



COM 840 (Computer On Module) Reference Manual

P/N 5001833A Revision A

Notice Page

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Ampro Computers, Incorporated
5215 Hellyer Avenue
San Jose, CA 95138-1007
Tel. 408 360-0200
Fax 408 360-0222
www.ampro.com
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Audience Assumptions

This reference manual is for the person who designs computer related equipment, including but not limited to hardware and software design and implementation of the same. Ampro Computers, Inc. assumes you are qualified in designing and implementing your hardware designs and its related software into your prototype computer equipment.

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Chapter 1 About This Manual

Purpose of this Manual

This manual is for designers of systems based on the COM 840 (Computer On Module). This manual contains information that permits designers to create an embedded system based on specific design requirements.

Information provided in this reference manual includes:

- COM 840 specifications
- Environmental requirements
- Major chips and features implemented
- COM 840 connector/pin numbers and definitions
- BIOS Setup information

Information not provided in this reference manual includes:

- Detailed chip specifications
- Internal component operation
- Internal registers or signal operations
- Bus or signal timing for industry standard busses and signals

Reference Material

The following list of reference materials may be helpful for you to complete your custom design successfully. Most of this reference material is also available on the Ampro web site in the InfoCenter. The InfoCenter was created for embedded system developers to share Ampro's knowledge, insight, and expertise.

Specifications

- COM Express Specification
Web site: <http://www.pcisig.com>

Chip Specifications

The following integrated circuits (chips) are used in the COM 840 Computer On Module:

- Intel® Corporation, Core 2 Duo® CPU; the chips GMCH and ICH8M, used for the Memory Hub (Northbridge/Video controller) and I/O Hub (Southbridge), respectively
Web site: <http://www.intel.com>
- Intel Corporation, 82556PHY chip, used for the Ethernet controller
Web site: <http://www.intel.com>

NOTE If you are unable to locate the datasheets using the links provided, go to the manufacturer's web site where you can perform a search using the chip datasheet number or name listed, including the extension (htm for web page, pdf for file name, etc.)

Chapter 2 Product Overview

This introduction presents general information about the COM Express™ architecture and the COM 840 (Computer On Module). After reading this chapter you should understand:

- COM Express concept
- COM Express architecture
- COM 840 features
- COM 840 major components
- COM 840 connectors
- COM 840 specifications

COM Express Concept

COM Express is an open industry standard defined specifically for COMs (computer on modules). Its creation provides the ability to make a smooth transition from legacy parallel interfaces to the newest technologies based on serial buses available today. COM Express modules are available in the following form factors:

- Compact 95mm x 95mm (not specified by PICMG®)
- Basic 125mm x 95mm
- Extended 155mm x 110mm

The COM Express specification 1.0 defines five different pinout types.

Table 2-1. COM Express Pinout Types

Types	Connector Rows	PCI Express Lanes	PCI	IDE Channels	LAN ports
Type 1	A-B	Up to 6			1
Type 2	A-B C-D	Up to 22	32 bit	1	1
Type 3	A-B C-D	Up to 22	32 bit		3
Type 4	A-B C-D	Up to 32		1	1
Type 5	A-B C-D	Up to 32			3

The COM 840 utilizes the Type 2 pinout definition. They are equipped with two high performance connectors that ensure stable data throughput.

The COM (computer on module) integrates all the core components and is mounted onto an application specific baseboard. COM modules are a legacy-free design (no Super I/O, PS/2 keyboard and mouse) and provide most of the functional requirements for any application. These functions include, but are not limited to, a rich complement of contemporary, high bandwidth serial interfaces such as PCI Express, Serial ATA, USB 2.0, and Gigabit Ethernet. The Type 2 pinout provides the ability to offer 32-bit PCI, Parallel ATA, and LPC options thereby expanding the range of potential peripherals. The robust thermal and mechanical concept, combined with extended power management capabilities, is perfectly suited for all applications.

Baseboard designers can utilize as little or as many of the I/O interfaces as necessary. The baseboard can therefore provide all the interface connectors required to attach the system to the application specific peripherals. This versatility allows the designer to create a dense and optimized package, which results in a more reliable product while simplifying system integration. Most importantly, COM Express modules are scalable, which means once an application has been created there is the ability to diversify the product range through the use of different performance class or form factor modules. Simply unplug one module and replace it with another. No redesign is necessary.

COM Express Architecture

The COM Express specification was developed by the PCI Industrial Computer Manufacturing Group (PICMG) in close collaboration with many leading companies across the embedded industry in order to find an implementation solution to handle upcoming new high speed serial I/Os, processors and chipsets. COM Express specifies two form factors, as well as five different types of connector pinouts.

The two form factors are referred to as Basic and Extended. The Basic module footprint is 125mm x 95mm and focuses on space-constrained, low power systems which typically do not contain more than one horizontal mounted SODIMM. The Extended footprint is slightly larger at 155mm x 110mm and supports up to two full-size, vertically mounted DIMM modules to accommodate larger memory configurations for high-performance CPUs, chipsets and multiprocessor systems. The placement of the shielded 220-pin connectors and the mounting holes are identical between these two footprints. In addition to these footprints, the embedded industry created a 'Compact' footprint that is 95mm x 95mm to match the requirements of small applications. At this point in time, the 'Compact' form factor has not been adopted by the COM Express specification.

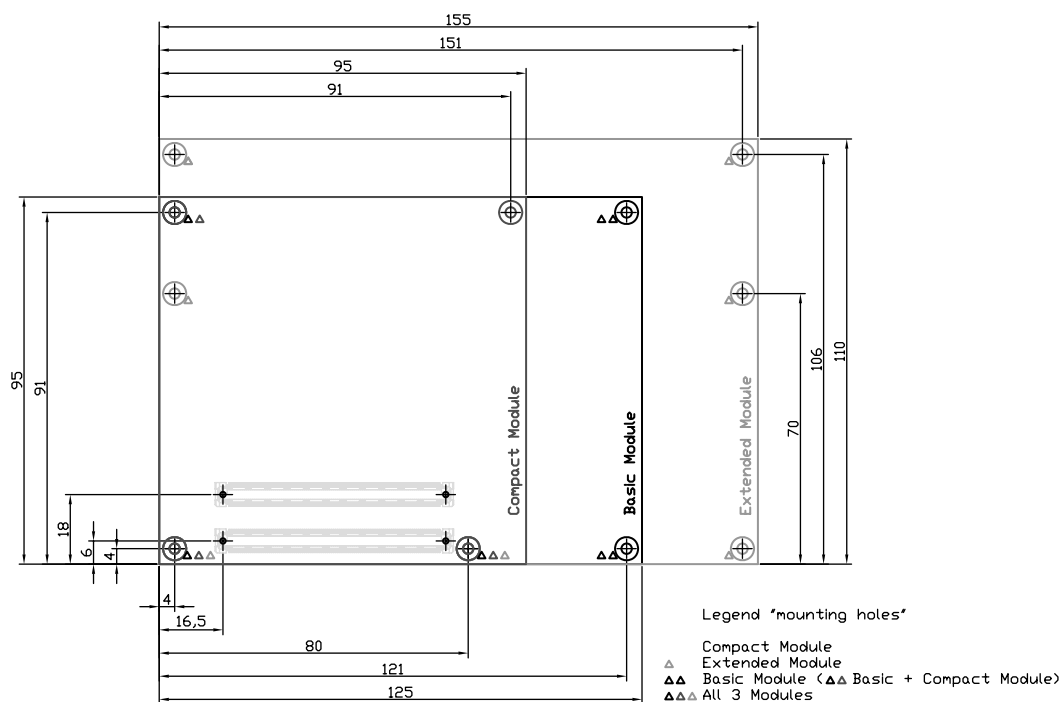


Figure 2-1. Compact, Basic and Extended Form Factors

Product Description

The COM 840 is an exceptionally high integration, high performance, rugged Intel® Core™ 2 Duo processor based system compatible with the COM Express standard. This rugged and high quality module system contains all the component subsystems of an ATX motherboard plus the equivalent of several PCI expansion boards.

The Intel 965GME chipset provides controllers for the Graphics and Memory Hub (Northbridge, GMCH) and the I/O Hub (Southbridge, ICH8M) and provides eight USB ports, two SATA ports, eight GPIO ports, one Ultra DMA 33/66/100 IDE controller supporting two IDE drives, and one Gigabit Ethernet interface (external magnetics required). The COM 840 also supports up to 4GB of onboard SODIMM memory and a graphics controller, included in the Northbridge, which provides CRT and LVDS flat panel video interfaces for most popular LCD panels.

Expansion for additional system functions is possible on the COM 840 through the PCI, PCIE, and LPC expansion buses. The PCI bus operates at a clock speed of 33MHz.

The COM 840 is particularly well suited to either embedded or portable applications and meets the size, power consumption, temperature range, quality, and reliability demands of embedded system applications. The COM 840 requires a single ATX power supply.

Module Features

- CPU
 - ♦ Low voltage Intel Core 2 Duo processor
 - ♦ 800-MHz, source-synchronous processor front side bus
 - ♦ Internal 4MB L2 cache
- Memory
 - ♦ Two standard 200-pin DDR SODIMM sockets
 - ♦ Supports two DDR2 SODIMMs, up to 4 GB
 - ♦ 667MHz Clock Speed
 - ♦ DDR2 ODT support
- Interface Buses
 - ♦ PCI bus on two COM Express connectors
- IDE Interface
 - ♦ Supports two enhanced IDE devices
 - ♦ Supports single master mode
 - ♦ Supports Ultra DMA 100/66/33 in master mode
 - ♦ Supports ATAPI and DVD peripherals
 - ♦ Supports IDE native and ATA compatibility modes
- COM Express Interface
 - ♦ USB Port Interface
 - Supports two root USB hub
 - Supports eight USB ports
 - Supports USB V2.0
 - ♦ Supports external battery for Real Time Clock operation
 - ♦ Supports a reset switch for system reset
- Ethernet Interface
 - ♦ Intel 82566PHY controller chip
 - ♦ Supports one Gigabit Ethernet port
 - ♦ Supports IEEE 802.3 compatible physical layer
 - ♦ Supports Auto-negotiation for speed, duplex mode, and flow control
 - ♦ Supports full duplex or half-duplex mode
 - Full-duplex mode supports transmit and receive frames simultaneously
 - Supports IEEE 802.3x flow control in full duplex mode
 - Half-duplex mode supports enhanced proprietary collision reduction mode
 - ♦ Requires an external isolation transformer

- Video Interfaces (CRT/LCD)
 - ♦ Support CRT (up to 2048 x 1546 bpp at 60Hz)
 - ♦ 24-bit flat panel outputs (LCD/LVDS)
- Miscellaneous
 - ♦ Real-time clock (RTC) with external replaceable battery
 - ♦ Watchdog Timer
 - ♦ Logo Screen (Splash)

Block Diagram

Figure 2-2 shows the functional components of the module.

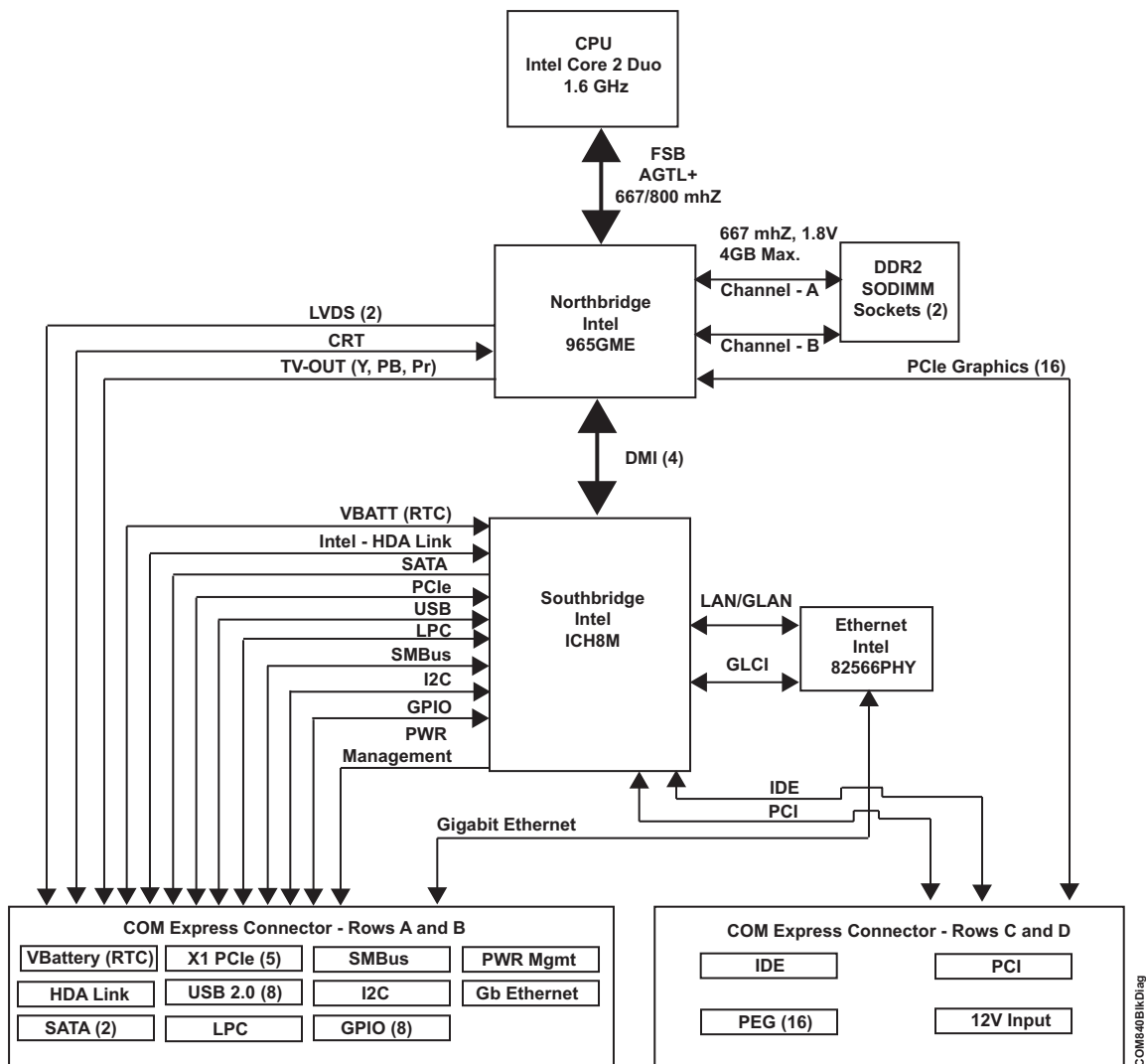


Figure 2-2. Functional Block Diagram

Major Integrated Circuits (ICs)

Table 2-2 lists the major integrated circuits on the COM 840, including a brief description of each IC.

Figure 2-3 shows the locations of the major chips.

Table 2-2. Major Integrated Circuit Descriptions and Functions

Chip Type	Mfg.	Model	Description	Function
CPU (U1)	Intel	Core 2 Duo	1.6 GHz 4 MB L2 cache processor	Integrated CPU, memory, and video
Memory and Graphics Hub (U3)	Intel	965GME (GMCH)	Northbridge functions plus video	Memory and Video
I/O Hub (U5)	Intel	ICH8M	Southbridge I/O controller functions	I/O functions
Ethernet Controller (U9)	Intel	82566PHY	Ethernet Controller – This chip provides Gigabit Ethernet function.	Ethernet

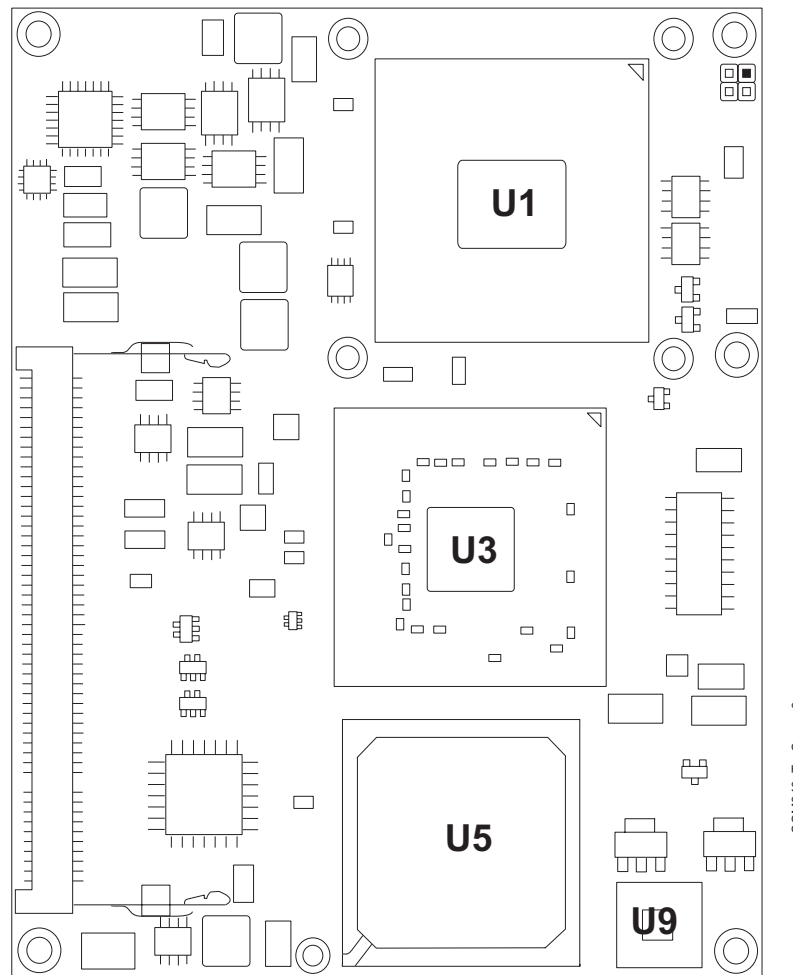


Figure 2-3. Component Locations (Top view)

Connectors and Jumpers

Table 2-3 describes the connectors shown in Figures 2-4 and 2-5. All connectors use 0.1" pin spacing unless otherwise indicated.

Table 2-3. Module Connector Descriptions

Jack/Plug #	Board Access	Description
J1 – Memory	Top	200-pin socket for DDR SODIMM
J2 – Memory (see Figure 2-5 on page 9.)	Bottom	200-pin socket for DDR SODIMM
J3 – COM Express (see Figure 2-5 on page 9.)	Bottom	440-pin connector for Northbridge Video, Southbridge I/O, and Ethernet functions

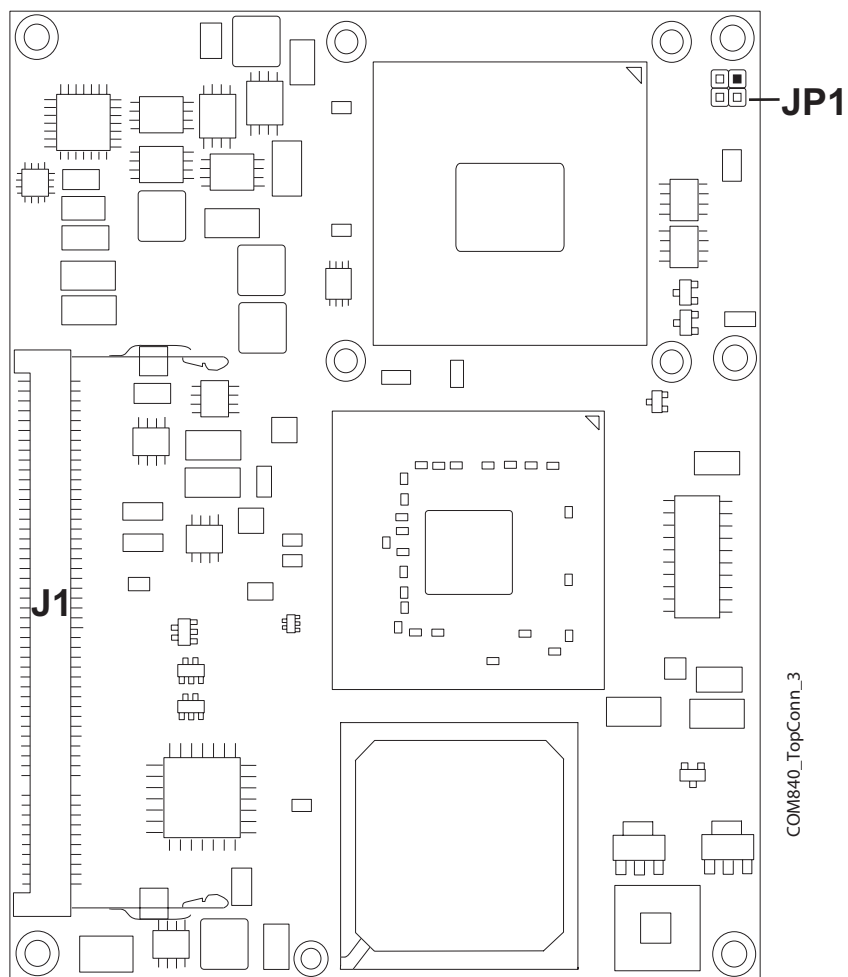


Figure 2-4. Connector and Jumper Locations (Top view)

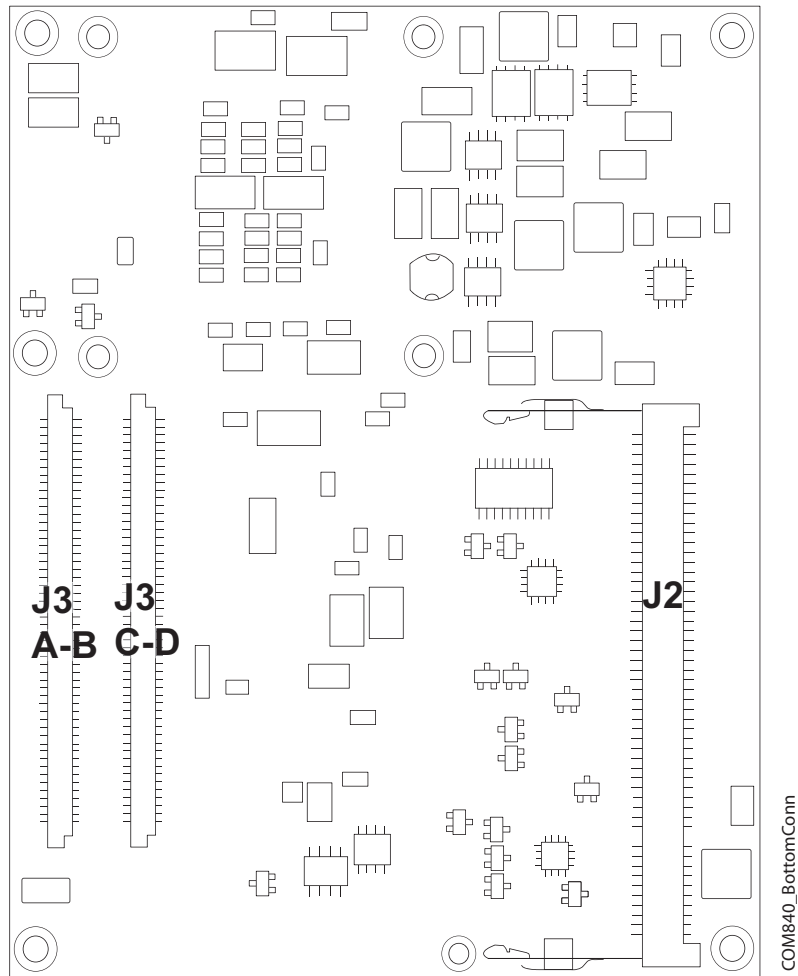


Figure 2-5. Connector Locations (Bottom view)

Jumper Definitions

Table 2-4 describes the jumper pins shown in Figure 2-4.

Table 2-4. Jumper Settings

Jumper Header#	Installed	Removed/Enabled
JP1 – CMOS	Enable clear CMOS (3-4) (Default - 1-2)	Enable keep CMOS (Removed)

Specifications

Physical Specifications

Table 2-5 gives the physical dimensions of the module.

Table 2-5. Weight and Footprint Dimensions

Item	Dimension	NOTE
Weight	0.14 kg (0.30 lb)	
Height (overall)	6.73 mm (0.265 inches)	
Board thickness	2.362 mm (0.093 inches)	
Width	95.00 mm (3.74 inches)	
Length	125.00 mm (4.92 inches)	Overall height is measured from the upper board surface to the highest permanent component on the upper board surface. This measurement does not include the heatspreader, which can vary. The heatspreader could increase this dimension.

Mechanical Specifications

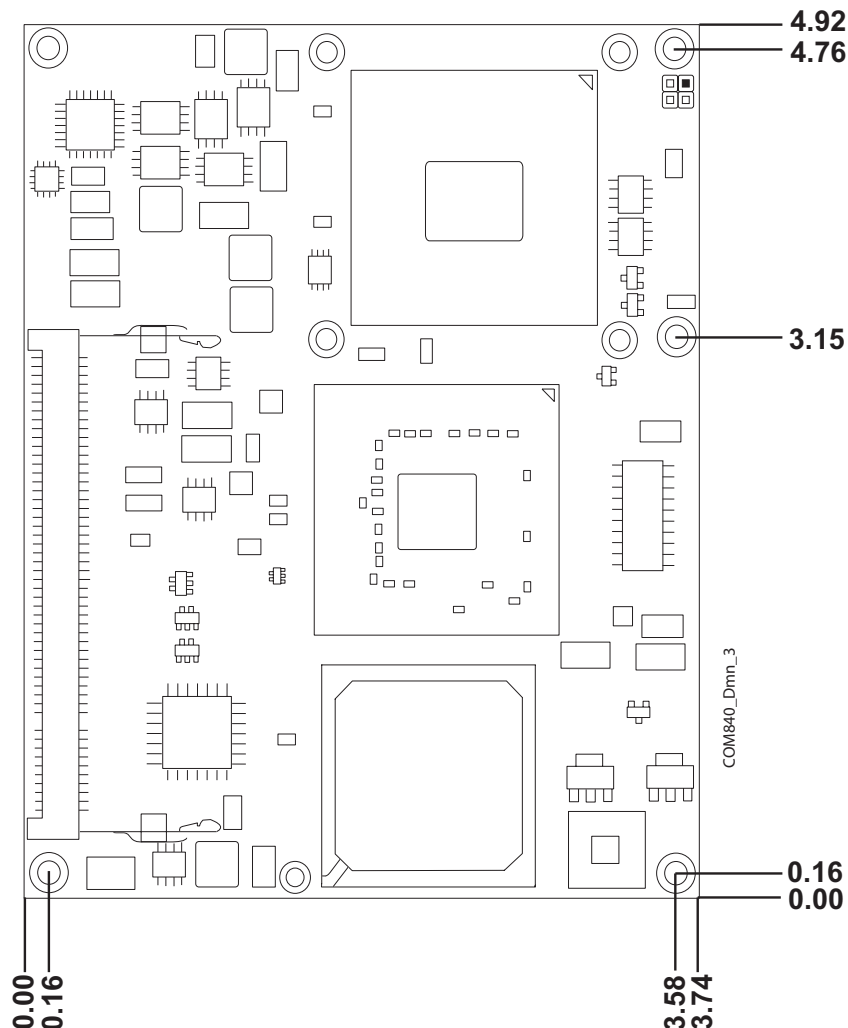


Figure 2-6. Mechanical Overview (Top View)

NOTE All dimensions are given in inches. Pin 1 is shown as a black square on jumper pins and connectors in all illustrations.

Power Specifications

Table 2-6 shows the power requirements.

Table 2-6. Power Supply Requirements

Parameter	1.6GHz Characteristics
Input Type	Regulated DC voltage
In-rush Voltage & Current	6.76A (81.12W)
Typical Idle Power	0.83A (9.95W)
BIT Voltage & Current	1.11A (13.27W)

Operating conditions:

- In-rush operating conditions include CRT video, 512MB DDR RAM, and power.
- Idle operating conditions include the in-rush conditions as well as IDE hard drive with Windows XP, keyboard, and mouse.
- BIT = Burn-In-Test. Operating conditions include idle conditions as well as two serial COM ports with loop-backs, one Ethernet connection, one USB floppy drive, and five USB Compact Flash readers.

Environmental Specifications

Table 2-7 provides the most efficient operating and storage condition ranges required for this module.

Table 2-7. Environmental Requirements

Parameter	Conditions
Temperature	
Operating	–20 to +70 C (–4 to +158 F)
Extended (Optional)	–40 to +85 C (–40 to +185 F)
Storage	–55 to +85 C (–67 to +185 F)
Humidity	
Operating	5% to 90% relative humidity, non-condensing
Non-operating	5% to 95% relative humidity, non-condensing

Thermal/Cooling Requirements

The CPU, Northbridge, Southbridge, and the voltage regulators are the primary sources of heat generated on the board. The COM 840 is designed to operate at its maximum CPU speed of 1.6GHz. The CPU and Northbridge each require a heatsink but no fan below +70C. However, the CPU requires a fan above +70C. The CPU provides thermal sensors, and the COM 840 provides an optional heatspreader plate.

NOTE The optional heatspreader plate requires another form of cooling, such as a fan. A heatspreader plate is not a complete thermal solution for the COM 840.

Chapter 3 Hardware

Overview

This chapter discusses the chips and connectors of the module features in the following order:

- Memory Map
- Interrupt Channel Assignments
- I/O Address Map
- COM Express Connector A-B
 - ♦ LPC interface
 - ♦ SATA interface
 - ♦ USB interface
 - ♦ Power interface
 - ♦ Power Management
 - ♦ Video interface
 - ♦ Audio interface
 - ♦ Gigabit Ethernet interface
 - ♦ I²C bus interface
 - ♦ PCI Express
 - ♦ Express Card
 - ♦ SMBus
 - ♦ GPIO interface
- COM Express Connector C-D
 - ♦ IDE interface
 - ♦ PCI interface
 - ♦ PCI Express Graphics (PEG) interface
 - ♦ SDVO
- Watchdog Timer

NOTE Ampro Computers, Inc. only supports the features/options tested and listed in this manual. The main chips used in the COM 840 may provide more features or options than are listed for the COM 840, but some of these features/options are not supported on the module and will not function as specified in the chip documentation.

Memory Map

The following table provides the common PC/AT memory allocations. Memory below 000500h is used by the BIOS.

Table 3-1. Memory Map

Base Address			Function
00000000h	-	0009FFFFh	Conventional Memory
000A0000h	-	000AFFFFh	Graphics Memory
000B0000h	-	000B7FFFh	Mono Text Memory
000B8000h	-	000BFFFFh	Color Text Memory
C0000h	-	CFFFFh	Standard Video BIOS
000F0000h	-	000FFFFFh	System BIOS Area (Storage and RAM Shadowing)
00100000h	-	04000000h	Extended Memory (If onboard VGA is enabled, then the amount of memory assigned is subtracted from extended memory)
FFE00000h	-	FFFFFFFFh	System Flash

Interrupt Channel Assignments

The interrupt channel assignments are shown in [Table 3-2](#).

NOTE [Table 3-2](#) is only for reference. Interrupt channel assignments are tied to the specific legacy Super I/O device residing on the baseboard. This table can be used with the baseboard in Ampro's Quick Start Kit.

Table 3-2. Interrupt Channel Assignments

Device vs IRQ No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Timer	D															
Keyboard*		D														
Secondary Cascade			D													
COM1*				O	D											
COM2*				D	O											
COM3*					O					O	O	D				
COM4*				O						O	D	O				
Floppy*							D									
Parallel*						O		D								
RTC									D							
IDE															D	O
Math Coprocessor														D		
PS/2 Mouse*													D			
Sound Blaster*						D										
PCI INTA	Automatically Assigned															
PCI INTB	Automatically Assigned															
PCI INTC	Automatically Assigned															
PCI INTD	Automatically Assigned															
USB	Automatically Assigned															

Table 3-2. Interrupt Channel Assignments (Continued)

VGA	Automatically Assigned
Ethernet	Automatically Assigned

*Located on the baseboard.

Legend: D = Default, O = Optional

NOTE The IRQs for the Ethernet, Video, and USB are automatically assigned by the BIOS Plug and Play logic. Local IRQs assigned during initialization can not be used by external devices.

I/O Address Map

Table 3-3 shows the I/O address map.

NOTE Table 3-3 is only for reference. I/O addresses are tied to the specific legacy Super I/O device residing on the baseboard. This table can be used with the baseboard in Ampro's Quick Start Kit.

Table 3-3. I/O Address Map

Address (hex)	Subsystem
000-00F	Primary DMA Controller
020-021	Master Interrupt Controller
040-043	Programmable Interrupt Timer (Clock/Timer)
060-06F	Keyboard Controller*
070-07F	CMOS RAM, NMI Mask Reg, RT Clock
080-09F	DMA Page Registers
092	Fast A20 gate and CPU reset
094	Motherboard enable
102	Video subsystem register
0A0-0BF	Slave Interrupt Controller
0C0-0DF	Slave DMA Controller #2
0F0-0FF	Math Coprocessor
1F0-1F8	IDE Hard Disk Controller
201	Watchdog Timer (WDT)
278-27F	Parallel Printer
2E8-2FF	Serial Port 4 (COM4)*
2F8-2FF	Serial Port 2 (COM2)*
378-37F	Parallel Port (Standard and EPP)*
3C0-3DF	VGA
3E8-3EF	Serial Port 3 (COM3)*
3F0-3F7	Floppy Disk Controller
3F8-3FF	Serial Port 1 (COM1)*
778-77A	Parallel Port (ECP Extensions) (Port 378+400)*
CF8-CFF	PCI bus Configuration Address and Data

*Located on the baseboard.

COM Express A-B Connector (J3)

This section provides descriptions of interfaces within the COM Express A-B connector. The COM Express connector interface comprises two identical 220-pin connectors (A-B and C-D). The COM Express A-B connector provides the following features:

- LPC interface
- SATA interface
- USB interface
- Power interface
- Power Management
- Video interface
- Audio interface
- Gigabit Ethernet interface
- I²C bus interface
- PCI Express
- Express Card
- SMBus
- GPIO

LPC Interface

The COM 840 offers the LPC (Low Pin Count) bus through the Intel® 82801HBM (ICH8M). Many devices already exist for this Intel defined bus. The LPC bus corresponds approximately to a serialized ISA bus yet with a significantly reduced number of signals. Because of the software compatibility to the ISA bus, I/O extensions such as additional serial ports can be easily implemented on an application specific baseboard using this bus.

SATA Interface

Two Serial ATA connections are provided through the Intel 82801HBM (ICH8M). SATA is an enhancement of the parallel ATA therefore offering higher performance. As a result of this enhancement the traditional restrictions of parallel ATA are overcome with respect to speed and EMI. SATA starts with a transfer rate of 150 Mbytes/s and can be expanded up to 600 Mbytes/s in order to accommodate future developments. SATA is completely protocol and software compatible to parallel ATA.

USB Interface

The ICH8M offers four UHCI USB host controllers and two EHCI USB host controllers. These controllers comply with USB standard 1.1 and 2.0 and offer a total of eight USB ports through connector A-B. All ports are high-speed, full-speed, and low-speed capable. The port routing logic determines whether a USB port is controlled by one of the UHCI controllers or by one of the EHCI controllers.

Power Interface

A 12V voltage rail on both A-B and C-D COM Express connectors accepts the voltages required for the board. The RTC 3.3V battery feed and 5V standby functions draw power through the A-B connector.

Power Management

The COM 840 is ACPI 2.0 compliant with battery support. The board also supports Suspend to RAM (S3).

Video Interface

CRT

The COM 840 graphics are driven by an Intel internal graphics interface which provides the interface for an analog display. A 300-MHz integrated, 24-bit RAM-based, Digital -to-Analog Converter (RAMDAC) converts up to 2048x1536 digital pixels at a maximum refresh rate of 60-Hz. Three 8-bit DACs provide R, G, B signals to the monitor.

LCD

The Intel 82965GME chipset provides direct LVDS outputs. The outputs are independent of other panel interfaces. The LVDS interface will support 1 or 2 channels and can support five pairs of LVDS in each channel.

TV-Out

TV-Out support is integrated into the Intel 82965GME chipset and supports component-out functions.

Audio Interface

The A-B connector provides an interface that supports the AC'97 digital audio codecs as well as HDA audio codecs.

Ethernet Interface

The COM 840 supports one Gigabit Ethernet interface implemented through a controller in the ICH8M chip. The controller is utilized through the PHY82566 and provides two interfaces: LCI and GLCI. The GLCI interface is shared with PCI Express port 6 and can be enabled by a soft strap stored in system SPI flash. The ethernet function supports multi-speed operation 10/100/1000 Mbps and operates in full-duplex at all supported speeds or half duplex at 10/100 Mbps while adhering to the IEEE 802.3x flow control specification.

I²C™ Bus

The I²C bus is implemented through the ICH8M chip and provides a Fast Mode multi-master I²C Bus that has maximum I²C bandwidth.

PCI Express™

The COM 840 offers six (6) x1 PCI Express lanes through the ICH8M, which can be configured to support PCI Express edge cards or ExpressCards. One of the six (6) x1 PCI Express lanes is utilized by the onboard Ethernet controller therefore there are only five (5) x1 PCI Express lanes available on the A-B connector. The PCI Express interface is based on the *PCI Express Specification 1.0a*.

ExpressCard™

The COM 840 supports the implementation of ExpressCards, which require the dedication of one USB port and one PCI Express lane for each ExpressCard used.

System Management Bus (SMBus)

The I/O Hub (ICH8M) contains an integrated SMBus controller with both a host and slave SMBus port; but the host cannot access the slave internally. The slave port allows an external master access to the I/O Hub through the COM Express A-B connector. The master contained in the I/O Hub is used to communicate with the SEEP, SDRAM EPROM, ADM 1023 (thermal monitor), and the clock generator.

GPIO

The COM 840 provides GPIO (General Purpose I/O) pins for custom use through the COM Express A-B connector.

COM Express C-D Connector (J3)

The COM Express C-D connector is a 220-pin connector providing the following features:

- IDE interface
- PCI interface
- PCI Express Graphics (PEG) interface
- SDVO functionality

IDE Interface

The ICH8 provides a fast IDE interface that supports two IDE devices, including IDE hard drives and ATAPI devices with independent timings. The IDE interface supports PIO IDE transfers up to 16 MB/second and Ultra ATA transfers up to 100 MB/second.

PCI Interface

The PCI bus complies with PCI specification Rev. 2.3 and provides a 32-bit parallel PCI bus that is capable of operating at 33MHz.

PCI Express Graphics (PEG)

The COM 840 supports the implementation of a x16 link for an external high-performance PCI Express Graphics card. It supports a theoretical bandwidth of up to 4GB/s. Each lane of the PEG Port consists of a receive and transmit differential signal pair designated from PEG_RX0 (+ and -) to PEG_RX15 (+ and -) and correspondingly from PEG_TX0 (+ and -) to PEG_RX15 (+ and -).

SDVO

The pins of the PEG Port are shared with the Serial Digital Video Output (SDVO) functionality and may be alternatively used for two third party SDVO compliant devices connected to channels B and C.

Watchdog Timer

The watchdog timer (WDT) restarts the system if a mishap occurs, ensuring proper start-up after the interruption. Possible problems include failure to boot properly, the application software's loss of control, failure of an interface device, unexpected conditions on the bus, or other hardware or software malfunctions.

The WDT (watchdog timer) can be used both during the boot process and during normal system operation.

- During the Boot process – If the OS fails to boot in the time interval set in the BIOS, the system will reset.

Enable the WDT in the Custom Configuration Screen of BIOS Setup. Set the WDT for a time-out interval in seconds, between 1 and 255, in one second increments. Ensure you allow enough time for the boot process to complete and for the OS to boot. The OS or application must tickle the WDT as soon as it comes up. This can be done by accessing the hardware directly or through a BIOS call.

- During System Operation – An application can set up the WDT hardware through a BIOS call, or by accessing the hardware directly. Some Ampro Board Support Packages provide an API interface to the WDT. The application must tickle the WDT in the time set when the WDT is initialized or the system will be reset. You can use a BIOS call to tickle the WDT or access the hardware directly.

The BIOS implements interrupt 15 function 0C3h to manipulate the WDT.

- Watchdog Code examples – Ampro has provided source code examples on the COM 840 Support Software DVD illustrating how to control the WDT. The code examples can be easily copied to your development environment to compile and test the examples, or make any desired changes before compiling. Refer to the WDT Readme file on the COM 840 Support Software DVD.

Chapter 4 BIOS Setup

Introduction

This section assumes the user is familiar with general BIOS Setup and does not attempt to describe the BIOS functions. Refer to the appropriate PC reference manuals for information about the software interface of the onboard ROM-BIOS. If Amprom has added to or modified the standard functions, these functions will be described.

Entering BIOS Setup (VGA Display)

To enter BIOS Setup using a VGA display for the COM 840:

1. Turn on the VGA monitor and the power supply to the COM 840.
2. Start Setup by pressing the [Del] key, when the following message appears on the boot screen.

Hit if you want to run SETUP

NOTE	If the setting for <i>Memory Test</i> is set to Fast, you may not see this prompt appear on screen if the monitor is too slow to display it on start up. If this happens, press the key early in the boot sequence to enter BIOS Setup.
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3. Use the <Enter> key to select the screen menus listed in the Opening BIOS screen.
4. Follow the instructions at the bottom of each screen to navigate through the selections and modify any settings.

Logo Screen Customization (Splash Screen)

The COM 840 BIOS supports a graphical logo screen, which can be customized by the user and displayed on screen when enabled through the BIOS Setup Utility. The graphical image can be a company logo or any custom image the user wants to display during the boot process. The custom image can be displayed as the first image displayed on screen during the boot process and remain there, depending on the options selected in BIOS Setup, while the OS boots.

Logo Screen Image Requirements

The user's image may be customized with any bitmap software editing tool, but must be converted into an acceptable format with the tools (files and utilities) provided by Amprom. If the custom image is not converted with the utilities provided, then the image will not display properly when this field is selected in BIOS Setup.

NOTE	Do not use other logo screen conversion tools, as these will render an image that is not compatible with the COM 840 BIOS.
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The COM 840 Logo Screen Utility supports the following image formats:

- Bitmap image
 - ♦ 16-Color, 640x480 pixels
 - ♦ 256-Color, 640x480 pixels
- JPG image
 - ♦ 16-Color, 640x480 pixels
 - ♦ 256-Color, 800x600 pixels

- ♦ 256-Color, 1024x768 pixels
- PCX image
 - ♦ 256-Color, 640x480 pixels
- A file size of not greater than 40kB

NOTE For procedures on loading custom images, see the logo screen utility document available on the Ampro web site.
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Appendix A Technical Support

Ampro Computers, Inc. provides a number of methods for contacting Technical Support listed in the [Table A-1](#) below. Requests for support through the Ask an Expert are given the highest priority, and usually will be addressed within one working day.

- Ampro Ask an Expert – This is a comprehensive support center designed to meet all your technical needs. This service is free and available 24 hours a day through the Ampro web site at <http://ampro.custhelp.com>. This includes a searchable database of Frequently Asked Questions, which will help you with the common information requested by most customers. This is a good source of information to look at first for your technical solutions. However, you must register online if you wish to use the Ask a Question feature.
- Personal Assistance – You may also request personal assistance by creating an Ask an Expert account and then going to the Ask a Question feature. Requests can be submitted 24 hours a day, 7 days a week. You will receive immediate confirmation that your request has been entered. Once you have submitted your request, you must log in to go to My Stuff area where you can check status, update your request, and access other features.
- InfoCenter – This service is also free and available 24 hours a day at the Ampro web site at <http://www.ampro.com>. However, you must sign up online before you can login to access this service.

The InfoCenter was created as a resource for embedded system developers to share Ampro's knowledge, insight, and expertise. This page contains links to White Papers, Specifications, and additional technical information.

Table A-1. Technical Support Contact Information

Method	Contact Information
Ask an Expert	http://ampro.custhelp.com
Web Site	http://www.ampro.com
Standard Mail	Ampro Computers, Incorporated 5215 Hellyer Avenue San Jose, CA 95138-1007, USA

