COM Express™ Baseboard (ATX, Type 2) Reference Manual

P/N 5001831A Revision A

Notice Page

NOTICE

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REVISION HISTORY

Revision	Reason for Change	Date
A, A	Initial Release	Nov/07

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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

This manual provides information about the components, features and connectors available on the Ampro COM Express Baseboard.

Messages

The following messages are used in this manual:

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

CAUTION Cautions warn the user about how to prevent damage to hardware or loss of data.

NOTE Notes call attention to important information that should be observed.

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Terminology

Table 1-1. List of Terms

Term	Description
PCI Express (PCIe)	Peripheral Component Interface Express – next-generation high speed Serialized I/O bus.
PCI Express Lane	One PCI Express Lane is a set of 4 signals that contains two differential lines for Transmitter and two differential lines for Receiver. Clocking information is embedded into the data stream.
x1, x2, x4, x16	x1 refers to one PCI Express Lane of basic bandwidth; x2 to a collection of two PCI Express Lanes; etc.. Also referred to as x1, x2, x4 or x16 link.
ExpressCard	A PCMCIA standard built on the latest USB 2.0 and PCI Express buses.
USB	Universal Serial Bus.
SATA	Serial AT Attachment: serial-interface standard for hard disks.
AC ‘97 / HDA	Audio CODEC (Coder-Decoder) / High Definition Audio.
LPC	Low Pin-Count Interface: a low speed interface used for peripheral circuits such as Super I/O controllers, which typically combine legacy-device support into a single IC.

Table 1-1. List of Terms (Continued)

I²C Bus	Inter-Integrated Circuit Bus: is a simple two-wire bus with a software-defined protocol that was developed to provide the communications link between integrated circuits in a system.
SM Bus	System Management Bus: is a popular derivative of the I²C-bus.
GBE	Gigabit Ethernet.
LVDS	Low-Voltage Differential Signaling.
SDVO	Serial Digital Video Out is a proprietary technology introduced by Intel® to add additional video signaling interfaces to a system.
CRT	Cathode Ray Tube.
DDC	Display Data Channel is an I²C bus interface between a display and a graphics adapter.
N.C.	Not connected.
N.A.	Not available.
T.B.D.	To be determined.

Technical Support

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Electrostatic Sensitive Device

All electronic parts described in this manual are electrostatic sensitive devices and are packaged accordingly. Do not open or handle a baseboard or module except at an electrostatic-free workstation. Additionally, do not ship or store electronic devices near strong electrostatic, electromagnetic, magnetic, or radioactive fields unless the device is contained within its original manufacturer’s packaging.

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Concept of COM Express

A Computer On Module (COM) integrates all the core components and standard I/O interfaces of a common PC onto an application specific board. The key advantage of the COM in the embedded computer industry is that all highly integrated, high speed components like CPUs, chipsets and memory are combined on a small module form factor for easy adaptation into different applications across multiple market segments.

COM Express modules have standardized form factors and specified pinouts on two system connectors that remain the same regardless of the vendor. The COM Express module reflects the functional requirements for a wide range of embedded applications. These functions include, but are not limited to PCI Express, PCI, Graphics, High Definition Audio, parallel ATA, serial ATA, Gigabit Ethernet and USB 2.0 ports. Two ruggedized, shielded connectors provide the baseboard interface and carry all the I/O signals to and from the COM Express module.

Baseboard designers can utilize as little or as many of the I/O interfaces as deemed necessary. Therefore the baseboard can 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 applications are scalable, which means once a product has been created there is the ability to diversify the product range through the use of different performance class COM Express modules. Simply unplug one module and replace it with another. No redesign is necessary.

Lead-Free Designs (RoHS)

All Ampro designs are created from lead-free components and are completely RoHS compliant.

Certification

Ampro is certified to ISO 9001:2000 standard.

Chapter 2 COM Express Overview

Module Form Factors

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 horizontally mounted SO-DIMM. 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.

The COM Express Baseboard can utilize either Compact or Basic form factor CPU modules.

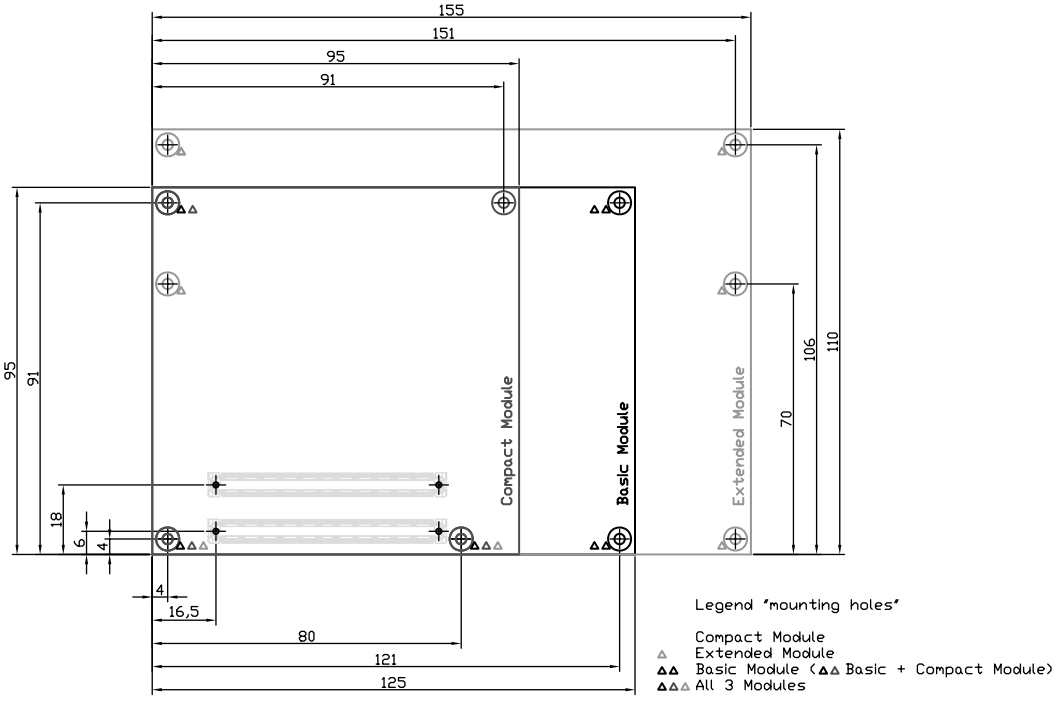

Figure 2-1. Compact, Basic and Extended Form Factors

Module Types Overview

COM Express specifies five module types with different pinouts and connectivity features (see table). The common features listed below are utilized by all five module types and constitute the minimum configuration of a COM Express module.

- Up to 8 USB 2.0 ports
- Up to 4 Serial ATA

- Up to 6 PCI Express lanes
- Support pins for up to 2 ExpressCards
- Dual 24-bit LVDS channels
- Analog VGA
- TV Out
- AC '97 digital audio interface
- Gigabit Ethernet
- LPC interface
- 8 GPIO pins

Table 2-1. Module type supported features

Module Type	Connectors 220-pin	Connector Rows	PCI-Express Lanes	PCI Bus	IDE Channels	LAN Ports
1	1	A,B	6	No	No	1
2	2	A,B,C,D	22	Yes	Yes	1
3	2	A,B,C,D	22	Yes	No	3
4	2	A,B,C,D	32	No	Yes	1
5	2	A,B,C,D	32	No	No	3

The preferred choice of the embedded computer industry thus far is the Type 2 pinout and therefore the leading manufacturers have chosen to produce COM Express Type 2 modules, including Ampro. This pinout offers the best balance between older technology such as PCI and Parallel ATA while providing the latest technologies including PCI Express, Serial ATA and PCI Express graphics. The COM Express Baseboard that is described herein is based on the Type 2 pinout.

Connector Layout

Figure 2-2 shows the names of the connectors and jumper headers of the COM Express Baseboard.

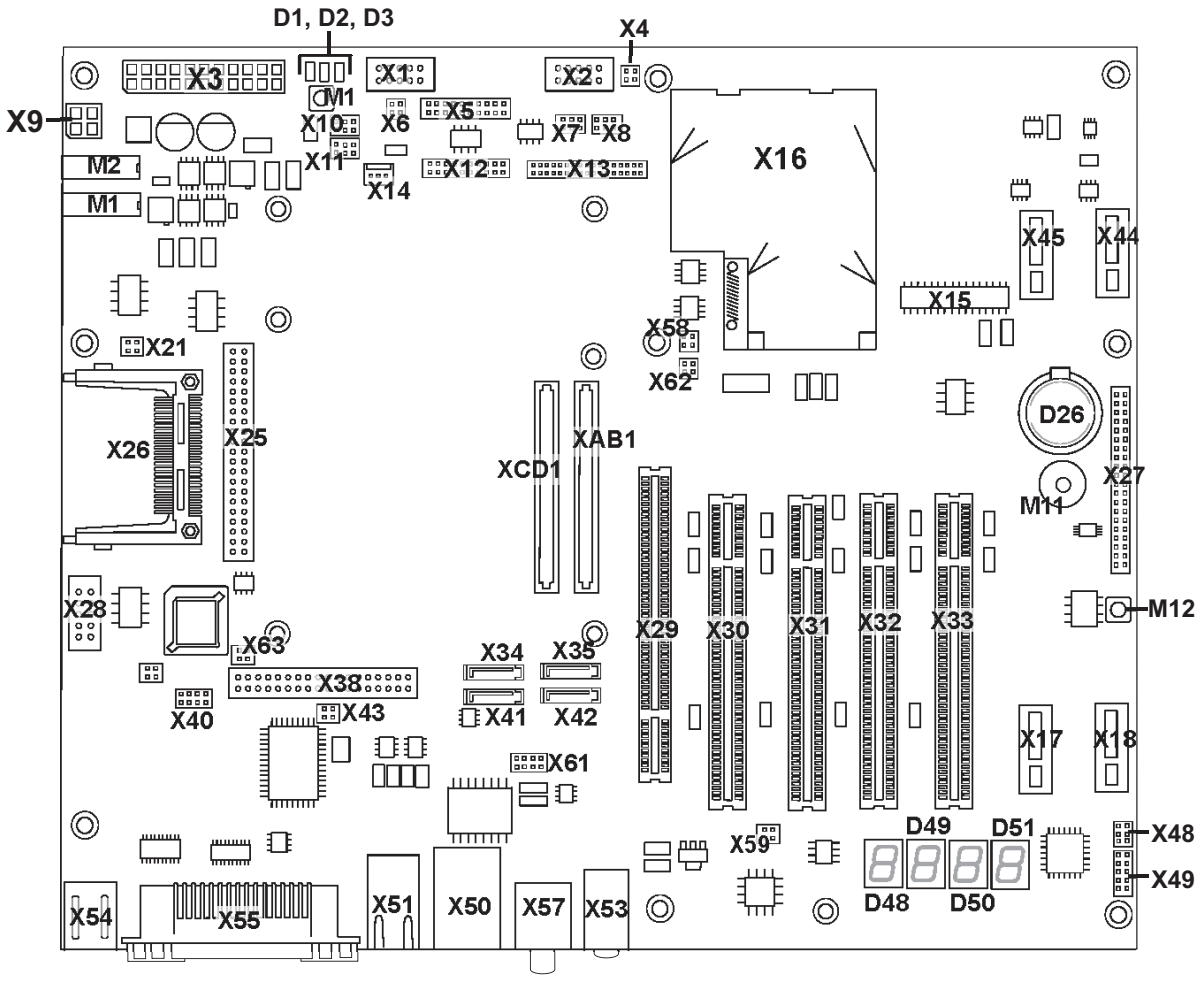

Figure 2-2. COM Express Baseboard Connector Layout

Specifications

Mechanical Dimensions

- 294.0mm x 244.0mm
- Height approx. 43mm

Power Supply

The COM Express Baseboard can be used with standard ATX (Connector X3) power supplies.

When using an ATX power supply, the COM Express module will start after the power-on button M1 is pressed. The ATX power supply can also be used in AT mode. In this case the module will start after the power switch on the power supply is turned on.

Table 2-2. X6 Jumper Header

Jumper X6	Configuration
1 - 2	ATX Power supply (default)
3 - 4	ATX Power supply runs in AT mode

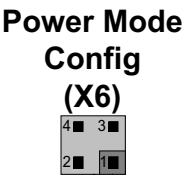

Figure 2-3. X6 Connector

X6: 2.54mm grid jumper.

> **NOTE** The COM Express Baseboard can also be used with 12V DC power supply (connector M2 and M7).

Table 2-3. The following table lists the pinout for the power supply connector.

Connector	Configuration
M7	Ground
M2	+12VDC (11.4 – 12.6V)

4mm diameter plug

> **NOTE** The +3.3V and +5V power signals used by some devices on the COM Express Baseboard are generated onboard by the 3.3V and 5V DCDC regulators regardless of whether the power is applied through the X3, ATX connector or through the M2/M7 connectors.
>
> The 3.3V, 5V, and -5V power outputs of the ATX power supply are not used.
>
> The 12V ATX connector X9 is provided as an additional power connector and should only be used if the current applied by the ATX connector X3 is not sufficient.

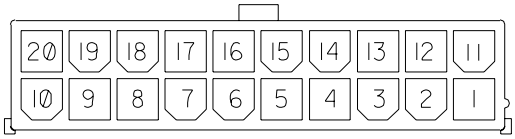

Figure 2-4. X3 Connector

Table 2-4. X3 ATX Connector Pinout

Pin	Signal	Description	Pin	Signal	Description
1	+3.3V	Power Supply +3.3VDC	11	+3.3V	Power Supply +3.3VDC
2	+3.3V	Power Supply +3.3VDC	12	-12V	Power Supply -12VDC
3	GND	Power Ground	13	GND	Power Ground
4	+5V	Power Supply +5VDC	14	PS_ON#	Power Supply On (active low). Short this pin to GND to switch power supply ON, disconnect from GND to switch OFF.
5	GND	Power Ground	15	GND	Power Ground
6	+5V	Power Supply +5VDC	16	GND	Power Ground
7	GND	Power Ground	17	GND	Power Ground
8	PWR_OK	Power Ok: A status signal generated by the power supply to notify the computer that the DC operating voltages are within the ranges required for proper computer operation.	18	N.C.	
9	5V_SB	Standby Power Supply +5VDC	19	+5V	Power Supply +5VDC
10	+12V	Power Supply +12DC	20	+5V	Power Supply +5VDC

Table 2-5. X9 Power Connector Pinout

Pin	Signal	Description	Pin	Signal	Description
1	GND	Power Ground	3	+12V	Power Supply +12VDC
2	GND	Power Ground	4	+12V	Power Supply +12VDC

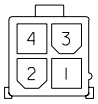

Figure 2-5. X9 Connector

Status LEDs D1-D3

The three status LEDs D1, D2 and D3 indicate different power states of the COM Express Baseboard. Refer to the following table for detailed information.

Table 2-6. D1, D2, and D3 LED Pinouts

LEDs D1-D3	Power state
All Off	No power applied.

Table 2-6. D1, D2, and D3 LED Pinouts (Continued)

D2 only	The yellow LED D2 alone indicates that the ATX power supply is mechanically switched on and only 5V standby power is applied to the COM Express Baseboard.
All On	ATX power supply is running and 3.3V and 5V are generated by the onboard DCDC regulator. The green LED D1 indicates 3.3V and the red LED D3 indicates 5V.
D1 and D3	Power is supplied by the previously described power connectors M2 and M7 and 3.3V and 5V are generated by the on board DCDC regulator. The green LED D1 indicates 3.3V and the red LED D3 indicates 5V.

PWR_OK Signal

The COM Express specification defines the signal PWR_OK, which is a HIGH active input from the main power supply to the module and indicates whether the power is good.

Jumper X11 on the COM Express Baseboard provides the ability to choose different settings for this signal.

Table 2-7. X11 Jumper Header Pinout

Jumper X11	Configuration
1 - 2	Add 3.3V Pullup with 10K to signal PWR_OK.
3 - 4	Connect PWRGOOD of ATX power supply.
5 - 6	Connect PWRGOOD of onboard DCDC regulator.

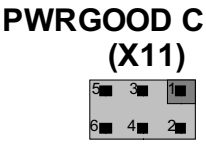

Figure 2-6. X11 Jumper Header

X11: 2.54mm grid jumper.

Power-up Control

The Power-up control is responsible for switching the ATX power supply on or off.

On the COM Express Baseboard there are two ways to implement the system Power-up control for the COM Express module.

Power-Up Control by Module

The native system Power-up support of Ampro modules uses the *'SUS_S3#'* signal to control the *'PS_ON#'* signal, which is used to switch the ATX power supply on or off. When using the *SUS_S3#'* signal the COM Express module is capable of supporting Suspend to RAM (S3).

When the system goes to Suspend to RAM (S3) or Soft Off (S5), the *'SUS_S3#'* signal is asserted by the chipset of the module. Through the use of an inverter, the low active *'PS_ON#'* signal goes high and switches off the ATX power supply. Vice versa, if the system resides in a power-down system state, any system wake-up event invokes the chipset of the module to de-assert the *'SUS_S3#'* signal. This results in a system transition to Full On (S0).

The way Suspend to RAM is implemented on a COM Express module may differ depending on the module manufacturer. For this reason, it is recommended that a hardware jumper be implemented on the baseboard in order to provide the ability to choose if the *'PS_ON#'* signal should be controlled either by the *'SUS_S3#'* signal or '*SUS_S5#'* signal. On the COM Express Baseboard, this is accomplished through the use of jumper X63.

Table 2-8. X63 Jumper Header Pinout

Jumper X63	Configuration
1 - 2	Power-up controlled via SUS_S3# (default)
3 - 4	Power-up controlled via SUS_S5#

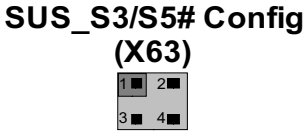

Figure 2-7. X63 Jumper Header

X63: 2.54mm grid jumper.

Power-Up Control by Super I/O

The Super I/O is capable of detecting a power button event using the '*PSIN'* input pin. For this reason the power button signal *'PWRBTN_EXT#'* is connected via an inverter to the high active *'PSIN'* input pin. If a power button event occurs, the power-up logic of the Super I/O sets the output pin *'PSOUT#'* to low and asserts the *'PWRBTN#'* signal of the module's chipset. At the same time, the Super I/O sets the *'PWRCTL#'* pin to low, which asserts the *'PS_ON#'* signal and switches on the ATX power supply.

Furthermore, the Super I/O provides a *'SLP_SX#'* signal, which can be connected to the Suspend to RAM (S3) system status *'SUS_S3#'* signal. If the module transitions to a power down system state such as Suspend to RAM (S3) or Soft Off (S5), the modules chipset asserts the *'SUS_S3#'* signal to advise the Super I/O controller to switch off the ATX power supply. This way it is also possible to wake-up the system when it is in a Suspend to RAM or Soft Off state. If the power management logic of the modules chipset detects a system wake-up event it de-asserts the *'SUS_S3#'* signal to advise the Super I/O to switch on the ATX power supply.

On the COM Express Baseboard it is possible to select the Power-up configuration via jumper X40.

Table 2-9. X40 Jumper Header Pinout

Jumper X40	Configuration
1-2 / 4-6 / 9-10	Power-up by module (default)
3-4 / 5-6 / 7-8	Power-up by Super I/O

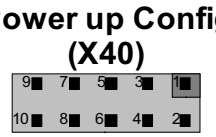

Figure 2-8. X40 Connector

X40: 2.54mm grid jumper.

Module Type Detection

The COM Express Specification includes three signals to determine the pinout type of the module connected to the baseboard. The pins *'TYPE0#'*, *'TYPE1#'* and *'TYPE2#'* are either left open (NC) or strapped to ground (GND) by the module to encode the pinout type according to the following table. The Module Type 1 does not require encoding because it is a subset of all other module types. For more information about this subject refer to the COM Express Specification.

Table 2-10. Module Type Detection Pinout

Module Type	Pin TYPE0#	Pin TYPE1#	Pin TYPE2#	
Module Type 1	X (don't care)	X (don't care)	X (don't care)	
Module Type 2	NC	NC	NC	
Module Type 3	NC	NC	GND	No IDE interface
Module Type 4	NC	GND	NC	No PCI interface
Module Type 5	NC	GND	GND	No IDE, no PCI interface

NOTE If an incompatible module pinout type is detected on the COM Express Baseboard, an onboard logic will prevent the board from powering up the whole system by controlling the *'PS_ON#'* signal of the ATX power supply. Additionally, this scenario is indicated by the red LED D58 found on the COM Express Baseboard.

CMOS Battery

The COM Express Baseboard includes a battery that supplies the RTC and CMOS memory of the COM Express CPU module. The battery needs to provide 3V of power. The specified battery type is CR2032.

WARNING: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

To fulfill the requirements of the EN60950, the COM Express Baseboard incorporates two current-limiting devices (resistor and diode) in the battery power supply path.

Environmental Specifications

Temperature	Operation: 0° to 60°C	Storage: -20° to +80°C
Humidity	Operation: 10% to 90%	Storage: 5% to 95%

NOTE The above operating temperatures must be strictly adhered to at all times.

Humidity specifications are for non-condensing conditions.

Chapter 3 Connector Descriptions

Connector Pinout Rows A and B (XAB1)

Table 3-1. Module Type 2 Connector Pinout Rows A and B

Pin	Row A	Pin	Row B	Pin	Row A	Pin	Row B
A1	GND (FIXED)	B1	GND (FIXED)	A56	PCIE_TX4-	B56	PCIE_RX4-
A2	GBE0_MDI3-	B2	GBE0_ACT#	A57	GND	B57	GPO2
A3	GBE0_MDI3+	B3	LPC_FRAME#	A58	PCIE_TX3+	B58	PCIE_RX3+
A4	GBE0_LINK100#	B4	LPC_AD0	A59	PCIE_TX3-	B59	PCIE_RX3-
A5	GBE0_LINK1000#	B5	LPC_AD1	A60	GND (FIXED)	B60	GND (FIXED)
A6	GBE0_MDI2-	B6	LPC_AD2	A61	PCIE_TX2+	B61	PCIE_RX2+
A7	GBE0_MDI2+	B7	LPC_AD3	A62	PCIE_TX2-	B62	PCIE_RX2-
A8	GBE0_LINK#	B8	LPC_DRQ0#	A63	GPI1	B63	GPO3
A9	GBE0_MDI1-	B9	LPC_DRQ1#	A64	PCIE_TX1+	B64	PCIE_RX1+
A10	GBE0_MDI1+	B10	LPC_CLK	A65	PCIE_TX1-	B65	PCIE_RX1-
A11	GND (FIXED)	B11	GND (FIXED)	A66	GND	B66	WAKE0#
A12	GBE0_MDI0-	B12	PWRBTN#	A67	GPI2	B67	WAKE1#
A13	GBE0_MDI0+	B13	SMB_CK	A68	PCIE_TX0+	B68	PCIE_RX0+
A14	GBE0_CTREF	B14	SMB_DAT	A69	PCIE_TX0-	B69	PCIE_RX0-
A15	SUS_S3#	B15	SMB_ALERT#	A70	GND (FIXED)	B70	GND (FIXED)
A16	SATA0_TX+	B16	SATA1_TX+	A71	LVDS_A0+	B71	LVDS_B0+
A17	SATA0_TX-	B17	SATA1_TX-	A72	LVDS_A0-	B72	LVDS_B0-
A18	SUS_S4#	B18	SUS_STAT#	A73	LVDS_A1+	B73	LVDS_B1+
A19	SATA0_RX+	B19	SATA1_RX+	A74	LVDS_A1-	B74	LVDS_B1-
A20	SATA0_RX-	B20	SATA1_RX-	A75	LVDS_A2+	B75	LVDS_B2+
A21	GND (FIXED)	B21	GND (FIXED)	A76	LVDS_A2-	B76	LVDS_B2-
A22	SATA2_TX+	B22	SATA3_TX+	A77	LVDS_VDD_EN	B77	LVDS_B3+
A23	SATA2_TX-	B23	SATA3_TX-	A78	LVDS_A3+	B78	LVDS_B3-
A24	SUS_S5#	B24	PWR_OK	A79	LVDS_A3-	B79	LVDS_BKLT_EN
A25	SATA2_RX+	B25	SATA3_RX+	A80	GND (FIXED)	B80	GND (FIXED)
A26	SATA2_RX-	B26	SATA3_RX-	A81	LVDS_A_CK+	B81	LVDS_B_CK+
A27	BATLOW#	B27	WDT	A82	LVDS_A_CK-	B82	LVDS_B_CK-
A28	ATA_ACT#	B28	AC_SDIN2	A83	LVDS_I2C_CK	B83	LVDS_BKLT_CTRL

Table 3-1. Module Type 2 Connector Pinout Rows A and B (Continued)

A29	AC_SYNC	B29	AC_SDIN1	A84	LVDS_I2C_ DAT	B84	VCC_5V_SB Y
A30	AC_RST#	B30	AC_SDIN0	A85	GPI3	B85	VCC_5V_SB Y
A31	GND (FIXED)	B31	GND (FIXED)	A86	KBD_RST#	B86	VCC_5V_SB Y
A32	AC_BITCLK	B32	SPKR	A87	KBD_ A20GATE	B87	VCC_5V_SB Y
A33	AC_SDOUT	B33	I2C_CK	A88	PCIE0_CK_ REF+	B88	RSVD
A34	BIOS_ DISABLE#	B34	I2C_DAT	A89	PCIE0_CK_ REF-	B89	VGA_RED
A35	THRMTRIP#	B35	THRM#	A90	GND (FIXED)	B90	GND (FIXED)
A36	USB6-	B36	USB7-	A91	RSVD	B91	VGA_GRN
A37	USB6+	B37	USB7+	A92	RSVD	B92	VGA_BLU
A38	USB_6_7_OC #	B38	USB_4_5_OC#	A93	GPO0	B93	VGA_HSYNC
A39	USB4-	B39	USB5-	A94	RSVD	B94	VGA_VSYNC
A40	USB4+	B40	USB5+	A95	RSVD	B95	VGA_I2C_CK
A41	GND (FIXED)	B41	GND (FIXED)	A96	GND	B96	VGA_I2C_D AT
A42	USB2-	B42	USB3-	A97	VCC_12V	B97	TV_DAC_A
A43	USB2+	B43	USB3+	A98	VCC_12V	B98	TV_DAC_B
A44	USB_2_3_OC #	B44	USB_0_1_OC#	A99	VCC_12V	B99	TV_DAC_C
A45	USB0-	B45	USB1-	A100	GND (FIXED)	B100	GND (FIXED)
A46	USB0+	B46	USB1+	A101	VCC_12V	B101	VCC_12V
A47	VCC_RTC	B47	EXCD1_PERST #	A102	VCC_12V	B102	VCC_12V
A48	EXCD0_PERS T#	B48	EXCD1_CPPE#	A103	VCC_12V	B103	VCC_12V
A49	EXCD0_CPPE #	B49	SYS_RESET#	A104	VCC_12V	B104	VCC_12V
A50	LPC_SERIRQ	B50	CB_RESET#	A105	VCC_12V	B105	VCC_12V
A51	GND (FIXED)	B51	GND (FIXED)	A106	VCC_12V	B106	VCC_12V
A52	PCIE_TX5+	B52	PCIE_RX5+	A107	VCC_12V	B107	VCC_12V
A53	PCIE_TX5-	B53	PCIE_RX5-	A108	VCC_12V	B108	VCC_12V
A54	GPI0	B54	GPO1	A109	VCC_12V	B109	VCC_12V
A55	PCIE_TX4+	B55	PCIE_RX4+	A110	GND (FIXED)	B110	GND (FIXED)

Connector Pinout Rows C and D (XCD1)

Table 3-2. Module Type 2 Connector Pinout Rows C and D

Pin	Row C	Pin	Row D	Pin	Row C	Pin	Row D
C1	GND (FIXED)	D1	GND (FIXED)	C56	PEG_RX1-	D56	PEG_TX1-
C2	IDE_D7	D2	IDE_D5	C57	TYPE1#	D57	TYPE2#
C3	IDE_D6	D3	IDE_D10	C58	PEG_RX2+	D58	PEG_TX2+
C4	IDE_D3	D4	IDE_D11	C59	PEG_RX2-	D59	PEG_TX2-
C5	IDE_D15	D5	IDE_D12	C60	GND (FIXED)	D60	GND (FIXED)
C6	IDE_D8	D6	IDE_D4	C61	PEG_RX3+	D61	PEG_TX3+
C7	IDE_D9	D7	IDE_D0	C62	PEG_RX3-	D62	PEG_TX3-
C8	IDE_D2	D8	IDE_REQ	C63	RSVD0 RX_CGBC	D63	RSVD
C9	IDE_D13	D9	IDE_IOW#	C64	RSVD1 TX_CGBC	D64	RSVD
C10	IDE_D1	D10	IDE_ACK#	C65	PEG_RX4+	D65	PEG_TX4+
C11	GND (FIXED)	D11	GND (FIXED)	C66	PEG_RX4-	D66	PEG_TX4-
C12	IDE_D14	D12	IDE_IRQ	C67	FAN_PWMOUT RSVD2	D67	GND
C13	IDE_IORDY	D13	IDE_A0	C68	PEG_RX5+	D68	PEG_TX5+
C14	IDE_IOR#	D14	IDE_A1	C69	PEG_RX5-	D69	PEG_TX5-
C15	PCI_PME#	D15	IDE_A2	C70	GND (FIXED)	D70	GND (FIXED)
C16	PCI_GNT2#	D16	IDE_CS1#	C71	PEG_RX6+	D71	PEG_TX6+
C17	PCI_REQ2#	D17	IDE_CS3#	C72	PEG_RX6-	D72	PEG_TX6-
C18	PCI_GNT1#	D18	IDE_RESET#	C73	SDVO_DATA	D73	SVDO_CLK
C19	PCI_REQ1#	D19	PCI_GNT3#	C74	PEG_RX7+	D74	PEG_TX7+
C20	PCI_GNT0#	D20	PCI_REQ3#	C75	PEG_RX7-	D75	PEG_TX7-
C21	GND (FIXED)	D21	GND (FIXED)	C76	GND	D76	GND
C22	PCI_REQ0#	D22	PCI_AD1	C77	RSVD3 (FAN_TACHOIN)	D77	IDE_CBLID#
C23	PCI_RESET#	D23	PCI_AD3	C78	PEG_RX8+	D78	PEG_TX8+

Table 3-2. Module Type 2 Connector Pinout Rows C and D (Continued)

C24	PCI_AD0	D24	PCI_AD5	C79	PEG_RX8-	D79	PEG_TX8-
C25	PCI_AD2	D25	PCI_AD7	C80	GND (FIXED)	D80	GND (FIXED)
C26	PCI_AD4	D26	PCI_C/BE0#	C81	PEG_RX9+	D81	PEG_TX9+
C27	PCI_AD6	D27	PCI_AD9	C82	PEG_RX9-	D82	PEG_TX9-
C28	PCI_AD8	D28	PCI_AD11	C83	RSVD4 (PP_TPM)	D83	RSVD
C29	PCI_AD10	D29	PCI_AD13	C84	GND	D84	GND
C30	PCI_AD12	D30	PCI_AD15	C85	PEG_RX10+	D85	PEG_TX10+
C31	GND (FIXED)	D31	GND (FIXED)	C86	PEG_RX10-	D86	PEG_TX10-
C32	PCI_AD14	D32	PCI_PAR	C87	GND	D87	GND
C33	PCI_C/BE1#	D33	PCI_SERR#	C88	PEG_RX11+	D88	PEG_TX11+
C34	PCI_PERR#	D34	PCI_STOP#	C89	PEG_RX11-	D89	PEG_TX11-
C35	PCI_LOCK#	D35	PCI_TRDY#	C90	GND (FIXED)	D90	GND (FIXED)
C36	PCI_DEVSEL#	D36	PCI_FRAME#	C91	PEG_RX12+	D91	PEG_TX12+
C37	PCI_IRDY#	D37	PCI_AD16	C92	PEG_RX12-	D92	PEG_TX12-
C38	PCI_C/BE2#	D38	PCI_AD18	C93	GND	D93	GND
C39	PCI_AD17	D39	PCI_AD20	C94	PEG_RX13+	D94	PEG_TX13+
C40	PCI_AD19	D40	PCI_AD22	C95	PEG_RX13-	D95	PEG_TX13-
C41	GND (FIXED)	D41	GND (FIXED)	C96	GND	D96	GND
C42	PCI_AD21	D42	PCI_AD24	C97	RSVD	D97	PEG_ENABLE#
C43	PCI_AD23	D43	PCI_AD26	C98	PEG_RX14+	D98	PEG_TX14+
C44	PCI_C/BE3#	D44	PCI_AD28	C99	PEG_RX14-	D99	PEG_TX14-
C45	PCI_AD25	D45	PCI_AD30	C100	GND (FIXED)	D100	GND (FIXED)
C46	PCI_AD27	D46	PCI_IRQC#	C101	PEG_RX15+	D101	PEG_TX15+

Table 3-2. Module Type 2 Connector Pinout Rows C and D (Continued)

C47	PCI_AD29	D47	PCI_IRQD#	C102	PEG_RX15-	D102	PEG_TX15-
C48	PCI_AD31	D48	PCI_CLKRUN#	C103	GND	D103	GND
C49	PCI_IRQA#	D49	PCI_M66EN	C104	VCC_12V	D104	VCC_12V
C50	PCI_IRQB#	D50	PCI_CLK	C105	VCC_12V	D105	VCC_12V
C51	GND (FIXED)	D51	GND (FIXED)	C106	VCC_12V	D106	VCC_12V
C52	PEG_RX0+	D52	PEG_TX0+	C107	VCC_12V	D107	VCC_12V
C53	PEG_RX0-	D53	PEG_TX0-	C108	VCC_12V	D108	VCC_12V
C54	TYPE0#	D54	PEG_LANE_RV#	C109	VCC_12V	D109	VCC_12V
C55	PEG_RX1+	D55	PEG_TX1+	C110	GND (FIXED)	D110	GND (FIXED)

Subsystems of COM Express Connector Rows A&B

SM Bus

The SM Bus signals are available on the feature connector (X27) described in “Feature Connector” on page 47 of this document.

On the COM Express module, the System Management Bus (SMB) is powered by the standby power rail in order to have control over the system during the system states S0-S5. The devices on the COM Express Baseboard (e.g. PCI Express clock buffer or PCI Express connectors) using the SMB are normally powered by the 3.3V main power. To avoid current leakage between the main power of the baseboard and the standby power of the module, the SMB on the COM Express Baseboard is separated by a bus switch from the SMB of the module.

I²C Bus

The I²C signals are available in different locations on the COM Express Baseboard including the feature connector (X27) described in “Feature Connector” on page 47 of this document.

The COM Express Baseboard includes a socket for an I²C EEPROM (U17) that can be used for test purposes during the system development. This 8-pin DIP socket can be used with different 2-wire serial EEPROMS (for example 24C04 / 08 / 16 ...) and can be accessed easily by using the I²C control commands implemented in the Ampro CGOS API driver. Refer to the COM Express module's reference manual and CGOS manual for details.

Furthermore, the COM Express Baseboard includes an I²C application implemented by a PCA9555 device from Philips, a 16-bit I²C I/O port with interrupt. This device provides 16 bits of general purpose parallel Input/Output (GPIO) expansion for I²C applications.

It provides the ability to display and read different byte configurations via the eight green LEDs D4 to D11 and both I²C digital I/O jumper connectors X5 and X12.

Contact the Ampro support team through the Ask an Expert web page for more information.

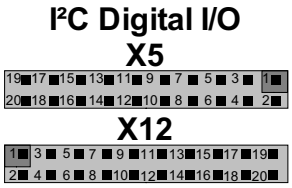

Figure 3-1. X5, X12 Digital I/O Connectors

X5/X12: 2.54mm grid jumper header

AC'97/HDA Audio

The COM Express Baseboard has an AC'97 audio codec (VIA VT1616) mounted on it. The stereo audio output interface of this codec is available on the connector described below. A jumper (X59) on the COM Express Baseboard allows you to choose between using the corresponding serial data input line AC_SDIN0 or AC_SDIN2. The jumper (X59) configuration is described in Table 3-6.

The AC'97 codec can be used in two different modes, either stereo or 5.1 audio mode. The modes can be changed in the audio codec driver.

Table 3-3. X53 Jack 1 Pinout

Stereo Jack 1	Stereo Mode	5.1 Channel Mode
Tip	Line Input Left	Rear Channel Output Left
Ring	Line Input Right	Rear Channel Output Right
Sleeve	Ground	Ground

Table 3-4. X53 Jack 2 Pinout

Stereo Jack 2	Stereo Mode	5.1 Channel Mode
Tip	Line Output Left	Front Channel Output Left
Ring	Line Output Right	Front Channel Output Right
Sleeve	Ground	Ground

Table 3-5. X53 Jack 3 Pinout

Stereo Jack 3	Stereo Mode	5.1 Channel Mode
Tip	Microphone	Center Output
Ring	Not used	Low Frequency Effects Output (Sub Woofer)
Sleeve	Ground	Ground

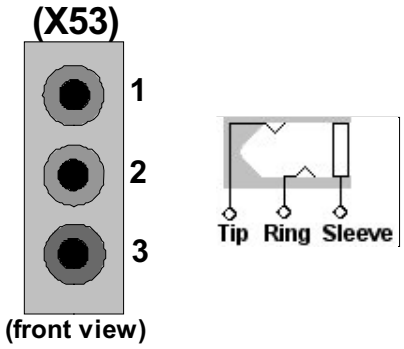

Figure 3-2. X53 Stereo Jack Configuration

X53: triple 3.5mm stereo plug

NOTE	Only mono microphones can be used on the COM Express Baseboard.

Table 3-6. X59 SDIN Jumper Header Pinout

Jumper X59	Configuration
1 - 2	AC_SDIN2 connected to codec (default)
3 - 4	AC_SDIN0 connected to codec

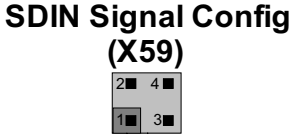

Figure 3-3. X59 Pin Configuration

X59: 2.54mm grid jumper.

HDA Header X49

Additionally, the COM Express Baseboard includes an HDA header (X49), which allows the connection of other AC'97/HDA solutions. By attaching a solution to this connector the onboard codec will be switched off and the connected application can be operated. Ampro has developed an HDA evaluation sound board that features the VIA VT1708 HDA codec. Contact the Ampro support team through Ask an Expert for more information about this product.

The following table describes the pinout of connector X49.

Table 3-7. X49 HDA Header Pinout

Pin	Signal	Description	Pin	Signal	Description
1	+12V (750 mA fuse)	Power Supply +12VDC	2	+3.3V (750 mA fuse)	Power Supply +3.3VDC
3	AC_SYNC	48kHz fixed-rate, sample-synchronization signal to the CODEC(s).	4	AC_RST#	Reset output to AC'97 CODEC, active low.

Table 3-7. X49 HDA Header Pinout (Continued)

5	AC_SDIN0/2	Serial TDM data inputs from up to 3 CODECs. The connection of SDIN0 or SDIN2 to connector X49 is dependent on the setting of jumper X59.	6	AC_BITCLK	12.228 MHz serial data clock generated by the external CODEC(s).
7	AD_SDOUT	Serial TDM data output to the CODEC.	8	CODECSET (Input 3.3V)	Onboard codec disable input. Pull high to disable onboard audio codec.
9	GND	Power Ground	10	GND	Power Ground

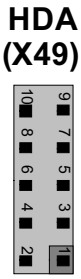

Figure 3-4. X49 HDA Header

X49: 2.54mm grid jumper.

LPC Super I/O device

The COM Express Baseboard integrates a Super I/O controller that provides additional interfaces such as PS/2 keyboard and mouse, two serial ports, a parallel port and a floppy port. The Winbond W83627HG controller is connected to the LPC Bus of the COM Express module and the module must support these interfaces in order for them to function. Refer to the module's reference manual for information about supported features.

The interfaces provided by this Super I/O controller are available on connectors X28, X38, X54, and X55. Both Serial port COM1 and COM2 follow the RS232 standard.

For the pinout of the mouse, keyboard, COM1, COM2, LPT1 and the Floppy port see the table below.

Table 3-8. Super I/O Interface Pinout

Pin	LPT1	COM1	COM2	Mouse	Keyboard
1	STROBE#	DCD#	DCD#	MSDAT	KBDAT
2	PD0	RXD	DSR	N.C.	N.C.
3	PD1	TXD	RXD	GND	GND
4	PD2	DTR#	RTS#	+5V	+5V
5	PD3	GND	TXD	MSCLK	KBCLK
6	PD4	DSR	CTS#	N.C.	N.C.
7	PD5	RTS#	DTR#		
8	PD6	CTS#	RI#		
9	PD7	RI#	GND		
10	ACK#		+5V (750mA fuse)		

Table 3-8. Super I/O Interface Pinout (Continued)

11	BUSY				
12	PE				
13	SEL				
14	AUTOFD#				
15	ERROR#				
16	INIT#				
17	SELIN#				
18	GND				
19	GND				
20	GND				
21	GND				
22	GND				
23	GND				
24	GND				
25	GND				

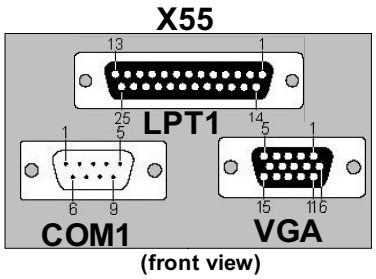

Figure 3-5. X55 I/O Connectors

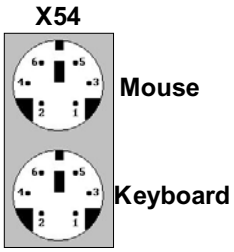

Figure 3-6. X54 I/O Connectors

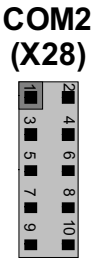

Figure 3-7. X28 COM2 Connector

NOTE	The Floppy signals are available on the standard Floppy connector X38.

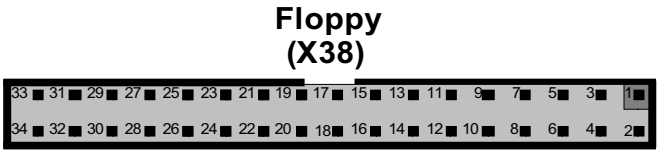

Figure 3-8. X38 Floppy Connector

Table 3-9. X38 Floppy Connector Pinout

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	GND	2	DENSEL	19	GND	20	STEP#
3	GND	4	N.C.	21	GND	22	WDATA#
5	GND	6	N.C.	23	GND	24	WGATE#
7	GND	8	INDEX#	25	GND	26	TRK0#
9	GND	10	N.C.	27	GND	28	WP#
11	GND	12	DRV	29	GND	30	RDATA#
13	GND	14	N.C.	31	GND	32	HDSEL
15	GND	16	MOT	33	GND	34	DSKCHG#
17	GND	18	DIR#				

Mouse and Keyboard (X54): 6 pin MINI-DIN male

Floppy (X38): 34 pin, 2 row 2.54mm grid female.

COM1 (X55): 9 pin, D-SUB female.

LPT1 (X55): 24 pin, D-SUB male. VGA: 15 pin, high density D-SUB male.

COM2 (X28): 10 pin, 2 row 2.54mm grid female.

NOTE	The I/O address of the LPC Super I/O can be set using jumper X43 to either address 2Eh or 4Eh.

Table 3-10. X43 Jumper Header Pinout

Jumper X43	Configuration
1 - 2	Super I/O on address 2Eh (default)
3 - 4	Super I/O on address 4Eh

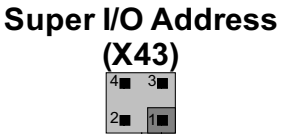

Figure 3-9. X43 Super I/O Jumper Header

X43: 2.54mm grid jumper.

Universal Serial Bus (USB)

Table 3-11. X50 USB I/O Connector Pinout

Pin	Signal
1	+5V
2	DATA-
3	DATA+
4	GND

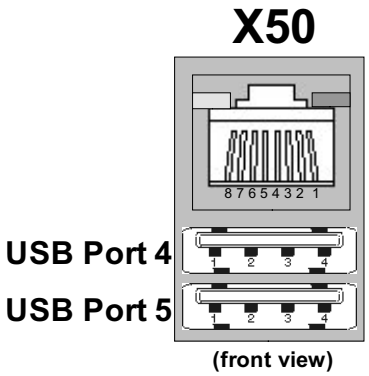

Figure 3-10. X50 USB I/O Connector

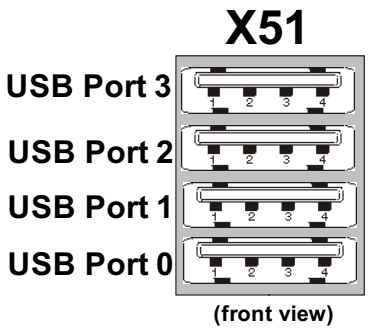

Figure 3-11. X51 USB I/O Connector

NOTE	USB ports 4 and 5, found on connector X50, are supplied by suspend power and can be used to test "wake-up via USB" functionality.

LAN 10/100/1000

Table 3-12. X50 LAN I/O Connector Pinout

Pin	Signal	Pin	Signal
1	MDI[0]+	2	MDI[0]-
3	MDI[1]+	4	MDI[2]+
5	MDI[2]-	6	MDI[1]-
7	MDI[3]+	8	MDI[3]-

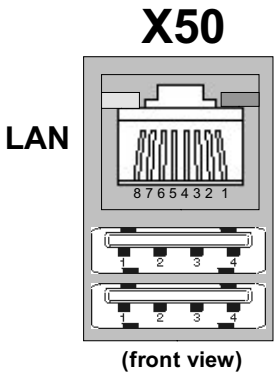

Figure 3-12. X50 LAN I/O Connector

8-pin RJ45 plug

Table 3-13. D30 and D31 LED Descriptions

LEDs	Description
Yellow	Activity
Green	Link
D30	LK100/SLED#
D31	LK1000#

NOTE If the COM Express Baseboard is to be used in conjunction with a COM Express CPU module that only supports 10/100 fast Ethernet interface, the configuration of the LAN magnetics must be changed. The X61 jumper can be used to setup the center taps of the LAN magnetics (U29) for 10/100 operation.

Table 3-14. X61 LAN Jumper Header Pinout

Jumper X61	Configuration
1-2 / 5-6	operation mode 10/100/1000 (default)
3-4 / 7-8	operation mode 10/100

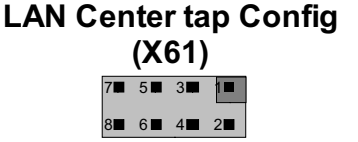

Figure 3-13. LAN Jumper Header

X61: 2.54mm grid jumper.

Serial ATA™

Table 3-15. SATA Connector Pinout

Pin	Signal
1	GND
2	TX+
3	TX-
4	GND
5	RX+
6	RX-
7	GND

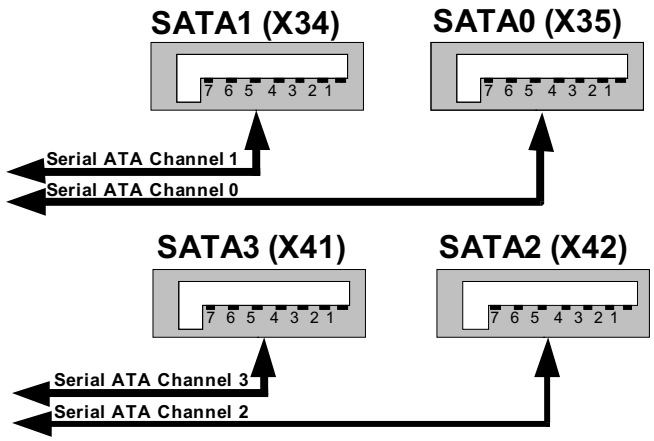

Figure 3-14. SATA Connectors

NOTE	The red LED D29 indicates activity on each SATA interface.

VGA

A CRT monitor can be connected using the X55 connector.

Table 3-16. X55 VGA Connector Pinout

Pin	Signal
1	RED
2	GREEN
3	BLUE
4	N.C.
5	GND
6	GND
7	GND
8	GND
9	DDC Power
10	GND
11	N.C.
12	DDC DAT
13	HSYNC
14	VSYNC
15	DDC CLK

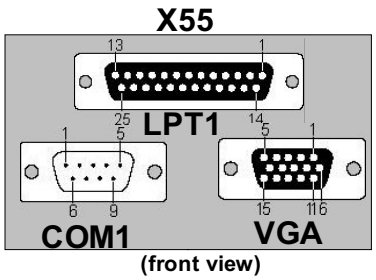

Figure 3-15. X55 I/O VGA Connector

VGA (X55): 15-pin, high density DSUB male

LVDS Flat Panel Interface

Table 3-17. X13 LCD Header Pinout

Pin	LVDS Output	Description	Pin	LVDS Output	Description
1	LVDS_I2C_DAT	I²C data line for LVDS display use	2	LVDS_I2C_CLK	I²C clock output for LVDS display use
3	N.C.		4	N.C.	
5	GND	Power Ground	6	LCDD0	LVDS Channel A differential pairs
7	LCDD1	LVDS Channel A differential pairs	8	LVDS_VDD_EN	LVDS panel power enable
9	LCDD2	LVDS Channel A differential pairs	10	LCDD3	LVDS Channel A differential pairs
11	BKLT_EN_EPI	LVDS panel backlight enable (See jumper X4.)	12	LCDD5	LVDS Channel A differential pairs
13	LCDD4	LVDS Channel A differential pairs	14	N.C.	
15	LCDD6	LVDS Channel A differential clock	16	LCDD7	LVDS Channel A differential clock
17	N.C.		18	LCDD9	LVDS Channel A differential pairs
19	LCDD8	LVDS Channel A differential pairs	20	GND	Power Ground

Table 3-17. X13 LCD Header Pinout (Continued)

21	LCDD10	LVDS Channel B differential pairs	22	LCDD11	LVDS Channel B differential pairs
23	GND	Power Ground	24	LCDD12	LVDS Channel B differential pairs
25	LCDD13	LVDS Channel B differential pairs	26	GND	Power Ground
27	LCDD14	LVDS Channel B differential pairs	28	LCDD15	LVDS Channel B differential pairs
29	GND	Power Ground	30	LCDD17	LVDS Channel B differential clock
31	LCDD16	LVDS Channel B differential clock	32	N.C.	
33	LCDD19	LVDS Channel B differential pairs	34	LCDD18	LVDS Channel B differential pairs

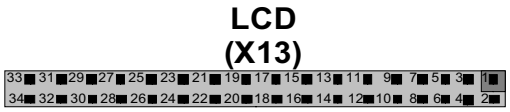

Figure 3-16. X13 LCD Connector

X13: 34-pin, 2 row 2mm grid female.

The polarity of the backlight enable signal LVDS_BKLT_EN from the COM Express module can be set up using configuration jumper X4.

Table 3-18. X4 Backlight Polarity Jumper Header Pinout

Jumper X4	Configuration
1 - 2	Backlight enable HIGH active (default)
3 - 4	Backlight enable LOW active

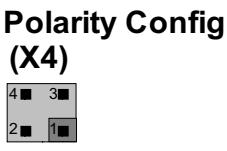

Figure 3-17. X4 Backlight Polarity Jumper Header

X4: 2.54mm grid jumper.

See “Flat Panel and Backlight Power Supply Connection” on page 32 for information about connection possibilities for the Backlight Polarity Config. jumper X4.

Flat Panel and Backlight Power Supply

The power supply for flat panels and their backlight inverter is available on connector X2.

Table 3-19. X2 LCD Power Connector Pinout

Pin	Signal	Pin	Signal
1	SW_VDD (1.5A Fuse)	2	SW_BACK (2.0A Fuse)
3	+5V (1.5A Fuse)	4	LCD12V
5	LVDS_VDD_EN	6	BKLT_EN_EPI
7	Potentiometer Low Terminal	8	Potentiometer Wiper Terminal
9	GND	10	GND

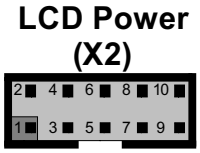

Figure 3-18. X2 LCD Power Connector

10 pin, 2 row 2.54 mm grid female.

Table 3-20. X7 LCD Power Jumper Header Pinout

Jumper X7	Configuration
1 - 2	5V LCD Voltage
3 - 4	N.C.
5 - 6	3.3V LCD Voltage

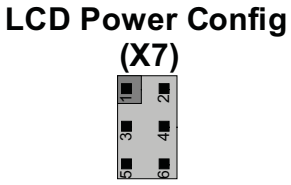

Figure 3-19. X7 LCD Power Jumper Header

Table 3-21. X8 Backlight Power Jumper Header Pinout

Jumper X8	Configuration
1 - 2	12V Backlight Voltage
3 - 4	N.C.
5 - 6	5V Backlight Voltage

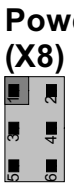

Figure 3-20. X8 Backlight Power Jumper Header

X7 and X8: 2.54mm grid jumper

See section "Flat Panel and Backlight Power Supply Connection" on page 32 for information about connection possibilities for the LCD Power X2 connector.

Flat Panel and Backlight Power Supply Connection

The following diagram shows a typical connection possibility for powering panel/backlight by either the SW_VDD/SW_BACK signals or by using DIGON/BL_ON for external power switches.

- Signals 1-10 correspond to signals 1-10 found on the X2 connector.
- X4, X7, and X8 represent jumpers X4, X7, and X8 found on the COM Express Baseboard.
- The COM Express Baseboard is equipped with a Maxim MAX5434 device referred to in the diagram below as "DIG. TRIMMER".

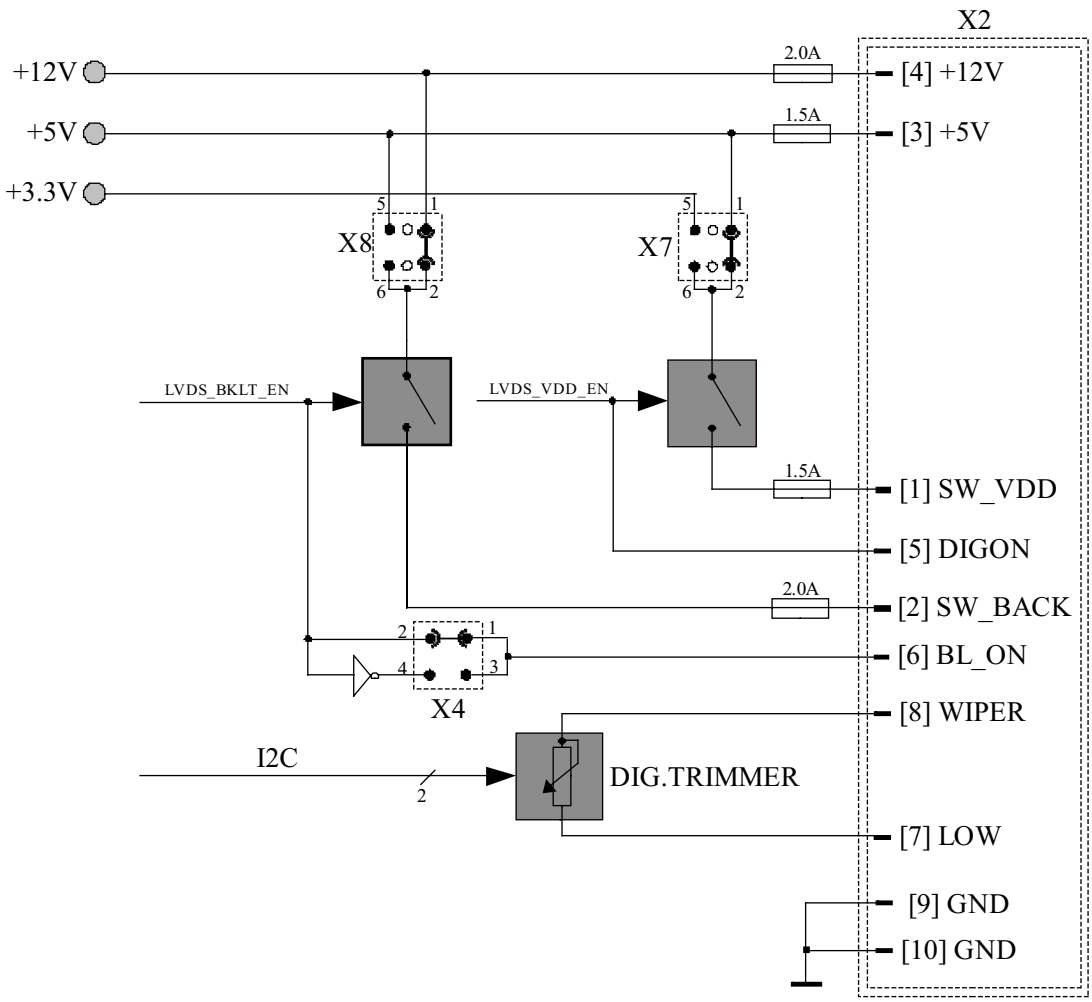

Figure 3-21. LCD Back Light Power Supply Diagram

Flat Panel Configuration Data

The flat panel configuration data (EPI extended EDID™ 1.3 file) for most common displays is included in the Ampro COM Express CPU module's system BIOS. The customer also has the possibility to use a customized EPI extended EDID 1.3 file that can be stored in a serial EEPROM located on the COM Express Baseboard (DIL 8 socket U8).

Supported EEPROMs: 24C02, 24C04 and 24C16 at address A0h.

PCI Express X1 Connectors

The COM Express Baseboard is equipped with 4, x1 PCI Express Slots. The following tables describe the pinouts for each of these slots.

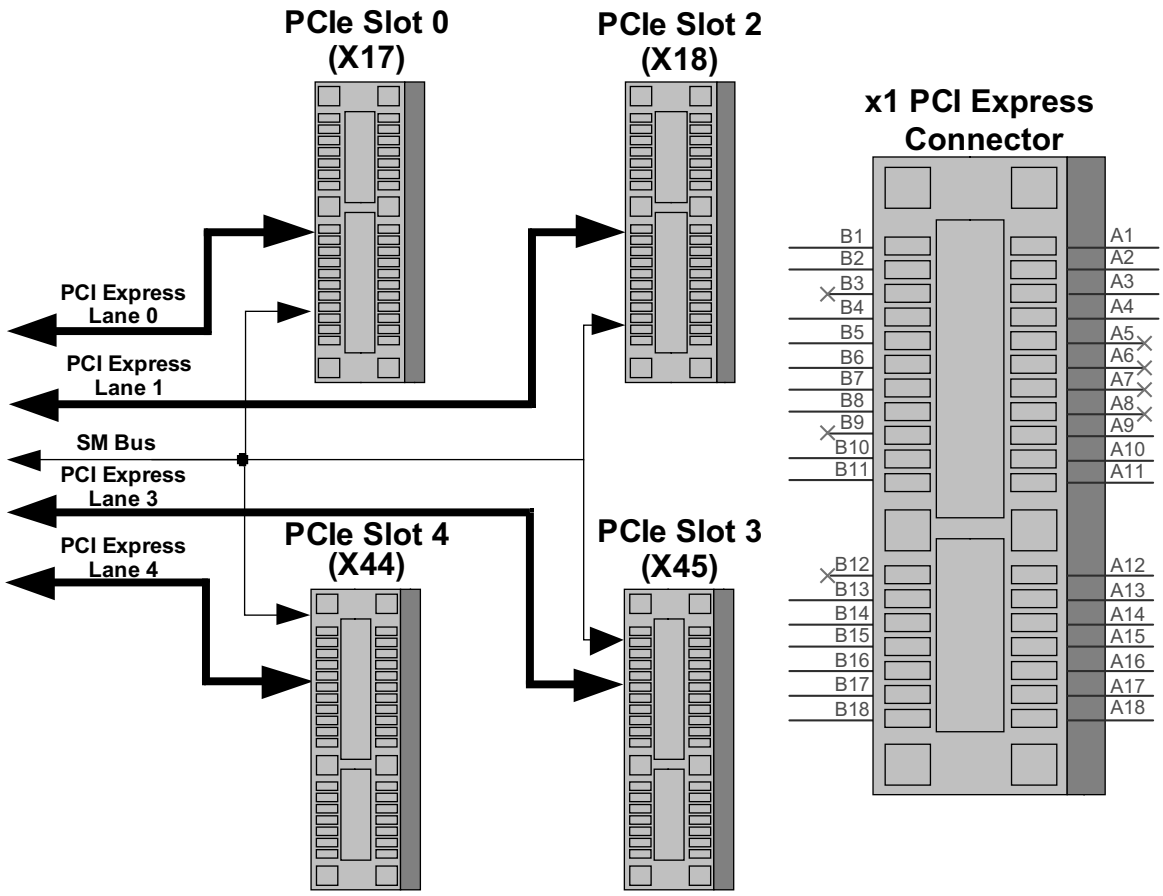

Figure 3-22. PCI Express Slots

Table 3-22. X17, X18 PCIe Slot Pinouts

PCI Express Slot 0/Lane 0 Connector X17				PCI Express Slot 1/Lane 1 Connector X18			
Pin	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**
B1	+12V	A1	PRSNT#1_S0	B1	+12V	A1	PRSNT#1_S1
B2	+12V	A2	+12V	B2	+12V	A2	+12V
B3	N.C.	A3	+12V	B3	N.C.	A3	+12V
B4	GND	A4	GND	B4	GND	A4	GND
B5	SMB_CK	A5	N.C.	B5	SMB_CK	A5	N.C.
B6	SMB_DAT	A6	N.C.	B6	SMB_DAT	A6	N.C.
B7	GND	A7	N.C.	B7	GND	A7	N.C.
B8	+3.3V	A8	N.C.	B8	+3.3V	A8	N.C.
B9	N.C.	A9	+3.3V	B9	N.C.	A9	+3.3V
B10	+3.3V Standby	A10	+3.3V	B10	+3.3V Standby	A10	+3.3V
B11	WAKE0#	A11	PCIE_RST#	B11	WAKE0#	A11	PCIE_RST#
B12	N.C.	A12	GND	B12	N.C.	A12	GND

Table 3-22. X17, X18 PCIe Slot Pinouts (Continued)

B13	GND	A13	PCIE_CLKS0+	B13	GND	A13	PCIE_CLKS1+
B14	PCIE_TX0+	A14	PCIE_CLKS0-	B14	PCIE_TX1+	A14	PCIE_CLKS1-
B15	PCIE_TX0-	A15	GND	B15	PCIE_TX1-	A15	GND
B16	GND	A16	PCIE_RX0+	B16	GND	A16	PCIE_RX1+
B17	PRSNT#2_S0	A17	PCIE_RX0-	B17	PRSNT#2_S1	A17	PCIE_RX1-
B18	GND	A18	GND	B18	GND	A18	GND

Table 3-23. X44, X45 PCIe Slot Pinouts

PCI Express Slot 2/Lane 3 Connector X45				PCI Express Slot 3/Lane 4 Connector X44			
Pin	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**
B1	+12V	A1	PRSNT#1_S2	B1	+12V	A1	PRSNT#1_S3
B2	+12V	A2	+12V	B2	+12V	A2	+12V
B3	N.C.	A3	+12V	B3	N.C.	A3	+12V
B4	GND	A4	GND	B4	GND	A4	GND
B5	SMB_CK	A5	N.C.	B5	SMB_CK	A5	N.C.
B6	SMB_DAT	A6	N.C.	B6	SMB_DAT	A6	N.C.
B7	GND	A7	N.C.	B7	GND	A7	N.C.
B8	+3.3V	A8	N.C.	B8	+3.3V	A8	N.C.
B9	N.C.	A9	+3.3V	B9	N.C.	A9	+3.3V
B10	+3.3V Standby	A10	+3.3V	B10	+3.3V Standby	A10	+3.3V
B11	WAKE0#	A11	PCIE_RST#	B11	WAKE0#	A11	PCIE_RST#
B12	N.C.	A12	GND	B12	N.C.	A12	GND
B13	GND	A13	PCIE_CLKS2+	B13	GND	A13	PCIE_CLKS3+
B14	PCIE_TX3+	A14	PCIE_CLKS2-	B14	PCIE_TX4+	A14	PCIE_CLKS3-
B15	PCIE_TX3-	A15	GND	B15	PCIE_TX4-	A15	GND
B16	GND	A16	PCIE_RX3+	B16	GND	A16	PCIE_RX4+
B17	PRSNT#2_S2	A17	PCIE_RX3-	B17	PRSNT#2_S3	A17	PCIE_RX4-
B18	GND	A18	GND	B18	GND	A18	GND

ExpressCard and PCI Express Mini Card

ExpressCard

The COM Express Baseboard is equipped with an ExpressCard slot (connector X16). ExpressCard is a small, modular add-in card designed to replace common PCMCIA and PC Cards. It takes advantage of the scalable, high-bandwidth serial PCI Express and USB 2.0 interfaces to provide much higher data rates. COM Express modules offer support for up to two ExpressCard slots. More information about the ExpressCard Standard can be found at http://www.expresscard.org.

The following table lists the default pinout of the ExpressCard slot. It utilizes USB port 6 and PCI Express lane 2 by default.

Table 3-24. ExpressCard Slot X16 Pinout

Pin	Signal	Pin	Signal
1	GND	14	+3.3V
2	USB6-	15	+3.3V
3	USB6+	16	CLKREQ#
4	CPUSB#	17	EXCD0_CPPE#
5	RSVD	18	PCIE_CLKC0-
6	RSVD	19	PCIE_CLKC0+
7	SMB_CK	20	GND
8	SMB_DAT	21	PCIE_RX2-
9	+1.5V	22	PCIE_RX2+
10	+1.5V	23	GND
11	WAKE0#	24	PCIE_TX2-
12	+3.3V Standby	25	PCIE_TX2+
13	EXCD0_PERST#	26	GND

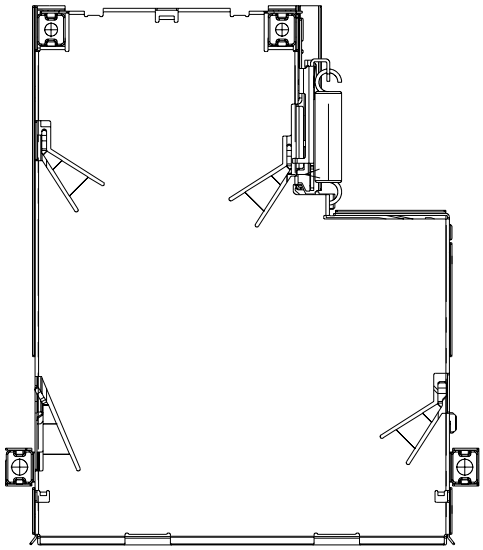

Figure 3-23. X16 PCI Express Slot

NOTE LED D24 is a red LED that indicates an 'Overcurrent Event' has occurred in the ExpressCard slot.

PCI Express Mini Cards

The COM Express Baseboard is equipped with a PCI Express Mini Card socket. PCI Express Mini Card is a unique small size form factor optimized for mobile computing platforms equipped with communication applications such as Wireless LAN. The small footprint connector can be implemented on baseboard designs providing the ability to insert different removable PCI Express Mini Cards. Using this approach gives the flexibility to mount an upgradable, standardized PCI Express Mini Card device to the baseboard without additional expenditure of a redesign. The PCI Express Mini Card utilizes USB port 7 and PCI Express lane 5 by default.

The following table lists the default pinout of the PCI Express Mini Card.

Table 3-25. X15 PCI Express Mini Card Connector Pinout

Pin	Signal	Pin	Signal
1	WAKE0#	2	+3.3V
3	RSVD	4	GND
5	RSVD	6	+1.5V
7	CLKREQ#	8	N.C.
9	GND	10	N.C.
11	PCIE_CLKC1-	12	N.C.
13	PCIE_CLKC1+	14	N.C.
15	GND	16	N.C.
17	RSVD	18	GND
19	RSVD	20	RSVD
21	GND	22	EXCD1_PERST#
23	PCIE_RX5-	24	+3.3V Standby
25	PCIE_RX5+	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CK
31	PCIE_TX5-	32	SMB_DAT
33	PCIE_TX5+	34	GND
35	GND	36	USB7-
37	RSVD	38	USB7+
39	RSVD	40	GND
41	RSVD	42	LED_WWAN#
43	RSVD	44	LED_WLAN#
45	RSVD	46	LED_WPAN#
47	RSVD	48	+1.5V
49	RSVD	50	GND
51	RSVD	52	+3.3V

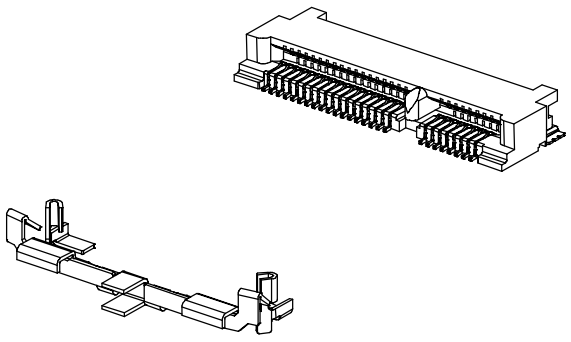

Figure 3-24. X15 PCI Express Mini Card Connector

The PCI Mini Card socket has three different red LEDs to indicate the presence of certain area network types. The following table describes these LEDs.

Table 3-26. PCI Mini Card LED Descriptions

LED	Indicates
D21	Wireless Wide Area Network
D22	Wireless Local Area Network
D23	Wireless Personal Area Network

Jumper Header X62

Jumper header X62 provides the ability to switch between using different PCI Express lanes for the ExpressCard slot and PCI Express Mini Card socket. This is necessary since some Ampro COM Express modules have onboard devices attached to PCI Express lane 5. Additionally, some modules do not offer more than 4 PCI Express lanes. The default configuration is that the ExpressCard slot uses PCI Express lane 2 and the PCI Express Mini Card socket uses PCI Express lane 5.

In certain cases it is necessary to use this jumper. For instance, some Ampro COM Express modules support onboard Gigabit Ethernet that is implemented through the use of PCI Express lane 5. This means that PCI Express lane 5 is not available externally. If the PCI Express Mini Card socket must be used as well, then it is necessary to configure it so that it uses PCI Express lane 2 instead of the default configuration, which is PCI Express lane 5. Jumper X62 provides the ability to do this.

NOTE In order to use both the ExpressCard slot and PCI Express Mini Card socket at the same time, PCI Express Lane 2 and 5 must be available.

Table 3-27. X62 PCI Express Lane Jumper Header Pinout

Jumper X62	Configuration
1 - 2	PCIe lane 5 ExpressCard PCIe lane 2 PCI Express Mini Card
3 - 4	PCIe lane 2 ExpressCard (default) PCIe lane 5 PCI Express Mini Card (default)

Figure 3-25. X62 PCI Express Lane Jumper Header

X62: 2.54mm grid jumper

TV-Out

The COM Express Baseboard provides TV-Out connectors for S-Video and Composite Video through connector X57. The S-Video connector can be used with a standard 4-pin SVIDEO cable whereas the Composite Video requires a coax cable with an RCA jack on each end.

Table 3-28. X57 TV-Out Video Connector Pinout

Pin	Signal	Description	Pin	Signal	Description
1	Chrominance (C)	S-Video Chrominance Analog Signal (C)	2	Luminance (Y)	S-Video Luminance Analog Signal (Y)
3	GND (C)	Analog Ground for Chrominance (C)	4	GND (Y)	Analog Ground Luminance (Y)
5	GND	Analog Ground	6	GND	Analog Ground
7	Composite	Composite Video Output			

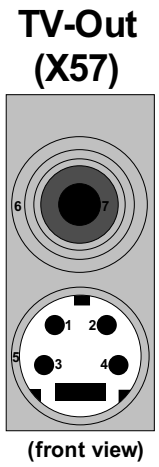

Figure 3-26. X57 TV-Out Video Connector

X57: Composite Video: Coax cable with RCA jacks on each end

S-VIDEO: 4 pin MINI-DIN male

Subsystems of COM Express Connector Rows C&D

PCI Express Graphics (PEG)

The PEG Port (connector X29) utilizes PCI Express lanes 16-32 and is suitable to drive a x16 link for an external high-performance PCI Express Graphics card. It supports a theoretical bandwidth of up to 4 GB/s. For information about the pinout of the PEG port connector refer to the 'PCI Express Card Electromechanical Specification, Rev. 1.1'.

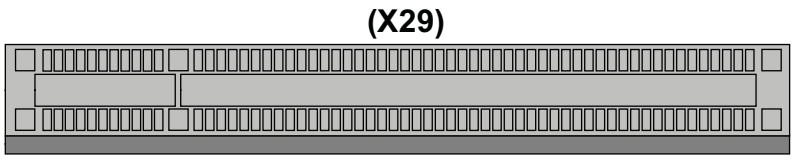

Figure 3-27. X29 PCI Express Graphics Connector

PATA ATA 100

The COM Express Baseboard has one PATA (Parallel ATA) port that is accessible via the X25 connector. The following table lists the pinout for the PATA port. LED D25 indicates activity on the PATA port.

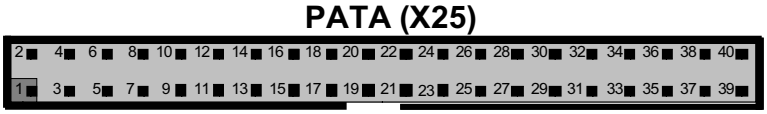

Figure 3-28. X25 PATA Connector

Table 3-29. X25 PATA Connector Pinout

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	HDRSTJ	2	GND	21	PIDE_DRQ	22	GND
3	PIDE_D7	4	PIDE_D8	23	PIDE_IOWJ	24	GND
5	PIDE_D6	6	PIDE_D9	25	PIDE_IORJ	26	GND
7	PIDE_D5	8	PIDE_D10	27	PIDE_RDY	28	CSEL_P
9	PIDE_D4	10	PIDE_D11	29	PIDE_AKJ	30	GND
11	PIDE_D3	12	PIDE_D12	31	PIDE_INTRQ	32	N.C.
13	PIDE_D2	14	PIDE_D13	33	PIDE_A1	34	CBLID_P
15	PIDE_D1	16	PIDE_D14	35	PIDE_A0	36	PIDE_A2
17	PIDE_D0	18	PIDE_D15	37	PIDE_CS1J	38	PIDE_CS3J
19	GND	20	N.C.	39	DASP_PIDE	40	GND

40-pin, 2 row 2.54mm grid female.

CompactFlash Socket

The COM Express Baseboard has a CompactFlash socket (X26) that is connected to the PATA port. The CF card can be configured as either a Master or Slave device through the use of jumper X21. LED D25 indicates activity on the PATA port.

Table 3-30. X21 CompactFlash Jumper Header Pinout

Jumper X21	Configuration
1. 1 - 2	2. CF Master
3. 3 - 4	4. CF Slave (default)

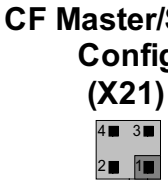

Figure 3-29. X21 CompactFlash Jumper Header

X21: 2.54mm grid jumper.

The following table lists the pinout of the CompactFlash socket.

Table 3-31. X26 CompactFlash Socket Pinout

Pin	Signal	Pin	Signal
1	GND	26	CD1
2	PIDE_D3	27	PIDE_D11
3	PIDE_D4	28	PIDE_D12
4	PIDE_D5	29	PIDE_D13
5	PIDE_D6	30	PIDE_D14
6	PIDE_D7	31	PIDE_D15
7	PIDE_CS1J	32	PIDE_CS3J
8	A10	33	VS1
9	OE	34	IDE_IORJ
10	A09	35	IDE_IOWJ
11	A08	36	CF_WE#
12	A07	37	PIDE_INTRQ
13	VCC3	38	VCC3
14	A06	39	CSEL
15	A05	40	N.C.
16	A04	41	HDRSTJ
17	A03	42	PIDE_RDY
18	PIDE_A2	43	PIDE_DRQ
19	PIDE_A1	44	PIDE_AKJ
20	PIDE_A0	45	DASP_CF
21	PIDE_D0	46	CBLID_P
22	PIDE_D1	47	PIDE_D8
23	PIDE_D2	48	PIDE_D9

Table 3-31. X26 CompactFlash Socket Pinout (Continued)

24	N.C.	49	PIDE_D10
25	CD2	50	GND

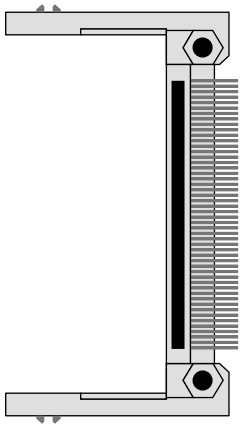

Figure 3-30. X26 CompactFlash Socket

PCI BUS

The COM Express Baseboard has four bus master capable PCI bus slots (connectors X30-X33). The COM Express PCI interface is compliant to the 'PCI Local Bus Specification Revision 2.3'. This interface is specified to be +5V tolerant, with +3.3V signaling. All necessary PCI bus pull-up resistors are included on the COM Express module.

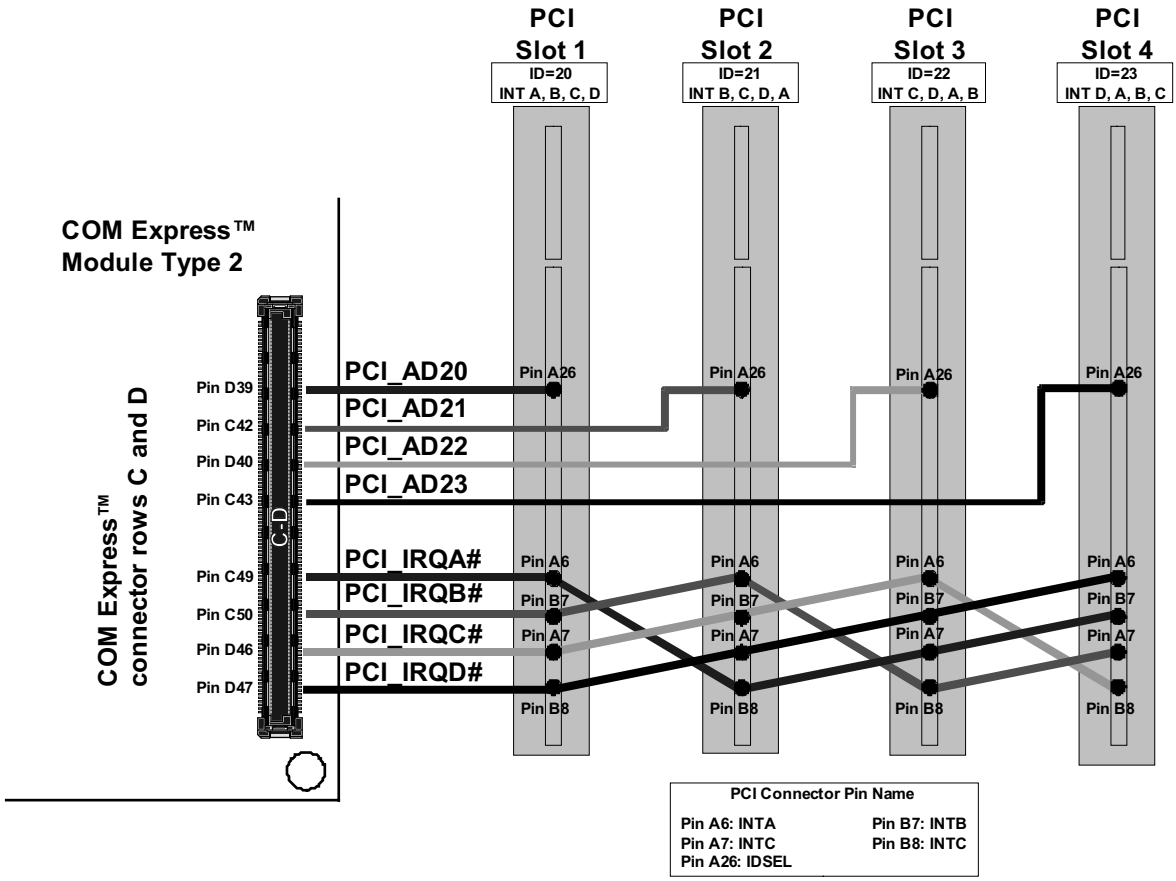

Figure 3-31. PCI Slot Diagram

Chapter 4 Additional Features

Reset

The COM Express module and all connected components will perform a hard reset when this button is pressed. The Reset button is connected to the COM Express module's SYS_RESET# signal.

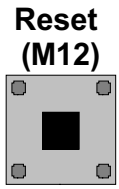

Figure 4-1. M12 Reset Button

PC Speaker (Beeper)

The speaker M11 is connected to the COM Express module's SPEAKER signal.

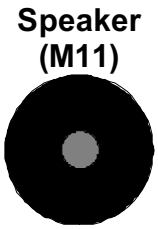

Figure 4-2. M11 Speaker

Debug Display

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

The COM Express Baseboard decodes these ports and displays their contents on 4 seven-segment displays (D48 to D51). The dots in the first two displays show the state of the Reset and the PCI Frame signals.

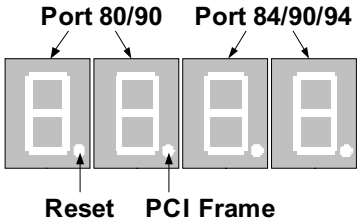

Figure 4-3. I/O Port Debug Displays

Table 4-1. X48 I/O Port Debug Jumper Header Pinout

Jumper X48	Configuration
1 - 2	Port 80h* and port 84h* output
3 - 4	Port 80h* and port 90h* output
5 - 6	Port 90h* and port 94h* output

*I/O port address

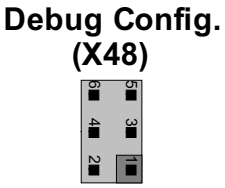

Figure 4-4. X48 I/O Port Debug Jumper Header

2.54mm grid jumper.

Ground Test Points

The COM Express Baseboard provides 4 test points that are connected to Ground Potential (M3, M6, M15, and M16). These test points make it easier to connect oscilloscope probes and/or multimeter lines to Ground when performing measurements on the COM Express™ module.

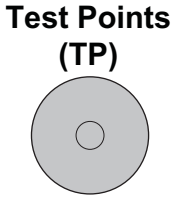

Figure 4-5. Ground Connection Test Point

TPM Physical Presence Pin

Jumper X58 is used to activate the physical presence pin of the optional TPM (Trusted Platform Module) chip available on some Ampro COM Express modules.

Table 4-2. X58 TPM Jumper Header Pinout

Jumper X58	Configuration
1 - 2	Indicates “physical presence” to the TPM chip
3 - 4	No physical presence (default)

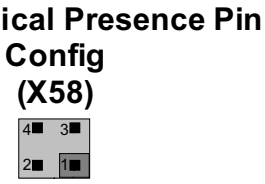

Figure 4-6. X58 TPM Jumper Header

X58: 2.54mm grid jumper

> **NOTE** For more information about the Physical Presence pin of the TPM chip, refer to the specification “TCG PC Client Specific TPM Interface Specification (TIS)” that can be found on the Trusted Computing Group web site at www.trustedcomputinggroup.org.

Fan Connector and Power Configuration

Table 4-3. X10 Fan Power Jumper Header

Jumper X10	Configuration
1 - 2	12 Volt Fan
3 - 4	N.C.
5 - 6	5 Volt Fan

Figure 4-7. X14 Fan Connector and X10 Fan Power Jumper Header

X14: 3 pin 2.54mm grid fan connector

X10: 2.54mm grid jumper.

> **NOTE** Ampro COM Express modules provide signals for fan control. This has been implemented through the use of some reserved pins. COM Express module pin C77 provides the FAN_TACHOIN signal that is attached to pin 3 of the fan connector X14 found on the COM Express Baseboard. This signal must receive two pulses per revolution in order to produce an accurate reading and therefore a two pulse per revolution fan is recommended.

Feature Connector

Table 4-4. Feature Connector Pinout

Pin	Signal	Description	Pin	Signal	Description
1	+5V (750 mA fuse)		2	5V_SB (750 mA fuse)	
3	+5V (750 mA fuse)		4	Hard Disk Activity	Shows activity on hard disk interface IDE1
5	I2DAT	General purpose I²C port data I/O line.	6	SMBCLK_SB	System Management Bus bidirectional clock line.

Table 4-4. Feature Connector Pinout (Continued)

7	I2CLK	General purpose I²C port clock output.	8	SMBDATA_SB	System Management Bus bidirectional data line.
9	Internal use		10	GPO0	
11	Internal use		12	GPO1	
13	PS_ON#	Power Supply On (active low).	14	GPO2	
15	SUS_S3#	Indicates system is in Suspend to RAM state. Active low output.	16	GPO3	
17	GND	Power Ground	18	GND	Power Ground
19	THRMTRIP#	Active low output indicating that the CPU has entered thermal shutdown.	20	SMBALRT#	System Management Bus Alert – active low input can be used to generate an SMI# (System Management Interrupt) or to wake the system.
21	GPI1		22	SUS_S4#	Indicates systems is in Suspend to Disk state. Active low output.
23	SUS_STAT#	Indicates imminent suspend operation; used to notify LPC devices.	24	GPI0	
25	GPI2		26	SUS_S5#	Indicates systems is in Soft Off state.
27	WDTRIG		28	THRM#	Input from off-module temp sensor indicating an over-temp situation.
29	GPI3		30	PCI_M66EN	Module input signal indicates whether an off-module PCI device is capable of 66MHz operation.
31	BATLOW#	Indicates that external battery is low.	32	WAKE1#	General purpose wake up signal. May be used to implement wake-up on PS2 keyboard or mouse activity.
33	PEG_ENABLE#	Strap to enable PCI Express x16 external graphics interface.	34	PEG_LANE_RV#	PCI Express Graphics lane reversal input strap.

Table 4-4. Feature Connector Pinout (Continued)

35	KBINH#		36	SYS_RESET#	Reset Button Input. Active low input. System is held in hardware reset while this input is low and comes out of reset upon release.
37	GND	Power Ground	38	GND	Power Ground
39	PWBTN#	Power Button to bring system out of S5 (soft off), active on rising edge.	40	PWR_OK	Power OK from main power supply. A high value indicates that the power is good. For additional information refer to PWRGOOD Config connector X11.

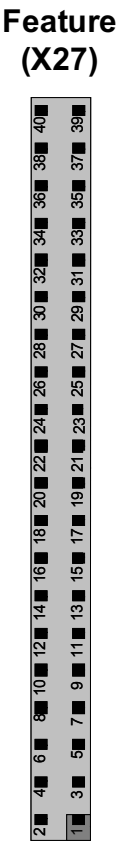

Figure 4-8. X27 Feature Connector

40 pin, 2 row 2.54mm grid female.

Mechanical Drawing COM Express Baseboard

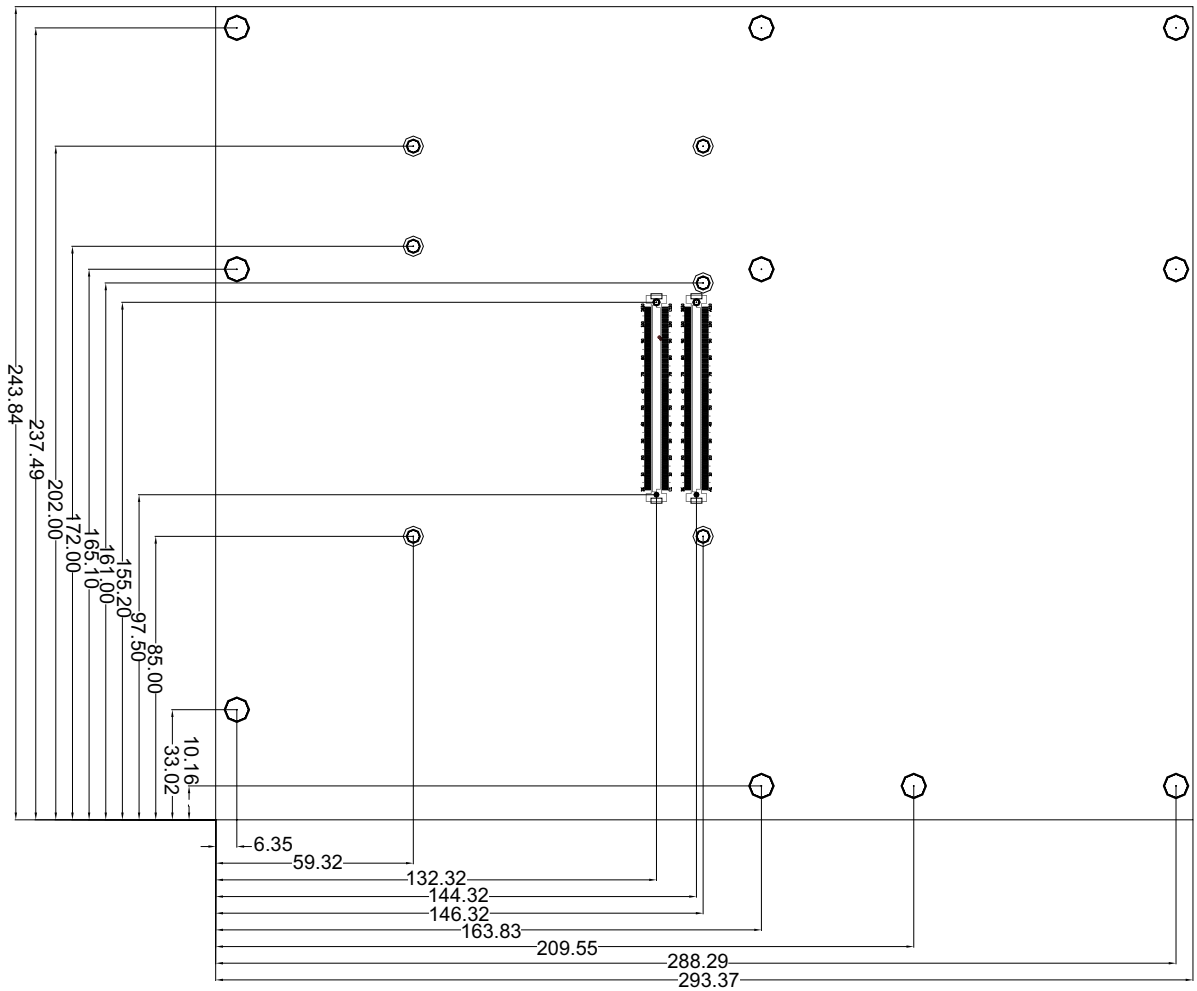

Figure 4-9. Baseboard Mechanical Drawing

Industry Specifications

The list below provides links to industry specifications that should be used as reference material when designing a COM Express Baseboard.

Table 4-5. Reference Web Sites

Specification	Link
PICMG® COM Express Module™ Base Specification	http://www.picmg.org/
PCI Express Base Specification, Revision 2.0	http://www.pcisig.com/specifications
PCI Local Bus Specification, Revision 2.3	http://www.pcisig.com/specifications

Table 4-5. Reference Web Sites (Continued)

Universal Serial Bus (USB) Specification, Revision 2.0	http://www.usb.org/home
ExpressCard Standard Release 1.0	http://www.expresscard.org/
Serial ATA Specification, Revision 1.0a	http://www.serialata.org
Low Pin Count Interface Specification, Revision 1.0 (LPC)	http://developer.intel.com/design/chipsets/industry/lpc.htm
Audio Codec '97 Component Specification, Version 2.3	http://www.intel.com/design/chipsets/audio/
High Definition Audio Specification, Rev. 1.0	http://www.intel.com/standards/hdaudio/
LVDS Owner's Manual	http://www.national.com
Extended Display Identification Data Standard Version 1.3 (EDID™)	http://www.vesa.org
Enhanced Display Data Channel Specification Version 1.1 (DDC)	http://www.vesa.org
IEEE standard 802.3ab 1000BASE T Ethernet	http://www.ieee.org/portal/site
Advanced Configuration and Power Interface Specification Rev. 3.0a	http://www.acpi.info/

The following reference material from Mindshare Books is recommended for use by Ampro. For more information and additional books visit www.mindshare.com.

Table 4-6. Technical Book References

Title	Author
PCI Express System Architecture	Ravi Budruk, Don Anderson, Tom Shanley
PCI System Architecture (4th Edition)	Tom Shanley, Don Anderson
Universal Serial Bus System Architecture	Don Anderson
SATA Storage Technology	Don Anderson
Protected Mode Software Architecture (The PC System Architecture Series)	Tom Shanley
The Unabridged Pentium 4	Tom Shanley

Additional books covering various PC architecture subjects, that should be used as reference material, can be found at www.intel.com/intelpress.

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. 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