by pressing the left and right plastic lids

Near the front USB connector there are 2 jumpers (Figure 30) which are used to customize how the board will start.

JP1: Disable On/Off power button (removing this jumper disables the power button).

JP2: Enable auto start (set power button on "ON" state always).

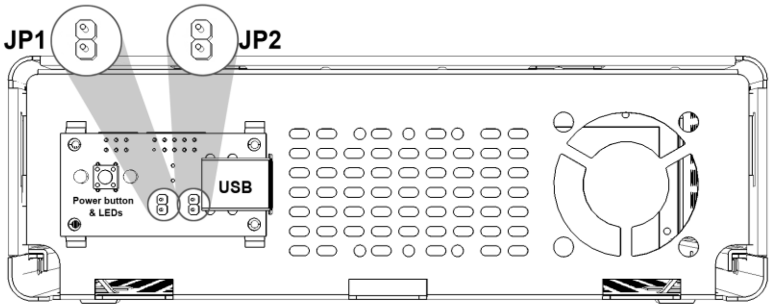


Figure 30. JP1, JP2 pin header and 2 x USB slots

Front view of the enclosure, with the front plate removed.

After installing the desired USB devices, snap back the front plate.

6.5 Installing SSD and Fans

Install the SSD using the provided screws. The SSD (and optional coolers) will be fastened onto the SSD Mounting Bracket see Figure 31. On the bracket you can install one 2.5" hard drive or two fans (40x40x10mm) pictured below.

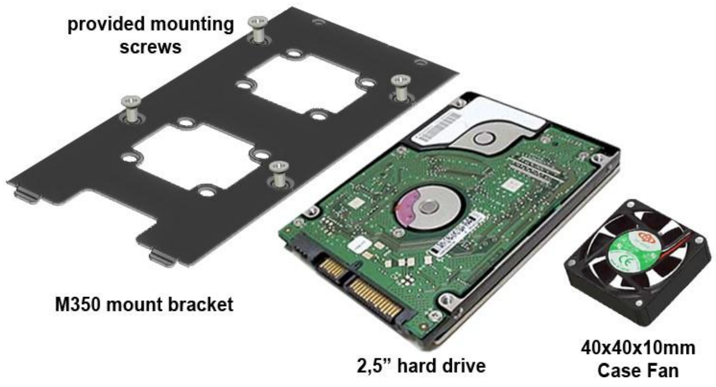


Figure 31. Mounting Bracket for SDD, HDD, or Fan

7 Operating System Reference

7.1 Installing Windows* 7

This section provides step-by-step instructions for installing Windows* 7 on platforms based on the Intel® Atom™ Processor N2000 or D2000 Series and Intel® NM10 Express Chipset.

The instructions in this section have been validated with the Intel® Atom™ Processor D2700 with Intel® NM10 Express Chipset and Intel® Atom™ Processor N2800 with Intel® NM10 Express Chipset Development Kits. However, the information in this section is applicable to any Intel platform based on the Intel® Atom™ Processor N2000 or D2000 Series and Intel® NM10 Express Chipset.

For customers evaluating or using the Development Kit(s) as a basis for their embedded design and Windows 7 as their operating system, this is the primary guidance Intel provides for installing the drivers and operating system to deliver optimized performance.

Windows 7 is the 2009 release of Microsoft Windows which is a series of operating systems produced by Microsoft for use on all different types of personal computers, including home and business desktops, laptops, netbooks, tablet PCs, and media center PCs.

Windows 7 is an officially supported OS for this platform. Starter, Home Basic and Home Premium are the supported versions of this OS for this platform.

Note: Six additional plan of record operating systems exist for this platform as well: Windows XP, Windows XP Embedded (XPe), Yocto Project, MeeGo 1.2, VxWorks, Windows Embedded Compact 7, and Windows Embedded Standard 7 (WES7).

Hardware and software required for installation of Windows 7 and the drivers made by Intel on this platform include:

- A system designed to Intel's platform design guide recommendations
- 40 GB or larger blank hard disk drive (HDD) or SSD
- USB DVD-ROM drive (or USB flash drive depending on how Microsoft Windows 7 is downloaded and installed)

7.1.1 Downloading and installing Windows 7 onto the Target SSD/HDD

Windows 7 is a closed source platform that includes the kernel, core OS, UI libraries and tools, reference user experiences for multiple devices and applications, a standard set of APIs across all target device types, and the flexibility to support add-ons and applications. Since Windows 7 is the exclusive property of Microsoft, Intel is legally not allowed to distribute a BSP or full OS image with Intel drivers already pre-installed in it. The purpose of this section is thus to provide the instructions necessary for downloading and creating the Microsoft Windows 7 OS and then installing the drivers created by Intel for this platform under Windows 7.

Before proceeding with the rest of this section which covers how to install Intel-created graphics, chipset and processor drivers into the target Windows 7 based platform, customers must first obtain a blank SATA based HDD or SSD (recommended size = 40 GB or more) and choose one of the acceptable methods in Table 53 to install Windows 7 from scratch.

Table 53. Windows 7 Installation Options

If you want to do this	Go here for more information
Format the HDD/SSD and install Windows 7.	http://windows.microsoft.com/en-us/windows7/Installing-and-reinstalling-Windows-7 See "Using the Custom installation option and formatting the hard disk" in this topic
Install Windows 7 on a HDD/SSD that did not previously have an operating system.	http://windows.microsoft.com/en-us/windows7/Installing-and-reinstalling-Windows-7 See "Using the Custom installation option if no operating system is installed" in this topic.
Install Windows 7 on a HDD/SSD based platform without using a DVD drive.	For information about downloading Windows 7, and then creating a USB flash drive to install Windows 7, go to: http://windows.microsoft.com/en-us/windows7/installing-windows-7-on-a-netbook

NOTE: Instructions are courtesy of Microsoft.

Once the SSD/HDD contains a fresh version of Windows 7, it is recommended that the latest service pack be downloaded and installed.

Note: This may not be necessary if the latest service pack is integrated into the original OS installation.

A service pack (SP) is a Windows update, often integrating previously released updates, that helps make Windows more reliable. Service packs, which are provided free of charge by Microsoft, can include security and performance improvements and support for new types of hardware. Installing the latest service pack helps keep Windows 7 up to date.

The easiest way to get any necessary service packs is to use the target platform's Windows 7 and turn on Windows Update for Windows 7. Step by step instructions on how to do this are posted here from Microsoft: http://windows.microsoft.com/en-US/windows7/learn-how-to-install-windows-7-service-pack-1-sp1

As of January 2012, the most recent service pack available for manual download is R2 SP1 (Service Pack 1). Download R2 SP1 from the Download Center here: http://www.microsoft.com/download/en/details.aspx?displaylang=en&id=5842#overview

Turning on Automatic Updating is optional. If you are creating a golden image for prototyping or production purposes, having explicit control over operating system updates is recommended.

7.1.2 Downloading and installing processor, graphics, chipset and other optional drivers

Though the standard OS may contain several drivers compatible with the platform it is recommended that you install the latest platform drivers found here:

http://downloadcenter.intel.com/SearchResult.aspx?lang=eng&ProductFamily=Desktop+Boards&ProductLine=Intel%c2%ae+NM10+Chipset+Family+Boards&ProductProduct=Intel%c2%ae+Desktop+Board+DN2800MT&DownloadType=Drivers

These drivers, in pre-release and release forms, are also available in the same package format from https://platformsw.intel.com. Please see your Intel field representative for access.

Driver files are generally available as an executable file. If you have downloaded the package file to your platform, and it is in ZIP format, extract the contents of the file using a file decompression program such as WinZip* or 7-Zip*.

7.2 Installing Windows* Embedded Standard 7

This section provides step-by-step instructions for installing Windows* Embedded Standard 7 on platforms based on the Intel® Atom™ Processor N2000 or D2000 Series and Intel® NM10 Express Chipset.

The instructions in this section have been validated with the Intel® Atom™ Processor D2700 with Intel® NM10 Express Chipset and Intel® Atom™ Processor N2800 with Intel® NM10 Express Chipset Development Kits. However, the information in this section is applicable to any Intel platform based on the Intel® Atom™ Processor N2000 or D2000 Series and Intel® NM10 Express Chipset.

For customers evaluating or using the Development Kit(s) as a basis for their embedded design, and Windows Embedded Standard 7 as their operating system, this is the primary guidance Intel provides for installing the drivers and operating system to deliver optimized performance.

Windows Embedded Standard 7, abbreviated WES7, is a Windows 7 compatible operating system from Microsoft designed specifically for use in embedded systems. With WES7 software developers and system engineers have the ability to customize the operating system by selecting components they most need to run their advanced commercial and consumer devices and existing Windows applications and drivers.

Developers can use Windows Embedded Standard 7 and the component selection menu built into it to create a custom, segment specific and highly space conscious OS build for a variety of connected, and service-oriented advanced commercial or consumer devices. Examples include operating system customizations for set-top boxes, full featured point of service appliances, gaming devices, industrial controls, multimedia internet devices, kiosks, digital signage, monitoring devices, and thin clients.

According to Microsoft, Windows Embedded Standard 7, is based on Windows 7 which was previously codenamed Windows Embedded 'Quebec'. Windows Embedded

Standard 7 includes Windows Vista and Windows 7 features such as Aero, SuperFetch, ReadyBoost, BitLocker Drive Encryption, Windows Firewall, Windows Defender, Address space layout randomization, Windows Presentation Foundation, Silverlight 2, Windows Media Center among several other packages. Windows Embedded Standard 7 is x86 compatible and applications that run under Windows 7 should perform equivalently under WES7.

Hardware and software required for installation of Windows 7 and the drivers made by Intel on this platform include:

- A system designed to Intel’s platform design guide recommendations
- 40 GB or larger blank hard disk drive (HDD) or SSD
- USB DVD-ROM drive (or USB flash drive depending on how Microsoft Windows 7 is downloaded and installed)
- Windows Embedded Standard 7 DVD Image

7.2.1 Downloading, burning, and installing the WES7 DVD image

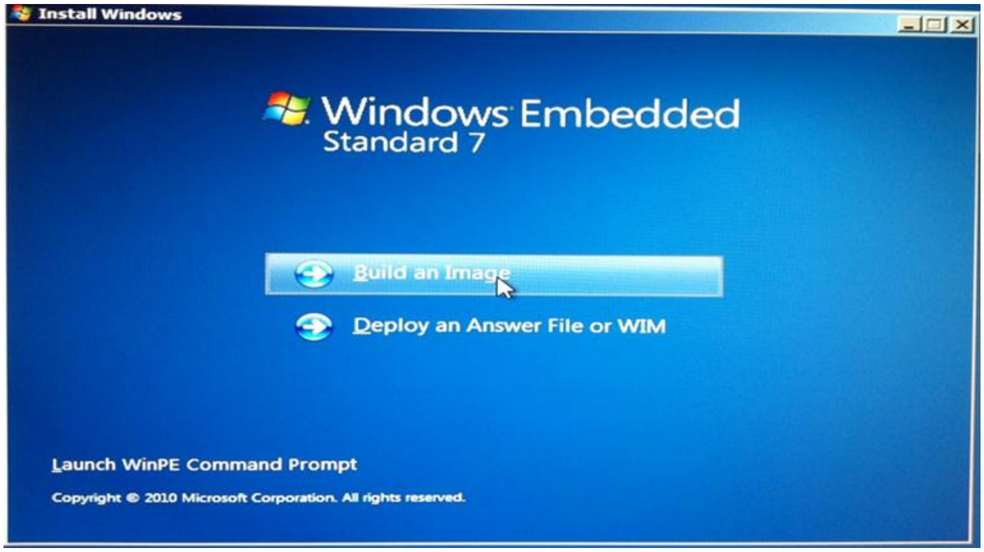
A DVD image for Windows Embedded Standard 7 SP1 with registration instructions for trial and full licenses can be found at: http://www.microsoft.com/windowsembedded/en-us/downloads/download-windows-embedded-standard-7.aspx

Download the image per the instructions provided by Microsoft on the page and burn to a writeable DVD disc.

7.2.2 Install WES7

1. Ensure that the hard disk or SSD to be used is not bootable to any operating system, and that the USB DVD-ROM drive is connected to platform.

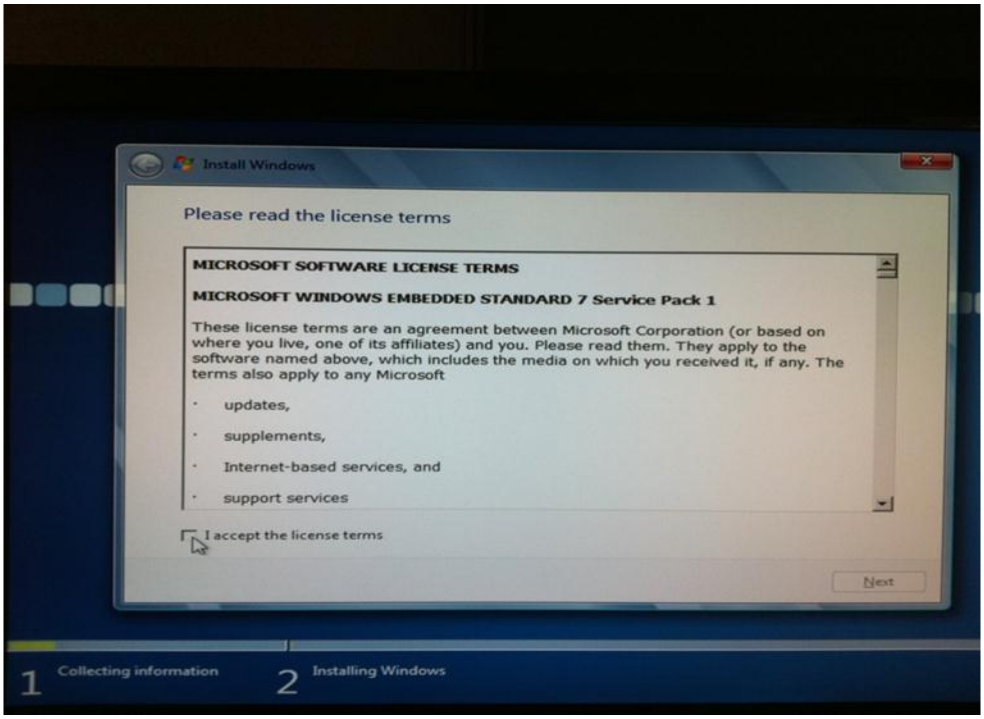
2. Boot the system with the WES7 DVD you have created. Choose Build an Image as shown in Figure 32.



Copyright © 2010 Microsoft Corporation. All rights reserved.

Figure 32: Build an image

3. Read and accept the license as shown in Figure 33. Click Next



Please read the license terms

MICROSOFT SOFTWARE LICENSE TERMS

MICROSOFT WINDOWS EMBEDDED STANDARD 7 Service Pack 1

These license terms are an agreement between Microsoft Corporation (or based on where you live, one of its affiliates) and you. Please read them. They apply to the software named above, which includes the media on which you received it, if any. The terms also apply to any Microsoft

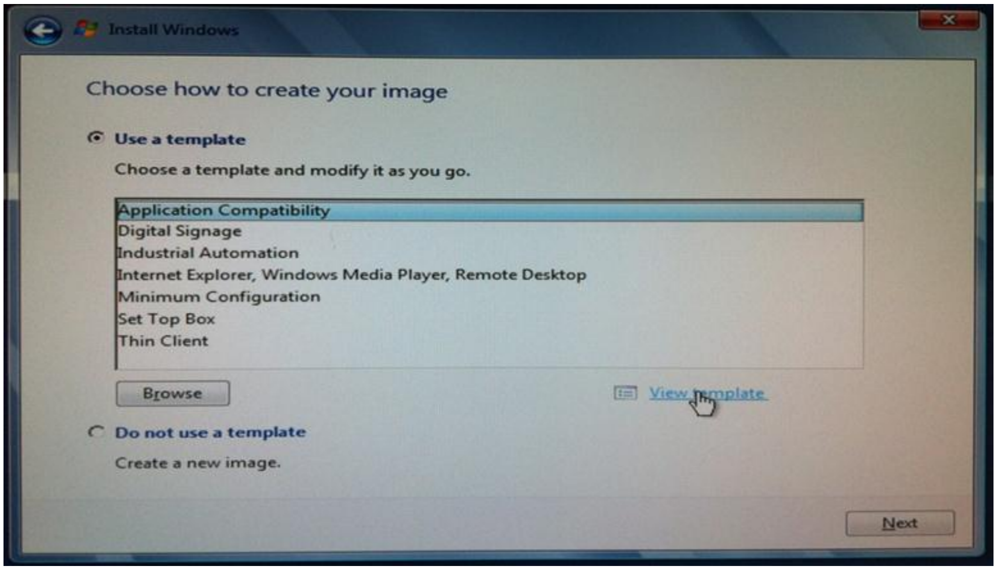
- updates,
- supplements,
- Internet-based services, and
- support services

☐ I accept the license terms

Figure 33: Accept the license terms

4. WES7 allows you to choose from several pre-configured templates when creating your image. Each selection has a different set of driver support and potentially different look and feel for the user interface. The default is Application Compatibility,

which installs many of the basic Windows applications (Media Player, Internet explorer, etc.) and drivers necessary for broad application support with the default windows desktop look and feel. Intel recommends that you click View Template on each as shown Figure 34.


Install Windows

Choose how to create your image

● Use a template

Choose a template and modify it as you go.

Application Compatibility
Digital Signage
Industrial Automation
Internet Explorer, Windows Media Player, Remote Desktop
Minimum Configuration
Set Top Box
Thin Client

○ Do not use a template

Create a new image.

Figure 34: View template

5. The template view will show you a list of the applications, drivers, and feature packages selected by each template. An example of the Application Compatibility template view is in Figure 35. When you are satisfied with your choice of template, click Close. Intel recommends that you thoroughly review each of the templates before clicking Next.


Install Windows

Template Details

Template: Application Compatibility

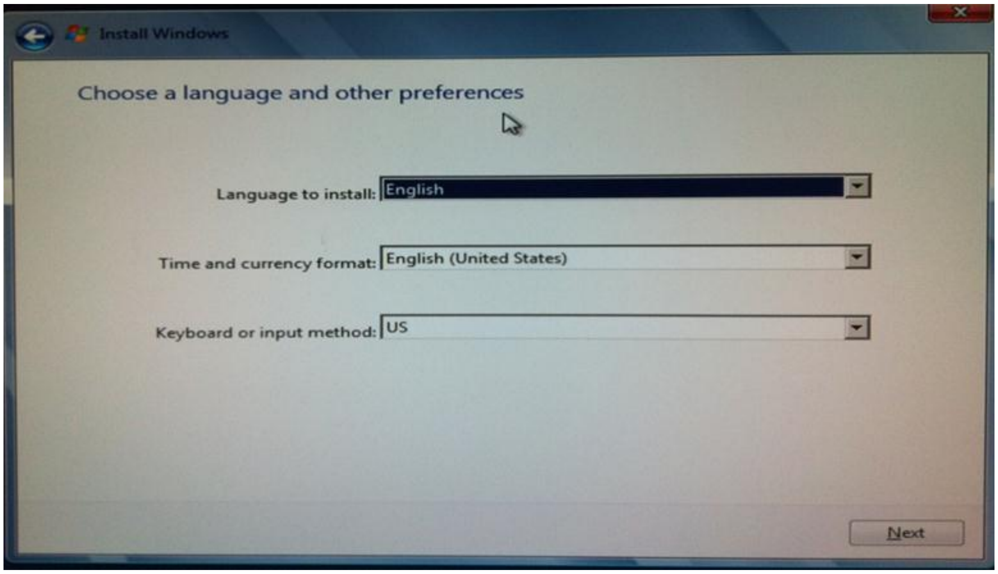
The following packages are included in this template:

- Drivers
  - Inbox Drivers
- Feature Packages
  - .NET Framework
  - Application Support
  - Boot Environments
  - Browsers
  - Data Access and Storage
  - Data Integrity
  - Devices and Printers
  - Diagnostics

Figure 35: Template details

You may also choose Do not use a template to create your own customized image with only the drivers and features that you need for your specific product implementation. In that case, select the desired features that you need, and click Next.

6. Select your preferred language and keyboard region as shown in Figure 36.



Install Windows

Choose a language and other preferences

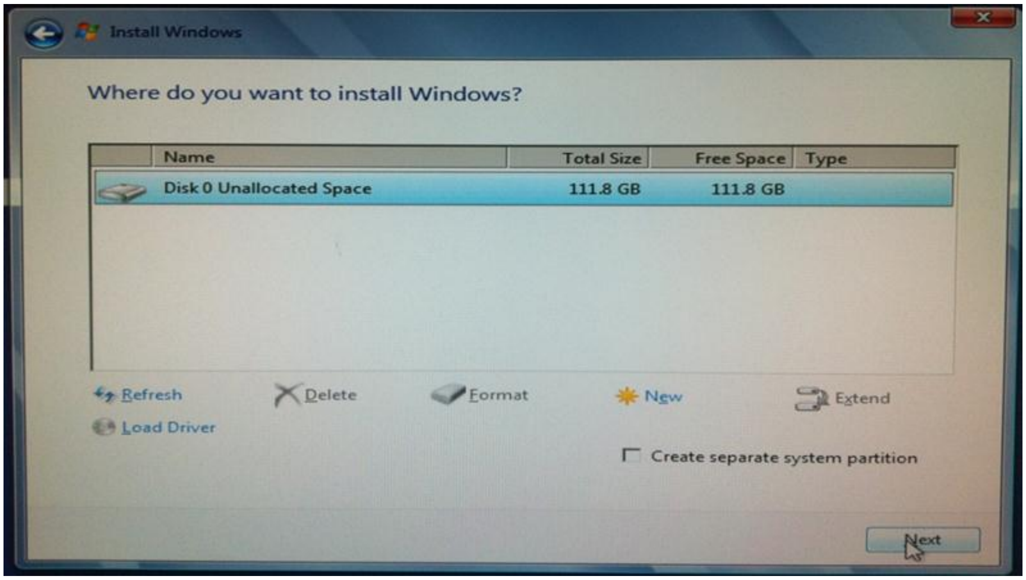
Language to install: English

Time and currency format: English (United States)

Keyboard or input method: US

Figure 36: Choose a language and other preferences

7. Select a disk install location as shown in Figure 37. You may want to delete any existing partitions that appear in the list. If not, you can use an unallocated section or create one using the options. Note that you will likely need at least 8GB of free space for an install depending on which image options and features you chose in step 5. When you are finished, click Next.



Install Windows

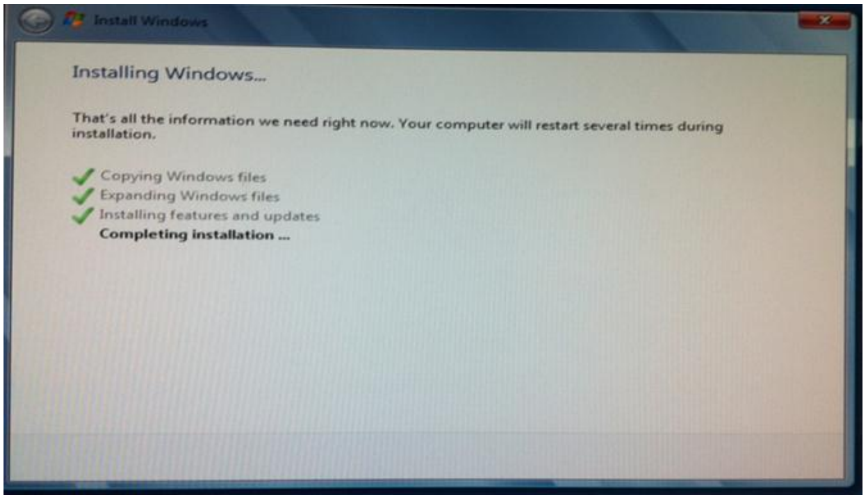
Where do you want to install Windows?

Name	Total Size	Free Space	Type
Disk 0 Unallocated Space	111.8 GB	111.8 GB	

☐ Create separate system partition

Figure 37: Where do you want to install Windows?

8. The installation will run for several minutes. During this time, the system may restart a number of times.



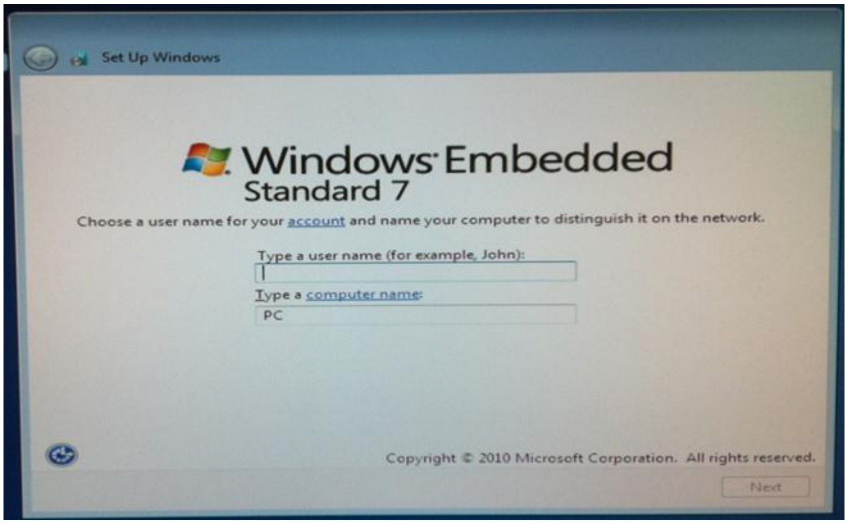
Installing Windows...

That's all the information we need right now. Your computer will restart several times during installation.

✓ Copying Windows files
✓ Expanding Windows files
✓ Installing features and updates
Completing installation ...

Figure 38: Installing Windows

9. When the install process completes, you will be presented with a login screen, where you can establish a user account and name for your system.



Choose a user name for your account and name your computer to distinguish it on the network.

Type a user name (for example, John):

Type a computer name: PC

Copyright © 2010 Microsoft Corporation. All rights reserved.

Figure 39: Set up Windows - Login

7.2.3 Downloading and installing processor, graphics, chipset and other optional drivers

Though the standard OS may contain several drivers compatible with the platform it is recommended that you install the latest platform drivers found here:

http://downloadcenter.intel.com/SearchResult.aspx?lang=eng&ProductFamily=Desktop+Boards&ProductLine=Intel%c2%ae+NM10+Chipset+Family+Boards&ProductProduct=Intel%c2%ae+Desktop+Board+DN2800MT&DownloadType=Drivers

These drivers, in pre-release and release forms are also available in the same package format from https://platformsw.intel.com. Please see your Intel field representative for access.

Driver files are generally available as an executable file. If you have downloaded the package file to your platform and it is in ZIP format, extract the contents of the file using a file decompression program such as WinZip* or 7-Zip*.

7.3 Installing Windows Embedded Compact 7*

For customers requiring WEC7 BSPs for their boards, please contact the respective Adeneo (http://www.adeneo-embedded.com/en/Products/Board-Support-Packages) and BSquare (http://www.bsquare.com/board-support-packages.aspx) ISVs.

7.4 Installing Windows XP*

This section provides step-by-step instructions for downloading the drivers for platforms featuring the Intel® NM10 chipset and the Embedded Graphics Driver for the Intel® Atom™ Processor N2600/D2700/N2800, to properly install and configure the Microsoft Windows XP* with Service Pack 3 image.

These instructions have been used with the Intel Customer Reference Board (CRB) and are applicable to any Intel platform based on the Intel Atom Processor N2600/D2700/N2800 paired with Intel NM10 Express Chipset.

For customers evaluating or using the Development Kit as a basis for their embedded design, and Windows* XP as their operating system, this document is the primary guidance Intel provides for setting up the drivers and operating system.

7.4.1 Overview

Windows XP with Service Pack 3 does not provide drivers for all the SATA controllers, requiring an extra step during the install procedure. There are two different methods of performing the installation to accommodate for the missing SATA drivers.

The first method requires a USB floppy drive with the SATA drivers loaded on the floppy disk. This approach is typically referred to as an *F6 Install* since the user is required to press F6 early in the install to indicate the SATA drivers will be read from a floppy disk.

The second method requires a tool to produce a new Windows XP image typically referred to as slipstreamed image. The slipstreamed image eliminates the need for the floppy drive and floppy disk, but requires a software tool to create the image. The preferred approach is the slipstream method due to the limited availability of validated floppy drives. Both install methods require you download the SATA drivers from Intel separately from the Windows image. If you skip this step, you will get a blue screen early in the installation sequence. Additional information about this issue can be found on the Microsoft website.

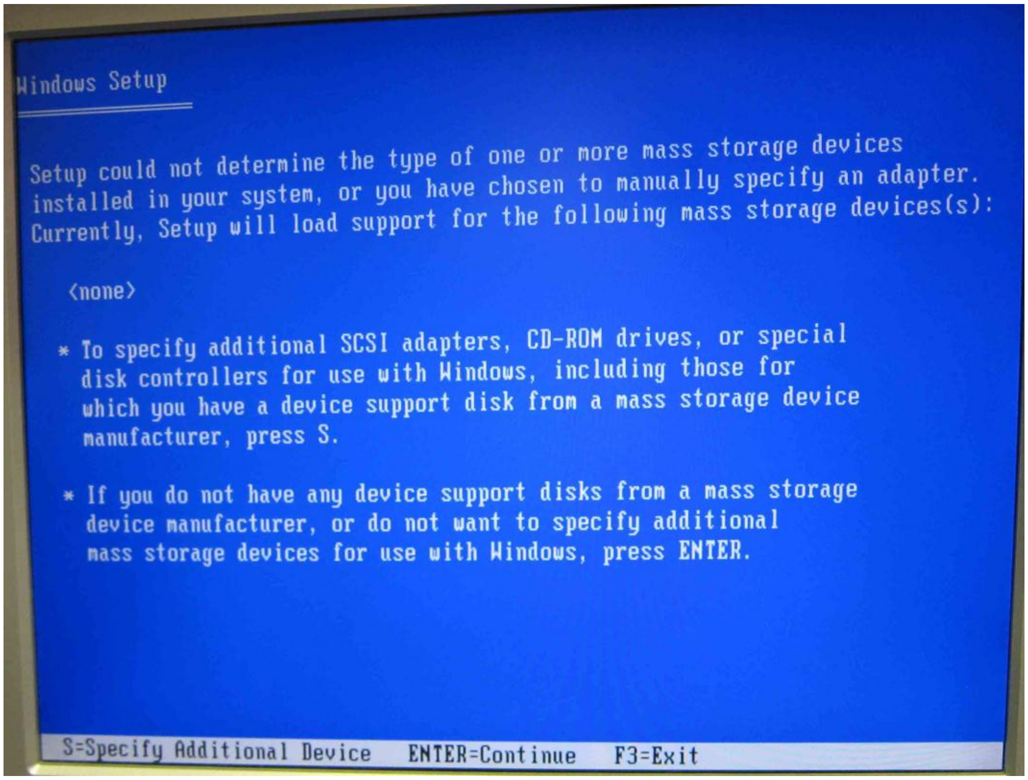
http://support.microsoft.com/kb/314859

http://support.microsoft.com/kb/916196

Note: Not all USB floppy disk drives are created equal. If you go this route, please read the above support documents from Microsoft to get a list of supported floppy drives.

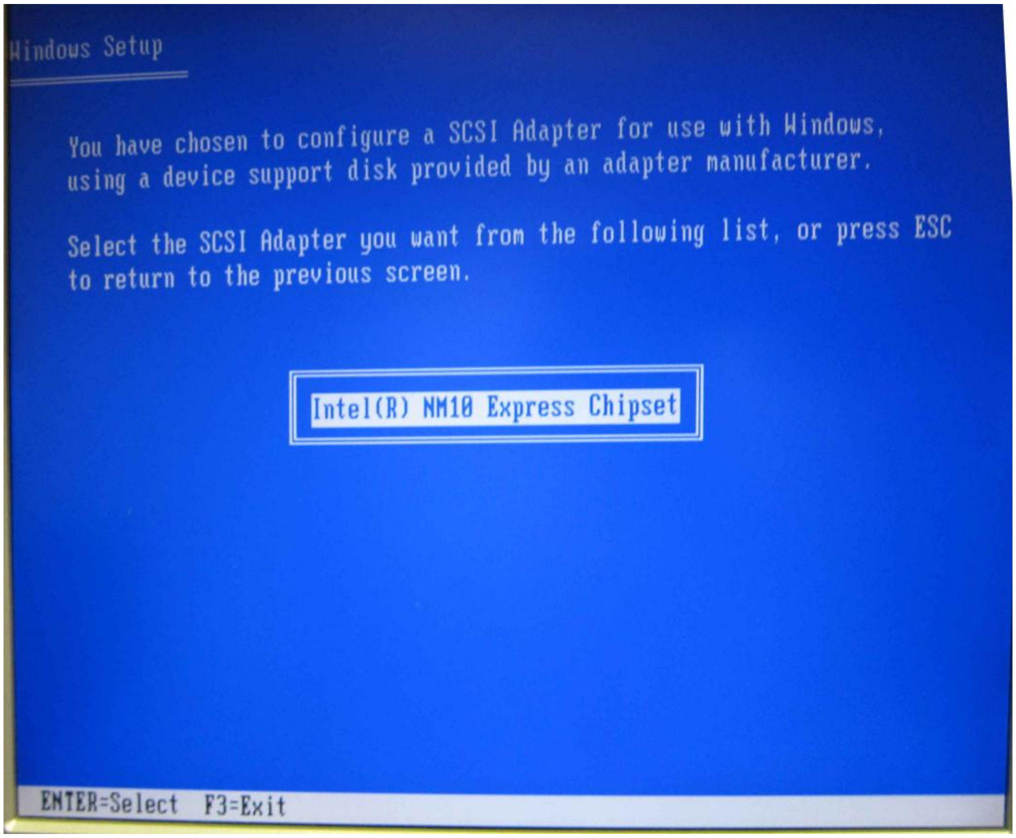
7.4.2 F6 install with floppy

1. Download either the STOR_10.1.0.1008_f6flpy-x86.zip or STOR_10.1.0.1008_f6flpy-x64.zip SATA Driver files from here
2. Put the SATA drivers on a floppy disk.
    a) iaahci.cat
    b) iaAHCI.inf
    c) iastor.cat
    d) iaStor.inf
    e) iaStor.sys
    f) license.txt
    g) TXTSETUP.OEM
    h) F6Readme.txt
3. Attach the USB Floppy drive to the CRB.
4. Connect a SATA or USB CD or DVD drive with the Microsoft Windows XP with Service Pack 3 image.
5. Boot the CRB to initiate the Windows XP Setup process.
6. When the Windows XP Setup screen appears, you will soon see a message in the grey bar at the bottom of the screen. This message will say, "Press F6 if you need to install a third party SCSI or RAID driver…."
    a) Press F6.
    b) The installer will continue on for a minute or so before the F6 install screen will appear.



```
Windows Setup

Setup could not determine the type of one or more mass storage devices
installed in your system, or you have chosen to manually specify an adapter.
Currently, Setup will load support for the following mass storage devices(s):

  <none>

 * To specify additional SCSI adapters, CD-ROM drives, or special
   disk controllers for use with Windows, including those for
   which you have a device support disk from a mass storage device
   manufacturer, press S.

 * If you do not have any device support disks from a mass storage
   device manufacturer, or do not want to specify additional
   mass storage devices for use with Windows, press ENTER.

 S=Specify Additional Device   ENTER=Continue   F3=Exit
```

c) Press S to Specify Additional Device. The SCSI adapter screen will appear.



Windows Setup

You have chosen to configure a SCSI Adapter for use with Windows, using a device support disk provided by an adapter manufacturer.

Select the SCSI Adapter you want from the following list, or press ESC to return to the previous screen.

Intel(R) NM10 Express Chipset

ENTER=Select F3=Exit

d) Press Enter to Select the Intel® NM10 Express Chipset. The screen titled "Setup will load support for Intel® NM10 Express Chipset" will appear.

Windows Setup

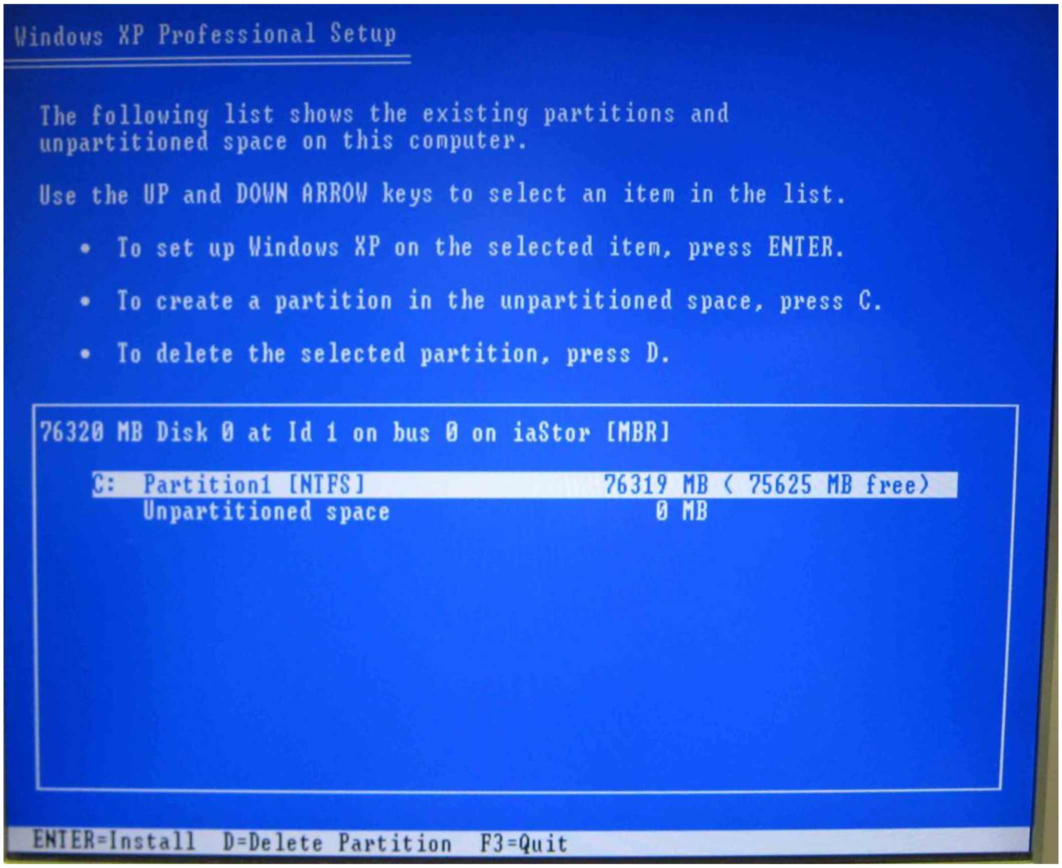
Setup will load support for the following mass storage device(s):

Intel(R) NM10 Express Chipset

- To specify additional SCSI adapters, CD-ROM drives, or special disk controllers for use with Windows, including those for which you have a device support disk from a mass storage device manufacturer, press S.

- If you do not have any device support disks from a mass storage device manufacturer, or do not want to specify additional mass storage devices for use with Windows, press ENTER.

e) Press Enter to continue. The partitions screen will appear.



Windows XP Professional Setup

The following list shows the existing partitions and unpartitioned space on this computer.

Use the UP and DOWN ARROW keys to select an item in the list.

- To set up Windows XP on the selected item, press ENTER.
- To create a partition in the unpartitioned space, press C.
- To delete the selected partition, press D.

76320 MB Disk 0 at Id 1 on bus 0 on iaStor [MBR]

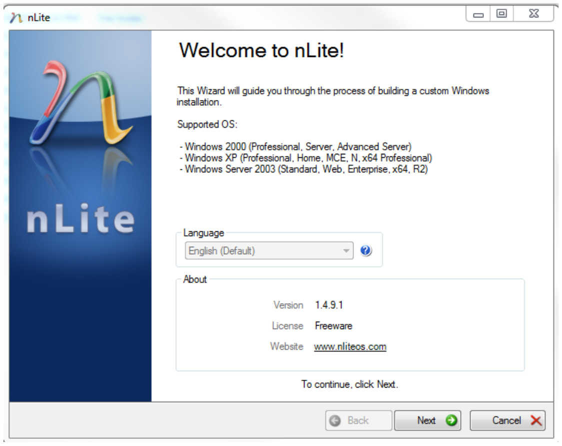
C:	Partition1 [NTFS]	76319 MB (75625 MB free)
	Unpartitioned space	0 MB

f) Select the C: partition and press Enter. Setup will continue as normal.

7.4.3 Slipstream install

There are several tools available that can create a slipstream image. This document uses the nLite* 1.4.9.1 tool.

1. Download and install nLite from: http://www.nliteos.com/index.html.
2. Download either the STOR_10.1.0.1008_f6flpy-x86.zip or STOR_10.1.0.1008_f6flpy-x64.zip SATA Driver files from here.
3. Extract the Intel® Rapid Storage Technology F6 Driver files.
4. Download the Windows XP installation ISO or insert the Windows XP installation Disk into the disk drive.
5. Start the nLite tool.
    a. Select your language and click Next



Welcome to nLite!

This Wizard will guide you through the process of building a custom Windows installation.

Supported OS:

- Windows 2000 (Professional, Server, Advanced Server)
- Windows XP (Professional, Home, MCE, N, x64 Professional)
- Windows Server 2003 (Standard, Web, Enterprise, x64, R2)

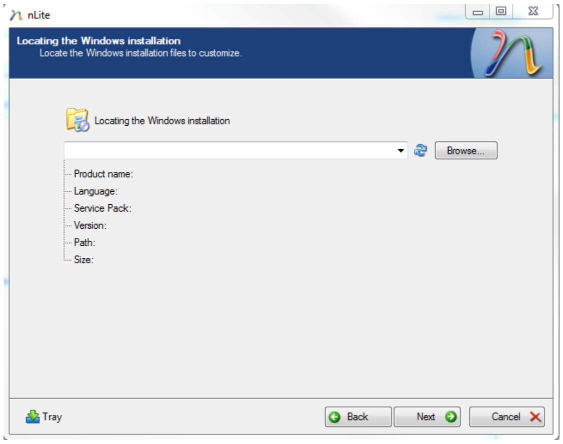
Language: English (Default)

About

Version: 1.4.9.1
License: Freeware
Website: www.nliteos.com

To continue, click Next.

b. Click on Browse and point to the folder with the Windows XP installation files (from step 4). You will see the information fields populate. Click Next.



Locating the Windows installation

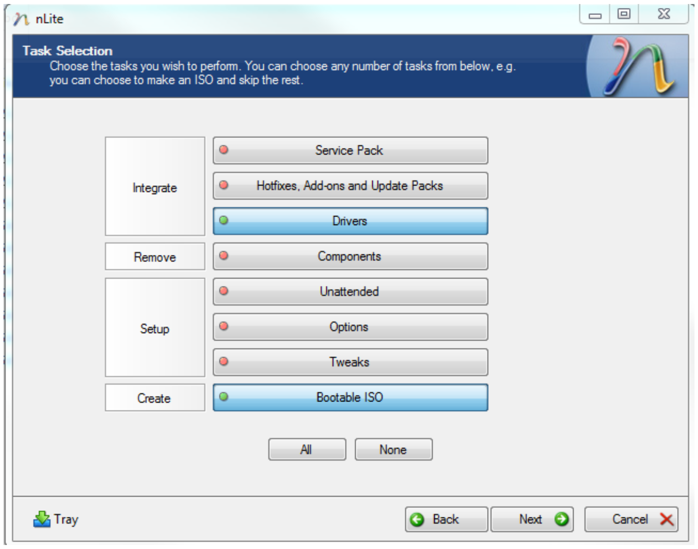
Locate the Windows installation files to customize.

Locating the Windows installation

Product name:
Language:
Service Pack:
Version:
Path:
Size:

c. Click Next on the Presets page.

d. Select Drivers and Bootable ISO on the Task Selection page. Click Next.



Task Selection

Choose the tasks you wish to perform. You can choose any number of tasks from below, e.g. you can choose to make an ISO and skip the rest.

e. Click Insert ☐ Single Driver

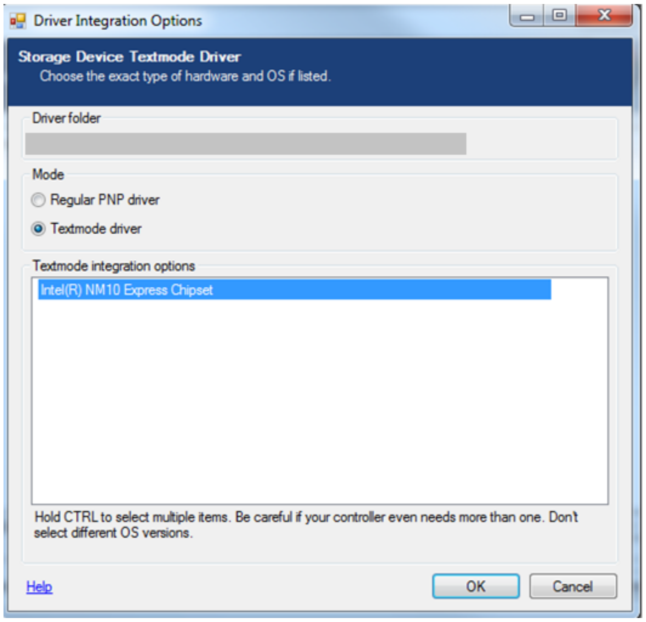
i. Browse to the Intel Rapid Storage Technology F6 Driver files.

ii. Select the iaAHCI.inf file.

f. Select the Textmode driver radio button.

g. Select the Intel® NM10 Express Chipset in the Textmode integration options pane.

h. Click OK.



Driver Integration Options

Storage Device Textmode Driver

Choose the exact type of hardware and OS if listed.

Driver folder

Mode

○ Regular PNP driver

● Textmode driver

Textmode integration options

Intel(R) NM10 Express Chipset

Hold CTRL to select multiple items. Be careful if your controller even needs more than one. Don't select different OS versions.

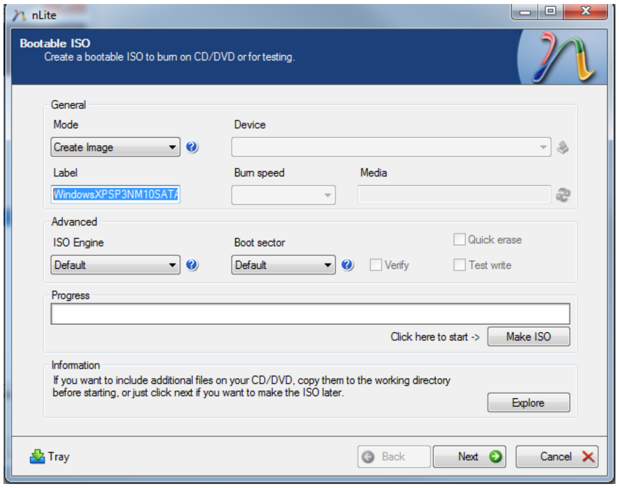
i. On the Drivers page, click Next.

j. Click Yes to start the process.

k. On the Processing… page, click Next.

l. On the Bootable ISO page, .abel your new Windows XP installation with something meaningful such as: WindowsXPSP3NM10SATA.

m. Click Make ISO.



Create a bootable ISO to burn on CD/DVD or for testing.

Mode: Create Image

Label: WindowsXPSP3NM10SATA

ISO Engine: Default

Boot sector: Default

Click here to start ->

If you want to include additional files on your CD/DVD, copy them to the working directory before starting, or just click next if you want to make the ISO later.

n. Name your ISO with a meaningful name, such as: WindowsXPSP3WithNM10Sata.iso

o. Click Next.

p. Click Finish.

6. Burn the newly generated ISO file to a CD using your favorite tool.
7. Attach a SATA CD ROM or USB CD ROM to Intel’s CRB.
8. Install Windows XP by selecting the appropriate options in the setup screens.

7.4.4 Install Device Drivers

The Rapid Storage Technology Drivers, Audio Drivers, LAN Drivers, and Chipset Drivers can be found here:

http://downloadcenter.intel.com/SearchResult.aspx?lang=eng&ProductFamily=Desktop+Boards&ProductLine=Intel%c2%ae+NM10+Chipset+Family+Boards&ProductProduct=Intel%c2%ae+Desktop+Board+DN2800MT&DownloadType=Drivers

7.4.5 Install and configure EMGD

The Intel® Embedded Media and Graphics Driver (Intel® EMGD) comprises a suite of multi-platform graphics drivers designed to meet the requirements of embedded applications, featuring Intel® Dynamic Display Configuration Technology (DDCT).

The Intel® Embedded Media and Graphics Drivers support the following types of display devices:

- Analog CRT
- LVDS flat panels
- HDMI / DVI
- DisplayPort / Embedded DisplayPort

Intel® EMGD is designed to work with fixed-function systems, such as Point-of-Sale (POS) devices, ATMs, gaming devices, In-vehicle Information/Entertainment systems, etc. It can be configured to work with various hardware and software systems.

For more information, please refer to the EMGD User's Guide bundled with the EMGD Graphics Driver.

7.5 Using MeeGo*

This section provides step-by-step instructions for downloading, installing, and configuring MeeGo for the Intel® Atom™ Processor N2600/D2700/N2800.

These step-by-step instructions have been used with the Intel Customer Reference Board (CRB) and are applicable to any Intel platform based on the Intel Atom Processor N2600/D2700/N2800 paired with Intel NM10 Express Chipset.

For customers evaluating or using the Development Kit as a basis for their embedded design, and MeeGo* as their operating system, this is the primary guidance Intel provides for setting up the drivers and operating system.

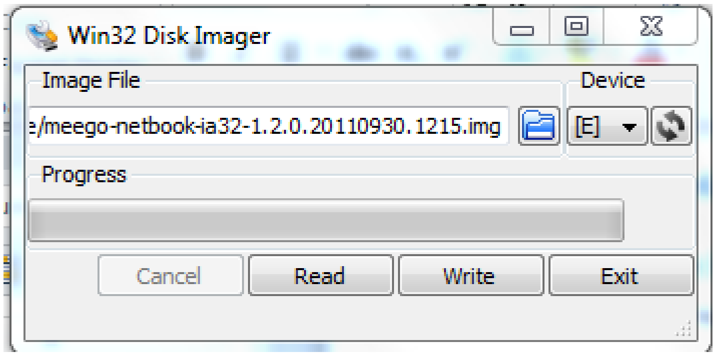
7.5.1 Booting MeeGo*

The MeeGo* project provides a Linux-based, open source software platform for the next generation of computing devices. The MeeGo software platform is designed to give developers the broadest range of device segments to target for their applications, including netbooks, handheld computing and communications devices, in-vehicle infotainment devices, smart TVs, tablets and more – all using a uniform set of APIs based on Qt. For consumers, MeeGo will offer innovative application experiences that they can take from device to device. For more information, visit the MeeGo website at https://meego.com/.

7.5.2 Live Image on USB stick

1. Insert and Format the USB stick.
   a. On Windows 7, right click on Computer.
   b. Click on Manage.
   c. On the Computer Management page, Select Storage>Disk Management on the Left hand side
   d. Remove any partitions or volumes. This is particularly important when you have used the USB stick for other Linux distributions or previous versions of MeeGo.
2. Download the Beta MeeGo image.
   a. http://download.meego.com/snapshots/latest-cedartrail/images/meego-netbook-ia32/
   b. Choose the meego-netbook-ia32-*.img file

3. Download and install Win32 Disk Imager from:
    a. https://launchpad.net/win32-image-writer/+download
4. Use Win32DiskImager to put the image on your USB Stick



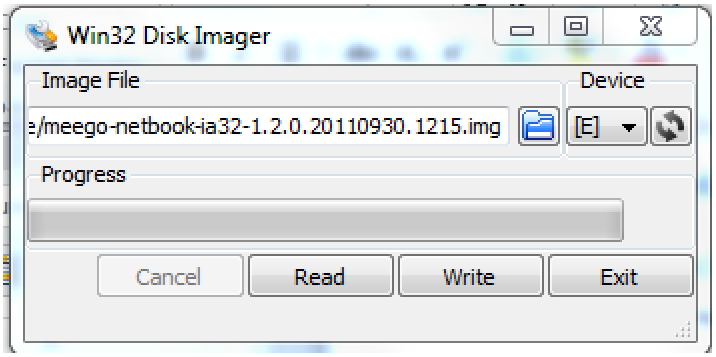
:/meego-netbook-ia32-1.2.0.20110930.1215.img

[E]

5. Write the image to the USB stick by selecting Write.
6. Insert the USB stick into the CRB.
7. When you boot the BIOS be sure to select the USB stick as the primary boot drive.
8. When the selection options appear, select the first option to Boot MeeGo.

7.5.3 Install with USB stick

1. Insert and format the USB stick.
    a. On Windows 7, right click on Computer.
    b. Click on Manage.
    c. On the Computer Management page, Select Storage>Disk Management on the left hand side
    d. Remove any partitions or volumes. This is particularly important when you have used the USB stick for other Linux distributions or previous versions of MeeGo.
2. Download the Beta MeeGo image.
    a. http://download.meego.com/snapshots/latest-cedartrail/images/meego-netbook-ia32/
    b. Choose the meego-netbook-ia32-*.img file
3. Download and install Win32 Disk Imager from:
    a. https://launchpad.net/win32-image-writer/+download
4. Use Win32DiskImager to put the image on your USB Stick



5. Write the image to the USB stick by selecting Write.

6. Insert the USB stick into the CRB.

7. When you boot the BIOS be sure to select the USB stick as the primary boot drive.

8. When the selection options appear, select the second option to Installation Only option.

9. Follow the prompts to install.

Note: MeeGo Bug number 23757 has been created recently due to a mismatch size of the GUI installer when BOTH the VGA and LVDS screens are attached. If you do not see the arrows or next buttons on the screen, you may press enter as the next buttons will be enabled by default. Or you can attach just one monitor for the installation procedure, and the GUI installer should size correctly.

7.5.4 Graphics Driver

The MeeGo Graphics driver is integrated into the MeeGo Alpha image. Since the graphics capabilities are integrated in the image, no additional installations are required, and no additional configuring is required to benefit from the Linux based hardware accelerated graphics drivers. The source file for the stand alone files for the graphics drivers in MeeGo are at: http://download.meego.com/live/MeeGo:/1.2.0:/CedarTrail:/

7.5.5 Flash

Hardware accelerated flash for MeeGo can be downloaded from the following site: https://registrationcenter.intel.com/RegCenter/ComForm.aspx?ProductID=1618.

7.6 Using Yocto Project*

This section provides step-by-step instructions for downloading the drivers for platforms featuring the Intel® NM10 chipset and the Embedded Graphics Driver for the Intel® Atom™ Processor N2600/D2700/N2800, to properly install and configure the Yocto Project*.

The step-by-step instructions in this section have been used with the Intel Customer Reference Board (CRB). The information in this quick start guide is applicable to any

Intel platform based on the Intel Atom Processor N2600/D2700/N2800 paired with Intel NM10 Express Chipset.

For customers evaluating or using the Development Kit as a basis for their embedded design, and Yocto Project * to develop a custom Linux* operating system, this is the primary guidance Intel provides for setting up the drivers and operating system.

7.6.1 Booting Yocto Project*

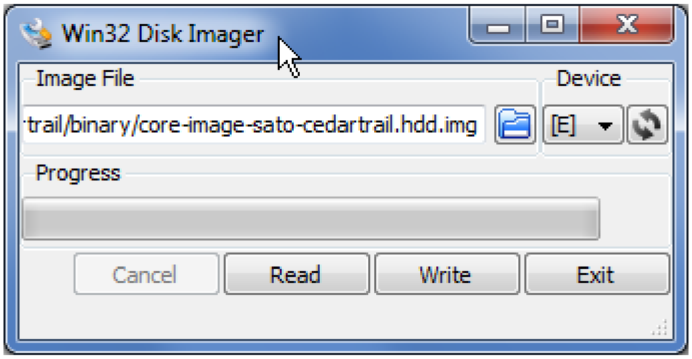
The Yocto Project* is an open source collaboration project that provides templates, tools and methods to help you create custom Linux-based systems for embedded products regardless of the hardware architecture. The Yocto Project* BSP used in this quick start guide is a custom Linux-based BSP that was generated using the Yocto Project* tools and methods. See http://www.yoctoproject.org/ for more information.

7.6.2 Live Image on USB stick

1. Insert and Format the USB stick.
    a. On Windows 7, right click on Computer.
    b. Click on Manage.
    c. On the Computer Management page, Select Storage>Disk Management on the Left hand side
    d. Remove any partitions or volumes on the USB Stick. This is particularly important when you have used the USB stick for other Linux distributions or previous versions of Yocto Project*.
2. Download the Yocto Project* image.
    a. http://www.yoctoproject.org/download/bsp/intel%C2%AE-atom%E2%84%A2-processor-n2000-and-d2000-series-based-platform-cedar-trail
3. The image (and other supporting files) will be contained within a TAR.BZ2 (also known as a tarball) archive. Use the latest version of WinZip or 7-Zip to extract the image.
    a. The image filename should be similar to the following:

    core-image-sato-cedartrail.hdd.img

    b. If necessary change the file extension to .IMG.
4. Download and install Win32 Disk Imager from:
    a. https://launchpad.net/win32-image-writer/+download
5. Use Win32DiskImager to put the image on your USB Stick



trail/binary/core-image-sato-cedartrail.hdd.img

[E]

6. Write the image to the USB stick by selecting Write.

7. Insert the USB stick into the CRB.

8. When you boot the BIOS be sure to select the USB stick as the primary boot drive.

9. When the Boot: prompt appears, you can type boot at the prompt. If you do not type anything the default behavior will be to boot off of the USB stick.

7.6.3 Install with USB stick

1. Insert and Format the USB stick.

   a. On Windows 7, right click on Computer.

   b. Click on Manage.

   c. On the Computer Management page, Select Storage>Disk Management on the Left hand side

   d. Remove any partitions or volumes on the USB Stick. This is particularly important when you have used the USB stick for other Linux distributions or previous versions of Yocto Project*.

2. Download the Yocto Project* image.

   a. http://www.yoctoproject.org/download/bsp/intel%C2%AE-atom%E2%84%A2-processor-n2000-and-d2000-series-based-platform-cedar-trail

3. The image (and other supporting files) will be contained within a TAR.BZ2 (also known as a tarball) archive. Use the latest version of WinZip or 7-Zip to extract the image.

   a. The image filename should be similar to the following:

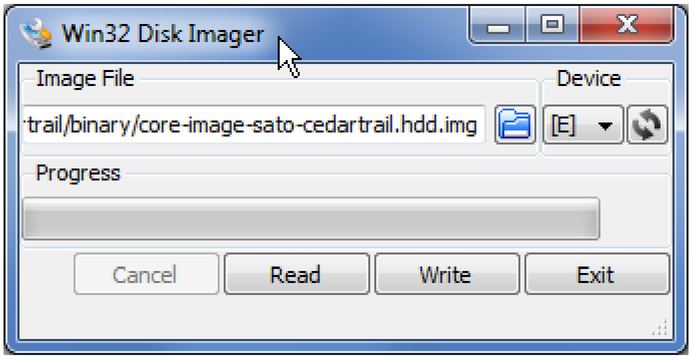
   core-image-sato-cedartrail.hdd.img

   b. If necessary change the file extension to .IMG.

4. Download and install Win32 Disk Imager from:

   a. https://launchpad.net/win32-image-writer/+download

5. Use Win32DiskImager to put the image on your USB Stick



'trail/binary/core-image-sato-cedartrail.hdd.img

[E]

6. Write the image to the USB stick by selecting Write.

7. Insert the USB stick into the CRB.

8. When you boot the BIOS be sure to select the USB stick as the primary boot drive.

9. When the Boot: prompt appears, you must type install to install to the attached SATA drive.

    a. Note this prompt only remains on the screen for a few seconds, so you need to be prepared for it.

10. You will be asked to confirm the drive you intend to install the Yocto Project* bits on. Type 'Y' at the prompt to complete the installation to the drive.

Note: The Yocto Project install will assume the entre drive will be used for Project. Dual boot options, discovery of existing partitions and OSs are not enabled.*

7.6.4 Install with CD or DVD

Currently, installing Yocto Project* via CD or DVD is not enabled.

7.6.5 Graphics Driver

The preliminary Yocto Project* BSP graphics driver will be based on the standard Linux VESA driver. This VESA driver will not be able to take advantage of Intel's graphics engine. Closed source hardware accelerated graphics drivers will be incorporated into future releases of the Yocto Project BSP.

8 Battery Disposal Information

CAUTION

Risk of explosion if the battery is replaced with an incorrect type. Batteries should be recycled where possible. Disposal of used batteries must be in accordance with local environmental regulations.

PRÉCAUTION

Risque d'explosion si la pile usagée est remplacée par une pile de type incorrect. Les piles usagées doivent être recyclées dans la mesure du possible. La mise au rebut des piles usagées doit respecter les réglementations locales en vigueur en matière de protection de l'environnement.

FORHOLDSREGEL

Eksplosionsfare, hvis batteriet erstattes med et batteri af en forkert type. Batterier bør om muligt genbruges. Bortskaffelse af brugte batterier bør foregå i overensstemmelse med gældende miljølovgivning.

OBS!

Det kan oppstå eksplosjonsfare hvis batteriet skiftes ut med feil type. Brukte batterier bør kastes i henhold til gjeldende miljølovgivning.

VIKTIGT!

Risk för explosion om batteriet ersätts med felaktig batterityp. Batterier ska kasseras enligt de lokala miljövårdsbestämmelserna.

VARO

Räjähdysvaara, jos pariston tyyppi on väärä. Paristot on kierrätettävä, jos se on mahdollista. Käytetyt paristot on hävitettävä paikallisten ympäristömääräysten mukaisesti.

VORSICHT

Bei falschem Einsetzen einer neuen Batterie besteht Explosionsgefahr. Die Batterie darf nur durch denselben oder einen entsprechenden, vom Hersteller empfohlenen Batterietyp ersetzt werden. Entsorgen Sie verbrauchte Batterien den Anweisungen des Herstellers entsprechend.

AVVERTIMENTO

Esiste il pericolo di un esplosione se la pila non viene sostituita in modo corretto. Utilizzare solo pile uguali o di tipo equivalente a quelle consigliate dal produttore. Per disfarsi delle pile usate, seguire le istruzioni del produttore.

PRECAUCIÓN

Existe peligro de explosión si la pila no se cambia de forma adecuada. Utilice solamente pilas iguales o del mismo tipo que las recomendadas por el fabricante del equipo. Para deshacerse de las pilas usadas, siga igualmente las instrucciones del fabricante.

WAARSCHUWING

Er bestaat ontploffingsgevaar als de batterij wordt vervangen door een onjuist type batterij. Batterijen moeten zoveel mogelijk worden gerecycled. Houd u bij het weggooien van gebruikte batterijen aan de plaatselijke milieuwetgeving.

ATENÇÃO

Haverá risco de explosão se a bateria for substituída por um tipo de bateria incorreto. As baterias devem ser recicladas nos locais apropriados. A eliminação de baterias usadas deve ser feita de acordo com as regulamentações ambientais da região.

AŚCIAROŽZNAŚĆ

Існуе рызыка выбуху, калі заменены акумулятар неправільнага тыпу. Акумулятары павінны, па магчымасці, перапрацоўвацца. Пазбаўляцца ад старых акумулятараў патрэбна згодна з мясцовым заканадаўствам па экалогіі.

UPOZORNÌNÍ

V případě výměny baterie za nesprávný druh může dojít k výbuchu. Je-li to možné, baterie by měly být recyklovány. Baterie je třeba zlikvidovat v souladu s místními předpisy o životním prostředí.

Προσοχή

Υπάρχει κίνδυνος για έκρηξη σε περίπτωση που η μπαταρία αντικατασταθεί από μία λανθασμένου τύπου. Οι μπαταρίες θα πρέπει να ανακυκλώνονται όταν κάτι τέτοιο είναι δυνατό. Η απόρριψη των χρησιμοποιημένων μπαταριών πρέπει να γίνεται σύμφωνα με τους κατά τόπο περιβαλλοντικούς κανονισμούς.

VIGYÁZAT

Ha a telepet nem a megfelelő típusú telepre cseréli, az felrobbanhat. A telepeket lehetőség szerint újra kell hasznosítani. A használt telepeket a helyi környezetvédelmi előírásoknak megfelelően kell kiselejtezni.

注意

異なる種類の電池を使用すると、爆発の危険があります。リサイクルが可能な地域であれば、電池をリサイクルしてください。使用後の電池を破棄する際には、地域の環境規制に従ってください。

AWAS

Risiko letupan wujud jika bateri digantikan dengan jenis yang tidak betul. Bateri sepatutnya dikitar semula jika boleh. Pelupusan bateri terpakai mestilah mematuhi peraturan alam sekitar tempatan.

OSTRZEŻENIE

Istnieje niebezpieczeństwo wybuchu w przypadku zastosowania niewłaściwego typu baterii. Zużyte baterie należy w miarę możliwości utylizować zgodnie z odpowiednimi przepisami ochrony środowiska.

PRECAUȚIE

Risc de explozie, dacă bateria este înlocuită cu un tip de baterie necorespunzător. Bateriile trebuie reciclate, dacă este posibil. Depozitarea bateriilor uzate trebuie să respecte reglementările locale privind protecţia mediului.

ВНИМАНИЕ

При использовании батареи несоответствующего типа существует риск ее взрыва. Батареи должны быть утилизированы по возможности. Утилизация батарей должна проводится по правилам, соответствующим местным требованиям.

UPOZORNENIE

*Ak batériu vymeníte za nesprávny typ, hrozí nebezpečenstvo jej výbuchu.
Batérie by sa mali podľa možnosti vždy recyklovať. Likvidácia použitých batérií sa musí vykonávať v súlade s miestnymi predpismi na ochranu životného prostredia.*

POZOR

*Zamenjava baterije z baterijo drugačnega tipa lahko povzroči eksplozijo.
Če je mogoče, baterije reciklirajte. Rabljene baterije zavrzite v skladu z lokalnimi okoljevarstvenimi predpisi.*

คำเตือน

ระวังการระเบิดที่เกิดจากเปลี่ยนแบตเตอรี่ผิดประเภท หากเป็นไปได้ ควรนำแบตเตอรี่ไปรีไซเคิล การทิ้งแบตเตอรี่ใช้แล้วต้องเป็นไปตามกฎข้อบังคับด้านสิ่งแวดล้อมของท้องถิ่น.

UYARI

Yanlış türde pil takıldığında patlama riski vardır. Piller mümkün olduğunda geri dönüştürülmelidir. Kullanılmış piller, yerel çevre yasalarına uygun olarak atılmalıdır.

ОСТОРОГА

*Використовуйте батареї правильного типу, інакше існуватиме ризик вибуху.
Якщо можливо, використані батареї слід утилізувати. Утилізація використаних батарей має бути виконана згідно місцевих норм, що регулюють охорону довкілля.*

UPOZORNĚNÍ

V případě výměny baterie za nesprávný druh může dojít k výbuchu. Je-li to možné, baterie by měly být recyklovány. Baterie je třeba zlikvidovat v souladu s místními předpisy o životním prostředí.

ETTEVAATUST

Kui patarei asendatakse uue ebasobivat tüüpi patareiga, võib tekkida plahvatusoht. Tühjad patareid tuleb võimaluse korral viia vastavasse kogumispunkti. Tühjade patareide äraviskamisel tuleb järgida kohalikke keskkonnakaitse alaseid reegleid.

FIGYELMEZTETÉS

Ha az elemet nem a megfelelő típusúra cseréli, felrobbanhat. Az elemeket lehetőség szerint újra kell hasznosítani. A használt elemeket a helyi környezetvédelmi előírásoknak megfelelően kell kiselejtezni.

UZMANĪBU

Pastāv eksplozijas risks, ja baterijas tiek nomainītas ar nepareiza veida baterijām. Ja iespējams, baterijas vajadzētu nodot attiecīgos pieņemšanas punktos. Bateriju izmešanai atkritumos jānotiek saskaņā ar vietējiem vides aizsardzības noteikumiem.

DĖMESIO

Naudojant netinkamo tipo baterijas įrenginys gali sprogti. Kai tik įmanoma, baterijas reikia naudoti pakartotinai. Panaudotas baterijas išmesti būtina pagal vietinius aplinkos apsaugos nuostatus.

ATTENZJONI

Riskju ta' splużjoni jekk il-batterija tinbidel b'tip ta' batterija mhux korrett. Il-batterji għandhom jiġu riċiklati fejn hu possibbli. Ir-rimi ta' batterji użati għandu jsir skond ir-regolamenti ambjentali lokali.

OSTRZEŻENIE

Ryzyko wybuchu w przypadku wymiany na baterie niewłaściwego typu. W miarę możliwości baterie należy poddać recyklingowi. Zużytych baterii należy pozbywać się zgodnie z lokalnie obowiązującymi przepisami w zakresie ochrony środowiska.