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EBC1

E²Brain Module Carrier
for the
EB405 – EB425 – EB8245 – EB860
CPUs

Manual ID: 26873, Rev. Index 02
27 October, 2004

E²BRAIN®

CE The product described in this manual is in compliance with all applied CE standards.

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Environmental Protection Statement

This product has been manufactured to satisfy environmental protection requirements where possible. Many of the components used (structural parts, printed circuit boards, connectors, batteries, etc.) are capable of being recycled.

Final disposition of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.

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Explanation of Symbols



CE Conformity

This symbol indicates that the product described in this manual is in compliance with all applied CE standards. Please refer also to the section “Applied Standards” in this manual.



Caution, Electric Shock!

This symbol and title warn of hazards due to electrical shocks (> 60V) when touching products or parts of them. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.

Please refer also to the section “High Voltage Safety Instructions” on the following page.



Warning, ESD Sensitive Device!

This symbol and title inform that electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Please read also the section “Special Handling and Unpacking Instructions” on the following page.



Warning!

This symbol and title emphasize points which, if not fully understood and taken into consideration by the reader, may endanger your health and/or result in damage to your material.



Note...

This symbol and title emphasize aspects the reader should read through carefully for his or her own advantage.

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For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions



Warning!

All operations on this device must be carried out by sufficiently skilled personnel only.



Caution, Electric Shock!

Before installing your new Kontron product into a system always ensure that your mains power is switched off. This applies also to the installation of piggybacks.

Serious electrical shock hazards can exist during all installation, repair and maintenance operations with this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing work.

Special Handling and Unpacking Instructions



ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory back-up, ensure that the board is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the board.

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General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the device, which are not explicitly approved by Kontron Modular Computers GmbH and described in this manual or received from Kontron's Technical Support as a special handling instruction, will void your warranty.

This device should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This applies also to the operational temperature range of the specific board version, which must not be exceeded. If batteries are present their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the board please re-pack it as nearly as possible in the manner in which it was delivered.

Special care is necessary when handling or unpacking the product. Please, consult the special handling and unpacking instruction on the previous page of this manual.

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If the customer's eligibility for warranty has not been voided, in the event of any claim, he may return the product at the earliest possible convenience to the original place of purchase, together with a copy of the original document of purchase, a full description of the application the product is used on and a description of the defect. Pack the product in such a way as to ensure safe transportation (see our safety instructions).

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Chapter 1

Introduction

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1. Introduction

The E²Brain™ product described in this manual is designed to Kontron Modular Computers' "E²Brain™ Module Specification", revision 01. Section 1.1 provides general information regarding this specification and the system environment as envisioned for E²Brain™ modules. For more detailed information regarding the "E²Brain™ Module Specification", please contact Kontron Modular Computers.

The remaining sub-sections of the Introduction provide more specific details of the EBC1 E²Brain™ carrier board itself to familiarize the user with this product as a whole.

1.1 The E²Brain™ Concept

The E²Brain™ concept is a highly flexible approach to providing application developers with the ability to concentrate on the definition of application requirements without having to continuously factor in potential restrictions concerning available data processing and communications functionality.

More specific, data processing and communications requirements become a function of the application and not vice versa. This is possible through the implementation of the E²Brain™ concept. Unlike other approaches to providing application solutions, the E²Brain™ concept concentrates on the most essential aspects of providing data processing and communications without attempting to provide in one entity a complete, self-contained computer system.

The E²Brain™ specification first of all defines a PCB module with a form factor of 115 x 75 x nn millimeters where nn is a function of the height of the board's components. For interfacing with applications, the specification calls for up to four connectors which provide not only interfacing capability for current industry standards but also for future standards or application specific requirements. The type, location, and usage of these connectors is also defined in the specification so as to guarantee standardized compatibility. The specification is open as to the data processing and communications functionality to be implemented which is by definition a function of the application requirements. In addition, the specification envisions considerations for thermal energy dissipation through the implementation of what are to be known as BrainCAP™s (E²Brain™ **C**ooling **A**ssembly, **P**rotector) which can range from heat spreaders to highly sophisticated heat sink cooling designs.

The key features of the E²Brain™ concept are:

- Very compact and robust form factor
- Independent of CPU architecture
- Scalable, flexible, and open system interface
- PCI Master and Agent Mode
- PCI-64 and PCI-X capability
- Versatile and very powerful communications interfaces
- Complete thermal design concept

1.1.1 E²Brain™ Functionality

E²Brain™ (Embedded Electronic Brain) is a new platform architecture for advanced computer modules. The E²Brain™ specification defines a very compact mechanical form factor and a comprehensive set of functional interfaces which can be adapted to a wide variety of applications. E²Brain™ modules provide complete computer cores integrating a high-performance CPU, system memory and - typical for E²Brain™ - advanced communications controllers.

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E²Brain™ modules are plugged into customized backplanes or standardized carrier boards which themselves provide the physical interfaces (PHYs) and connectors, power, and additional IO controllers. Through the use of E²Brain™ modules the system developer is relieved of the task of designing computers, and, instead, they permit him to concentrate on the specific product development.

E²Brain™ is a computer platform dedicated not just to one architecture like the PC and Windows architecture, but it is open for all architectures including PowerPC, ARM, SH, x86, and others. E²Brain™ modules are very suitable for “deeply” embedded applications requiring flexible computing power combined with versatile and high-performance communications power.

Although typical E²Brain™ modules are designed to be low power consumption devices, they are part of a well thought out thermal design concept which considers the thermal aspects right from the beginning. Where higher power consumption is unavoidable, E²Brain™ modules are fitted with appropriate BrainCAP™s. By utilizing BrainCAP™s, cooling, mechanical stabilization, and EMI protection are combined in a single concept to satisfy almost any application requirement.

1.1.2 Basic Architecture

The following figure illustrates the basic functional architecture of E²Brain™ modules. Common to all E²Brain™ modules are the data processing and communications core and the system and communications interfaces.

The application requirements determine the functionality required of the E²Brain™ module core which in turn mandates the functionality to be provided by the system and communications interfaces. Both of these interfaces are comprised of a base set and an extended set of functional features.

The system interface to the application is accomplished through connectors Pn1 and Pn2. Connector Pn1 provides the base set of system interfacing and Pn2 the extended set. If the application does not require extended system interfacing, it is not necessary to populate connector Pn2. The same analogy applies to the communications interfacing whereby connector Pn3 provides the base set of communications interfacing and Pn4 the extended set. Pn4 is not required to be populated if there is not an application requirement for it. This concept together with a corresponding core provides a maximum of scalability and flexibility to satisfy the most demanding of applications.

1.1.3 E²Brain™ System Environment

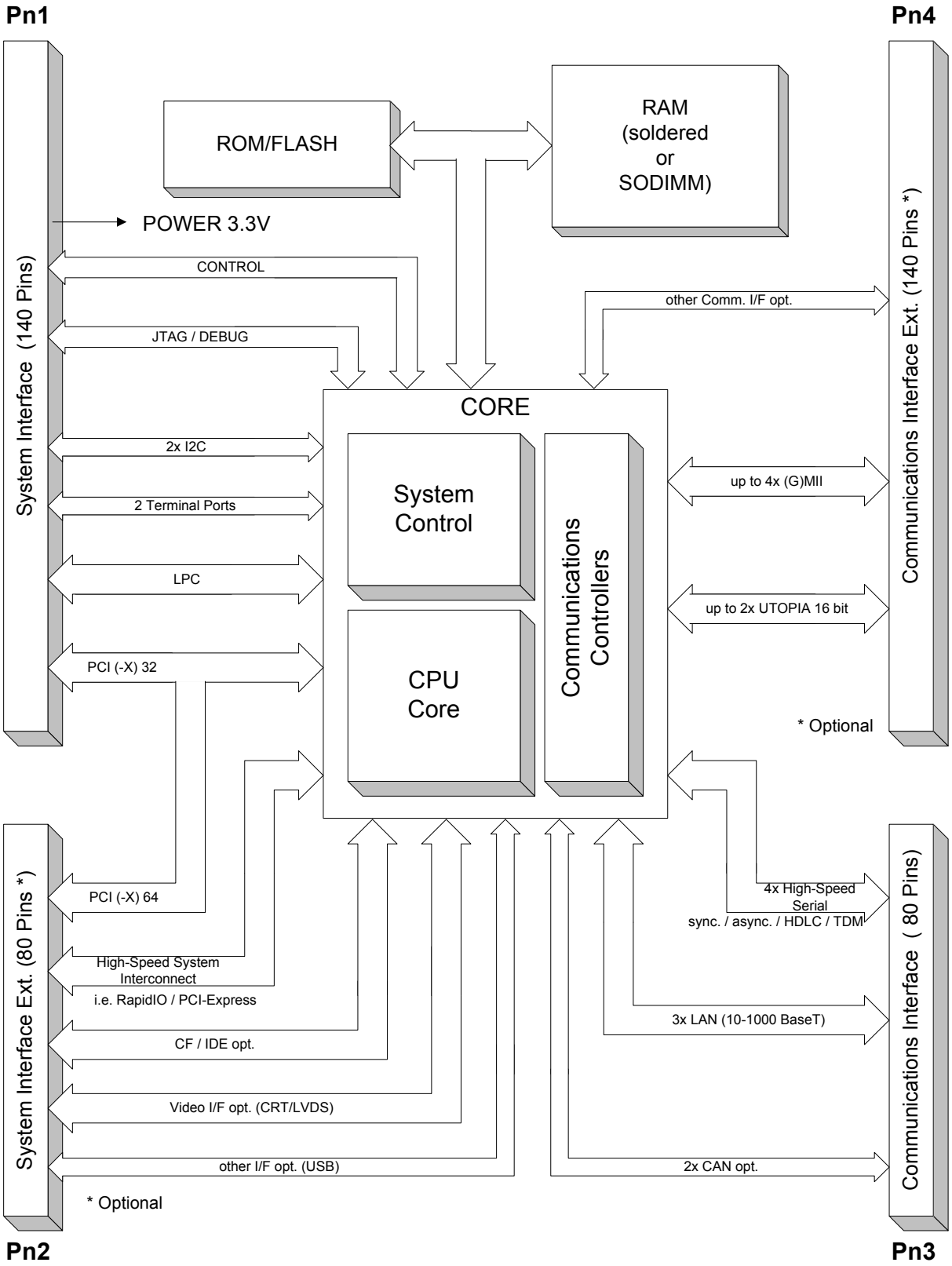
The E²Brain™ module form factor and mechanical and electrical interfacing are so conceived as to allow the use of E²Brain™ modules in practically any kind of system environment. These mezzanine modules can easily be integrated on most standardized carrier boards (VME, CompactPCI, PC PCI, etc.) as well as any other conceivable type of carrier board capable of providing the required mechanical and electrical infrastructure.

In addition to this infrastructure, thermal energy dissipation requirements must be taken into consideration when implementing applications using E²Brain™ modules. The E²Brain™ concept basically calls for modules to provide their own thermal energy dissipation. It may, however, be necessary to add additional thermal energy dissipation capability depending on the overall system environment. To satisfy such requirements, E²Brain™ modules may be equipped with specially designed cooling devices that are adapted to the specific system environment.

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Figure 1-1: E²Brain™ Basic Architecture



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1.2 EBC1 System Overview

The EBC1 is a special purpose E²Brain™ module carrier board which is designed to provide customers with a platform for the development of their own applications based on Kontron's E²Brain™ high performance processor modules. This carrier board takes advantage of an extensive range of the many features offered by these modules thus allowing developers to become familiar with their capabilities without having to first invest time and engineering resources in the development of an operational test environment.

In addition to supporting application development for the E²Brain™ modules themselves, the EBC1 can also be used as a model for the development of application specific carrier boards.

Designed as part of an overall system development kit, the EBC1 provides a comprehensive set of industry standard interfacing as well as test and programming interfaces. Coupled with an appropriate E²Brain™ module, board support package (BSP), and operating system it is an ideal starting basis for rapid efficient system application design and integration.

1.3 Product Overview

The EBC1 E²Brain™ carrier board is a part of an innovative concept to provide system integrators with a complete range of off-the-shelf as well as custom embedded computer cores for the most demanding of applications.

This carrier board which supports the EB405, EB425, EB8245, and the EB860 E²Brain™ module as its computer core provides a comprehensive set of standard computer functionality coupled with industry standard system and communications I/O capability.

The following table provides a quick overview of the EBC1 board.

Table 1-1: EBC1 Product Overview

EBC1 FEATURES	DESCRIPTION

Product Type	E²Brain™ module carrier board:
	• Core Processor types supported:
	  • EB405
	  • EB425
	  • EB8245
	  • EB860
	  • other E²Brain™ compliant modules
	• Form factor: 244 mm x 244 mm (micro ATX)
	• Complies with the E²Brain™ specification

I/O Interfaces	System: • I²C bus • LPC bus • PCI-bus • ATA/IDE • SPI-bus • Serial: terminal and console • USB • CompactFlash • Keyboard • Mouse • Digital I/O • EEPROM • LPC FLASH

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Table 1-1: EBC1 Product Overview

EBC1 FEATURES	DESCRIPTION
I/O Interfaces	Communications: • Serial: high speed UART • Fast Ethernet • CAN • UTOPIA Graphics: • TFT flat-panel display • CRT display
Other	Test and Programming: • EB405 JTAG/DEBUG • EB425 JTAG/DEBUG • EB8245 JTAG/DEBUG • EB860 JTAG/DEBUG • EBC1 logic • ATMEL Monitor and Control: • Seven segment displays • Signal inputs • LEDs • Switches • Jumpers • Resistors

1.4 Board Overview

1.4.1 Board Introduction

The EBC1 is a custom simplified application interface (SAI) for E²Brain™ high performance mezzanine computer modules. It provides physical accommodations for mounting one E²Brain™ module and a comprehensive set of interfaces for application development.

1.4.2 Board Specific Information

Major board components of the EBC1 E²Brain™ SAI board are:

- Graphics controller for TFT and CRT output
- Logic controller for digital IO and POST code display
- PCI-IDE bridge
- SuperIO controller (Low Pin Count) for keyboard and mouse interfaces
- EEPROM
- Computer core interface: two system connectors and two communications connectors
- PCI interface
- Low Pin Count (LPC) interface
- I²C interface
- SPI interface
- TFT and CRT interfaces
- Keyboard and mouse interfaces
- High speed serial interfaces:

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- Two RS232 full modem
- Two RS422/RS485
- Two RS232 only (no hardware handshaking)

- Two ATA/IDE interfaces
- Two Fast Ethernet interfaces
- USB interface
- CAN interface
- Four digital input interfaces and four digital output interfaces (non-opto-isolated)
- Four opto-isolated digital input interfaces
- Four opto-isolated digital output interfaces
- LPC FLASH interface (PLCC32)
- Compact FLASH interface (Type I/II, IBM Microdrive)
- Three debugging interfaces
- Programming interfaces
- Monitor and control interfaces
  - Two, seven segment LED displays
  - Ten single LEDs
  - Various jumpers and resistors
  - Three control input signals
  - Two control output signals
  - Two push button switches
- DC/DC power supply

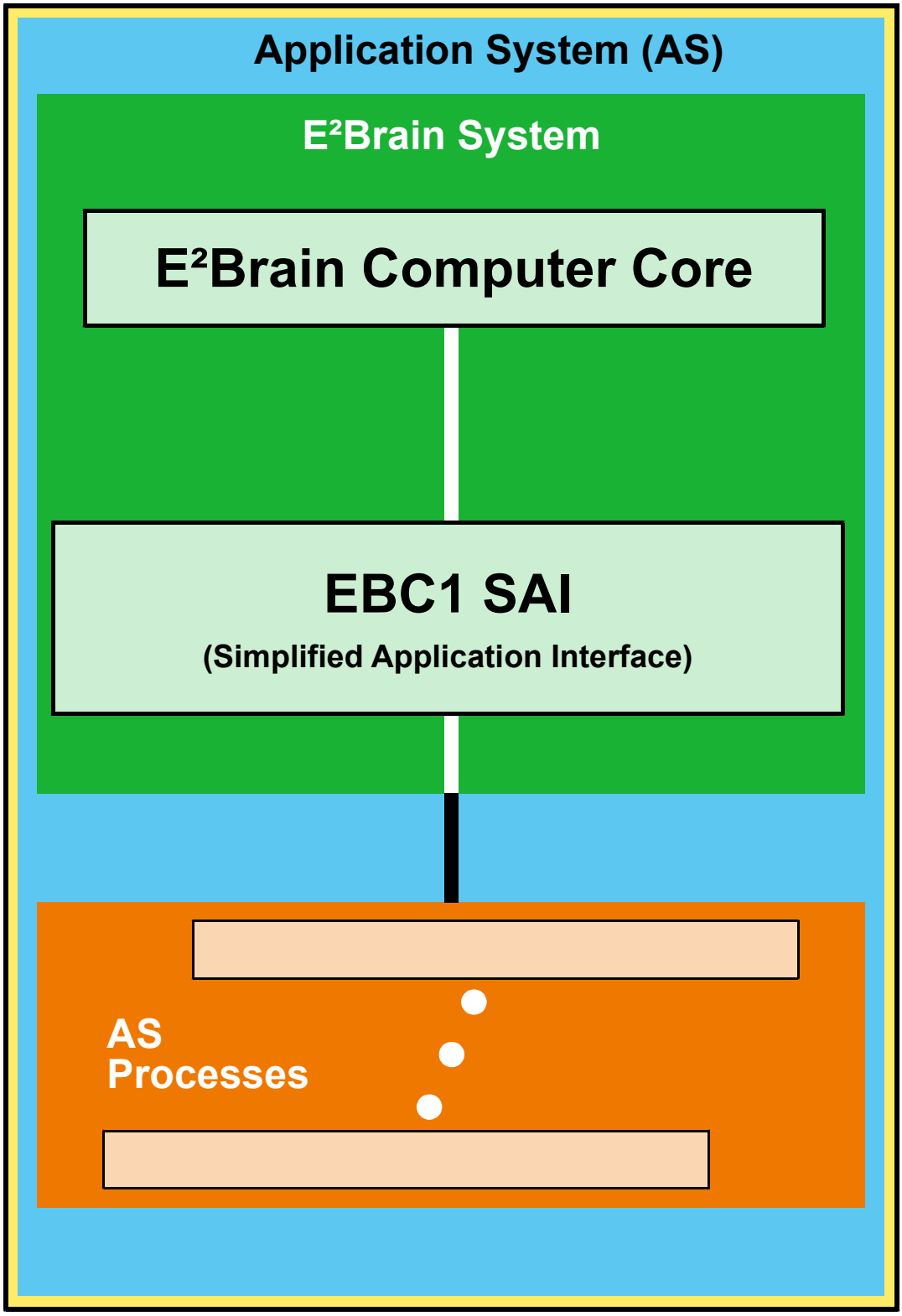
1.5 Board Diagrams

The following sections provide diagrams along with additional information concerning board functionality and component layout.

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1.5.1 Application System Interfacing

Figure 1-2: EBC1 Application System Interfacing Diagram



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1.5.2 System Level Interfacing

An E²Brain™ application sub-system is comprised of an E²Brain™ computer core and a simplified application interface (SAI). In this case, the EBC1 is the SAI, whereby its application functionality is to support E²Brain™ solutions development. The interfaces available on the EBC1 are representative of typical E²Brain™ application requirements and are best suited for application development. The following figure demonstrates the basic interfacing relationship of the E²Brain™ module to the EBC1 SAI. The following table provides a legend for Figure 1-3.

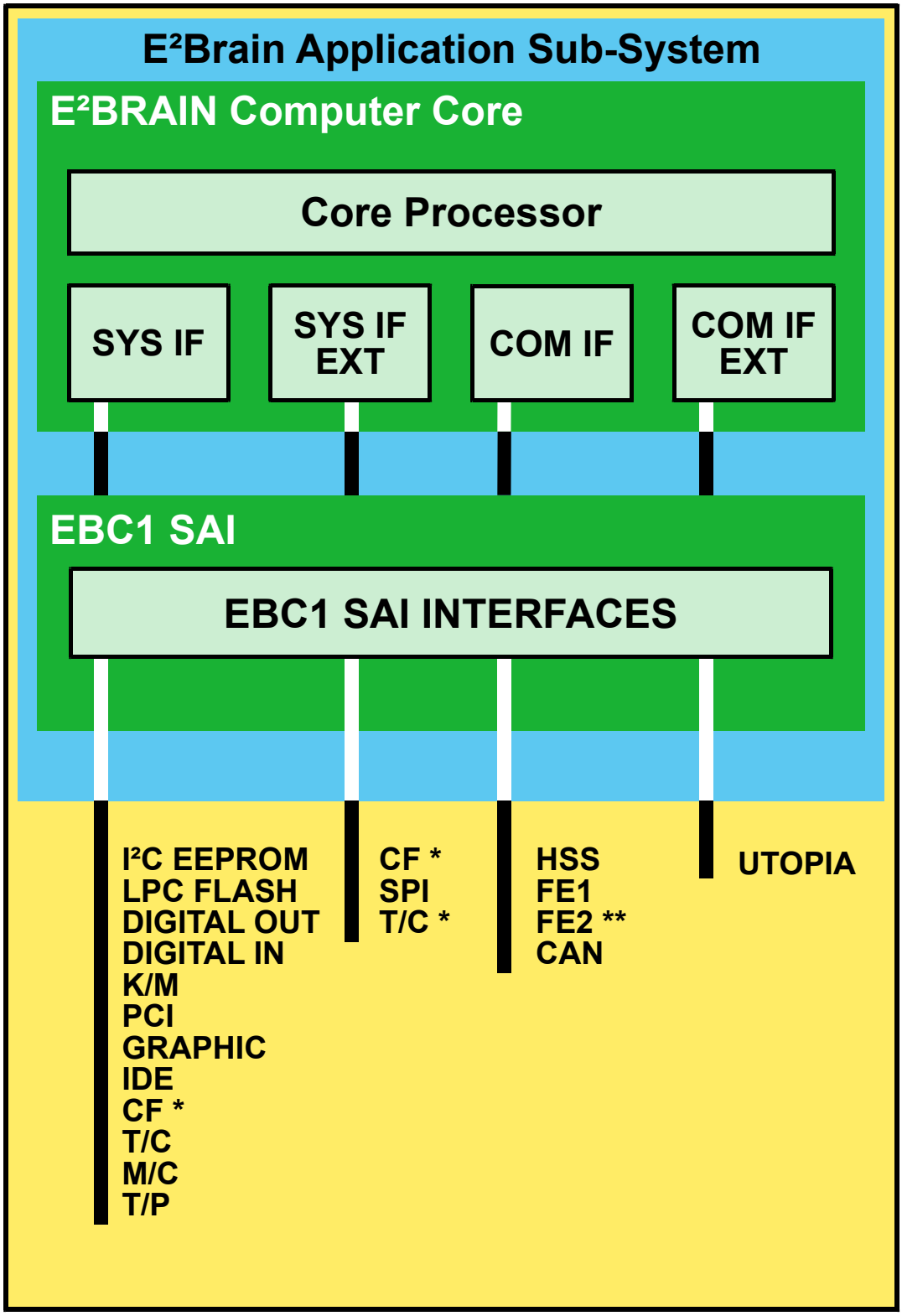
Table 1-2: Legend for Figure 1-3

ITEM	DESCRIPTION
CAN	Controller Area Network
CF * (SI) CF * (SIE)	Compact FLASH The EBC1 supports CF either by the PCI-IDE bridge (SI) or directly with the E²Brain™ module (SIE).
DIGITAL IN	Digital input
DIGITAL OUT	Digital output
FE1	Fast Ethernet 1
FE2 **	Fast Ethernet 2 This interface is not supported by the EB8245 or the EB860 E²Brain™ modules.
GRAPHIC	Graphic output Both TFT and CRT outputs are supported.
HSS	High Speed Serial interfaces
I²C EEPROM	I²C interface EEPROM is installed for application development usage.
IDE	ATA-IDE interface Provides support for standard IDE devices as well as 2.5” drives.
K/M	Keyboard / Mouse PS2 type combination interface
LPC FLASH	Low Pin Count FLASH Supports PLCC32 socket.
M/C	Monitor / Control interface
PCI	PCI Single, standard PCI connector available
SPI	Serial Peripheral Interface
T/C	Terminal / Console Serial interface for terminal/console type operations (RS232)
T/C *	Terminal / Console Serial interface for terminal/console type operations (USB 1.1)
T/P	Test / Programming JTAG / DEBUG and programming
UTOPIA	Universal Test & Operation Interface for ATM

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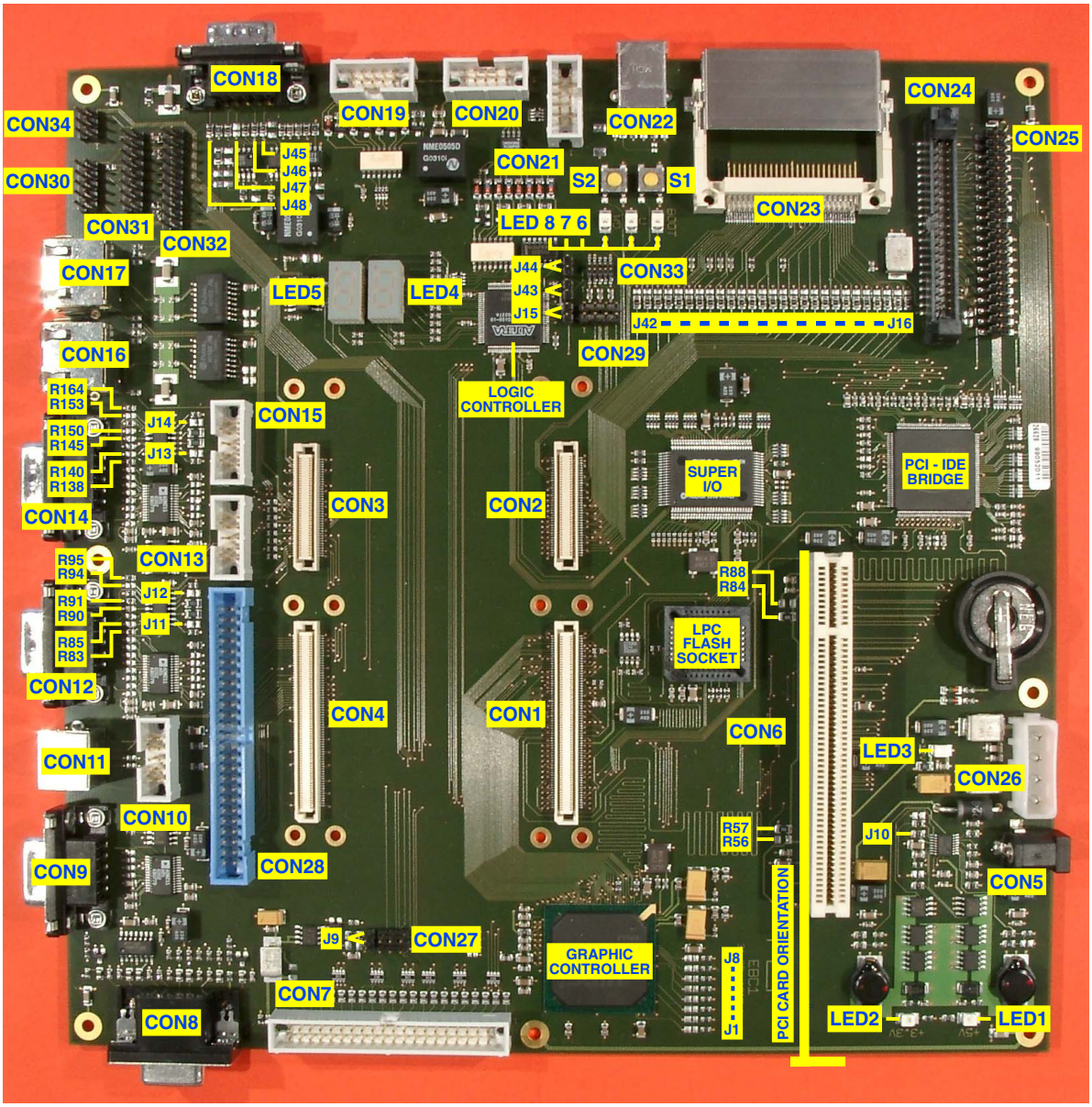
Figure 1-3: EBC1 System Level Interfacing Diagram



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1.5.3 Board Layout

Figure 1-4: EBC1 Board (Front View)



Warning!

The CON6 connector is 5V coded. Only 5V or universally coded cards may be used with this connector. Do not attempt to install 3.3V coded cards as this will result in damage to the PCI card, the EBC1, or E²Brain™ module itself.

The EBC1 is configured for 3.3V V(I/O) operation which supports currently available E²Brain™ modules. Do not change this configuration unless the E²Brain™ module employed supports 5V operation.

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1.6 Technical Specifications

Table 1-3: EBC1 Main Specifications

	DESIGNATOR	TYPE	Specifications
Mezzanine Modules	EB405 (currently available)		High Performance PowerPC™ Processor E²Brain™ Module based on IBM's 405EP Integrated Processor PowerPC
	EB425 (currently available)		High Performance XScale Processor E²Brain™ Module based on the Intel™ IXP425
	EB8245 (currently available)		High Performance PowerPC™ Processor E²Brain™ Module based on Motorola's MPC8245 Integrated Processor PowerPC
	EB860 (currently available)		High Performance PowerPC™ Processor E²Brain™ Module based on Motorola's MPC860 Integrated Processor PowerPC
Onboard Controllers	Graphic Controller		C&T 69030 Dual HiQVideo™ Accelerator graphic controller, CRT and TFT, PCI-bus interface
	IDE Controller		PCI-IDE Bridge, Sil680 dual channel
	SuperIO Controller		LPC device for PS2 type keyboard / mouse interface
	Logic Controller		CPLD controller, Altera EPM3128, for digital I/O and seven segment LED display, LPC-bus interface
Embedded Module Interfaces	CON 1	System Interface (SI)	E²Brain™ System Interface, 140-pin HIROSE connector
	CON 2	System Interface Extension (SIE)	E²Brain™ System Interface Extension, 80-pin HIROSE connector
	CON 3	Communications Interface (CI)	E²Brain™ Communications Interface, 80-pin HIROSE connector
	CON 4	Communications Interface Extension (CIE)	E²Brain™ Communications Interface Extension, 140-pin HIROSE connector
System Interfaces	PCI INTERFACES		
	CON 1 (internal)	PCI-bus	Standard PCI bus, 32-bit, 33 MHz
	CON 6	PCI Slot	Single standard PCI expansion slot interface, 124-pin connector
	LPC INTERFACES		
	CON 1 (internal)	LPC-bus	Standard LPC-bus, but no DMA support
	PLCC32 Socket	LPC FLASH	32-pin PLCC socket, supports LPC FLASH for system booting, jumper configurable

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Table 1-3: EBC1 Main Specifications (Continued)

	DESIGNATOR	TYPE	Specifications
System Interfaces	I²C INTERFACES		
	CON 1 (internal)	I²C-bus	Standard I²C-bus The only device on this bus is an EEPROM which is provided for application development of I²C functionality.
	GRAPHIC INTERFACES		
	CON 7	TFT	VGA TTL TFT flat-panel display interface, 40-pin, male, dual pin-row, shrouded connector
	CON 8	CRT	VGA CRT display interface, 15-pin D-Sub connector
	ATA / IDE INTERFACES		
	CON 25	ATA / IDE	Standard ATA/IDE single device interface, 40-pin, male, dual pinrow header connector
	CON 24	ATA / IDE	Standard ATA/IDE single, +5 V, 2.5” device interface, 44-pin, male, dual pinrow, shrouded, latching connector
	CON 23	CompactFLASH	Standard CompactFLASH device interface, 50-pin, male, dual pinrow, shrouded connector
	CON 2 (internal)	CompactFLASH	CompactFLASH interface routed from CON 2 to internal jumpers (J16 to J42) to allow for direct interfacing between the E²Brain™ module and CON 23
	KEYBOARD / MOUSE INTERFACES		
	CON 11	Keyboard / Mouse Port	Mixed keyboard / mouse Super I / O interface, PS2 type, 6-pin, female connector (mouse connection only using Y-cable adapter)
	TERMINAL / CONSOLE INTERFACES		
	CON 9	RS232	TERM1, terminal serial port (no HW handshake), 9-pin, male, D-Sub connector
	CON 10	RS232	TERM2 (SER0), console serial port (no HW handshake), 10-pin, male, shrouded, dual pinrow connector
	CON 22	USB 1.1	USB1, console serial port, 4-pin, type B receptacle connector (reserved for EB425)
	DIGITAL INPUT AND OUTPUT (DIO) INTERFACES		
	CON 19	Digital Output	Four channels of digital output with signal opto-isolation on 10-pin, male, shrouded, dual pinrow connector (DO 0, 1, 2, 3)
	CON 20	Digital Input	Four channels of digital input with signal opto-isolation on 10-pin, male, shrouded, dual pinrow connector (DI 0, 1, 2, 3)
	CON 21	Digital Input / Output	Four channels of digital input and four channels of digital output non-opto-isolated signals on 10-pin, male, shrouded, dual pinrow connector (DI 4, 5, 6, 7 and DO 4, 5, 6, 7)

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Table 1-3: EBC1 Main Specifications (Continued)

	DESIGNATOR	TYPE	Specifications
System Interfaces	SERIAL PERIPHERAL INTERFACE (SPI)		
	CON 2 (internal)	SPI-bus	Standard SPI-bus, slave interface only
	CON 29	SPI	SPI-bus extension, 8-pin, male, dual pinrow, header connector
Communications Interfaces	HIGH SPEED SERIAL INTERFACES		
	CON 12	RS232	SER1, full modem serial port, 9-pin, male, D-Sub connector
	CON 13	RS422 / 485	SER2, half / full duplex serial port, 10-pin, male, shrouded, dual pinrow connector
	CON 14	RS232	SER3, full modem serial port, 9-pin, male, D-Sub connector
	CON 15	RS422 / 485	SER4, half / full duplex serial port, 10-pin, male, shrouded, dual pinrow connector
	ETHERNET INTERFACES		
	CON 16	Fast Ethernet	10 / 100 Mbit Fast Ethernet interface (channel 2), auto-negotiation (second channel of the EB425 and EB405)
	CON 17	Fast Ethernet	10 / 100 Mbit Fast Ethernet interface (channel 1), auto-negotiation
	CAN INTERFACES		
	CON 18	CAN	Single CAN interface (CAN0), selectable with and without opto-isolation, 9-pin, male, D-Sub connector
	UTOPIA INTERFACES		
	CON 28	UTOPIA	UTOPIA interface, shrouded, 50-pin, male, dual pinrow connector (requires external PHY interface)
Monitor and Control (M/C) Interfaces	SWITCH INTERFACES		
	S1	Switch	Abort switch, generates abort input (non-maskable interrupt request)
	S2	Switch	Reset switch, generates reset input
	LED INTERFACES		
	LED1	LED single	+5V power applied indicator, green
	LED2	LED single	+3.3V power applied indicator, green
	LED3	LED single	+12V power applied indicator, green
	LED4	LED seven segment	General purpose indicator, most significant nibble (POST code and application)
	LED5	LED seven segment	General purpose indicator, least significant nibble (POST code and application)
	LED6	LED single	BOOT (BOOT) indicator, green

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Table 1-3: EBC1 Main Specifications (Continued)

	DESIGNATOR	TYPE	Specifications
Monitor and Control (M/C) Interfaces	LED7	LED single	GPIO (U) indicator, green
	LED8	LED single	WDOG (WD) indicator, green
	FE1LG	LED single	FE channel 1 link speed indicator, green, integrated in CON17
	FE1LY	LED single	FE channel 1 link status indicator, yellow, integrated in CON17
	FE2LG	LED single	FE channel 2 link speed indicator, green, integrated in CON16
	FE2LY	LED single	FE channel 2 link status indicator, yellow, integrated in CON16
	SIGNAL INTERFACES (on CON 27)		
	MC2	I/O	Specific use of these signals is function of application and E²Brain™ module employed CON27 is a 6-pin, male, dual pinrow header connector
	MC3	I/O	
	MC5	I/O	
	MC9	I/O	
	MC10	I/O	
	GND	Ground	
Test and Programming (T/P) Interfaces	CON 30	JTAG / DEBUG	EB860 T / P interface, 10-pin, male, dual pinrow header connector
	CON 31	JTAG / DEBUG	EB8245 and EB405 T / P interface, 16-pin, male, dual pinrow header connector
	CON 32	JTAG / DEBUG	EB425 T / P interface, 20-pin, male, dual pinrow header connector
	CON 33	JTAG	EBC1 Logic programming interface, 10-pin, male, dual pinrow, miniature header connector
	CON 34	ATMEL	E²Brain™ module logic programming interface, 6-pin, male, dual pinrow header connector
Power Interfaces	CON 5	+ 12 V	Main input power interface to EBC1 board, 2-pin female receptacle
	CON 1	+ 3.3 V, V(IO)	Input power interface to E²Brain™ module, 140-pin HIROSE connector
	CON 2	+ 3.3 V, V(IO)	Input power interface to E²Brain™ module, 80-pin HIROSE connector
	CON 26	+ 12 V, + 5 V	Output power interface for external IDE devices. Maximum current load for each voltage type is 1.5 A.
	Battery socket	AUX Power	Battery input power interface to E²Brain™ modules for power backup of RTC and SRAM memory devices Battery voltage range: 2.8 to 3.6 volts
	DC / DC	Power converter (onboard)	+ 12 V DC to + 3.3 V DC and + 5 V DC converter, distribution of power to EBC1 board and board connectors

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Table 1-3: EBC1 Main Specifications (Continued)

	DESIGNATOR	TYPE	Specifications
General	Mechanical		Conforms with Kontron Modular Computers' "E²Brain™ Module Specification", revision 01
	Electrical		Main board input power voltage: + 12 V DC Onboard voltages: + 3.3 V DC + 5 V DC + 12 V DC
	Power Consumption		Output rating of the onboard DC / DC converter is 30 W
	Temperature Range		Operational: 0ºC to +70ºC Standard Storage: -55ºC to +125ºC
	Humidity		5% to 90% non-condensing
	Dimensions		244 mm x 244 mm, micro ATX
	Board Weight		362 g (with all connectors populated and no E²Brain™ module installed)

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1.7 Applied Standards

The Kontron Modular Computers' E²Brain™ modules comply with the requirements of the following standards:

Table 1-4: Applied Standards

	TYPE	STANDARD
CE	Emission	EN55022
	Immunity, Industrial Environment	EN61000-6-2
	Immunity, IT Equipment	EN55024
	Electrical Safety	EN60950 Note: The EBC1 is specified I/O only for: SELV and EVL. It is **NOT SPECIFIED** for "Hazardous"
MECHANICAL	Mechanical Dimensions	IEEE 1101.1
ENVIRONMENTAL TESTS	Vibration, Sinusoidal	IEC 60068-2-6
	Random Vibration, Broadband	IEC 60068-2-64
	Bump	IEC 60068-2-29
	Single Shock	IEC 60068-2-27
	Temperature Tests A: Cold	IEC 60068-2-1
	Temperature Tests B: Dry Heat	IEC 60068-2-2
	Climatic Humidity	IEC 60068-2-78
PRODUCT PACKAGING	Transport and Storage	IEC 61131-2
	ESD Protection	IEC 61340-5-1 and IEC 61340-5-2

1.8 Related Publications

Table 1-5: Related Publications

	ISSUED BY	DOCUMENT
PCI	PCI-SIG	PCI Local Bus Specification, R.2.2
LPC	Intel®	Intel® Low Pin Count (LPC) Interface Specification, Rev. 1.1
I²C	Philips	I2C-BUS SPECIFICATION, Rev. 2.1
SPI	Motorola	SPI Block User Guide, Rev. V02.07
E²Brain™	Kontron Modular Computers	E²Brain™ Module Specification, Rev. 01

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Chapter 2

Functional Description

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2. Functional Description

The following chapters present more detailed, board level information about the EBC1 E²Brain™ SAI (Simplified Application Interface) whereby the board components and their basic functionality are discussed in general.

2.1 General Information

The EBC1 is comprised basically of the following:

- E²Brain embedded module interfaces
  - System Interface
  - System Interface Extension
  - Communications Interface
  - Communications Interface Extension
- Board system interfaces:
  - VGA graphics: TFT display and CRT display
  - PCI expansion slot
  - I²C bus
  - Super IO (LPC) (keyboard/mouse)
  - ATA/IDE
  - SPI
  - Terminal and Console (T/C) serial interfacing
  - Monitor and Control (M/C) interfacing
  - Test and Programming (T/P) interfacing
  - CompactFlash (CF) interface
  - Digital input and output interfacing
  - ROM BIOS FLASH
  - DC/DC power supply
- Board communications interfaces:
  - High Speed Serial (HSS) communications
  - Fast Ethernet (FE)
  - CAN
  - UTOPIA

2.1.1 Embedded Module Interfaces

The EBC1 E²Brain™ SAI is supplied with a comprehensive set of embedded module interfacing capabilities. The standard set of system interfaces is routed through the System Interface connector CON1. An extended set of system interfacing is routed through the System Interface Extension connector CON2. The standard set of communications interfaces is routed through the Communications Interface connector CON3. In addition, the EBC1 is provided with the Communications Interface Extension connector CON4.

The System Interface connector CON1 provides interfacing for the following:

- PCI bus
- LPC bus
- I²C bus
- Terminal and Console (T/C) serial interfacing (TERM and SER0)
- Monitor and Control (M/C) interfacing
- Test and Programming (T/P) interfacing

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The System Interface Extension connector CON2 provides interfacing for the following:

- CompactFlash (CF) interface
- SPI bus
- Terminal and Console (T/C) serial interfacing (USB)

The Communications Interface connector CON3 provides interfacing for the following:

- High Speed Serial (HSS) interfacing (TTL level) (SER1, SER2, SER3, SER4)
- Fast Ethernet (MDI interface)
- CAN

The Communications Interface Extension connector CON4 provides interfacing for the following:

- UTOPIA

2.1.2 Board System and Communications Interfaces

The EBC1 supports a very comprehensive sub-set of the E²Brain system and communications interfaces. Refer to the individual connector pinout descriptions for details.

2.2 Board-Level Interfacing Diagrams

The following four figures demonstrate the interfacing structure between the internal processing elements of the EBC1 and other major EBC1 components. The interfacing lines are shown in white where they are on board and in black for board external interfacing.

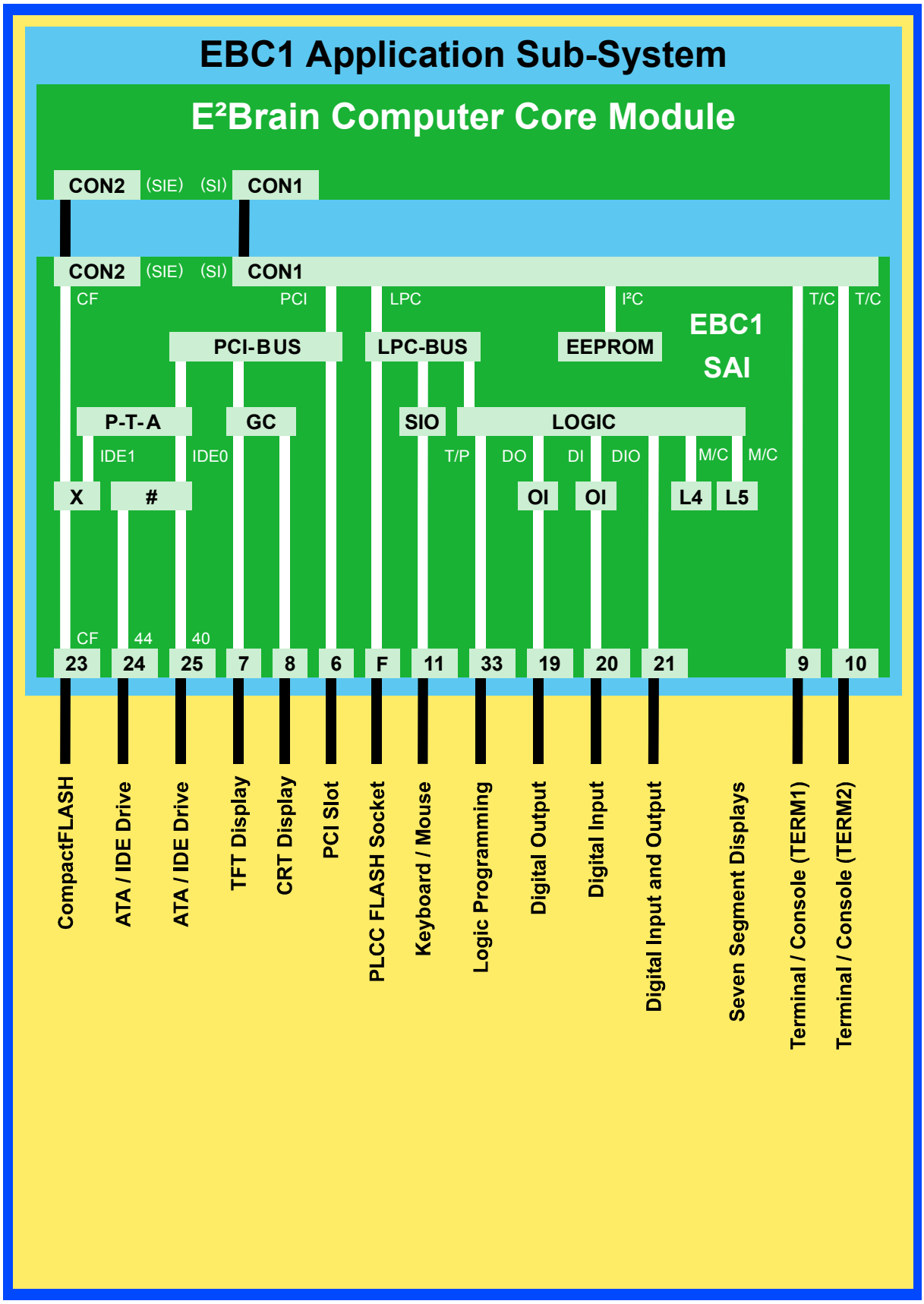
Legend for Figures 2-1 thru 2-4:

#	Interfacing without switching
ATA	AT Attachment
BAT1	Backup battery interface
CAN	Controller Area Network
CF	CompactFlash
CI	Communications Interface
CIE	Communications Interface Extension
DC/DC	DC to DC (converter)
DI	Digital Input
DIO	Digital Input and Output
DO	Digital Output
F	Flash socket
FE	Fast Ethernet
FM	Full modem
GC	Graphics Controller
GPIO	General Purpose Input or Output (LED)
H/F	Half or full (duplex)
HSS	High Speed Serial interfacing
I²C	Inter-Integrated Circuit
IDE	Integrated Device Electronics
L1-8	LEDs 1 through 8
LOGIC	Logic controller
LPC	Low Pin Count
M/C	Monitor and Control
MAG	Magnetics
nn	Connector number nn (CONnn)
OI	Opto-isolation
PCI	Peripheral Component Interface
P-T-A	PCI to ATA Bridge
S1-2	Switch 1 and 2
SAI	Simplified Application Interface
SI	System Interface (CON1)
SIE	System Interface Extension (CON2)
SIO	Super IO
SPI	Serial Peripheral Interface
T/C	Terminal/Console (Serial Interface)
T/P	Test and Programming
TXRX	Transceiver
USB	Universal Serial Bus
UTOPIA	Universal Test and Operations PHY Interface for ATM
WDOG	Watchdog (LED)
X	Interfacing with switching
YG	Yellow and green LEDs (on connector nn)

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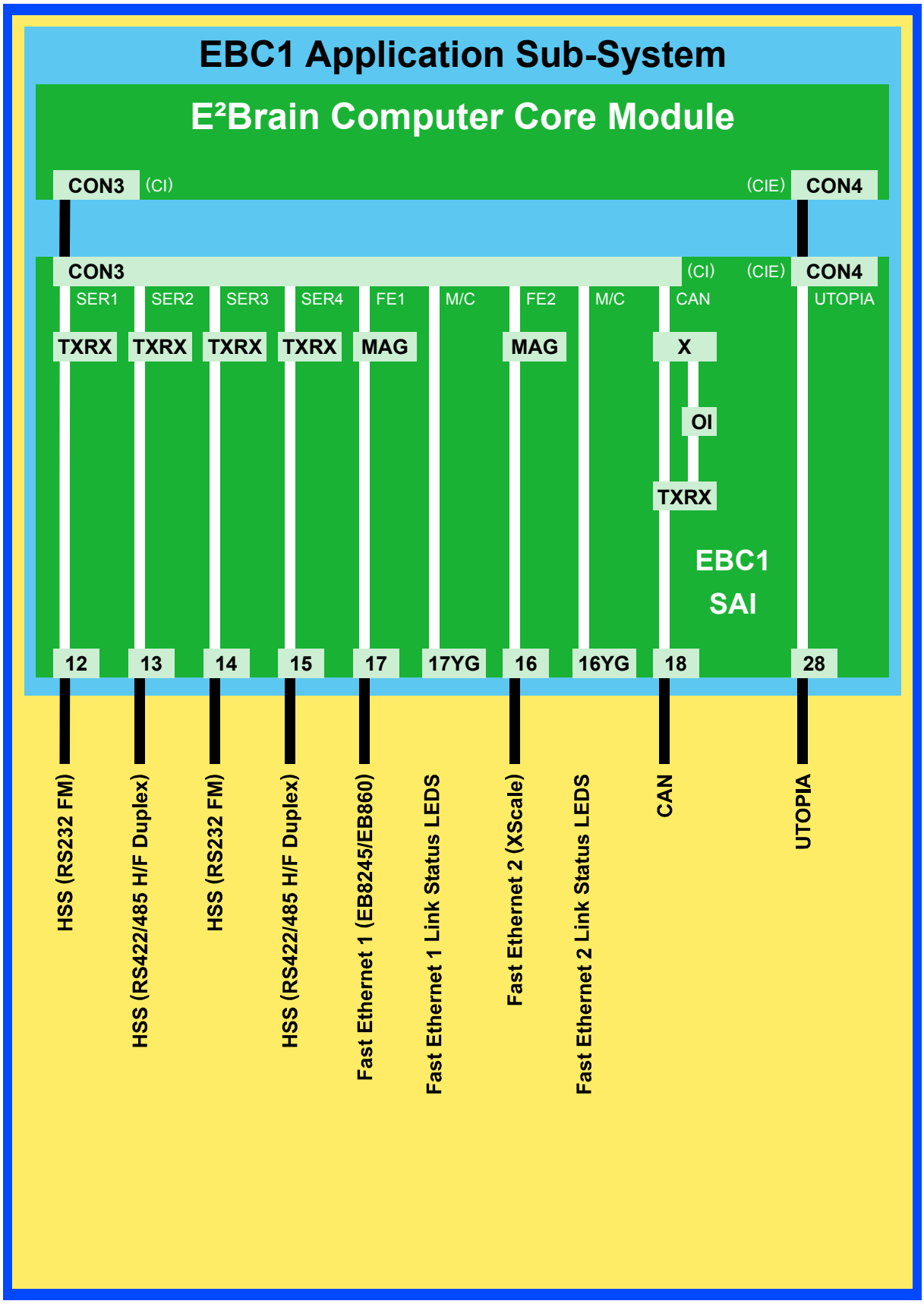
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Figure 2-1: EBC1 Board Level Interfacing (1 of 4)



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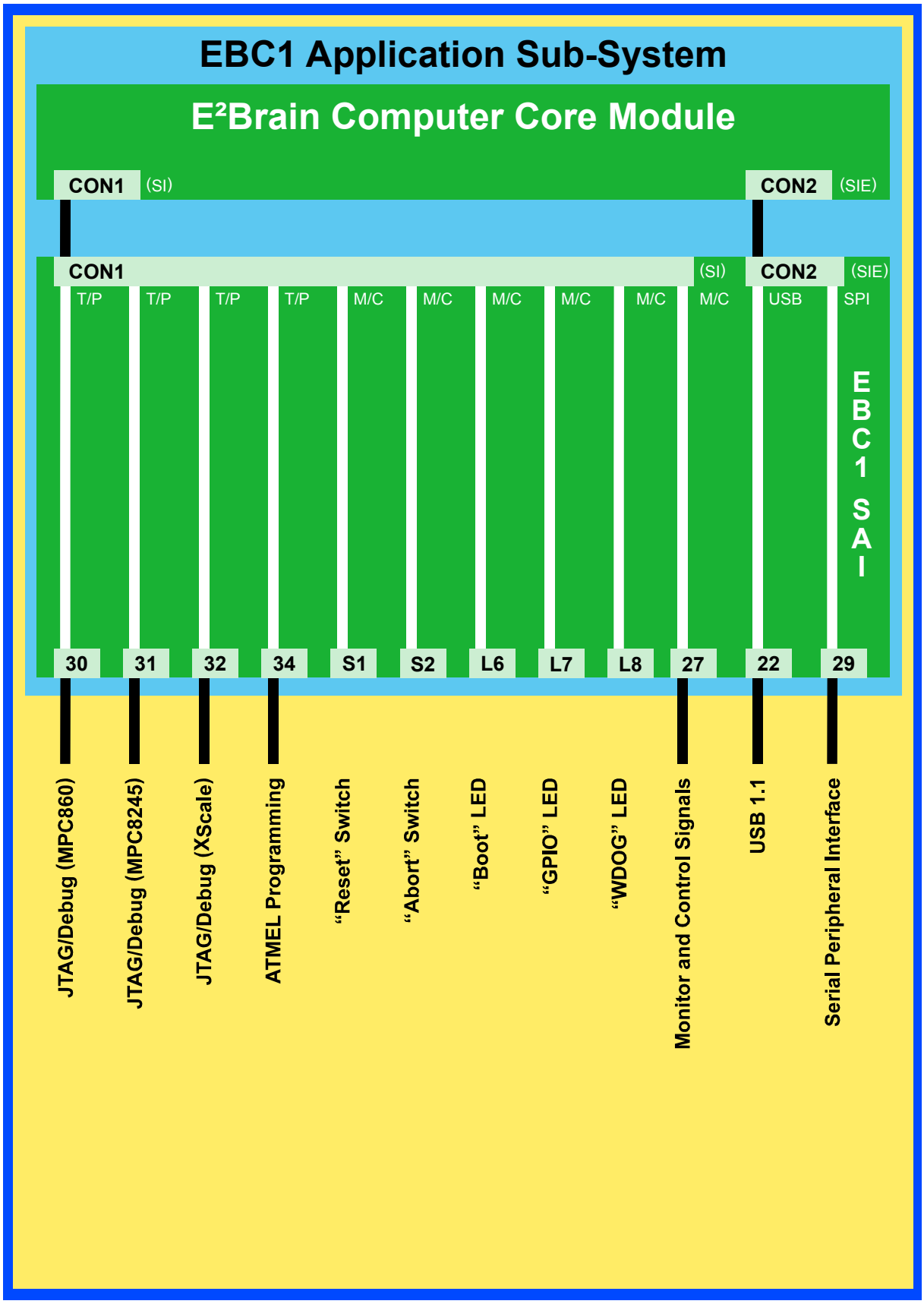
Figure 2-2: EBC1 Board Level Interfacing (2 of 4)



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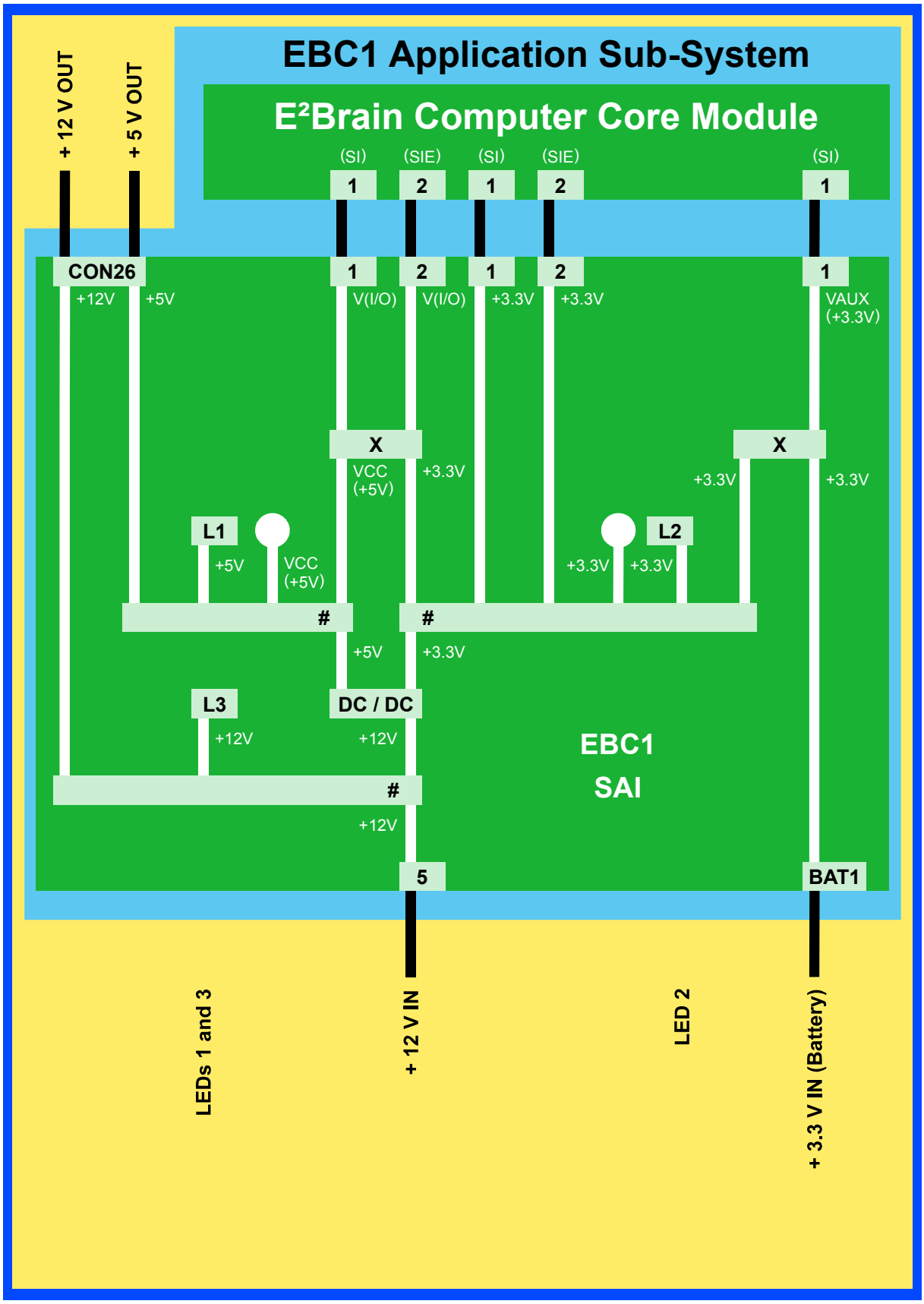
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Figure 2-3: EBC1 Board Level Interfacing (3 of 4)



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Figure 2-4: EBC1 Board Level Interfacing (4 of 4)



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2.3 Embedded Module Interfaces

As the name implies, these interfaces provide the basic interfacing functionality required for the realization of E²Brain™ applications using the EBC1 as the development platform.

2.3.1 Embedded Module System Interface

The System Interface is realized using a 140-pin, HIROSE FX8C-140S-SV connector designated as CON1 (Pn1). The following table provides an overview of the signal types and a brief description of the interfacing realized on this connector. The ensuing sections provide more detailed information concerning the signal specification for this interface.

Table 2-1: System Interface CON1 (Pn1) Signal Types

SIGNAL TYPE	DESCRIPTION
POWER	EBC1 E²Brain™ module input power, grounds, battery backup power, PCI signaling voltage V(I/O)
MONITOR AND CONTROL (M/C)	Monitor signals for LEDs and PCI operation. Control signals for E²Brain™ module operation
TEST AND PROGRAMMING (T/P)	JTAG and DEBUG signals. System programming signals
TERMINAL AND CONSOLE (T/C)	Two serial interfaces: one for connecting a terminal and one for use as a console interface
I2C	One I2C standard interface for low speed, serial, inter-chip communications
LPC	One LPC standard interface for (GP)IOs and simple memory interfacing
PCI	One PCI standard interface for PCI-bus interfacing

2.3.1.1 CON1 (Pn1) Connector Pinout

The following table provides signal pinouts along with information concerning signal characteristics for connector CON1 (Pn1) of EBC1 E²Brain™ module.

Figure 2-5: CON1 - System Interface Connector (SI)

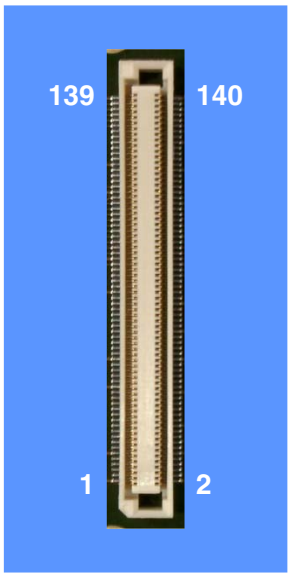


Table 2-2 notes:

1. Emulator VCC: is used to provide the applicable IO voltage to the emulator probe
2. Back-up power for the SRAM and RTC
3. Used in AGENT mode

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Table 2-2: Pinout of CON1 (Pn1) Connector

SIGNAL	DIR	SIGNAL GROUP	PIN	PIN	SIGNAL GROUP	DIR	SIGNAL
GND	I	POWER	1	2	POWER	I	AUX-Power (2
SDA1	I/O	I2C	3	4	I2C	I/O	SCL1
MC6	O	M/C	5	6	POWER	I	+3.3V
MC0	I	M/C	7	8	M/C	O	MC7
MC2	I	M/C	9	10	M/C	I	MC1
+3.3V	I	POWER	11	12	POWER	I	GND
MC3	I	M/C	13	14	M/C	O	MC11
MC4	I	M/C	15	16	M/C	I	MC5
MC9	O	M/C	17	18	M/C	I	MC8
GND	I	POWER	19	20	M/C	I/O	MC10
LPCCLK	O	LPC	21	22	LPC		RESERVED
LAD0	I/O	LPC	23	24	LPC	I/O	LAD1
LAD2	I/O	LPC	25	26	POWER	I	+3.3V
LFRAME#	O	LPC	27	28	POWER	I	GND
SERIRQ#	I/O	LPC	29	30	LPC	I/O	LAD3
TxD1 (TERM)	O	T/C	31	32	LPC		RESERVED
+3.3V	I	POWER	33	34	T/C	O	TxD2 (SER0)
GND	I	POWER	35	36	T/C	I	RxD2 (SER0)
RxD1 (TERM)	I	T/C	37	38	T/P	O	VFLS0/QUACK
EMU_VCC (1	O	T/P	39	40	T/P	I	COP-HRST/HRESET
CKSTP_OUT/VFLS1	O	T/P	41	42	POWER	I	GND
COP-SRST/SRESET	O	T/P	43	44	T/P	I	TMS
TRST	I	T/P	45	46	POWER	I	+3.3V
TCK	I	T/P	47	48	T/P	O	TDO
RESERVED		I2C	49	50	T/P	I	TDI
GND	I	POWER	51	52	I2C		RESERVED
PCI-CLK-OUT-0	O	PCI	53	54	POWER	I	V(I/O)
+3.3V	I	POWER	55	56	PCI	I	PCI-CLK-IN (3
PCI-CLK-OUT-1	O	PCI	57	58	POWER	I	GND
PCI-RST#	I/O	PCI	59	60	PCI	O	PCI-CLK-OUT-2
INTA#	I/O	PCI	61	62	PCI	I	INTC#
INTB#	I	PCI	63	64	PCI-MASTER	I/O	GNT#1
INTD#	I	PCI	65	66	POWER	I	+3.3V
GND	I	POWER	67	68	PCI-MASTER	O	GNT#2
AD31	I/O	PCI	69	70	PCI-MASTER	O	GNT#3

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Table 2-2: Pinout of CON1 (Pn1) Connector

SIGNAL	DIR	SIGNAL GROUP	PIN	PIN	SIGNAL GROUP	DIR	SIGNAL
AD29	I/O	PCI	71	72	PCI-MASTER	I/O	REQ#1
AD27	I/O	PCI	73	74	PCI-MASTER	I	REQ#2
+3.3V	I	POWER	75	76	POWER	I	GND
AD25	I/O	PCI	77	78	PCI-MASTER	I	REQ#3
C/BE3#	I/O	PCI	79	80	PCI	I/O	AD30
AD23	I/O	PCI	81	82	PCI	I/O	AD28
GND	I	POWER	83	84	PCI	I/O	AD26
AD21	I/O	PCI	85	86	PCI	I/O	AD24
V(I/O)	I	POWER	87	88	POWER	I	+3.3V
AD19	I/O	PCI	89	90	PCI	I/O	IDSEL
AD17	I/O	PCI	91	92	POWER	I	GND
C/BE2#	I/O	PCI	93	94	PCI	I/O	AD22
+3.3V	I	POWER	95	96	PCI	I/O	AD20
IRDY#	I/O	PCI	97	98	PCI	I/O	AD18
DEVSEL#	I/O	PCI	99	100	PCI	I/O	AD16
GND	I	POWER	101	102	PCI	I/O	FRAME#
PCI-X-CAP	I/O	PCI	103	104	POWER	I	GND
LOCK#	I/O	PCI	105	106	PCI	I/O	TRDY#
PERR#	I/O	PCI	107	108	PCI	I/O	STOP#
SERR#	I/O	PCI	109	110	POWER	I	+3.3V
GND	I	POWER	111	112	PCI	I/O	PAR
C/BE1#	I/O	PCI	113	114	PCI	I/O	AD15
AD14	I/O	PCI	115	116	POWER	I	V(I/O)
AD12	I/O	PCI	117	118	PCI	I/O	AD13
AD10	I/O	PCI	119	120	PCI	I/O	AD11
+3.3V	I	POWER	121	122	PCI	I/O	AD9
M66EN	I/O	PCI	123	124	POWER	I	GND
AD8	I/O	PCI	125	126	PCI	I/O	C/BE0#
AD7	I/O	PCI	127	128	PCI	I/O	AD6
AD5	I/O	PCI	129	130	POWER	I	+3.3V
GND	I	POWER	131	132	PCI	I/O	AD4
AD3	I/O	PCI	133	134	PCI	I/O	AD2
AD1	I/O	PCI	135	136	PCI	I/O	AD0
ACK64#	I/O	PCI	137	138	PCI	I/O	REQ64#
+3.3V	I	POWER	139	140	POWER	I	GND

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2.3.1.2 Power Interface

For the EBC1 E²Brain™ module, a single power supply voltage of 3.3 VDC is specified. The following table summarizes the power specifications.

Table 2-3: EBC1 Power Interface Requirements

VOLTAGE	DESCRIPTION
+ 3.3 VDC	Input voltage tolerance: +5% to -3% Supply voltage ripple: 100 mV peak-to-peak
GND	Ground voltage reference input
AUX-Power	Optional auxiliary power input for battery backup of RTC and/or SRAM devices
V(I/O)	PCI signalling voltage selection. Requires 5V if a connected PCI device on carrier is a 5V only PCI device, otherwise 3.3V.

2.3.1.3 Monitor and Control Interface

This interface is comprised of a set of twelve IO signals which can be used to facilitate system integration.

The following table provides a listing of Monitor and Control signals along with a brief description.

Table 2-4: Monitor and Control Interface Signal Description

SIGNAL	PIN	DESCRIPTION
MC0	7	Input (refer to the respective E²Brain™ module documentation for details)
MC1	10	Input (refer to the respective E²Brain™ module documentation for details)
MC2	9	Input (refer to the respective E²Brain™ module documentation for details)
MC3	13	Input (refer to the respective E²Brain™ module documentation for details)
MC4	15	Input (refer to the respective E²Brain™ module documentation for details)
MC5	16	Input (refer to the respective E²Brain™ module documentation for details)
MC6	5	Output (refer to the respective E²Brain™ module documentation for details)
MC7	8	Output (refer to the respective E²Brain™ module documentation for details)
MC8	18	Input (refer to the respective E²Brain™ module documentation for details)
MC9	17	Output (refer to the respective E²Brain™ module documentation for details)
MC10	20	Output (refer to the respective E²Brain™ module documentation for details)
MC11	14	Output (refer to the respective E²Brain™ module documentation for details)

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2.3.1.4 Test and Programming Interface

The Test and Programming interface supports JTAG/DEBUG and ISP operations. This interface can be used for connecting hardware emulators and debuggers (e.g. BDM, COP, …), and for “in system programming” (ISP) of programmable hardware as well as in system testing (JTAG). It is comprised of a set of six signals whereby some are common to all three interfaces and some are dedicated to only one.

The following table provides a listing of the Test and Programming interface signals and a brief description.

Table 2-5: Test and Programming Interface Signal Description

SIGNAL	DESCRIPTION
TCK	Test Clock in for JTAG/ISP and emulator/debugger
TDI	Test Data In for JTAG/ISP and emulator/debugger
TDO	Test Data Out JTAG/ISP and emulator/debugger
TMS	Test Mode Select, input for JTAG/ISP and emulator/debugger
TRST	Test Reset, input for JTAG/ISP and emulator/debugger
HRST	Hard Reset, emulator/debugger hard reset In
COP_SRST/SRESET	Soft Reset, emulator/debugger soft reset Out
VFLS0/QUACK	Emulator/debugger specific control/status
CKSTP_OUT/VFLS1	Emulator/debugger specific control/status
EMU_VCC	Reference Voltage of the JTAG/DEBUG core

2.3.1.5 Terminal and Console Interface

The EBC1 provides two serial interfaces for supporting a terminal port and a low speed communications interface (console) for firmware updating. These interfaces are realized using the CPU on-chip dual UART, and as such provide only a two wire interface without hardware handshake signals.

The following table provides a listing of the Terminal and Console interface signals and a brief description.

Table 2-6: Terminal and Console Interface Signal Description

SIGNAL	DESCRIPTION
TxD1, TxD2 (TERM, SER0)	Serial Transmit Data outputs, channel 1 and 2
RxD1, RxD2 (TERM, SER0)	Serial Receive Data signal inputs, channel 1 and 2

In addition to the above interfaces, the EBC1 also provides a standard USB 1.1 interface on CON22 as an option.

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2.3.1.6 I2C Interface

The EBC1 E²Brain™ module provides one I2C serial interface for supporting direct interfacing to the EBC1 carrier board devices. This interface is two signals wide and fully supports the I2C specification.

The following table provides a listing of the I2C interface signals and a brief description.

Table 2-7: I2C Interface Signal Description

SIGNAL	DESCRIPTION
SCL1	Serial Clock line, channel 1
SDA1	Serial Data line, channel 1

2.3.1.7 LPC Interface

One Low Pin Count (LPC) interface for supporting simple IOs, simple static memory devices, and IO controllers is available to the EBC1.

The controller is completely integrated in the E²Brain™ module and offers an 8-bit data access port to devices which use LPC IO or memory access protocols. I/O and memory area are selected using different address spaces.

The I/O address space is 64 kByte in size, whereas the memory area offers 16 MByte address space. For respective address mapping, refer to the corresponding E²Brain™module documentation.

In addition, a serial IRQ controller is also implemented in the E²Brain™ module, controlling and collecting the serial LPC IRQs and converting and processing them to IRQs for the CPU. DMA, however, is not supported by this interface.

The following table provides a listing of the LPC interface signals and a brief description.

Table 2-8: LPC Interface Signal Description

SIGNAL	DESCRIPTION
LAD[0:3]	Multiplexed Command, Address, and Data lines
LFRAME#	Indicates start of a new cycle, termination of broken cycle
LPCCLK	33 MHz clock
SERIRQ	Serialized IRQ, optional for peripherals that need interrupt

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2.3.1.8 PCI Interface

In contrast to all other PCI based modules, the E²Brain™ modules are capable of both PCI Master mode and PCI Agent mode. PCI Agent mode can be selected by setting the AGENT signal on the System Interface to low.

In PCI Master mode (default by the EBC1), the E²Brain™ module operates as the host, initializing and controlling up three PCI devices on the EBC1, whereas, in the Agent mode, the E²Brain™ module itself operates as a PCI target.

The following table identifies the EBC1 PCI bus signals and provides a short description of each signal.

Table 2-9: PCI Interface Signal Description

SIGNAL	DESCRIPTION
AD [0:31]	PCI multiplexed address and data bus
INT [A, B, C, D]#	PCI interrupt requests
C/BE [0:3]#	PCI multiplexed bus command and byte enable
IRDY#	Initiator Ready indicates the current bus master is ready to complete the current data phase.
TRDY#	Target Ready indicates the selected device is ready to complete the current data phase.
PCI-RST#	PCI Reset signal, is also used for LPC devices
PCI-CLK-OUT- [1:3]	PCI clock Outputs for up to 3 external bus mastering PCI devices. All PCI signals except PCI_RST#, and INT [A, B, C, D] # are sampled on the rising edge. (Consider routing guidelines for Carrier board)
FRAME#	Indicate the beginning and duration of a PCI access.
STOP#	Indicates the target is requesting the master to stop the current transaction
DEVSEL#	Device select generated by the target when cycle refers to its own address.
REQ [1:3]#	PCI Arbiter requests
GNT [1:3]#	PCI Arbiter grants
PAR	Calculated/Checked Parity
PERR#	Parity Error
LOCK#	PCI Lock resource signal
SERR#	System Error
REQ64#	PCI request for a 64-bit access
ACK64#	PCI grant for a 64-bit access
PCI-CLK-IN	PCI clock input, used in agent mode
AGENT	PCI-agent mode logic input, 0 -> PCI agent mode, 1 -> system controller

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2.3.2 System Interface Extension

The System Interface Extension is realized using an 80-pin, HIROSE FX8C-80S-SV connector designated as CON2 (Pn2), and it is used to provide CPU architecture specific system interfaces.

In the case of the EBC1, a CompactFlash interface (EB405, EB425, EB8245), an SPI interface (EB860), and a USB 1.1 interface (EB425) are made available on the System Interface Extension. The following sections provide further information concerning these interfaces.

2.3.2.1 CON2 (Pn2) Connector Pinout

The following figure and table provide pinout information for CON2 (Pn2).

Figure 2-6: CON2 - System Interface Extension Connector (SIE)

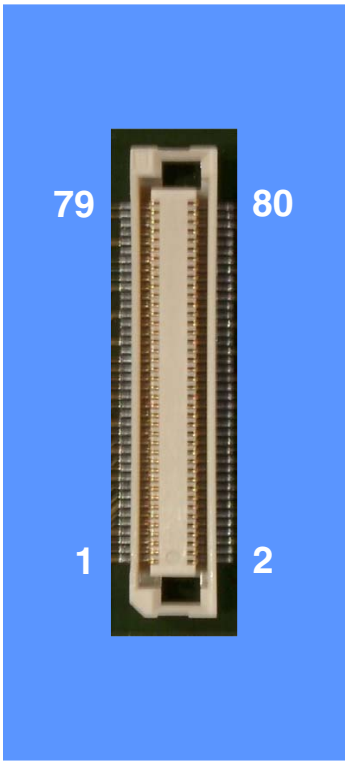


Table 2-10: Pinout of CON2 (Pn2) Connector

SIGNAL	PIN	PIN	SIGNAL	SIGNAL	PIN	PIN	SIGNAL
GND	1	2	CF_CD1	CF_D9	41	42	GND
CF_D3	3	4	CF_D11	V(I/O)	43	44	CF_CS16
CF_D4	5	6	+3.3V	CF_D10	45	46	CF_CD2
+3.3V	7	8	CF_D12	ATA_ DMARQ	47	48	GND
CF_D5	9	10	CF_D13	+3.3V	49	50	ATA/DMACK
CF_D6	11	12	GND	AC97- BIT_CLK	51	52	AC97-SYNC
GND	13	14	CF_D14	AC97- SDATA_IN	53	54	GND
CF_D7	15	16	CF_D15	GND	55	56	AC97- SDATA_OUT
CF_CS0	17	18	+3.3V	NC	57	58	NC
GND	19	20	CF_CS1	NC	59	60	+3.3V
CF_RD	21	22	CF_WR	GND	61	62	SPI_CLK
CF_INTRQ	23	24	GND	SPI_TXD	63	64	SPI_CS0
GND	25	26	CF_RST	SPI_RXD	65	66	GND
CF_IORDY	27	28	CF_A2	SPI_CS1	67	68	SPI_CS2
CF_A1	29	30	GND	NC	69	70	NC
+3.3V	31	32	CF_A0	+3.3V	71	72	DISP. ENAVDD
CF_DASP	33	34	CF_D0	NC	73	74	DISP.ENABKL
CF_PDIAG	35	36	+3.3V	NC	75	76	GND
GND	37	38	CF_D1	USB1+	77	78	USB2+
CF_D8	39	40	CF_D2	USB1-	79	80	USB2-

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2.3.2.2 CompactFlash Interface

The following table provides a summary of the CompactFlash signals implemented on the System Interface Extension connector.

Table 2-11: CompactFlash Interface Signals

SIGNAL	DESCRIPTION
CF-D[0:15]	Compact Flash data bus – 16-bit wide
CF-CS[0:1]	Compact Flash chip select
CF-RD	Compact Flash IO read strobe
CF-WR	Compact Flash IO write strobe
CF-RST	Compact Flash reset, active low
CF-INTRQ	Compact Flash interrupt request, active high
CF-IORDY	Compact Flash IO ready
CF-A[0:2]	Compact Flash address lines

The CompactFlash interface is realized as a true IDE interface (PIO mode). The PC CARD Memory Mode and the PC Card I/O Mode of the Compact Flash Specification are not supported. In addition, the pinout for the Compact Flash signals have been optimized for routing to a CompactFlash socket.

2.3.2.3 SPI Interface

The following table provides a summary of the SPI signals implemented on the System Interface Extension connector. The SPI interface on the E²Brain™ module is implemented only as a master interface, therefore only slave devices may be connected to this interface.

Table 2-12: SPI Interface Signals

SIGNAL	DESCRIPTION	SIGNAL	DESCRIPTION
SPI_CLK	SPI bus clock signal	SPI_CS0	SPI chip select 0
SPI_TXD	SPI output data	SPI_CS1	SPI chip select 1
SPI_RXD	SPI input data	SPI_CS2	SPI chip select 2

2.3.2.4 USB 1.1 Interface

The following table provides a summary of the USB 1.1 signals implemented on the System Interface Extension connector.

Table 2-13: USB Interface Signals

SIGNAL	DESCRIPTION	SIGNAL	DESCRIPTION
USB1+	Serial data + interface 1	USB2+	Serial data + interface 2
USB1-	Serial data - interface 1	USB2-	Serial data - interface 2

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2.3.3 Communications Interface

The Communications Interface Connector CON3 (Pn3), is used to provide a set of standard communications interfaces. In the case of the EBC1, there are three types of interfaces provided: four high speed serial interfaces, two Fast Ethernet interfaces, and one CAN interface.

All of these interfaces are provided on the Communications Interface CON3 (Pn3) connector (an 80-pin, HIROSE FX8C-80S-SV connector).

The following figure and table provide pinout information for CON3 (Pn3).

Figure 2-7: CON3 - Communications Interface Connector (CI)

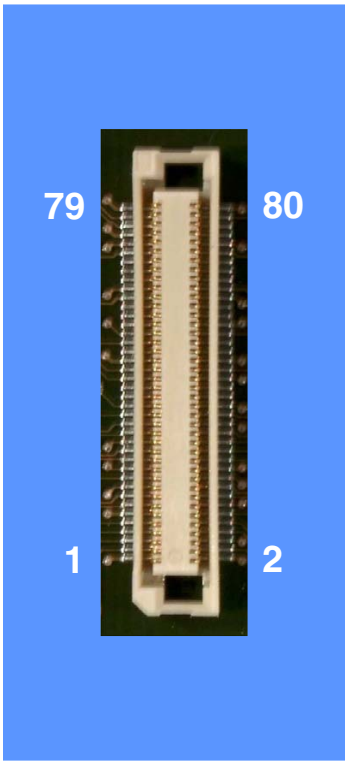


Table 2-14: Pinout of CON3 (Pn3) Connector

SIGNAL	PIN	PIN	SIGNAL
GND	1	2	GND
SER_DSR1/ TCLK1	3	4	SER_RI1/ RCLK1
SER_RTS1	5	6	SER_CTS1
SER_TXD1	7	8	SER_RXD1
SER_DTR1	9	10	SER_CD1
GND	11	12	SER_RI2/ RCLK2
SER_DSR2/ TCLK2	13	14	SER_CTS2
SER_RTS2	15	16	SER_RXD2
SER_TXD2	17	18	SER_CD2
SER_DTR2	19	20	SER_RI3/ RCLK3
SER_DSR3/ TCLK3	21	22	GND
SER_RTS3	23	24	SER_CTS3
SER_TXD3	25	26	SER_RXD3
SER_DTR3	27	28	SER_CD3
SER_DSR4/ TCLK4	29	30	SER_RI4/ RCLK4
SER_RTS4	31	32	SER_CTS4
SER_TXD4	33	34	SER_RXD4
SER_DTR4	35	36	SER_CD4
NC	37	38	NC
NC	39	40	NC

SIGNAL	PIN	PIN	SIGNAL
CAN1 TXD0	41	42	CAN1 RXD0
CAN1 TXD1	43	44	CAN1 RXD1
GND	45	46	GND
NC	47	48	NC
ETH2_LINK	49	50	NC
ETH2_ACT	51	52	ETH2_SPEED
ETH2_SD	53	54	GND
NC	55	56	NC
NC	57	58	NC
ETH2_T-	59	60	ETH2_R-
ETH2_T+	61	62	ETH2_R+
NC	63	64	NC
NC	65	66	NC
NC	67	68	NC
ETH1_T-	69	70	ETH1_R-
ETH1_T+	71	72	ETH1_R+
GND	73	74	ETH1_SD
ETH1_LINK	75	76	NC
ETH1_ACT	77	78	ETH1_SPEED
GND	79	80	GND

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2.3.3.1 High Speed Serial Interfaces

Four, full modem, serial ports (SER1, 2, 3 and 4) are available on the EBC1 SAI. Depending on the E²Brain™ module employed with the EBC1 up to eight signals per port are provided to realize asynchronous or synchronous (EB860) high speed serial links interfaced using dedicated controlling/handshaking.

The following table provides a summary of the HSS signals implemented on the Communications Interface connector.

Table 2-15: High Speed Serial Interface Signal Type and Description

SIGNAL	DESCRIPTION
TXD	Transmit data output
RXD	Receive data input
RTS	Request to send output
CTS	Clear to send input
DTR	Data terminal ready output
CD	Carrier detect input
TCLK/DSR	Transmit clock for synchronous transmissions/Data set ready input
RCLK/RI	Receive clock for synchronous transmissions/Ring indicator input

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2.3.3.2 Ethernet Interface

The EBC1 SAI provides two Fast Ethernet interfaces: FE1 for EB405, EB425, EB8245, and EB860 E²Brain™ modules and FE2 for the EB405 and EB425 E²Brain™ modules. FE2 is an optional interface.

For monitoring and control purposes, LED functionality is provided to indicate activity, link, and speed status information for the respective interfaces.

Table 2-16: Ethernet Port Signal Type and Description

SIGNAL	DESCRIPTION
ETH1_T+, ETH2_T+	Transmit pair in 10BaseT/100BaseTX configuration
ETH1_T-, ETH2_T-	
ETH1_R+, ETH2_R+	Receive pair in 10BaseT/100BaseTX configuration
ETH1_R-, ETH2_R-	
ETH1_LINK, ETH2_LINK	Indicates that link is present Asserted: link is present
ETH1_ACT, ETH2_ACT	Indicates that link is actively transmitting data Asserted intermittently: traffic on link
ETH1_SPEED, ETH2_SPEED	Indicates link speed Not asserted: 10 Mb Asserted: 100 Mb

2.3.3.3 CAN Interface

The EBC1 SAI provides only one Controller Area Network (CAN) interface. Defaultwise, CAN A0 is implemented on the EBC1. If CAN A1 is required, it must be specified when ordering the EBC1. In addition, the default configuration for this interface is with opto-isolation. Again if non-opto-isolation is required, it also must be specified when ordering.

The following table provides a summary of the CAN signals implemented on the Communications Interface connector.

Table 2-17: CAN Port Signal Type and Description

SIGNAL	DESCRIPTION
CANTXA0	Transmit data output driver (default)
CANRXA0	Receive data input channel (default)
CANTXA1	Transmit data output driver
CANRXA1	Receive data input channel

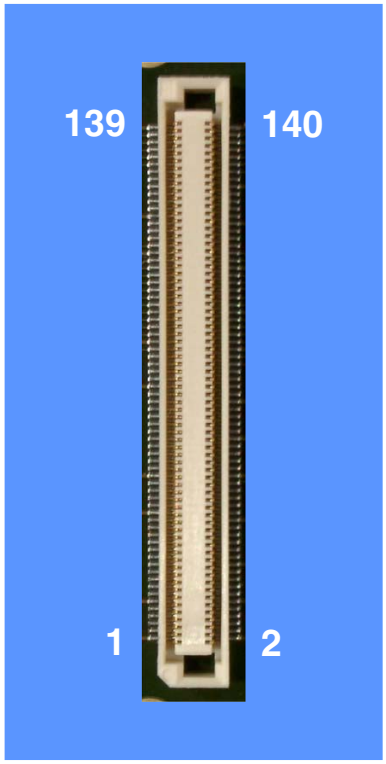
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2.3.4 Communications Interface Extension

The Communications Interface Extension is realized using a 140-pin, HIROSE FX8C-140S-SV connector designated as CON4 (Pn4). The following table provides signal pinouts along with information concerning signal characteristics for connector CON4 (Pn4) of the EBC1 SAI.

Figure 2-8: CON4 - Communications Interface Extension Connector (CIE)



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Table 2-18: Pinout of CON4 (Pn4) Connector

SIGNAL	DIR	SIGNAL GROUP	PIN	PIN	SIGNAL GROUP	DIR	SIGNAL
GND	I	POWER	1	2	POWER	I	GND
NC	-	-	3	4	-	-	NC
NC	-	-	3	4	-	-	NC
NC	-	-	3	4	-	-	NC
NC	-	-	3	4	-	-	NC
GND	I	POWER	11	12	POWER	I	GND
NC	-	-	13	14	-	-	NC
NC	-	-	15	16	-	-	NC
NC	-	-	17	18	-	-	NC
NC	-	-	19	20	-	-	NC
NC	-	-	21	22	POWER	I	GND
NC	-	-	23	24	-	-	NC
NC	-	-	25	26	-	-	NC
NC	-	-	27	28	-	-	NC
NC	-	-	29	30	-	-	NC
NC	-	-	31	32	-	-	NC
NC	-	-	33	34	POWER	I	GND
GND	I	POWER	35	36	-	-	NC
NC	-	-	37	38	-	-	NC
NC	-	-	39	40	-	-	NC
NC	-	-	41	42	-	-	NC
NC	-	-	43	44	-	-	NC
GND	I	POWER	45	46	POWER	I	GND
NC	-	-	47	48	-	-	NC
NC	-	-	49	50	-	-	NC
NC	-	-	51	52	-	-	NC
NC	-	-	53	54	-	-	NC
NC	-	-	55	56	POWER	I	GND
NC	-	-	57	58	-	-	NC
NC	-	-	59	60	-	-	NC
NC	-	-	61	62	-	-	NC
NC	-	-	63	64	-	-	NC
NC	-	-	65	66	POWER	I	GND
NC	-	-	67	68	-	-	NC
GND	I	POWER	69	70	-	-	NC

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Table 2-18: Pinout of CON4 (Pn4) Connector

SIGNAL	DIR	SIGNAL GROUP	PIN	PIN	SIGNAL GROUP	DIR	SIGNAL
NC	-	-	71	72	-	-	NC
NC	-	-	73	74	-	-	NC
NC	-	-	75	76	UTOPIA	O	UTP1_TxD0
NC	-	-	77	78	UTOPIA	O	UTP1_TxD2
UTP1_TxD1	O	UTOPIA	79	80	POWER	I	GND
GND	I	POWER	81	82	UTOPIA	O	UTP1_TxD4
UTP1_TxD3	O	UTOPIA	83	84	UTOPIA	O	UTP1_TxD6
UTP1_TxD5	O	UTOPIA	85	86	UTOPIA	I	UTP1_RxD6
UTP1_TxD7	O	UTOPIA	87	88	UTOPIA	I	UTP1_RxD4
UTP1_RxD7	I	UTOPIA	89	90	POWER	I	GND
UTP1_RxD5	I	UTOPIA	91	92	UTOPIA	I	UTP1_RxD2
UTP1_RxD3	I	UTOPIA	93	94	UTOPIA	I	UTP1_RxD0
UTP1_RxD1	I	UTOPIA	95	96	UTOPIA	I	UTP1_RxA4
UTP1_TxA4	O	UTOPIA	97	98	UTOPIA	I	UTP1_RxA3
UTP1_TxA3	O	UTOPIA	99	100	UTOPIA	I	UTP1_RxA2
UTP1_TxA2	O	UTOPIA	101	102	POWER	I	GND
UTP1_TxA1	O	UTOPIA	103	104	UTOPIA	I	UTP1_RxA1
GND	I	POWER	105	106	UTOPIA	I	UTP1_RxA0
UTP1_TxA0	O	UTOPIA	107	108	-	-	NC
NC	-	-	109	110	-	-	NC
NC	-	-	111	112	-	-	NC
NC	-	-	113	114	POWER	I	GND
GND	I	POWER	115	116	-	-	NC
NC	-	-	117	118	-	-	NC
NC	-	-	119	120	-	-	NC
NC	-	-	121	122	-	-	NC
NC	-	-	123	124	POWER	I	GND
NC	-	-	125	126	-	-	NC
NC	-	-	127	128	UTOPIA	O	UTP1_TxClav
UTP1_TxEnb	O	UTOPIA	129	130	UTOPIA	I	UTP1_RxEnb
UTP1_TxSOC	O	UTOPIA	131	132	UTOPIA	I	UTP1_RxClav
UTP1_RxSOC	I	UTOPIA	133	134	UTOPIA	I	UTP1_RxCLK
UTP1_RxPrty	I	UTOPIA	135	136	POWER	I	GND
UTP1_TxPrty	O	UTOPIA	137	138	UTOPIA	O	UTP1_TxCLK
GND	I	POWER	139	140	POWER	I	GND

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2.3.5 Monitor and Control (M/C)

Monitor and Control functions are divided essentially into Pre-operation and Operation. Pre-operation M/C deals with board configuration and system requirements. Operation M/C covers direct operational interfaces.

2.3.5.1 Pre-Operation M/C

Pre-operation M/C is a direct function of the application and the system requirements. These requirements dictate the EBC1 configuration as well as the overall system integration. Overall system integration and compliance with its requirements is beyond the scope of this manual.

2.3.5.2 Operation M/C

Operation M/C is primarily a function of the E²Brain™ module driver software and the application. M/C signals are available, and, if implemented as part of the application, the operator as well as application software has access to these functions.

2.4 Board Interfaces

The following sections provide detailed information regarding the connector layout and pinout of the various board interfaces of the EBC1. The section ordering is by the connector designator.

2.4.1 CON5 - 12V DC Power Input Connector

This connector is used for providing main input power to the EBC1 E²Brain™

Figure 2-9: CON5 - 12V DC Power Input Connector

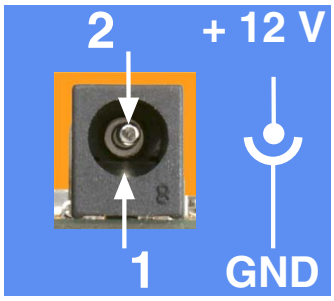


Table 2-19: Pinout of CON5

PIN	DESCRIPTION
1	GND
2	+ 12 V DC

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2.4.2 CON6 - PCI Expansion Slot Connector

This connector is used for providing interfacing for one standard PC PCI board. The factory setting for V(I/O) is +3.3 V. If required, it can be set to +5 V. Refer to section 4.2.3 for configuration information. CON6 is a standard 124-pin, 5V coded, PC PCI expansion slot connector. Only universally or 5V coded PCI cards may used with this connector.

Figure 2-10: CON6 - PCI Expansion Slot Connector

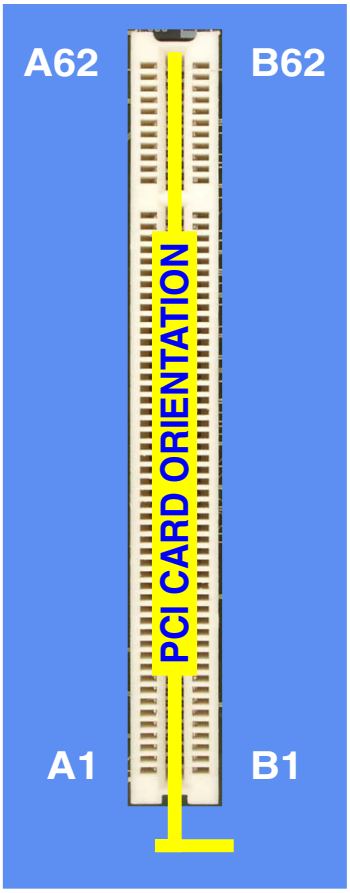


Table 2-20: Pinout of CON6

SIGNAL	PIN	PIN	SIGNAL	SIGNAL	PIN	PIN	SIGNAL
TRST#	A1	B1	-12V	AD16	A32	B32	AD17
+12V	A2	B2	TCK	+3.3V	A33	B33	C/BE2#
TMS	A3	B3	GND	FRAME#	A34	B34	GND
TDI	A4	B4	TDO	GND	A35	B35	IRDY#
+5V	A5	B5	+5V	TRDY#	A36	B36	+3.3V
INTA#	A6	B6	+5V	GND	A37	B37	DEVSEL#
INTC#	A7	B7	INTB#	STOP#	A38	B38	GND
+5V	A8	B8	INTD#	+3.3V	A39	B39	LOCK#
RES	A9	B9	PRSNT1#	RES	A40	B40	PERR#
V(I/O)	A10	B10	RES	RES	A41	B41	+3.3V
RES	A11	B11	PRSNT2#	GND	A42	B42	SERR#
GND	A12	B12	GND	PAR	A43	B43	+3.3V
GND	A13	B13	GND	AD15	A44	B44	C/BE1#
3.3Vaux	A14	B14	RES	+3.3V	A45	B45	AD14
RST#	A15	B15	GND	AD13	A46	B46	GND
V(I/O)	A16	B16	CLK	AD11	A47	B47	AD12
GNT#	A17	B17	GND	GND	A48	B48	AD10
GND	A18	B18	REQ#	AD9	A49	B49	GND
PME#	A19	B19	V(I/O)	Key	A50	B50	Key
AD30	A20	B20	AD31	Key	A51	B51	Key
+3.3V	A21	B21	AD29	C/BE0#	A52	B52	AD8
AD28	A22	B22	GND	+3.3V	A53	B53	AD7
AD26	A23	B23	AD27	AD6	A54	B54	+3.3V
GND	A24	B24	AD25	AD4	A55	B55	AD5
AD24	A25	B25	+3.3V	GND	A56	B56	AD3
IDSEL	A26	B26	C/BE3#	AD2	A57	B57	GND
+3.3V	A27	B27	AD23	AD0	A58	B58	AD1
AD22	A28	B28	GND	V(I/O)	A59	B59	V(I/O)
AD20	A29	B29	AD21	REQ64#	A60	B60	ACK64#
GND	A30	B30	AD19	+5V	A61	B61	+5V
AD18	A31	B31	+3.3V	+5V	A62	B62	+5V

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2.4.3 CON7 - Flatpanel Display Connector

This connector is used to provide interfacing between the EBC1 and TFT flatpanel displays at TTL levels. This is a 40-pin, male, dual pinrow, shrouded header type connector.

Figure 2-11: CON7 - Flatpanel Display Connector

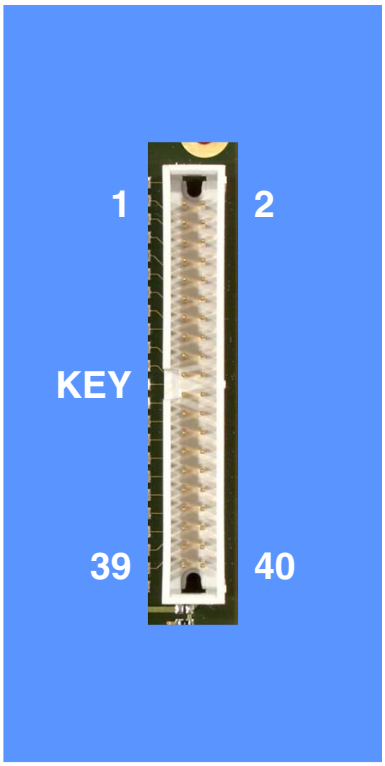


Table 2-21: Pinout of CON7

SIGNAL	PIN	PIN	SIGNAL
GND	1	2	SHFCLK
GND	3	4	LP
FLM	5	6	GND
GND	7	8	GND
P18	9	10	P19
P20	11	12	GND
P21	13	14	P22
P23	15	16	GND
GND	17	18	GND
P10	19	20	P11
P12	21	22	GND
P13	23	24	P14
P15	25	26	GND
GND	27	28	GND
P2	29	30	P3
P4	31	32	GND
P5	33	34	P6
P7	35	36	GND
M	37	38	GND
VDDSAVE	39	40	VDDSAVE

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2.4.4 CON8 - CRT Display Connector

This connector is used to provide interfacing between the EBC1 and CRT displays. This is a standard 15-pin, female, D-Sub, VGA type connector.

Figure 2-12: CON8 - CRT Display Connector

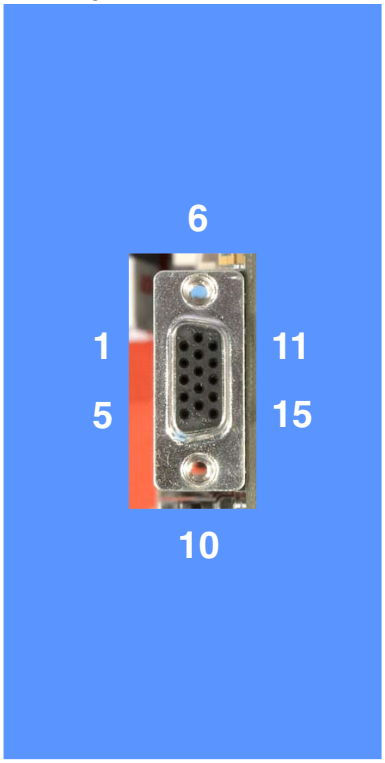


Table 2-22: Pinout of CON8

PIN	SIGNAL	DESCRIPTION
1	VGA_RED	Red video (75 ohm, 0.7 V p-p)
2	VGA_GREEN	Green video (75 ohm, 0.7 V p-p)
3	VGA_BLUE	Blue video (75 ohm, 0.7 V p-p)
4	NC	
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	NC	
10	GND	Ground
11	NC	
12	VGA_DDDA	DDC port data
13	VGA_HSYNC	Horizontal sync
14	VGA_VSYNC	Vertical sync
15	VGA_DDCK	DDC port clock

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2.4.5 CON9 - TERM1 T/C Connector

This connector is used to provide serial terminal or console interfacing without hardware handshaking. This is a standard 9-pin, male, D-Sub connector.

Figure 2-13: CON9 - TERM1 T/C Connector

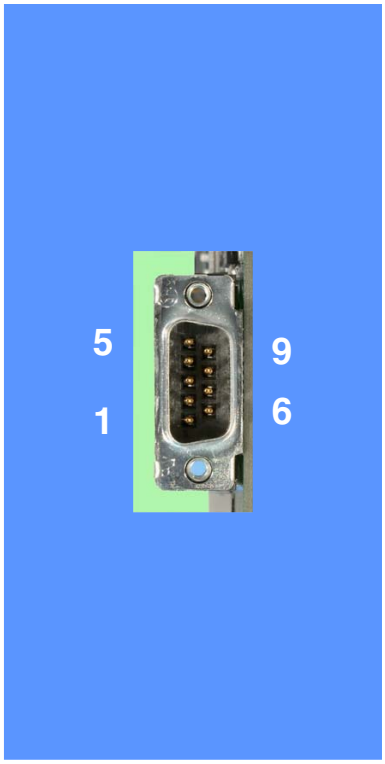


Table 2-23: Pinout of CON9

PIN	SIGNAL	DESCRIPTION
1	NC	Not connected
2	RXD	Receive data
3	TXD	Transmit data
4	RS232+	RS232 positive voltage level
5	GND	Ground
6	NC	Not connected
7	RS232+	RS232 positive voltage level
8	NC	Not connected
9	NC	Not connected

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2.4.6 CON10 - TERM2 T/C Connector

This connector is used to provide additional serial terminal or console interfacing without hardware handshaking. This is a 10-pin, male, dual pinrow, shrouded header connector.

Figure 2-14: CON10 - TERM2 T/C Connector



Table 2-24: Pinout of CON10

PIN	SIGNAL	DESCRIPTION
1	NC	Not connected
2	NC	Not connected
3	RXD	Receive data
4	VCC	Terminated with 1 k ohm resistor to VCC (+5VDC)
5	TXD	Transmit data
6	NC	Not connected
7	VCC	Terminated with 1 k ohm resistor to VCC (+5VDC)
8	NC	Not connected
9	GND	Ground
10	NC	Not connected

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2.4.7 CON11 - Keyboard / Mouse Connector

This connector is used to provide keyboard and mouse interfacing. Interfacing with a mouse requires a Y-type cable adapter. This is a standard PS/2 type, 6-pin, female connector.

Figure 2-15: CON11 - Keyboard / Mouse Connector

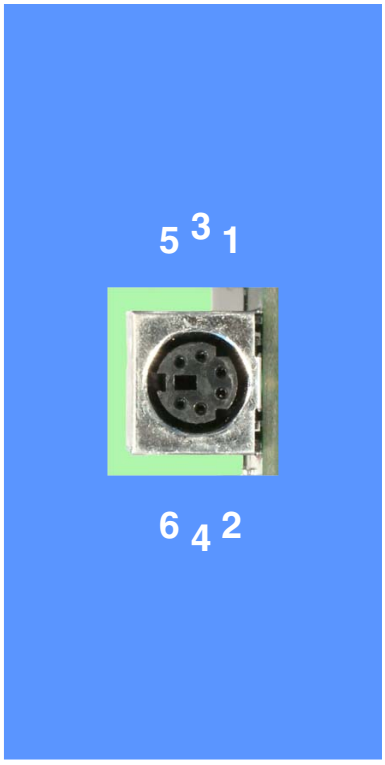


Table 2-25: Pinout of CON11

PIN	SIGNAL	DESCRIPTION
1	KDAT	Keyboard data
2	PMDAT	PS/2 mouse data
3	GND	Ground
4	VCC	+ 5 V DC
5	KCLK	Keyboard clock
6	PMCLK	PS/2 mouse clock

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2.4.8 CON12 - HSS SER1 Connector

This connector is used to provide high speed RS232 full modem or HDLC serial interfacing. This is a standard 9-pin, male, D-Sub connector.

Figure 2-16: CON12 - HSS SER1 Connector



Table 2-26: Pinout of CON12

PIN	SIGNAL	DESCRIPTION
1	CD	Carrier detect
2	RXD	Receive data
3	TXD	Transmit data
4	DTR	Data terminal ready
5	GND	Signal ground
6	DSR/TCLK	Data set ready / Transmit clock (for synchronous transmission)
7	RTS	Request to send
8	CTS	Clear to send
9	RI/RCLK	Ring indicator / Receive clock (for synchronous transmission)

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2.4.9 CON13 - HSS SER2 Connector

This connector is used to provide high speed RS422/485 half/full duplex serial interfacing. This is a 10-pin, male, dual pinrow, shrouded header connector.

Figure 2-17: CON13 - HSS SER2 Connector



Table 2-27: Pinout of CON13

PIN	SIGNAL	
	HALF DUPLEX	FULL DUPLEX
1	NC	RX+
2	NC	RX-
3	NC	NC
4	NC	NC
5	TRX+	TX+
6	TRX-	TX-
7	NC	NC
8	NC	NC
9	GND	GND
10	NC	NC

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2.4.10 CON14 - HSS SER3 Connector

This connector is used to provide high speed RS232 full modem serial or HDLC interfacing. This is a standard 9-pin, male, D-Sub connector.

Figure 2-18: CON14 - HSS SER3 Connector

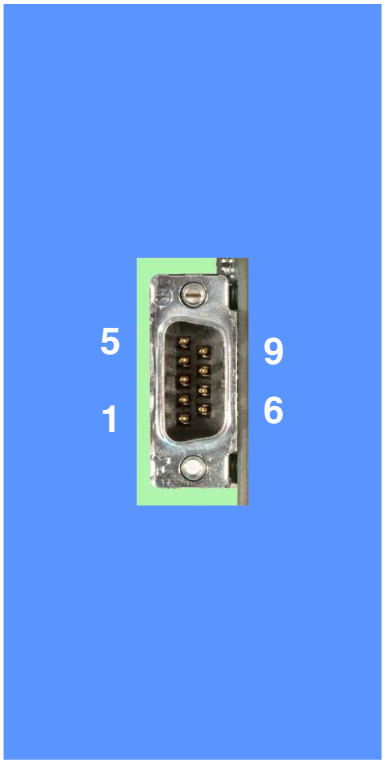


Table 2-28: Pinout of CON14

PIN	SIGNAL	DESCRIPTION
1	CD	Carrier detect
2	RXD	Receive data
3	TXD	Transmit data
4	DTR	Data terminal ready
5	GND	Signal ground
6	DSR/TCLK	Data set ready / Transmit clock (for synchronous transmission)
7	RTS	Request to send
8	CTS	Clear to send
9	RI/RCLK	Ring indicator / Receive clock (for synchronous transmission)

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2.4.11 CON15 - HSS SER4 Connector

This connector is used to provide high speed RS422/485 half/full duplex serial interfacing. This is a 10-pin, male, dual pinrow, shrouded header connector.

Figure 2-19: CON15 - HSS SER4 Connector



Table 2-29: Pinout of CON15

PIN	SIGNAL	
	HALF DUPLEX	FULL DUPLEX
1	NC	RX+
2	NC	RX-
3	NC	NC
4	NC	NC
5	TRX+	TX+
6	TRX-	TX-
7	NC	NC
8	NC	NC
9	GND	GND
10	NC	NC

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2.4.12 CON16 - FE2 Fast Ethernet Connector

This connector is used to provide Fast Ethernet interfacing for EB405 and EB425 E²Brain™ modules. This is an 8-pin, RJ45 type connector which has link status LEDs integrated in the connector housing.

Figure 2-20: CON16 - FE2 Fast Ethernet Connector



Table 2-30: Pinout of CON16

PIN	SIGNAL	DESCRIPTION
1	TDP2	Transmit data +
2	TDN2	Transmit data -
3	RDP2	Receive data +
4	NC	
5	NC	
6	RDN2	Receive data -
7	NC	
9	NC	

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2.4.13 CON17 - FE1 Fast Ethernet Connector

This connector is used to provide Fast Ethernet interfacing for EB405, EB425, EB8245, and EB860 E²Brain™ modules. This is an 8-pin, RJ45 type connector which has link status LEDs integrated in the connector housing.

Figure 2-21: CON17 - FE1 Fast Ethernet Connector

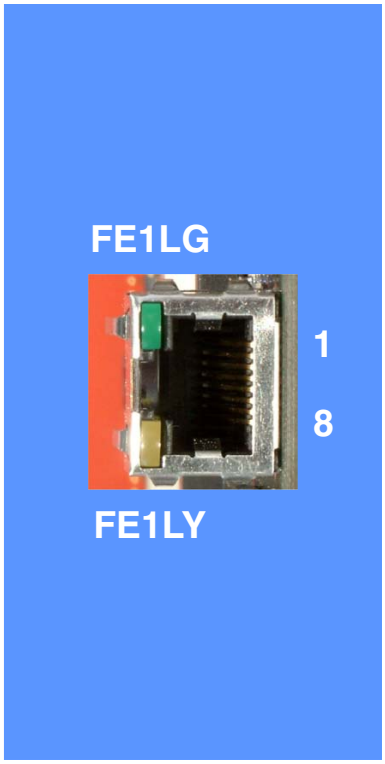


Table 2-31: Pinout of CON17

PIN	SIGNAL	DESCRIPTION
1	TDP2	Transmit data +
2	TDN2	Transmit data -
3	RDP2	Receive data +
4	NC	
5	NC	
6	RDN2	Receive data -
7	NC	
9	NC	

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2.4.14 CON18 - CAN Connector

This connector is used to provide Controller Area Network (CAN) interfacing. Defaultwise, CAN A0 is implemented on the EBC1. If CAN A1 is required, it must be specified when ordering the EBC1. In addition, the default configuration for this interface is with opto-isolation. Again if non-opto-isolation is required, it also must be specified when ordering. This is a standard 9-pin, male, D-Sub connector.

Figure 2-22: CON18 - CAN Connector

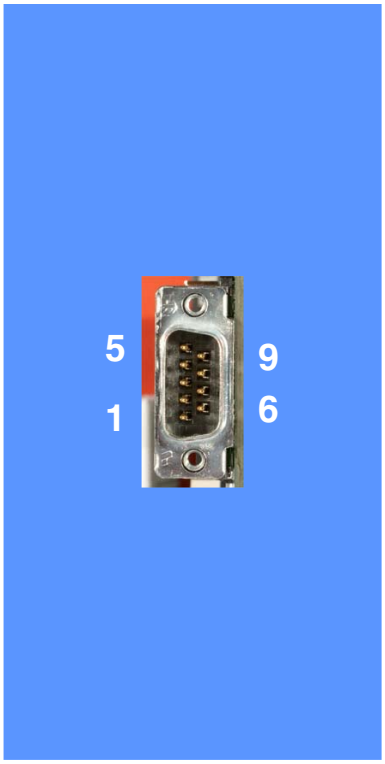


Table 2-32: Pinout of CON18

PIN	SIGNAL	DESCRIPTION
1	NC	
2	CAN1_L	CAN low
3	GND	Ground (isolated)
4	NC	
5	NC	
6	GND	Ground (isolated)
7	CAN1_H	CAN high
8	NC	
9	VCC	+5V isolated (max. 90 mA)

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2.4.15 CON19 - Digital Output Connector

This connector is used to provide opto-isolated digital output interfacing. This is a 10-pin, male, dual pinrow, shrouded header connector. The outputs on this connector are a function of the application input voltage which can be nominally + 5 V DC and up to a maximum of + 24 V DC.

Figure 2-23: CON19 - Digital Output Connector

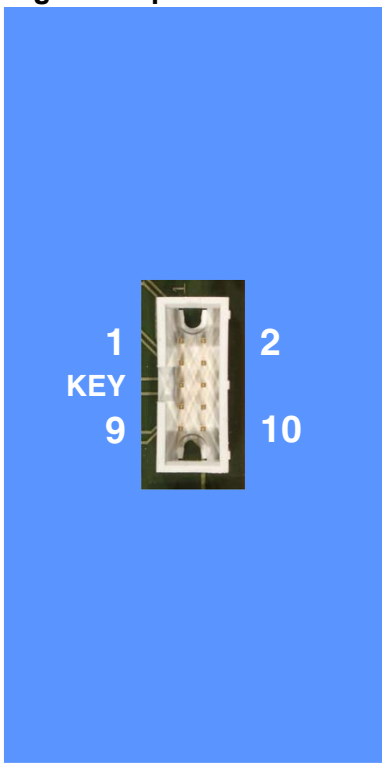


Table 2-33: Pinout of CON19

PIN	SIGNAL	DESCRIPTION
1	+DO0	Digital output 0, positive
2	-DO0	Digital output 0, negative
3	+DO1	Digital output 1, positive
4	-DO1	Digital output 1, negative
5	+DO2	Digital output 2, positive
6	-DO2	Digital output 2, negative
7	+DO3	Digital output 3, positive
8	-DO3	Digital output 3, negative
9	VCC_ISO1	+ 5 V DC (max. 200 mA) This voltage supply is shared with the opto-isolated digital inputs. Therefore, the combined loading must not exceed the 200 mA.
10	GND_ISO1	

Note...

The digital output circuit is designed to handle supply voltages from + 5 to + 24V DC. The maximum allowable current per output is 100 mA.

The typical voltage drop over the EBC1 output stage is 0.7 to 1 volt depending on the load.

The supply voltage from the onboard DC/DC converter can be used for low current external boards, however, for higher current boards or voltages other than +5V an external power supply is required.

The opto-isolated outputs can be used in either high or low side driver configuration

The onboard polarity protection is realized with 200 mA diodes directly connected to the “+” and “-“ output pins of each channel. Therefore, to achieve full polarity protection for each channel, external fuses or current limiting measures are necessary.

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2.4.16 CON20 - Digital Input Connector

This connector is used to provide opto-isolated digital input interfacing. This is a 10-pin, male, dual pinrow, shrouded header connector. The inputs are fully protected against polarity reversal. Inputs can be nominally + 5 V DC and up to + 12 V DC.

Figure 2-24: CON20 - Digital Input Connector



Table 2-34: Pinout of CON20

PIN	SIGNAL	DESCRIPTION
1	+DI0	Digital input 0, positive
2	-DI0	Digital input 0, negative
3	+DI1	Digital input 1, positive
4	-DI1	Digital input 1, negative
5	+DI2	Digital input 2, positive
6	-DI2	Digital input 2, negative
7	+DI3	Digital input 3, positive
8	-DI3	Digital input 3, negative
9	VCC_ISO1	+ 5 V DC (max. 200 mA) This voltage supply is shared with the opto-isolated digital outputs. Therefore, the combined loading must not exceed the 200 mA.
10	GND_ISO1	

Note...

The DC supply voltage from the onboard DC/DC converter may be used to supply the digital inputs, however, if required, an external voltage source of up to +12 V DC may also be used.

The nominal input current in the high state is typically 12 to 16 mA depending on the supply voltage.

The typical switching levels of the inputs are approximately 2 volts

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2.4.17 CON21 - Digital Input and Output Connector

This connector is used to provide non-opto-isolated digital input and digital output interfacing. This is a 10-pin, male, dual pinrow, shrouded header connector. Both the inputs and outputs are at +3.3V TTL levels, whereby the inputs may be up to a maximum +5V DC.

Figure 2-25: CON21 - Digital Input Connector



Table 2-35: Pinout of CON21

PIN	SIGNAL	DESCRIPTION
1	DO4	Digital output 4
2	DI4	Digital input 4
3	DO5	Digital output 5
4	DI5	Digital input 5
5	DO6	Digital output 6
6	DI6	Digital input 6
7	DO7	Digital output 7
8	DI7	Digital input 7
9	+3.3V	+ 3.3 volt supply
10	GND	Ground

Note...

If the non-opto-isolated inputs are left open, they will report an active high input because of onboard connected pull up resistors. To avoid this erroneous indication, a connection to GND is recommended for all unused inputs of the CON21 connector (for example, to pin 10 of the CON21 connector which is GND).

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2.4.18 CON22 - USB Connector

This connector is used to provide USB 1.1 serial interfacing. This is a 4-pin USB series “B” receptacle connector.

Figure 2-26: CON22 - USB Connector

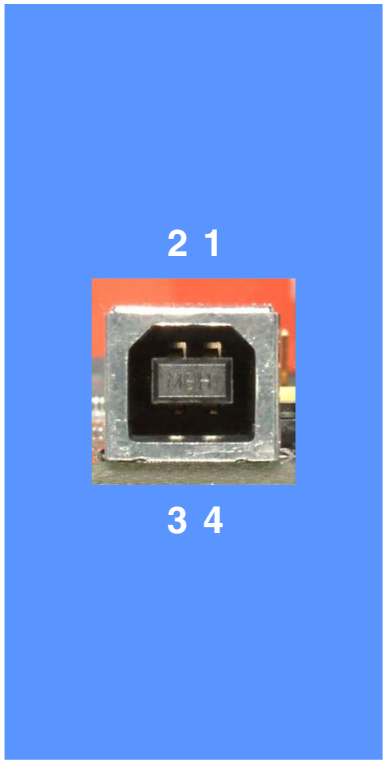


Table 2-36: Pinout of CON22

PIN	SIGNAL	DESCRIPTION
1	VBUS	
2	D-	Data -
3	D+	Data +
4	GND	Ground

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2.4.19 CON23 - CompactFLASH Type II Connector

This connector is used for providing interfacing for CompactFLASH Type II devices. Depending on the type of E²Brain™ module employed, interfacing is achieved either directly with the E²Brain™ module or with channel B of the IDE controller. It is a standard Type II Compact-FLASH connector assembly with a 50-pin, male, dual pinrow connector.

Figure 2-27: CON23 - CompactFLASH Type II Connector

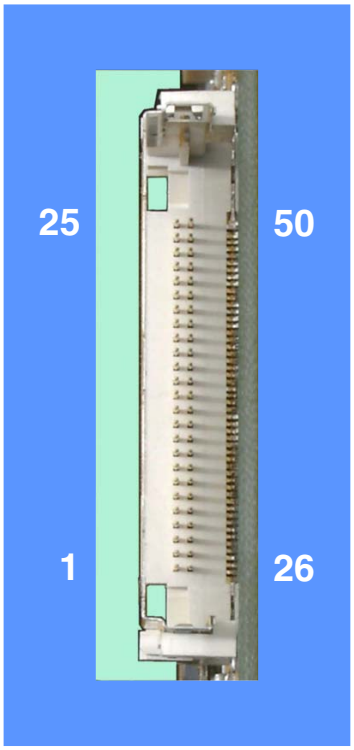


Table 2-37: Pinout of CON23

SIGNAL	PIN	PIN	SIGNAL
GND	1	26	CF_CD1
CF_D3	2	27	CF_D11
CF_D4	3	28	CF_D12
CF_D5	4	29	CF_D13
CF_D6	5	30	CF_D14
CF_D7	6	31	CF_D15
CF_CS0	7	32	CF_CS1
GND	8	33	GND
GND	9	34	CF_RD
GND	10	35	CF_WR
GND	11	36	+3.3V
GND	12	37	CF_IRQ
+3.3V	13	38	+3.3V
GND	14	39	GND
GND	15	40	NC
GND	16	41	CF_RST
GND	17	42	CF_IORDY
CF_A2	18	43	CF_INPACK
CF_A1	19	44	+3.3V
CF_A0	20	45	CF_DASP
CF_D0	21	46	CF_PDIAG
CF_D1	22	47	CF_D8
CF_D2	23	48	CF_D9
CF_CS16	24	49	CF_D10
CF_CD2	25	50	GND

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2.4.20 CON24 - ATA / IDE Channel A 44-Pin Connector

This connector is used for providing interfacing for ATA/IDE 2.5 inch devices which require +5 volt drive supply. It has a connector pin pitch of 2.0 mm. Only one device may be interfaced to this connector, It is a 44-pin, male, dual pinrow, shrouded connector.

Figure 2-28: CON24 - Channel A 44-Pin Connector



Table 2-38: Pinout of CON24

SIGNAL	PIN	PIN	SIGNAL
ATA_RST#	1	2	GND
ATA_D7	3	4	ATA_D8
ATA_D6	5	6	ATA_D9
ATA_D5	7	8	ATA_D10
ATA_D4	9	10	ATA_D11
ATA_D3	11	12	ATA_D12
ATA_D2	13	14	ATA_D13
ATA_D1	15	16	ATA_D14
ATA_D0	17	18	ATA_D15
GND	19	20	NC
ATA_DMARQ	21	22	GND
ATA_WR#	23	24	GND
ATA_RD#	25	26	GND
ATA_IORDY	27	28	GND
ATA_DMACK#	29	30	GND
ATA_IRQ	31	32	NC
ATA_A1	33	34	ATA_CBLID#
ATA_A0	35	36	ATA_A2
ATA_CS0#	37	38	ATA_CS1#
NC	39	40	GND
VCC (+5V)	41	42	VCC (+5V)
GND	43	44	NC

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2.4.21 CON25 - ATA / IDE Channel A 40-Pin Connector

This connector is used for providing interfacing for standard ATA/IDE devices. It has a connector pin pitch of 2.54 mm. Only one device may be interfaced to this connector. It is a 40-pin, male, dual pinrow connector.

Figure 2-29: CON25 - Channel A 40-Pin Connector

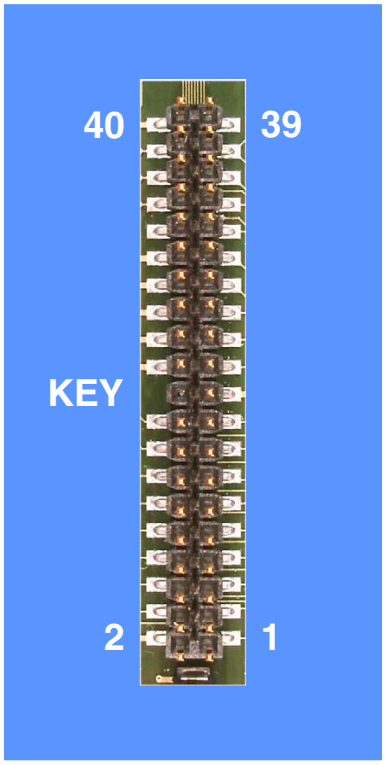


Table 2-39: Pinout of CON25

SIGNAL	PIN	PIN	SIGNAL
ATA_RST#	1	2	GND
ATA_D7	3	4	ATA_D8
ATA_D6	5	6	ATA_D9
ATA_D5	7	8	ATA_D10
ATA_D4	9	10	ATA_D11
ATA_D3	11	12	ATA_D12
ATA_D2	13	14	ATA_D13
ATA_D1	15	16	ATA_D14
ATA_D0	17	18	ATA_D15
GND	19	20	NC
ATA_DMARQ	21	22	GND
ATA_WR#	23	24	GND
ATA_RD#	25	26	GND
ATA_IORDY	27	28	GND
ATA_DMACK#	29	30	GND
ATA_IRQ	31	32	NC
ATA_A1	33	34	ATA_CBLID#
ATA_A0	35	36	ATA_A2
ATA_CS0#	37	38	ATA_CS1#
NC	39	40	GND

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2.4.22 CON26 - ATA / IDE Device Power Connector

This connector is used for providing + 12 volt and + 5 volt power interfacing for standard ATA/ IDE devices. It is a standard 4-pin power connector, The maximum current rating for the + 12 V DC is 1.5 A and for the + 5 V DC is also 1.5 A.

Figure 2-30: CON26 - ATA/ IDE Device Power Connector

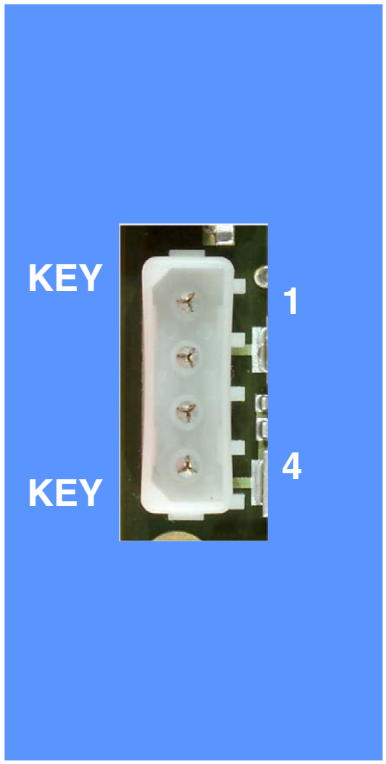


Table 2-40: Pinout of CON26

PIN	SIGNAL
1	+ 12 V DC
2	GND
3	GND
4	+ 5 V DC

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2.4.23 CON27 - Monitor and Control Signal Connector

This connector is used for providing selected monitor and control signal interfacing. It is a 6-pin, male, dual pinrow, header connector,

Figure 2-31: CON27 - Monitor and Control Signal Connector

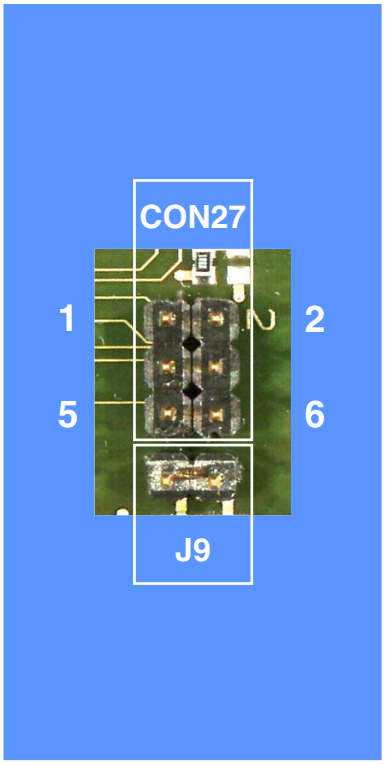


Table 2-41: Pinout of CON27

PIN	SIGNAL	DESCRIPTION
1	MC5	Refer to the respective E²Brain™ module documentation for details
2	MC10	Refer to the respective E²Brain™ module documentation for details
3	MC2	Refer to the respective E²Brain™ module documentation for details
4	MC3	Refer to the respective E²Brain™ module documentation for details
5	MC9	Refer to the respective E²Brain™ module documentation for details
6	GND	Ground

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2.4.24 CON28 - UTOPIA Connector

This connector is used for providing a single Universal Test and Operations Interface for ATM (UTOPIA) interface. Depending on the type of E²Brain™ module employed either a UTOPIA type 1 or type 2 interface can be realized on this connector. The UTOPIA signals on this connector are at TTL signal level. It is a 50-pin, male, dual pinrow, shrouded connector.

Figure 2-32: CON28 - UTOPIA Connector

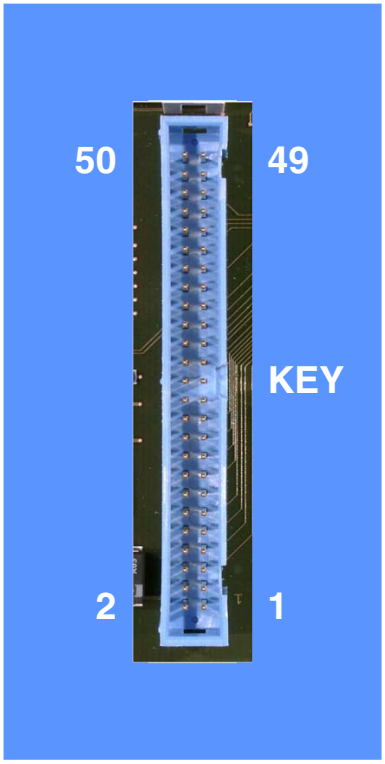


Table 2-42: Pinout of CON28

SIGNAL	PIN	PIN	SIGNAL
+3.3V	1	2	+3.3V
U_TXD1	3	4	U_TXD0
U_TXD3	5	6	U_TXD2
U_TXD5	7	8	U_TXD4
U_TXD7	9	10	U_TXD6
GND	11	12	GND
U_RXD7	13	14	U_RXD6
U_RXD5	15	16	U_RXD4
U_RXD3	17	18	U_RXD2
U_RXD1	19	20	U_RXD0
VCC	21	22	VCC
U_TXA4	23	24	U_RXA4
U_TXA3	25	26	U_RXA3
U_TXA2	27	28	U_RXA2
U_TXA1	29	30	U_RXA1
U_TXA0	31	32	U_RXA0
GND	33	34	GND
U_TXENB	35	36	U_TXCLAV
+3.3V	37	38	+3.3V
U_TXSOC	39	40	U_RXENB
U_RXSOC	41	42	U_RXCLAV
GND	43	44	GND
U_RXPAR	45	46	U_RXCLK
U_TXPAR	47	48	+3.3V
VCC	49	50	U_TXCLK

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2.4.25 CON29 - SPI Extension Connector

This connector is used for providing single master Serial Peripheral Interface (SPI) interfacing. It is an 8-pin, male, header connector. Up to 3 external SPI slave devices may be connected to this interface. It is an 8-pin, male, dual pinrow connector.

Figure 2-33: CON29 - SPI Extension Connector

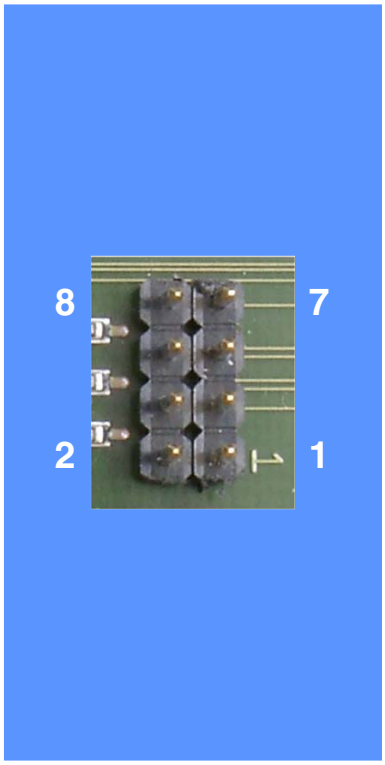


Table 2-43: Pinout of CON29

PIN	SIGNAL	DESCRIPTION
1	+3.3V	
2	SPI_TXD	Master data transmit
3	SPI_CS0	Slave select 0
4	SPI_RXD	Master data receive
5	SPI_CS1	Slave select 1
6	SPI_CS2	Slave select 2
7	SPI_CLK	Clock
8	GND	Ground

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2.4.26 CON30 - MPC860 Debug Connector

This connector is used for providing MPC860 debugging interfacing. It is a 10-pin, male, header connector. It is a 10-pin, male, dual pinrow connector.

Figure 2-34: CON30 - MPC860 Debug Connector

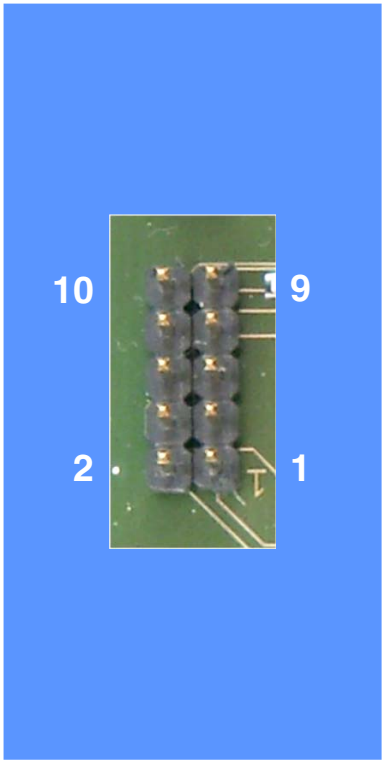


Table 2-44: Pinout of CON30

PIN	SIGNAL
1	VFLS0
2	SRST
3	GND
4	TCK
5	GND
6	VFLS1
7	HRST
8	TDI
9	TARGET_VCC
10	TDO

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2.4.27 CON31 - MPC8245 / PPC405EP Debug Connector

This connector is used for providing MPC8245 and PPC405EP debugging interfacing. It is a 16-pin, male, dual pinrow, header connector.

Figure 2-35: CON31 - MPC8245 / PPC405EP Debug Connector

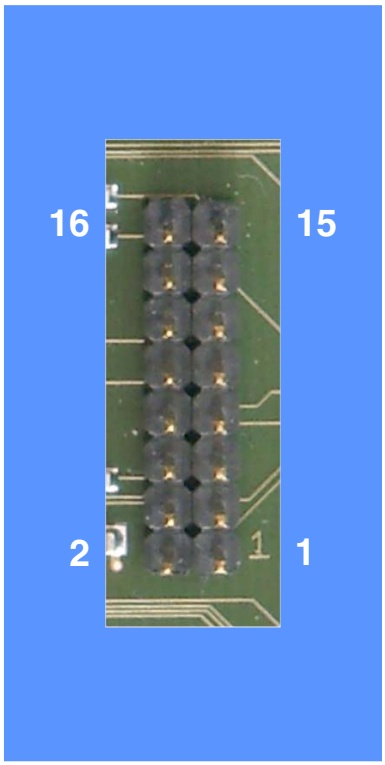


Table 2-45: Pinout of CON31

PIN	SIGNAL
1	TDO
2	NC
3	TDI
4	TRST_IN
5	Pull up 10 kΩ to +3.3V
6	TARGET_VCC
7	TCK
8	NC
9	TMS
10	NC
11	SRST / HALT
12	NC
13	HRST
14	KEY (NC)
15	Pull up 10 kΩ to +3.3V
16	GND

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2.4.28 CON32 - IXP425 Debug Connector

This connector is used for providing IXP425 debugging interfacing. It is a 20-pin, male, dual pinrow, header connector.

Figure 2-36: CON32 - IXP425 Debug Connector

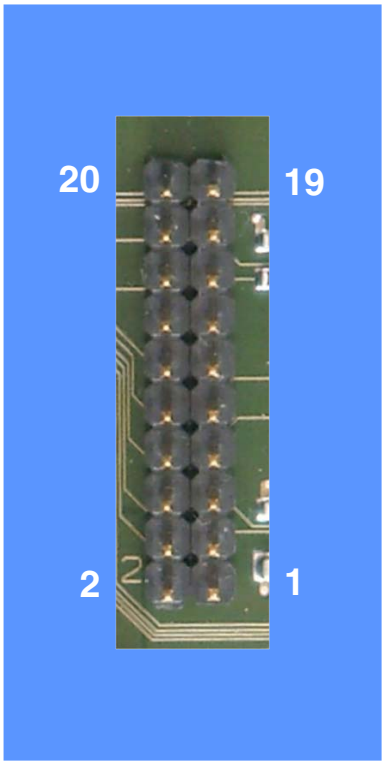


Table 2-46: Pinout of CON32

PIN	SIGNAL
1	TARGET_VCC
2	NC
3	TRST_IN
4	NC
5	TDI
6	NC
7	TMS
8	GND
9	TCK
10	GND
11	NC
12	NC
13	TDO
14	NC
15	HRST
16	NC
17	NC
18	NC
19	NC
20	NC

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2.4.29 CON33 - Logic Programming Connector

This connector is used for providing a programming interface for the EBC1 logic controller. It is a 10-pin, male, dual pinrow, header connector.

Figure 2-37: CON33 - Logic Programming Connector

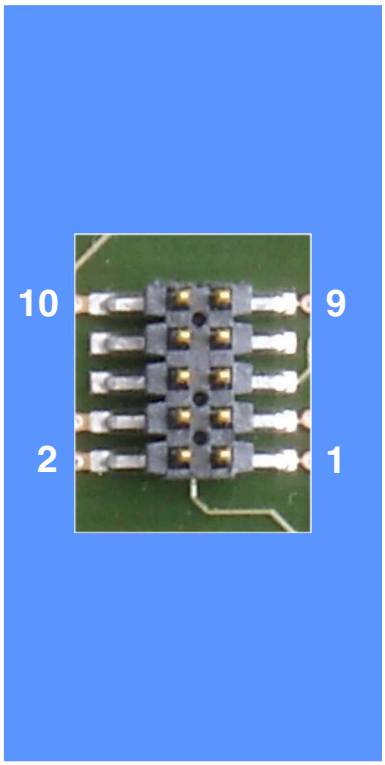


Table 2-47: Pinout of CON33

PIN	SIGNAL
1	LTCK
2	GND
3	LTDO
4	+3.3V
5	LTMS
6	NC
7	NC
8	NC
9	LTDI
10	GND

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2.4.30 CON34 - ATMEL Programming Connector

This connector is used for providing a programming interface for the ATMEL configuration EEPROM used with the E²Brain™ module FPGA logic controller. It is a 6-pin, male, dual pinrow, header connector.

Figure 2-38: CON33 - Logic Programming Connector

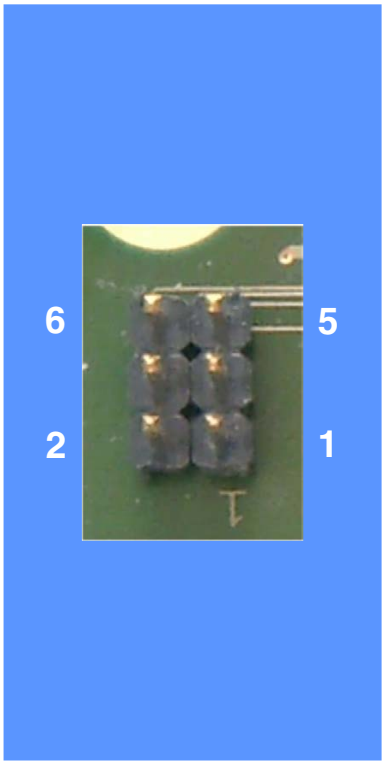


Table 2-48: Pinout of CON33

PIN	SIGNAL
1	DI
2	GND
3	AACK
4	DCLK
5	SER_EN
6	GND

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2.5 Monitor and Control Interfaces

The following sections provide detailed information regarding the monitor and control functions available on the EBC1.

2.5.1 Operational Status Indicators - LEDs 1 to 9

There are 12 operational status indicators available on the EBC1 for monitoring of the board operation. The following table provides an overview of these indicators.

Table 2-49:EBC1 Operational Status Indicators (LEDs)

DES.	NAME	COLOR	DESCRIPTION
LED1	+5V	GREEN	When on is general indication that +5V supply is functioning
LED2	+3.3V	GREEN	When on is general indication that +3.3V supply is functioning
LED3	+12V	GREEN	When on is general indication that +12V supply is functioning
LED4	7SHN	RED	Seven segment LED, most significant nibble General purpose indicator for POST codes and application
LED5	7SLN	RED	Seven segment LED, least significant nibble General purpose indicator for POST codes and application
LED6	BOOT	GREEN	General purpose indicator Used by bootloader to indicate boot status. After bootup is completed, is available for application use. At start of bootup, is flashing to indicate that bootup may be interrupted by pressing S1. Refer to the corresponding E²Brain™ product documentation for further information.
LED7	U	GREEN	General purpose indicator
LED8	WD	GREEN	Used to indicate the status of the E²Brain™ module watchdog Is a function of the application. If not used, remains off.
FE1LG	LINKSPD1	GREEN	FE channel 1 link speed indicator, integrated in CON17 connector When off: link speed is 10 Mbit When on: link speed is 100 Mbit
FE1LY	LINKSTA1	YELLOW	FE channel 1 link activity indicator, integrated in CON17 connector When off, the link is not active When on, the link is active When blinking, there is activity on the link
FE2LG	LINKSPD2	GREEN	FE channel 2 link speed indicator, integrated in CON16 connector When off: link speed is 10 Mbit When on: link speed is 100 Mbit

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Table 2-49:EBC1 Operational Status Indicators (LEDs)

DES.	NAME	COLOR	DESCRIPTION
FE2LY	LINKSTA2	YELLOW	FE channel 2 link activity indicator, integrated in CON16 connector When off, the link is not active When on, the link is active When blinking, there is activity on the link

2.5.2 Operator Switches - S1 and S2

There are two operator switches available on the EBC1 for interaction with the system. S2 can be used to invoke a system reset, and S1 can be used to invoke a system abort. S1 is used during the boot operation to cause the E²Brain™ module to abort the boot operation and allow command line inputs to the bootloader. Refer to the E²Brain™ module manual for further information.

2.5.3 M / C Signals

In addition to the above mentioned interfaces, there are monitor and control signals available for application development and usage. Refer to sections 2.3.1.3, 2.4.23, and the E²Brain™ module product documentation for further information.

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Chapter 3

Installation

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3. Installation

The EBC1 has been designed for easy installation. However, the following standard precautions, installation procedures, and general information must be observed to ensure proper installation and to preclude damage to the board or injury to personnel.

3.1 Hardware Installation

The product described in this manual is designed for use only with E²Brain™ modules that comply with Kontron's E²Brain™specification. For installation of E²Brain™ modules refer to the applicable E²Brain™ module documentation.

3.1.1 Safety Requirements

The following electrical hazard precautions must be observed.



Caution, Electric Shock Hazard!

Ensure that the system main power is removed prior to installing or removing this board. Ensure that there are no other external voltages or signals being applied to this board or other boards within the system. Failure to comply with the above could endanger your life or health and may cause damage to this board or other system components including process-side signal conditioning equipment.



ESD Equipment!

This Kontron board contains electrostatic sensitive devices. Please observe the following precautions to avoid damage to your board:

Discharge your clothing before touching the assembly. Tools must be discharged before use.

Do not touch any on board components, connector pins, or board conductive circuits.

If working at an anti-static workbench with professional discharging equipment, ensure compliance with its usage when handling this product.

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3.1.2 Installation Procedures

To install the EBC1 proceed as follows:

1. Ensure that the safety requirements indicated in chapter 3.1.1 are observed.



Warning!

Failure to comply with the instruction below may cause damage to the board or result in improper system operation. Please refer to chapter 4 for configuration information.

2. Ensure that the board is properly configured for operation before installing.



Note...

Care must be taken when applying the procedures below to ensure that when the board is assembled along with the other application system components that it is not damaged through contact with the other components of the system.

3. Ensure that the associated E²Brain™ module is properly installed on the EBC1.



Warning!

The EBC1 is designed for use only with E²Brain™ modules that comply with Kontron's E²Brain™ specification. Use of any other type of E²Brain™ module with the EBC1 will result in improper operation and possibly cause damage to the E²Brain™ module as well as the EBC1.

4. Assemble the EBC1 within the application system as required. See appropriate system documentation for assembly procedures.

3.1.3 Removal Procedures

To remove the EBC1 proceed as follows:

1. Ensure that the safety requirements indicated in chapter 3.1.1 are observed.



Warning!

Care must be taken when applying the procedures below to ensure that when the board is removed it is not damaged through contact with other components in the system.

2. Disassemble the EBC1 within the application sub-system as required. See appropriate system documentation for disassembly procedures.

3. Dispose of the EBC1 as required observing applicable environmental regulations governing the handling and disposition of this type of product.

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Chapter 4

Configuration

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4. Configuration

The following sections provide system integrators with detailed information for configuring the EBC1 module for operation

4.1 Jumper Settings

Prior to installation of the EBC1 board there are jumpers which must be configured appropriately to ensure proper operation of the board. Please refer to Figure 1-4 in section 1 for the location of the jumpers on the board.

4.1.1 Overview

The following table provides an overview of the EBC1 jumpers including a short description of the default settings.

Table 4-1: EBC1 Jumper Settings Overview

JUMPER	FUNCTION	DEFAULT SETTING	SETTING DESCRIPTION
J1	Enable PCI Access	open	PCI access enabled
J2	Clock Test Mode	open	Clock test mode disabled
J3	Reserved	open	Reserved
J4	Panel Type	open	Panel type
J5	Panel Type	open	Panel type
J6	Panel Type	open	Panel type
J7	Reserved	open	Reserved
J8	Panel Type	set	Panel type
J9	Reserved	open	Reserved
J10	Single Point Ground	set	Single point ground selected
J11	RS422/485 Line Termination	set	SER2 transmit differential pair termination (120 ohm)
J12	RS422/485 Line Termination	set	SER2 receive differential pair termination (120 ohm)
J13	RS422/485 Line Termination	set	SER4 transmit differential pair termination (120 ohm)
J14	RS422/485 Line Termination	set	SER4 receive differential pair termination (120 ohm)
J15	Boot Jumper	open	Boot from E²Brain™ module FLASH
J16 - J42	CompactFLASH Interface	1 - 2	CompactFLASH interfaced directly to E²Brain™ module
J43 - J44	Reserved	—	Reserved
J45/46/48	CAN Power Options	set	+5V isolated power supply
J47	CAN Termination	open	CAN transmission lines not terminated with 120 ohm termination resistor

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4.1.2 EBC1 Jumper Locations

The following figures indicate the locations of all EBC1 carrier board jumpers.

Figure 4-1: J1 to J8 Jumpers

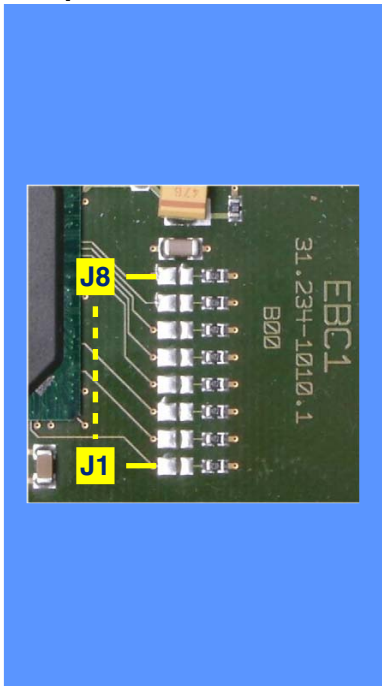


Figure 4-2: J9 Jumper

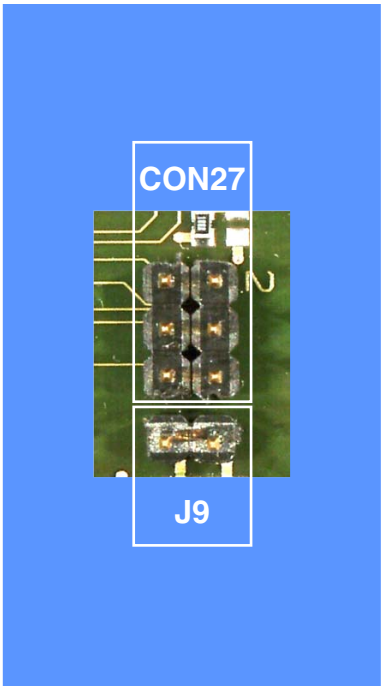


Figure 4-3: J10 Jumper

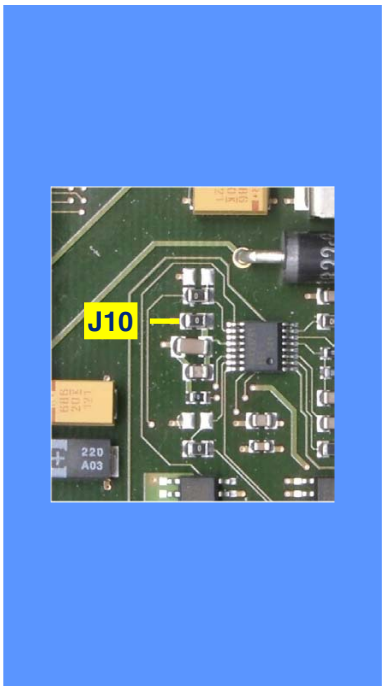


Figure 4-4: J11 and J12 Jumpers

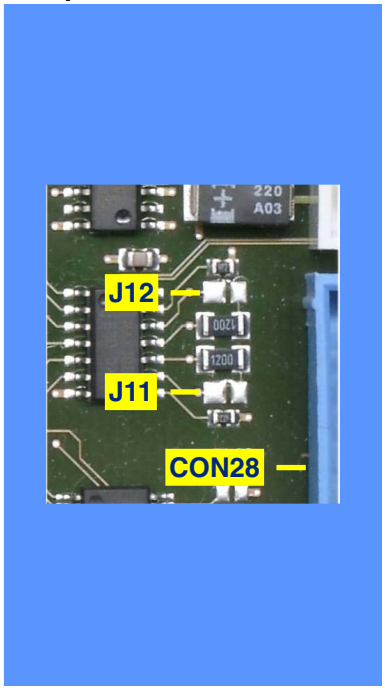


Figure 4-5: J13 and J14 Jumpers

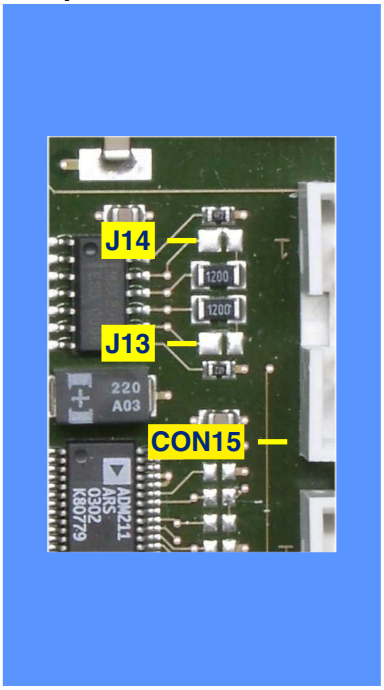
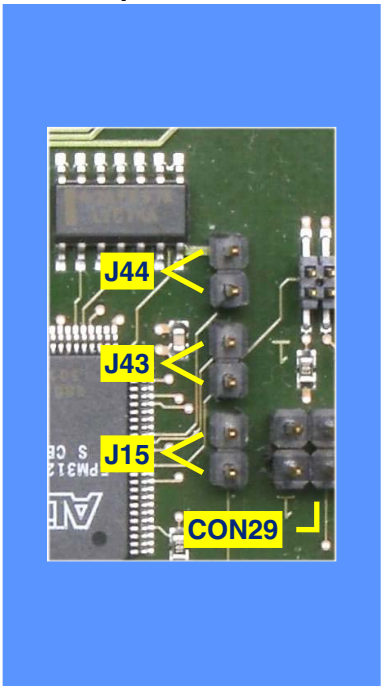


Figure 4-6: J15, J43, and J44 Jumpers



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Figure 4-7: J16 to J42 Jumpers

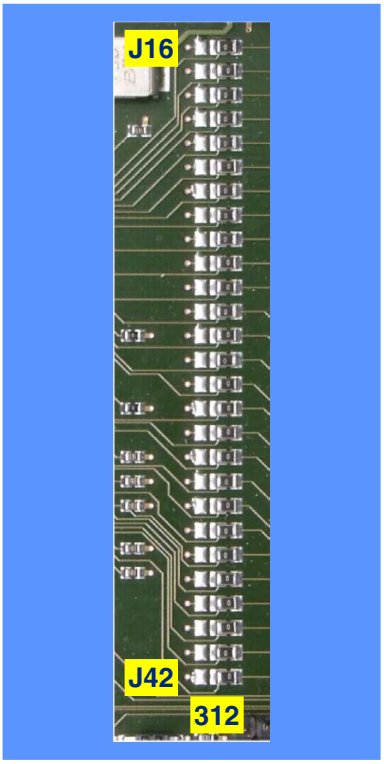
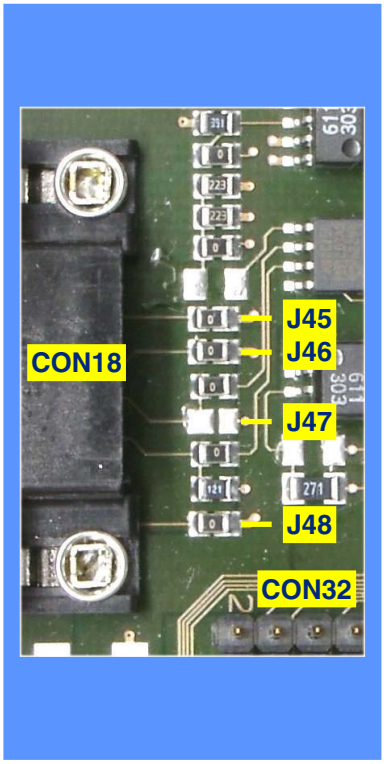


Figure 4-8: J45 to J48 Jumpers



4.1.3 J1 - Enable PCI Access

The purpose of the J1 jumper is to enable PCI access

Table 4-2: J1 - Enable PCI Access

JUMPER	SETTING	DESCRIPTION
J1	open	PCI access enabled
	set	PCI access disabled

4.1.4 J2 - Clock Test Mode

The purpose of the J2 jumper is to enable clock test mode.

Table 4-3: J2 - Clock Test Mode

JUMPER	SETTING	DESCRIPTION
J2	open	Clock test mode disabled
	set	Clock test mode enabled

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4.1.5 J3, J7, J9, J43, J44 - Reserved

These jumpers are reserved for future use.

4.1.6 J4, J5, J6, J8 - Panel Type

The purpose of these jumpers is to provide the capability of selecting a specific panel type

Table 4-4: J4, J5, J6, J8 - Panel Type

JUMPER	SETTING	DESCRIPTION
J4, J5, J6, J8	open (0)	Panel type selection: J4 J5 J6 J8 Description:
	set (1)	0 0 0 1 Panel type 1 selected (default)

4.1.7 J10 - Single Point Ground

The purpose of the J10 jumper is to provide a single point ground for the operation of the DC/DC power supply circuitry.

Table 4-5: J10 - Single Point Ground

JUMPER	SETTING	DESCRIPTION
J10	open	Single point ground not selected
	set	Single point ground selected

4.1.8 J11, J12 - SER2 Line Termination

The purpose of the J11 and J12 jumpers is to provide line termination for RS422/485 operation of the serial interface SER2.

Table 4-6: J11, J12 - SER2 Line Termination

JUMPER	SETTING	DESCRIPTION
J11, J12	open/open	No RS422/485 line termination of the SER2 serial interface
	set/set	RS422/485 line termination of the SER2 serial interface

4.1.9 J13, J14 - SER4 Line Termination

The purpose of the J13 and J14 jumpers is to provide line termination for RS422/485 operation of the serial interface SER4.

Table 4-7: J13, J14 - SER4 Line Termination

JUMPER	SETTING	DESCRIPTION
J13, J14	open/open	No RS422/485 line termination of the SER4 serial interface
	set/set	RS422/485 line termination of the SER4 serial interface

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4.1.10 J15 - Boot Jumper

The purpose of the J15 jumper is to select the device from which the E²Brain™ module is to be booted.

Table 4-8: J15 - Boot Jumper

JUMPER	SETTING	DESCRIPTION
J15	open	Boot from E²Brain™ module FLASH
	set	Boot from LPC FLASH installed in the PLCC32 socket

The following table indicates the types of LPC FLASH devices that may used.

Table 4-9: LPC FLASH Devices

MANUFACTURER	TYPE	SIZE	ORGANIZATION	VOLTAGE
ST	M 50 LPW 040	4 Mbit	512 kb x 8	3.3
ST	M 50 LPW 080	8 Mbit	1 Mb x 8	3.3

4.1.11 J16 to J42 - CompactFLASH Interface

The purpose of the J16 to J42 jumpers is to select the interface to the CompactFLASH. The EBC1 CompactFLASH connector can be interfaced either directly to the E²Brain™ module via CON2 or the onboard IDE1 interface. The setting of these jumpers should be specified when ordering the EBC1.

Table 4-10: J12 - Slave Mode Test

JUMPER	SETTING	DESCRIPTION
J16 - J42	1 - 2	The CompactFLASH connector is directly interfaced to the E²Brain™ module
	1 - 3	The CompactFLASH connector is interfaced to the onboard IDE1 interface

4.1.12 J45, J46, and J48 - CAN Power Options

The purpose of these jumpers is make isolated +5V DC power available on the CAN interface, CON18.

Table 4-11: J45, J46, and J48 - CAN Power Option

JUMPER	SETTING	DESCRIPTION
J45/46/48	open	No isolated +5V DC power on the CAN interface (CON18)
	set	Isolated +5V DC power available on the CAN interface (CON18) (default)

4.1.13 J47 - CAN Termination

The purpose of this jumper is to terminate the CAN transmission lines using a 120 ohm resistor.

Table 4-12: J47 - CAN Termination

JUMPER	SETTING	DESCRIPTION
J47	open	No CAN transmission lines termination
	set	CAN transmission lines terminated using 120 ohm resistor

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4.2 Resistor Settings

Prior to installation of the EBC1, there are various resistors which must be configured appropriately to ensure proper operation of the board. The following sections provide detailed location and configuration information for these resistors.

4.2.1 SER2 - RS422/485 Operation Configuration

The operational configuration of this interface is a function of the application. Prior to putting the EBC1 into operation the board must be configured for slew rate control and half / full duplex operation. The following figure and table provide detailed information for setting the appropriate resistors.

Figure 4-9: SER2 Configuration Resistor Location

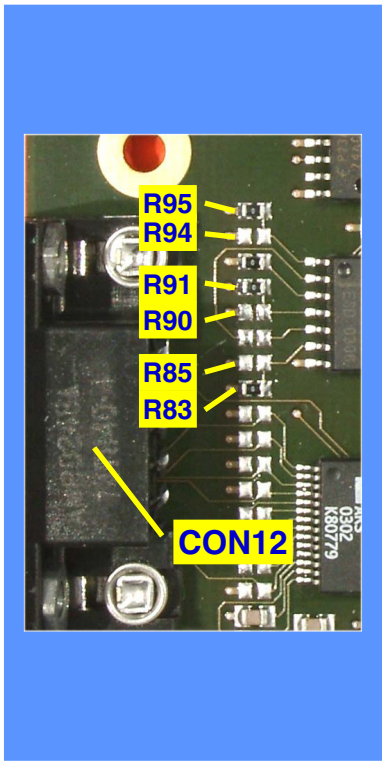


Table 4-13: SER2 Configuration Resistor Settings

RES.	SET.	DESCRIPTION
R83	—	R83 R85 Slew Rate Control 0 0 115 kb 0 1 500 kb 1 0 10 Mb (default)
R85	—	
R90	—	R90 R91 R94 R95 Operational Mode 0 1 1 0 Half duplex 1 0 0 1 Full duplex (default)
R91	—	
R94	—	
R95	—	

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4.2.2 SER4 - RS422/485 Operation Configuration

The operational configuration of this interface is a function of the application. Prior to putting the EBC1 into operation the board must be configured for slew rate control and half / full duplex operation. The following figure and table provide detailed information for setting the appropriate resistors.

Figure 4-10:SER4 Configuration Resistor Location

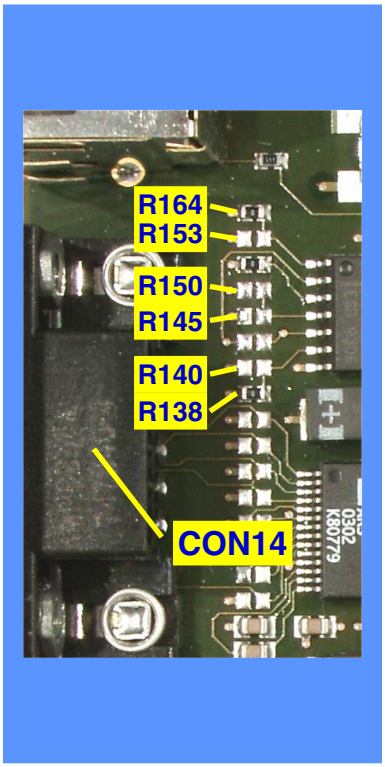


Table 4-14: SER4 Configuration Resistor Settings

RES.	SET.	DESCRIPTION
R138	—	R138 R140 SLEW RATE CONTROL 0 0 115 kb 0 1 500 kb 1 0 10 Mb (default)
R140	—	
R145	—	R145 R150 R153 R164 OPERATIONAL MODE 0 1 1 0 Half duplex 1 0 0 1 Full duplex (default)
R150	—	
R153	—	
R164	—	

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4.2.3 V(I/O) Configuration

Prior to putting the EBC1 into operation, V(I/O) must be properly configured. The default configuration is +3.3V. For operation of a PCI expansion slot board which requires a V(I/O) of +5V, the EBC1 must be configured for +5V V(I/O). The following figure and table provide detailed information for setting the appropriate resistors.

Warning!

The CON6 connector is 5V coded. Only 5V or universally coded cards may be used with this connector. Do not attempt to install 3.3V coded cards as this will result in damage to the PCI card, the EBC1, or E²Brain™ module itself.

The EBC1 is configured for 3.3V V(I/O) operation which supports currently available E²Brain™ modules. Do not change this configuration unless the E²Brain™ module employed supports 5V operation.

Figure 4-11: V(I/O) Configuration Resistor Location

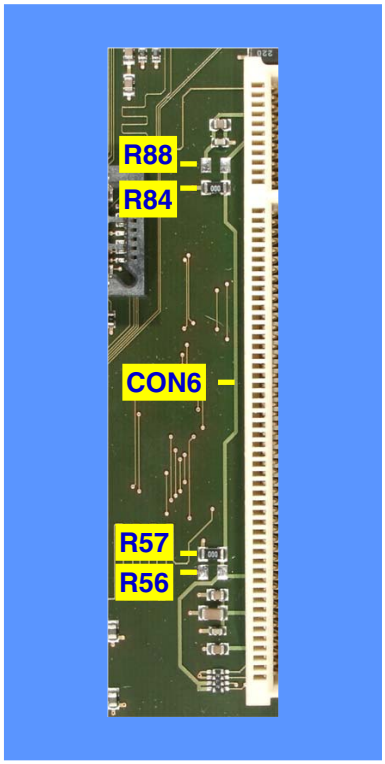


Table 4-15: V(I/O) Configuration Resistor Settings

RES.	SET.	DESCRIPTION
R56	—	R56 R57 R84 R88 V(I/O) Operational Mode
R57	—	0 1 1 0 +3.3V (default)
R84	—	1 0 0 1 +5V
R88	—	

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4.3 LPC Address Mapping

The following table indicates the LPC address mapping for access to the digital input, digital output, and POST code data.

Table 4-16: LPC Address Mapping

REGISTER	LPC I/O ADDRESS OFFSET
DIN_DATA	0x0000 0000
DOUT_DATA	0x0000 0001
POST_CODE_DATA	0x0000 0080

The address map describes the offset location for the LPC I/O area. The LPC I/O address itself is a function of the corresponding E²Brain™ module.

4.4 PCI Bus IDSEL Mapping and IRQ Routing

The IRQ´s of the different PCI devices on the EBC1 must be distributed to the four PCI interrupts (INTA#, INTB#, INTC#, INTD#) of the E²Brain™ module. In the same manner, different PCI ADxx lines from the E²Brain™ module must be connected to the IDSEL input of the PCI devices on the EBC1.

The following table provides the realized routing on the EBC1 with the corresponding PCI device.

Table 4-17: IDSEL Mapping and IRQ Routing

EBC1 PCI DEVICE	EBC1 IDSEL ← ADXX E²Brain™ MODULE	PCI INTERRUPT E²Brain™ MODULE
PCI connector slot CON6 INTA# INTB# INTC# INTD#	AD28	 INTA# INTB# INTC# INTD#
PCI – IDE Bridge SIL680 INTA#	AD27	 INTD#
Graphic Controller 69030 INTA#	AD26	 INTC#

For further information concerning this subject, please contact Kontron Modular Computers.

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4.5 EBC1 Register Description

The following sections provide register descriptions for the:

- Digital Input Data Register
- Digital Output Data Register
- POST Code Data Register

4.5.1 Digital Input Data Register

The digital input data register indicates the status of the respective input signals.

Address Offset: 0x0000 0000
Format: Byte
Access: Read
Value after reset: 0xF0 (if inputs are left open)

Digital input channels 0 to 3 are opto-isolated; channels 4 to 7 are non-opto-isolated inputs.

Table 4-18:Digital Input Data Register

REGISTER NAME		Digital Input Data Register						ACCESS	
ADDRESS		0x0000 0000 (offset)						R	
BIT POSITION		MSB 7	6	5	4	3	2	1	0 LSB
CONTENT		DIN_ DATA_7	DIN_ DATA_6	DIN_ DATA_5	DIN_ DATA_4	DIN_ DATA_3	DIN_ DATA_2	DIN_ DATA_1	DIN_ DATA_0
DEFAULT		0	0	0	0	0	0	0	0
0	DIN_ DATA_0	0	Input signal is low or open						
		1	Input signal is high						
1	DIN_ DATA_1	0	Input signal is low or open						
		1	Input signal is high						
2	DIN_ DATA_2	0	Input signal is low or open						
		1	Input signal is high						
3	DIN_ DATA_3	0	Input signal is low or open						
		1	Input signal is high						
4	DIN_ DATA_4	0	Input signal is low						
		1	Input signal is high or open						
5	DIN_ DATA_5	0	Input signal is low						
		1	Input signal is high or open						
6	DIN_ DATA_6	0	Input signal is low						
		1	Input signal is high or open						
7	DIN_ DATA_7	0	Input signal is low						
		1	Input signal is high or open						

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4.5.2 Digital Output Data Register

The digital output data register controls the digital output port or indicates the status of the respective output signals in the case of a read access.

Address Offset: 0x0000 0001
Format: Byte
Access: Read and write
Value after reset: 0x00

Digital output channels 0 to 3 are opto-isolated; channels 4 to 7 are non-opto-isolated outputs.

Table 4-19:Digital Output Data Register

REGISTER NAME		Digital Output Data Register						ACCESS	
ADDRESS		0x0000 0001 (offset)						R	W
BIT POSITION		MSB 7	6	5	4	3	2	1	0 LSB
CONTENT		DOUT_ DATA_7	DOUT_ DATA_6	DOUT_ DATA_5	DOUT_ DATA_4	DOUT_ DATA_3	DOUT_ DATA_2	DOUT_ DATA_1	DOUT_ DATA_0
DEFAULT		0	0	0	0	0	0	0	0
0	DOUT_ DATA_0	0	High impedance						
		1	Low impedance						
1	DOUT_ DATA_1	0	High impedance						
		1	Low impedance						
2	DOUT_ DATA_2	0	High impedance						
		1	Low impedance						
3	DOUT_ DATA_3	0	High impedance						
		1	Low impedance						
4	DOUT_ DATA_4	0	TTL signal level 0						
		1	TTL signal level 1						
5	DOUT_ DATA_5	0	TTL signal level 0						
		1	TTL signal level 1						
6	DOUT_ DATA_6	0	TTL signal level 0						
		1	TTL signal level 1						
7	DOUT_ DATA_7	0	TTL signal level 0						
		1	TTL signal level 1						

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4.5.3 POST Code Data Register

The POST code data register is used to control the seven segment LED displays - LED4 and LED5, and to indicate the status of the respective display in the case of a read access.

Address Offset: 0x0000 0080
Format: Byte
Access: Read and write
Value after reset: 0x5F (indicates that the boot process has been completed)

LED4 indicates the value of the higher nibble of the register, whereas, LED5 indicates the value of the lower nibble of the register.

Table 4-20:POST Code Data Register

REGISTER NAME		POST Code Data Register						ACCESS	
ADDRESS		0x0000 0080 (offset)						R	W
BIT POSITION		MSB 7	6	5	4	3	2	1	0 LSB
CONTENT		POST_ CODE_ DATA_7	POST_ CODE_ DATA_6	POST_ CODE_ DATA_5	POST_ CODE_ DATA_4	POST_ CODE_ DATA_3	POST_ CODE_ DATA_2	POST_ CODE_ DATA_1	POST_ CODE_ DATA_0
DEFAULT		0	0	0	0	0	0	0	0
0	POST_ CODE_ DATA_0	0	Register lower nibble: display indicates in hexadecimal value: **BITS 3 2 1 0** **HEX** **DISPLAY: LED5** 0 0 0 0 0x0 0 • • • 1 1 1 1 0xF F						
		1							
1	POST_ CODE_ DATA_1	0							
		1							
2	POST_ CODE_ DATA_2	0							
		1							
3	POST_ CODE_ DATA_3	0							
		1							
4	POST_ CODE_ DATA_4	0	Register higher nibble: display indicates in hexadecimal value: **BITS 7 6 5 4** **HEX** **DISPLAY: LED4** 0 0 0 0 0x0 0 • • • 1 1 1 1 0xF F						
		1							
5	POST_ CODE_ DATA_5	0							
		1							
6	POST_ CODE_ DATA_6	0							
		1							
7	POST_ CODE_ DATA_7	0							
		1							

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