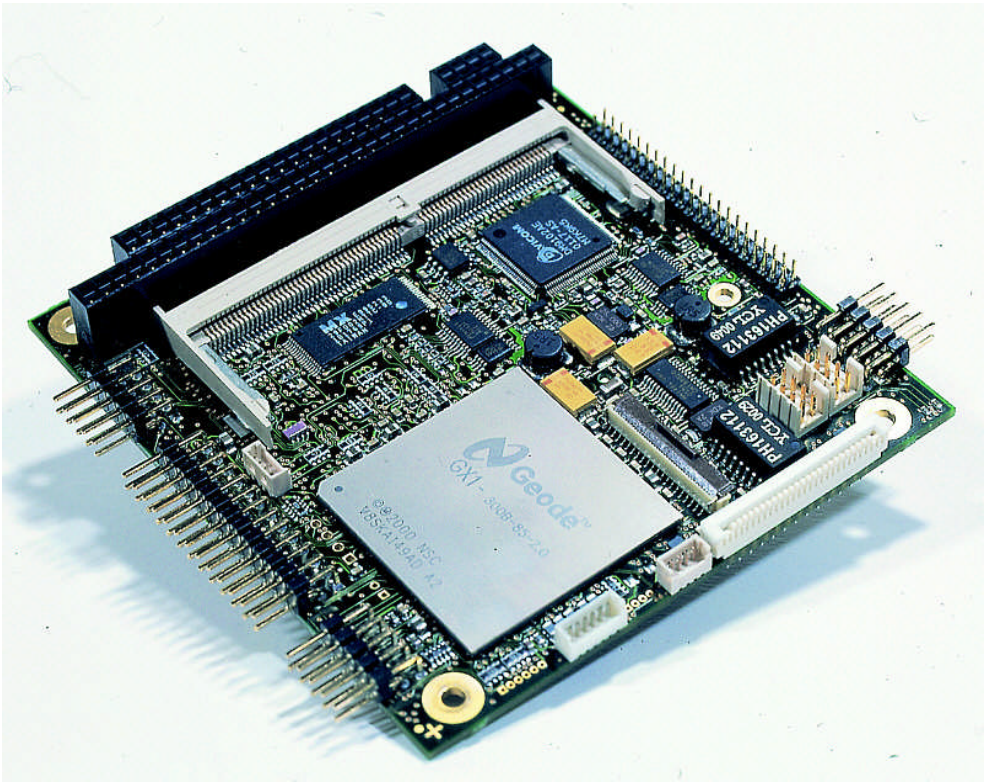


MOPSlcdGX1

User's Guide

Document Revision 1.8

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1. USER INFORMATION

1.1 About This Manual

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Kontron Embedded Modules is certified to ISO 9000 standards.

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1.6 Technical Support

Technicians and engineers from Kontron Embedded Modules and/or its subsidiaries and official distributors are available for technical support. We are committed to making our product easy to use and will help you use our products in your systems.

Before contacting Kontron Embedded Modules technical support, please contact your local representative or consult our Web site for the latest product documentation, utilities, and drivers. If the information does not help to solve the problem, contact us by telephone.

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2. INTRODUCTION

2.1 *MOPSlcdGX1*

The MOPS*lcd*GX1 uses the AMD (former National) Geode GX1 CPU. It provides a complete high performance embedded 80486 solution and offers the latest in features and technology.

One SO-DIMM socket on the topside of the board enables the MOPS*lcd*GX1 to be equipped with up to 256 MB of SDRAM.

The Geode CS5530A companion chip and a Winbond Super-I/O controller offer PC/AT subsystems found in desktop units. The subsystems built into the MOPS*lcd*GX1 include:

- CPU
- System ROM (BIOS)
- Direct memory access (DMA) controllers
- Counters
- Interrupt controllers
- Keyboard interface
- Speaker interface
- Floppy-drive interface
- Integrated Drive Electronics (IDE) hard-disk interface
- Serial ports (COM1 and COM2)
- Parallel port (LPT1)
- Integrated memory controller with up to 4MB unified memory architecture (UMA) for VGA

Additional subsystems integrated into the MOPS*lcd*GX1 enhance its PC/AT functionality. Subsystems include:

- PS/2 style mouse
- Universal serial bus (USB) ports
- Up to two peripheral component interconnect (PCI) Fast Ethernet chips

2.2 The MOPS Family

MOPS (**M**inimized **O**pen **P**C **S**ystem) PC/104 products represent the “Proven PC Platform for Instant Solutions." Each MOPS module is characterized by the same pinout for the keyboard, COM1 and COM2, 44-pin IDE, LPT, and 1st LAN. These homogeneous features facilitate easy upgrades within the Kontron Embedded Modules GmbH MOPS PC/104 product family.

Whenever a LCD panel is required, MOPS products with onboard graphics controllers serve as the right choice. Display connections are simplified when using these units, which come with a JUMPtec Intelligent LVDS Interface (JILI) and a JUMPtec Intelligent Panel Adapter (JIPA) interface. The two interfaces can recognize which display is connected and then independently set all video parameters. These interfaces are not available on all MOPS products.

All MOPS-PC/104 are plug-and-work enabled to further reduce time-to-market.

As part of the standard features package, all MOPS PC/104 modules come with a JUMPtec Intelligent Device Architecture (JIDA) interface, which is integrated into the BIOS of the PC/104 modules. This interface enables hardware independent access to the MOPS-PC/104 features that cannot be accessed via standard APIs. Functions such as watchdog timer, brightness and contrast of LCD backlight and user bytes in the EEPROM can be configured with ease by taking advantage of this standard MOPS PC/104 module feature.

All MOPS PC/104 products can be remote controlled by using JRC software feature. This allows you to change, update, and maintain the MOPS products from a host computer via a serial connection.

2.3 PC/104 an Embedded PC Standard

Over the past decade, PC architecture has become an accepted platform for far more than desktop applications. Dedicated and embedded applications for PCs are beginning to appear everywhere.

By standardizing hardware and software around the broadly supported PC architecture, embedded system designers can substantially reduce development costs, risks, and time-to-market.

For these reasons, companies that embed microcomputers as controllers within their products seek ways to reap the benefits of using the PC architecture. However, the standard form factor of a PC bus (12.4" x 4.8") and its associated card cages and backplanes are too bulky and expensive for most embedded control applications.

The only practical way to embed the PC architecture in space-and power-sensitive applications has been to design a PC chip by chip directly into the product. But this runs counter to growing trend away from "reinventing the wheel." Whenever possible, top management now encourages outsourcing of components and technologies to reduce development costs and accelerate product design cycles.

A need has arisen for a more compact implementation of the PC bus, satisfying the reduced space and power constraints of embedded control applications. PC/104 was developed in response to this need. It offers full architecture, hardware and software compatibility with the PC bus but in ultra-compact (3.6" x 3.8") stackable modules. PC/104 is ideally suited to the unique requirements of embedded control applications.

Although configuration and application possibilities with PC/104 modules are practically limitless, there are two ways to use them in embedded system designs:

- ***Standalone module stacks***
  PC/104 modules are self-stacking. The modules are used like ultra-compact bus boards but without a need for backplanes or card cages. Stacked modules are spaced 0.6 inches apart. (The three-module stack measures 3.6 by 3.8 by 2 inches.) Companies using PC/104 module stacks within their products frequently create one or more of their own application-specific PC/104 modules.

- ***Component-line applications***
  In this configuration, the modules function as highly integrated components, plugged into custom carrier boards that contain application-specific interfaces and logic. The modules' self-stacking bus can be useful to install multiple modules in one location. This facilitates product upgrades or options and allows temporary addition of modules during system debug or test.

3. GETTING STARTED

The easiest way to get the MOPS*lcd*GX1 board running is to use a starter kit from Kontron Embedded Modules GmbH. Take the following steps:

1. Turn off the power supply (part of the starter kit).
2. Connect the power supply to the starter kit baseboard (part of the starter kit).
3. Plug the MOPS*lcd*GX1 to the PC/104 bus connector on the starter kit baseboard.
4. Make all necessary connections from the MOPS*lcd* GX1 to the starter kit board. (Cables come with the starter kit). The starter kit board offers various interfaces on standard connectors.
5. Plug a suitable SDRAM memory module into the SODIMM socket of the MOPS*lcd* GX1.
6. Connect the CRT monitor to the CRT interface or a LCD panel to the JILI interface by using the corresponding adapter cable.
7. Plug a keyboard to the starter kit's keyboard connector.
8. Connect the floppy drive (part of the starter kit) with the data cable (part of the starter kit) to the MOPS*lcd*GX1 floppy interface.
9. Connect the power supply to the floppy's power connector.
10. Plug a hard-drive data cable to the MOPS*lcd*GX1 hard-disk interface. Attach the hard disk to the connector at the opposite end of the cable.
11. If necessary, connect the power supply to the hard disk's power connector.
12. Make sure all your connections have been made correctly.
13. Turn on the power.
14. Enter the BIOS by pressing the F2 key during boot-up. Make all changes in the BIOS setup. See the BIOS chapter of this manual for details.

4. SPECIFICATIONS

4.1 *Functional Specifications*

- **Processor**
  - AMD (formerNational Semiconductor) Geode GX1
  - 300MHz (33Mhz bus clock)
  - 16KB integrated unified L1 cache
- **Chipset**
  - Geode I/O Companion Multifunction South Bridge (CS5530A)
  - PCI 2.1 compliant
- **Super-I/O Controller**
  - Winbond W83977F or compatible
- **Power supply**
  - 5V only supply
- **Memory**
  - Supports 1 SDRAM-SODIMM-Module (8 – 256 MB)
- **Two serial ports, (COM1 and COM2)**
  - Standard RS232C serial ports with FIFO
  - 16550 compatible
- **Parallel port (LPT1)**
  - With SPP/ECP/EPP support
- **Floppy drive interface**
- **EIDE hard-disk interface (PCI)**
  - PCI bus master IDE port (up to two IDE Devices)
  - Programmable input/output (PIO) modes up to Mode 4 timing
  - Multiword DMA Mode 0, 1, 2 with independent timing
  - Supports Kontron chipDISK
- **Onboard CompactFlash socket**
  - Type 1 only for commercial compact flashes
  - Master on secondary IDE
  - Located on bottom of MOPS*lcd*GX1 board

USB interface

- Two USB 1.0 ports (OHCI)
- USB legacy-keyboard support

Ethernet interfaces

- Two Davicom 9102A PCI Ethernet chips
- 10BASE-T/100BASE-T LAN
- Fast Ethernet, network-interface card (NIC) controller
- according to the common criteria of the embedded technology market segment

Graphic interfaces

- Onboard VGA integrated in Geode I/O Companion Multifunction South Bridge (CS5530A) chipset
- 2D-graphics accelerator and display controller
- Cathode ray tube (CRT) and liquid crystal display (LCD) panel support
- Low voltage differential signaling (LVDS): 110MHz channel that uses the JUMPtec Intelligent LVDS Interface (JILI)
- Resolution up to 1280 x 1024 x 16bpp
- Up to 4MB Video RAM based on UMA

512KB FLASH-BIOS (Phoenix)

- NV-EEPROM for CMOS setup

Keyboard controller

PS/2 mouse interface

Watchdog timer (WDT)

Real-time clock (requires external battery)

4.2 *Mechanical Specifications*

4.2.1. PC/104 Bus Connector (ISA part)

- **One 2 X 32 pin stackthrough and one 2 X 20 pin stackthrough connector**

4.2.2. Module Dimensions

- **95 x 90 mm (3.7" x 3.5")**

4.2.3. **Height** (including PC/104 connector pins)

- **23.5 mm max (0.925")**

4.2.4. Weight

- **105 g (full feature version without memory module)**

4.3 *Electrical Specifications*

4.3.1. Supply Voltage

- 5V DC +/- 5%

4.3.2. Supply Voltage Ripple

- 100 mV peak to peak 0 - 20 MHz

4.3.3. Supply Current (Typical, DOS Prompt)

- 1.25A (with 256MB SDRAM)

4.3.4. Supply Current (Maximum)

- 2.64A + current SDRAM

(calculated theoretical values from all components maximum supply currents)

4.3.5. External RTC Battery

- External RTC battery voltage: 2.2 - 3.5V (typ. 3.0V)
- External RTC battery quiescent current, max 2.4µA

4.4 MTBF

The following MTBF (Mean Time Between Failure) values were calculated using a combination of manufacturer's test data, if the data was available, and a Bellcore calculation for the remaining parts. The Bellcore calculation used is "Method 1 Case 1". In that particular method the components are assumed to be operating at a 50 % stress level in a 40° C ambient environment and the system is assumed to have not been burned in. Manufacturer's data has been used wherever possible. The manufacturer's data, when used, is specified at 50° C, so in that sense the following results are slightly conservative. The MTBF values shown below are for a 40° C office or telecommunications environment. Higher temperatures and other environmental stresses (extreme altitude, vibration, salt water exposure, etc.) will lower the MTBF values.

- **System MTBF (hours) :** 151.518 for full feature version

Notes: Fans usually shipped with Kontron Embedded Modules GmbH products have 50,000-hour typical operating life. The above estimates assume no fan, but a passive heat sinking arrangement.
Estimated RTC battery life (as opposed to battery failures) is not accounted for in the above figures and needs to be considered separately. Battery life depends on temperature and operating conditions. When the Kontron unit has external power; the only battery drain is from leakage paths.

4.5 Environmental Specifications

4.5.1. Temperature

- **Operating: 0 to +60 °C (*) (with appropriate airflow.)**
- **Nonoperating: -10 to +85 °C (noncondensing)**

Note: (*) The maximum operating temperature is the maximum measurable temperature on any spot on the module's surface. You must maintain the temperature according to the above specification.

4.5.2. Humidity

- **Operating: 10% to 90% (noncondensing)**
- **Nonoperating: 5% to 95% (noncondensing)**

5. CPU, CHIPSET AND SUPER-I/O CONTOLLER

5.1 CPU

The MOPS*lcd* GX1 comes with a 300MHz AMD Geode® GX1 processor. This is a 80486 compatible high speed and low-power CPU with some enhancements to nearly reach Pentium® performance. The Geode GX1 integrates the following features:

- Support for Intel's MultiMedia eXtensions (MMX) instruction set extension for acceleration of multimedia applications
- 16KB unified L1 cache
- Six-stage pipelined Integer Unit
- Integrated floating point unit (FPU)
- Memory Management Unit (MMU)
- Advanced Power Management (APM 1.2) for legacy power management
- PCI host controller
- Virtual Software Architecture (VSA)
- Integrated 2D-graphics accelerator and display controller with direct interface to Geode CS5530A companion device for CRT and LCD support
- Unified Memory Architecture (UMA) with frame buffer and video memory residing in main memory
- Synchronous dynamic random access memory (SDRAM) interface tightly coupled to CPU core and graphics subsystem for maximum efficiency

The CPU of the MOPSlcdGX1 is equipped with a passive cooler and therefore suits for many embedded applications.

5.2 Chipset

The MOPS*lcd* GX1 board uses the Geode I/O Companion Multifunction South Bridge (CS5530A), which is especially designed to work with the GX1 processor line and provides the following features:

- General features
  - 3.3V or 5.0V, PCI-bus compatible
  - 5.0V-tolerant I/O interfaces
- PCI-to-ISA bridge
  - PCI-2.1 compliant
  - Support for PCI initiator to Industry Standard Architecture (ISA) and ISA master-to-PCI cycle translations
  - PCI master for IDE controllers
  - PCI-to-ISA interrupt mapper/translator
- AT compatibility
  - Two 8259A-equivalent interrupt controllers
  - 8254-equivalent timer
  - Two 8237-equivalent DMA controllers
  - Boot-Read Only Memory (ROM) and keyboard-chip select
- Bus mastering IDE controllers
  - Two controllers with support for up to three IDE devices
  - Independent timing for master and slave devices for both channels
  - PCI bus master burst reads and writes
  - Ultra DMA/33 support
  - Programmed I/O up to PIO mode 4 support
- Display subsystem extensions
  - Complements the GX1 processors' graphics and video capabilities
  - Three independent line buffers for accelerating video data streams
  - YUV to RGB conversion hardware
  - Display interface with three integrated DACs
  - Integrated DOT clock generator
  - Up to 1280x1024 pixel resolution
- Two independent USB interfaces
  - Open-host controller interface (OpenHCI), Revision 1.0
  - Second-generation design

5.3 Super-I/O Controller

The Winbond W83977F Super-I/O controller on the MOPSlcdGX1 provides the following additional features:

- General features
  - Plug & Play (PNP) 1.0A compliant
  - Supports 13 interrupt request (IRQ) lines, 4 direct memory access (DMA) channels, full 16-bit address decoding
- Floppy Disk Controller (FDC)
  - Compatible with IBM PC AT disk drive system
  - 16 byte data FIFO
  - Supports one 3.5" or 5.25" floppy disk drive with up to 2.88Mbyte disks
- Two Serial Ports with high-speed 16550 compatible UARTs (Universal Asynchronous Receiver Transmitter), 16-byte send/receive FIFOs
- One Parallel Port with SPP, bi-directional, EPP and ECP support
- 8042 based keyboard controller
- PS/2 mouse support
- Watchdog Timer
- Real Time Clock (RTC)

5.4 CPU, Chipset and Super-I/O Configuration

See the Advanced Menu and its submenus section of the Appendix B: BIOS chapter for information on possible settings.

6. SYSTEM MEMORY

The MOPS*lcd*GX1 uses only small outline Dual Inline Memory Modules (SO-DIMMs). One socket is available for 3.3 Volt (power level) unbuffered Synchronous Dynamic Random Access Memory (SDRAM). SDRAM modules of up to 256MB can be used and have to be plugged into SDRAM SO-DIMM socket X1.

The total amount of memory available on the SDRAM module is used for main memory and graphic memory on the MOPS*lcd*GX1. Unified Memory Architecture (UMA) supported by Virtual Software Architecture (VSA) manages the sharing of the system memory between graphic controller and processor. Therefore, the full memory size is not available for software applications. Between 1MB and 4MB of main memory are used as graphic memory.

To find the location of the SDRAM socket X1 on the MOPS*lcd*GX1 board, please see the Appendix E: Connector Layout chapter.

7. ISA BUS EXPANSION

The design of the MOPS*lcd*GX1 follows the standard PC/104 form factor and offers the ISA-bus signals for the use of expansion cards. The PCI-bus signals are only used internally.

7.1 *PC/104 Bus (ISA part)*

The PC/104 bus consists of two connectors that use 104 pins in total.

- XT bus connector (64 pins)
- AT bus connector (40 pins, which is optional for 16 bit-data bus system)

The pinout of the PC/104 bus connectors corresponds to the pinout of the ISA bus connectors with some added ground pins. The two PC systems with different form factors are electrically compatible.

The **XT bus connector**, Row A and B.

The corresponding 64-pin stackthrough header (ISA bus = 62pins) has two added ground pins at the end of the connector (Pin A32 and Pin B32). The pinout between PC/104 bus and XT ISA bus is identical between A1 - A31 and B1 - B31.

The **AT bus extension connector**, Row C and D.

The corresponding 40-pin stackthrough header (ISA bus = 36 pins) has four added ground pins, two on each side of the connector. To avoid confusion, the first two pins are defined as Pin C0 and Pin D0. The additional ground pins at the end of the connector are defined as C19 and D19. The pinout between PC/104 bus and AT ISA bus is identical between C1 - C18 and D1 - D18.

7.1.1. Connectors

The MOPS*lcd*GX1 features both – XT bus and AT bus extension – on two, dual-row socket connector with 2.54mm x 2.54mm grid (0.1" x 0.1").

The PC-104 XT bus is available through the X2A connector. The PC/104 AT bus is available through the X2B connector.

A detailed description of the signals including electrical characteristics and timings is beyond the scope of this document. Please refer to the official ISA bus and PC/104 specifications for more details.

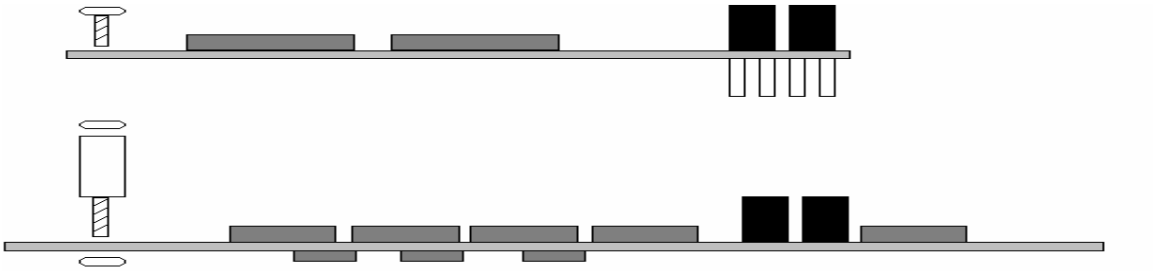
7.1.2. PC/104 Configuration

When using add-on boards on the PC/104 bus, make sure that there are no resource conflicts in the system. Carefully choose hardware interrupts, DMA channels, memory and I/O address ranges to avoid resource conflicts, which are often the reason for a board or a feature not functioning correctly. See Appendix A: System Resource Allocation for information about the resources already used by the MOPS*lcd* GX1.

7.2 *PC/104 Stack*

PC/104 adapter cards are mounted in a stack-through manner. Adapter cards are designed with plugs on their undersides that mate with the PC/104 socket connectors of MOPS*lcd*GX1. PC/104 adapters can support the socket connector version on their topside and allow additional stacking of adapters.

Whenever possible use the MOPS*lcd* GX1 as top module of the PC/104 stack as the CPU board is normally the board with the highest heat dissipation.



8. GRAPHICS INTERFACES

8.1 *Graphic Controller*

The MOPS*lcd* GX1 comes with a PCI graphic controller system integrated in the CPU and chipset. The Geode I/O Companion Multifunction South Bridge (CS5530A) incorporates extensions to the GX1 processor's display subsystem. These include:

- Video accelerator
  - Buffers and formats input luminance-bandwidth-chrominance (YUV) video data from the GX1 processor
  - 8-bit interface to the GX1 processor
  - X & Y scaler with bilinear filter
  - Color space converter (YUV to RGB)
- Video Overlay Logic
  - Color key
  - Data switch for graphics and video data
  - Gamma RAM
  - Brightness and contrast control
- Display Interface
  - Integrated RGB Video digital-to-analog converters (DACs)
  - VESA DDC2B/DPMS support
  - Flat-panel interface (simultaneous operation of CRT and LCD)
- Supported Resolutions (CRT and LCD)
  - The display controller on the MOPS*lcd* GX1 supports resolutions for CRT and LCD panels of up to 1280x1024x8 bpp and 1024x768x16 bpp.

The graphic subsystem of the MOPS*lcd* GX1 uses Unified Memory Architecture (UMA), which means up to 4MB of the system memory are used for video memory and frame buffer. The MOPS*lcd* GX1 video BIOS is integrated in the system BIOS and supports different panel types, which are identified via special configuration mechanisms.

8.2 CRT Connector

The CRT monitor interface is available through the X9 connector (6 pins). To have the signals available on a standard DSUB-15 CRT monitor connector, an adapter cable is required. A 15-pin DSUB cable is available from Kontron (KAB-VGA-2, Part Number 96053-0000-00-0).

Header	Pin	Signal Name	Function	DSUB-25
	1	RED	Analog video red	1
	2	GRN	Analog video green	2
	3	BLU	Analog video blue	3
	4	GND	Signal ground	7
	5	VSYNC	Vertical sync	14
	6	HSYNC	Horizontal sync	13

To find the location of the CRT connector on the MOPS*lcd*GX1 board, please see the Appendix E: Connector Layout chapter.

8.3 LCD Panel Connector

The interface for the LCD Panel is available through the X16 connector on the top side of the board. This connector represents the JILI interface (**J**UMPtec **I**ntelligent **L**VDS **I**nterface). The implementation of this subsystem complies with the JILI Specification of Kontron Embedded Modules GmbH. The MOPS*lcd*GX1 already supports the JILI3 implementation. A variety of cables for different display types are available from Kontron. Please refer to the actual cable list on the Kontron Web site for part numbers and cable names. A detailed description of the JILI interface standard also is available in a separate document JILIM???.PDF. The three question marks represent the documents revision number. You can download this document from the Kontron Web site, or contact your local Kontron technical support to receive it.

To find the location of the LCD Panel interface connector on the MOPS*lcd*GX1 board, please see the Appendix E: Connector Layout chapter.

8.4 Display Power Considerations

When using a LCD Panel, additional voltages may be required to drive the displays logic, supply the backlight converter and the display's contrast voltage.

The display logic may require +5V for standard or +3.3V for low-power LCDs. Contrast voltages for passive displays are normally very different and can range from –30V to +30V. Backlight converters usually are +5V or +12V types. When using a Kontron JILI cable, you do not need to determine such configurations. Display logic voltage and contrast voltage come preconfigured on the JILI cable. On occasion, backlight voltage has to be adjusted on the cable.

Even though the MOPS*lcd*GX1 is a +5V-only board, you need to supply the +12V for the backlight converter additionally when using such a converter type.

The onboard 3.3V-circuitry of the MOPS*lcd*GX1 and the +3.3V logic voltage of low-voltage panels are powered by separate voltage regulators. The one for the LCD is mounted on the JILI adapter cable.

8.5 Connecting a LCD Panel

To determine whether your panel display is supported, check the Kontron Web site for panel lists. We regularly update the list of panels that have been tested with the MOPS*lcd*GX1.

Many panel adapters for a wide spread variety of displays are available through Kontron. If you use one of those adapters supplied by Kontron, configuration is easy:

1. Check whether you have the correct adapter and cable for the panel you plan to use. Inspect the cable for damages.
2. Disconnect the power from your system.
3. Connect the panel adapter to the LCD Panel connector (JILI interface) on the MOPS*lcd*GX1.
4. Connect the other end of the cable to your display.
5. Connect the backlight converter.
6. Supply power to your system.
7. If no image appears on your display, connect a CRT monitor to the CRT connector.
8. If necessary program the EEPROM on the JILI cable with the matching configuration data.
9. If you still do not see improvement, consider contacting the dealer for technical support.

8.6 Configuration

You can set the general configuration for the graphic controller in the BIOS setup utility. Refer to the Advanced Chipset Control submenu and the Display Control submenu in the Appendix B: BIOS Operation chapter for more configuration information.

You can download available drivers for the Geode graphic controller subsystem from the Kontron Web site. For further information read the read-me or help files or contact technical support.

8.7 Graphics Technical Support

If problems occur, you can solve some of them by using the latest drivers for the Geode graphic controller subsystem. Kontron provides you with the latest Kontron-tested drivers, which can differ from newer ones. For further technical support, contact either Kontron or get support information and downloadable software updates from AMD.

8.8 *Available Video Modes*

The following lists show the video modes supported by the graphic controller with maximum video resolution. When configured for smaller video resolutions or using a LCD panel on the JILI interface, not all of the below video modes may be available. Availability depends upon controller configuration and the display capabilities.

8.8.1. Standard Video Modes

Video Mode	Display Mode	Characters/Pixels	Colors/Gray val.
00h/01h	Text	40x25	16
02h/03h	Text	80x25	16
04h/05h	Graphics	320x200	4 (packed pixel)
06h	Graphics	640x200	2 (packet pixel)
07h	Text	80x25	Mono
0Dh	Graphics	320x200	16 (planar)
0Eh	Graphics	640x200	16 (planar)
0Fh	Graphics	640x350	Mono (planar)
10h	Graphics	640x350	16 (planar)
11h	Graphics	640x480	Mono (planar)
12h	Graphics	640x480	16 (planar)
13h	Graphics	320x200	256 (packet pixel)

8.8.2. VESA Video Modes

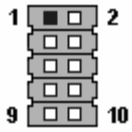
VESA Mode	VGA Mode	Display Mode	Characters/Pixels	Color Depths (bpp)
0100h	5Bh	Graphics	640x400	8
0101h	5Fh	Graphics	640x480	8
0102h	6Ah	Graphics	800x600	4
0103h	5Ch	Graphics	800x600	8
0104h	5Dh	Graphics	1024x768	4
0105h	60h	Graphics	1024x768	8
0106h	5Ah	Graphics	1280x1024	4
0107h	6Bh	Graphics	1280x1024	8
0110h	6Ch	Graphics	640x480	15
0111h	6Dh	Graphics	640x480	16
0113h	6Eh	Graphics	800x600	15
0114h	6Fh	Graphics	800x600	16
0116h	61h	Graphics	1024x768	15
0117h	62h	Graphics	1024x768	16
0120h	20h	Graphics	320x200	8
0121h	21h	Graphics	320x240	8
0122h	22h	Graphics	320x240	15
0123h	23h	Graphics	320x240	16
0124h	24h	Graphics	320x240	32
0125h	25h	Graphics	400x300	8
0126h	26h	Graphics	400x300	15
0127h	27h	Graphics	400x300	16
0128h	28h	Graphics	400x300	32
0129h	29h	Graphics	512x384	8
012Ah	2Ah	Graphics	512x384	15
012Bh	2Bh	Graphics	512x384	16
012Ch	2Ch	Graphics	512x384	32
012Dh	2Dh	Graphics	640x400	15
012Eh	2Eh	Graphics	640x400	16
012Fh	2Fh	Graphics	640x400	32

9. SERIAL-COMMUNICATION INTERFACES

Two fully functional serial ports (COMA and COMB) provide asynchronous serial communications. COMA and COMB support RS-232 operation modes. They are 16550 high-speed UART compatible and support 16-byte FIFO buffers for transfer rates from 50baud to 115.2Kbaud.

9.1 *Connectors*

COMA is available through the X11 connector (10 pins) and COMB through the X12 connector (10 pins). To have the signals available on the standard serial interface connectors DSUB9 or DSUB25, an adapter cable is required. A 9-pin DSUB cable is available from Kontron (KAB-DSUB9-2, Part Number 96017-0000-00-0). The following table shows the pinouts for COMA and COMB, as well as necessary connections for DSUB adapters.

Header	Pin	Signal Name	Function	In / Out	DSUB-25	DSUB-9
	1	/DCD	Data Carrier Detect	In	8	1
	2	/DSR	Data Set Ready	In	6	6
	3	RxD	Receive Data	In	3	2
	4	/RTS	Request to Send	Out	4	7
	5	TxD	Transmit Data	Out	2	3
	6	/CTS	Clear to Send	In	5	8
	7	/DTR	Data Terminal Ready	Out	20	4
	8	/RI	Ring Indicator	In	22	9
	9	GND	Signal Ground	--	7	5
	10	VCC *	+5V	--	--	--

Notes: (*) To protect the external power lines of peripheral devices, make sure that:
-- the wires have the right diameter to withstand the maximum available current
-- the enclosure of the peripheral device fulfils the fire-protecting requirements of
-- IEC/EN 60950.

To find the location of the serial ports on the MOPS*lcd*GX1 board, please see the Appendix E: Connector Layout chapter.

9.2 *Configuration*

You can set the two serial input/output interfaces to a variety of I/O addresses and IRQ configurations. Settings are changeable from the MOPS*lcd*GX1 BIOS menu. Refer to the I/O Device Configuration submenu in the Appendix B: BIOS Operation chapter for configuration information.

Note: Most operating systems detect the serial port with the I/O address 3F8h as COM1 and 2F8h as COM2.

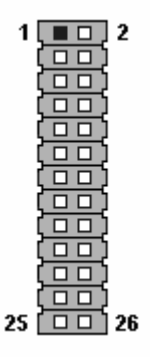
10. PARALLEL-COMMUNICATION INTERFACE

The MOPS*lcd*GX1 incorporates an IBM XT/AT compatible parallel port. It can be set to bi-directional and supports EPP and ECP operating modes. The bi-directional functions are compatible with those of an IBM PS/2 style parallel port. This functionality is always available and does not conflict with printer use.

10.1 *Connector*

The parallel port is available through the X15 connector (26 pins). To have the signals available on a standard, parallel-interface connector DSUB-25, an adapter cable is required, which is offered by Kontron (KAB-DSUB25-1, Part Number 96015-0000-00-0).

The following table shows the pinout as well as necessary connections for a DSUB-25 adapter.

Header	Pin	Signal Name	Function	In / Out	DSUB-25
	1	/STB	Strobe	Out	1
	3	PD0	Data 0	I/O	2
	5	PD1	Data 1	I/O	3
	7	PD2	Data 2	I/O	4
	9	PD3	Data 3	I/O	5
	11	PD4	Data 4	I/O	6
	13	PD5	Data 5	I/O	7
	15	PD6	Data 6	I/O	8
	17	PD7	Data 7	I/O	9
	19	/ACK	Acknowledge	In	10
	21	/BUSY	Busy	In	11
	23	PE	Paper out	In	12
	25	/SLCT	Select out	In	13
	2	/AFD	Autofeed	Out	14
	4	/ERR	Error	In	15
	6	/INIT	Init	Out	16
	8	/SLIN	Select in	Out	17
	26	VCC *	+ 5 V	--	NC
	10,12	GND	Signal Ground	--	18 - 25
	14,16	GND	Signal Ground	--	18 - 25
	18,20	GND	Signal Ground	--	18 - 25
	22,24	GND	Signal Ground	--	18 - 25

Notes: (*) To protect the external power lines of peripheral devices, make sure that:
-- the wires have the right diameter to withstand the maximum available current
-- the enclosure of the peripheral device fulfils the fire-protecting requirements of
-- IEC/EN 60950.

To find the location of the parallel port on the MOPS*lcd*GX1 board, please see the Appendix E: Connector Layout chapter.

10.2 *Configuration*

The parallel-port mode, I/O addresses, and IRQs are changeable in the MOPS*lcd*GX1 BIOS Setup Utility. You can program the base I/O-address 378h, 3BCh, 278h, disable the interface or set it to AUTO. You can choose IRQ5 or IRQ7 as the parallel-port interrupt. In ECP mode, you can choose DMA 1 or DMA 3.

Refer to the I/O Device Configuration Submenu in the Appendix B: BIOS Operation chapter for additional information on configuration.

11. KEYBOARD AND FEATURE INTERFACE

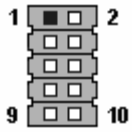
The keyboard and feature connector of the MOPS*lcd*GX1 offers five functions. The interface connects the following:

- Keyboard
- Keyboard lock switch
- Speaker
- Battery
- Reset button

11.1 *Connector*

The keyboard and feature connector is available through Connector X10 (10 pins). An adapter cable is required to connect a standard keyboard to this interface. There are two adapter cables available from Kontron. One can be used for AT-keyboard (KAB-KB-1, Part Number 96023-0000-00-0), the other for PS/2-keyboard (KAB-KB-PS2, Part Number 96060-0000-00-0). The adapter cables do not know the other functions on this interface.

The following table shows the pinout as well as necessary connections for adapters.

Header	Pin	Signal Name	Function	5-pin Din (Diode)	6-pin MiniDin (PS2)
	1	Speaker	Speaker output		
	2	GND	Ground		
	3	/RESIN	Reset input		
	4	/KBLOCK	Keyboard lock		
	5	KBDAT	Keyboard data	2	1
	6	KBCLK	Keyboard clock	1	5
	7	GND	Ground	4	3
	8	VCC *	+5V	5	4
	9	BATT	Battery in (3,0V)		
	10	PWRGOOD	Powergood		

Notes: (*) To protect the external power lines of peripheral devices, make sure that:
-- the wires have the right diameter to withstand the maximum available current
-- the enclosure of the peripheral device fulfils the fire-protecting requirements of
-- IEC/EN 60950.

To find the location of the keyboard and feature connector on the MOPS*lcd*GX1 board, please see the Appendix E: Connector Layout chapter.

11.2 Signal Descriptions

/KBLOCK (Keyboard Lock)

- Input on CPU modules
- Output on any other module
- Input to the keyboard controller input Port 1, Bit 7

/RESIN and PWRGOOD (Reset Inputs)

- Input on CPU modules
- When POWERGOOD goes high, it starts the reset generator on the CPU module to pull the onboard reset line high after a valid reset period. You also can use this pin as a low active hardware reset for modules.

Speaker

- Open collector output on modules that drive a piezo electronic speaker.
- Input on modules that connects a 5V piezo electronic speaker to this pin.
- An 8-Ohm loudspeaker also can be connected between SPEAKER and GND, but because of current limitation the volume will be low.
- Connect only one speaker to this pin. The CPU usually drives this pin. However, other modules also can use this signal to drive the system speaker.

KBDAT (Keyboard Data)

- Bi-directional I/O pin on CPU modules
- Keyboard data signal

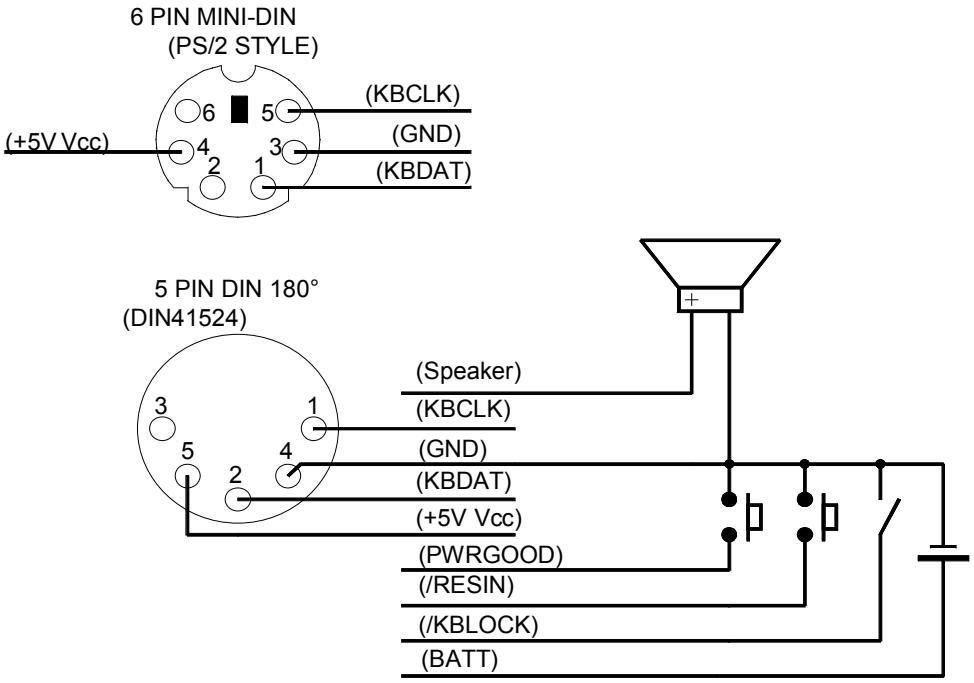
KBCLK (Keyboard Clock)

- Bi-directional I/O pin on CPU modules
- Keyboard clock signal

BATT (System Battery Connection)

- This pin connects a system battery to all modules.
- The battery voltage has to be higher than 2.2V and lower than 4.5V. A 3V battery is recommended.
- A battery is not needed to hold CMOS setup data. Your configurations for hard disks, floppy drives, and other peripherals are saved in an onboard EEPROM. However, you need a battery to save the CMOS date and time when power supply is turned off.

11.2.1. Example Connection AT-keyboard and Other Functions



11.3 *Configuration*

Refer to the Keyboard Features submenu in the Appendix B: BIOS chapter for information on configuration of the keyboard interface.

12. PS/2 MOUSE INTERFACE

The super-I/O controller of the MOPSlcdGX1 supports a PS/2 mouse.

12.1 *Connector*

The PS/2 mouse interface is available on Connector X20 (4 pins). An adapter cable is required to connect a standard PS/2 mouse. The cable is available from Kontron (KAB-MOUSE-PS2, Part Number 96062-0000-00-0).

The following table shows the pinout and connections for a PS/2 mouse adapter.

Header	Pin	Signal Name	Function	6-pin MiniDin (PS2)
	1	MSDAT	Mouse data	1
	2	VCC *	+5V	4
	3	GND	Ground	3
	4	MSCLK	Mouse clock	5

Notes: (*) To protect the external power lines of peripheral devices, make sure that:
-- the wires have the right diameter to withstand the maximum available current
-- the enclosure of the peripheral device fulfils the fire-protecting requirements of
-- IEC/EN 60950.

To find the location of the PS/2 mouse connector on the MOPS*lcd*GX1 board, please see the Appendix E: Connector Layout chapter.

12.2 *Configuration*

You can set the PS/2 mouse to enabled, disabled or autodetect from the BIOS Setup. If you enable the mouse, the IRQ12 is used as the interrupt and is no longer available for other devices. Please refer to the Advanced Menu in the Appendix B: BIOS chapter for additional information on configuration.

13. USB INTERFACES

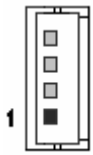
The chipset of the MOPS*lcd*GX1 has an integrated USB host bridge. It comes with two USB ports, which follows the OHCI specification and is USB-1.0 compliant.

You can expand the amount of USB connections by adding external hubs. You can connect up to 127 USB peripherals to each hub.

13.1 *Connectors*

The USB ports are available through the X6 and X7connectors (each 4 pins). To have the signals available on the standard USB interface connectors, an adapter cable is required. An USB interface cable is available from Kontron (KAB-USB-1, Part Number 96054-0000-00-0).

The following table shows the pinouts for the USB connectors.

Header	Pin	Signal Name	Function
	1	VCC *	+5V
	2	USB0	USB-
	3	USB1	USB+
	4	GND	Ground

Notes: (*) To protect the external power lines of peripheral devices, make sure that:
-- the wires have the right diameter to withstand the maximum available current
-- the enclosure of the peripheral device fulfils the fire-protecting requirements of
-- IEC/EN 60950.

To find the location of the USB ports on the MOPS*lcd*GX1 board, please see the Appendix E: Connector Layout chapter.

13.2 Configuration

Configuration entries are available for the USB ports in the BIOS Setup Utility. You can enable/disable the USB controller as well as the USB legacy support and specify the OHCI register location. Please refer to the I/O Device Configuration submenu in the Appendix B: BIOS chapter for information.

13.3 Limitations

The power contacts for USB devices on Pin 1 and Pin 4 are not protected. They are suitable to supply connected USB devices with a maximum of 500mA power dissipation. Do not supply external USB devices with higher power dissipation through these pins. Always use a fuse for power on external USB connectors, otherwise a defective USB device may damage the MOPS*lcd*GX1. Kontron recommends using a resetable fuse for power on external USB connectors to follow the USB specification.

14. FLOPPY-DRIVE INTERFACE

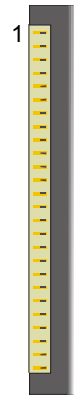
The floppy-drive interface of the MOPS*lcd*GX1 uses a 2.88MB super I/O floppy-disk controller and can support one floppy disk drive with densities that range from 360kB to 2.88MB. The controller is 100% IBM compatible.

14.1 *Connector*

The floppy disk interface is available on the flat-foil connector X13 (26 pins). This type of connector is often internally used in notebooks to connect a slim-line floppy drive.

Accessories are available for this interface from Kontron. To connect a standard 3.5" floppy drive, use an adapter cable (ADA-FLOPPY-2, Part Number 96001-0000-00-0). If you have a slim-line 3.5" floppy drive, you may need a flat foil cable (KAB-FLOPPY/MOPS-1, Part Number 96019-0000-00-0). It also is possible to get a slim line 3.5" floppy drive with cable from Kontron (FLOPPY-MOPS-1, Part Number 96010-0000-00-0).

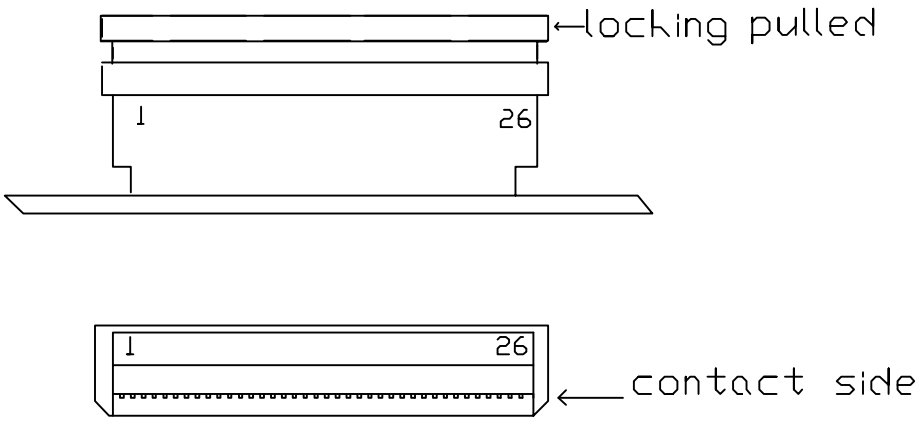
The following table shows the connector pinout.

Header	Pin	Signal Name	Function	Pin	Signal Name	Function
	1	VCC *	+5V	2	/IDX	Index
	3	VCC *	+5V	4	/DR0	Drive Select 0
	5	VCC *	+5V	6	/DSKCHG	Disk Change
	7	NC	Not connected	8	NC	Not connected
	9	NC	Not connected	10	/MTR0	Motor on 0
	11	NC	Not connected	12	/FDIR	Direction Select
	13	NC	Not connected	14	/STEP	Step
	15	GND	Ground	16	/WDATA	Write Data
	17	GND	Ground	18	/WGATE	Write Gate
	19	GND	Ground	20	/TRK0	Track 00
	21	GND	Ground	22	/WRTPRT	Write Protect
	23	GND	Ground	24	/RDATA	Read Data
	25	GND	Ground	26	/HDSEL	Side One Select

To find the location of floppy-drive interface on the MOPS*lcd*GX1 board, please see the Appendix E: Connector Layout chapter.

Notes: (*) To protect the external power lines of peripheral devices, make sure that:
-- the wires have the right diameter to withstand the maximum available current
-- the enclosure of the peripheral device fulfils the fire-protecting requirements of
-- IEC/EN 60950.

14.1.1. Connector Diagram



14.2 *Configuration*

You can configure the floppy disk interface in the BIOS Setup Utility. You can choose the 3.5" (common) or 5.25" drive types with densities of 360kB, 720kB, 1.2MB, 1.25MB, 1.44MB or 2.88MB. Refer to the Main Menu section of the Appendix B: BIOS Operation chapter for more information on configuring the floppy drive.

You also can disable the floppy-disk interface in the I/O Device Configuration Submenu.

15. IDE INTERFACES

PCI-bus devices serve as primary and secondary IDE hosts on the MOPS*lcd* GX1. The controller supports up to Ultra DMA 33 mode, up to PIO mode 4 timing and multiword DMA mode 0, 1, 2 with independent timing. The MOPS*lcd* GX1 features one IDE interface that can drive two hard disks and one CompactFlash socket. When two IDE devices share a single adapter, they are connected in a master/slave, daisy-chain configuration. If only one drive is in the system, you must set it as the master. The CompactFlash socket is implemented through the secondary host as master.

15.1 *IDE Interface Connector*

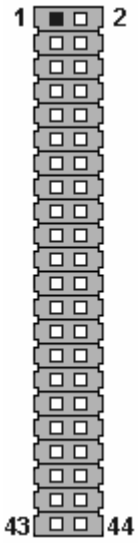
The IDE interface is available through Connector X5 (44 pins). This interface is designed in 2mm grid for optimal connectivity to a 2.5" hard disk.

There are several accessories available for IDE connectivity.

You can use two cables to directly connect a hard disk in a 2.5" form factor (KAB-IDE-2MM, Part Number 96021-0000-00-0) or a 3.5" form factor (KAB-IDE-25, Part Number 96020-0000-00-0).

You can plug a Kontron chipDISK, which is an IDE hard disk that uses Flash technology, into the IDE interface and mechanically mount it by using a mini-spacer on the chipDISK hole. You also can use a chipDISK adapter (chipDISK-ADA1, Part Number 96004-0000-00-0) or compact Flash adapter (CFC-ADA1, Part Number 96004-0000-00-2) for more disk support.

The following table shows the pinout.

Header	Pin	Signal Name	Function	Pin	Signal Name	Function
	1	/RESET	Reset	2	GND	Ground
	3	HDD7	Data 7	4	HDD8	Data 8
	5	HDD6	Data 6	6	HDD9	Data 9
	7	HDD5	Data 5	8	HDD10	Data 10
	9	HDD4	Data 4	10	HDD11	Data 11
	11	HDD3	Data 3	12	HDD12	Data 12
	13	HDD2	Data 2	14	HDD13	Data 13
	15	HDD1	Data 1	16	HDD14	Data 14
	17	HDD0	Data 0	18	HDD15	Data 15
	19	GND	Ground	20	Key (NC)	Key pin
	21	DRQ	IDE DMA Request	22	GND	Ground
	23	/IOW	I/O write	24	GND	Ground
	25	/IOR	I/O read	26	GND	Ground
	27	IOCHRDY	I/O channel ready	28	NC **	Not connected
	29	/ACK	Acknowledge	30	GND	Ground
	31	IRQ	Interrupt	32	NC	Not connected
	33	SA1	Addr 1	34	NC	Not connected
	35	SA0	Addr 0	36	SA2	Addr 2
	37	/CS1	Chip select 1	38	/CS3	Chip select 3
	39	NC	Not connected	40	GND	Ground
	41	VCC *	+5V	42	VCC Motor *	+5V
	43	GND	Ground	44	NC	Not connected

Notes: (*) To protect the external power lines of peripheral devices, make sure that:
-- the wires have the right diameter to withstand the maximum available current
-- the enclosure of the peripheral device fulfils the fire-protecting requirements of
-- IEC/EN 60950.

(**) Pin 28 is normally used as cable select signal. On the MOPS*lcd*GX1 it is not connected. IDE devices that have to use cable select will not function under all configurations.

To find the location of IDE interface on the MOPS*lcd*GX1 board, please see the Appendix E: Connector Layout chapter.

15.2 *CompactFlash Socket*

The CompactFlash socket X14 (50 pins) for commercial CompactFlashes (Type I) is integrated on the bottom side of the MOPS*lcd*GX1 board. As the signals of the socket are connected to the secondary IDE this socket is no hot-plug interface. Turn off power to the system before adding or removing a CompactFlash card.

The following table shows the pinout of the CompactFlash socket.

Pin	Signal Name	Function	Pin	Signal Name	Function
1	GND	Ground	2	D3	Data 3
3	D4	Data 4	4	D5	Data 5
5	D6	Data 6	6	D7	Data 7
7	/CS1	Chip select 1	8	GND	Ground
9	GND	Ground	10	GND	Ground
11	GND	Ground	12	GND	Ground
13	VCC	+5V	14	GND	Ground
15	GND	Ground	16	GND	Ground
17	GND	Ground	18	SA2	Addr. 2
19	SA1	Addr. 1	20	SA0	Addr. 0
21	D0	Data 0	22	D1	Data 1
23	D2	Data 2	24	NC	Not connected
25	GND	Ground	26	GND	Ground
27	D11	Data 11	28	D12	Data 12
29	D13	Data 13	30	D14	Data 14
31	D15	Data 15	32	/CS3	Chip select 3
33	GND	Ground	34	/IOR	I/O read
35	/IOW	I/O write	36	VCC	+5V
37	IRQ	Interrupt	38	VCC	+5V
39	GND	Ground	40	NC	Not connected
41	/RESET	Reset	42	IOCHRDY	Ready
43	NC	Not connected	44	VCC	+5V
45	NC	Not connected	46	NC	Not connected
47	D8	Data 8	48	D9	Data 9
49	D10	Data 10	50	GND	Ground

15.3 *Configuration*

The IDE interface and the CompactFlash socket offer several configuration settings. Refer to the Main Menu and I/O Device Configuration Submenu in the Appendix B: BIOS Operation chapter for additional information on configuration.

16. ETHERNET INTERFACES

The MOPS*lcd* GX1 uses two Davicom DM9102A PCI Fast Ethernet Controllers. The network controllers support 10/100Base-T interfaces. The devices auto-negotiate the use of a 10Mbit/sec or 100Mbit/sec connection. You can enable an onboard LAN RPL ROM to support the boot up of the system via Ethernet and a PXE-boot server.

The Davicom DM9102A provides the following features:

- Integrated Fast Ethernet MAC, Physical Layer, and transceiver on one chip
- Compliance with PCI Specification 2.2
- PCI-bus-master architecture
- EEPROM 93C46 interface supports node ID, access-configuration information
- Compliance with IEEE 802.3u 100Base-TX and 802.3 10Base-T
- Compliance with IEEE 802.3u autonegotiation protocol for automatic link- type selection
- Full-duplex/half-duplex capability
- Support IEEE 802.3x Full Duplex Flow Control
- Digital clock recovery circuit using advanced digital algorithm to reduce jitter
- High-performance 100Mbps clock generator and data-recovery circuit
- Loopback mode for easy system diagnostics

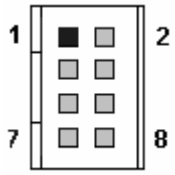
Note: The Ethernet interface works according to the common criteria of the embedded technology market segment.

16.1 Connectors

The Ethernet interfaces are available through connectors X17 and X18 (each 8 pins).

To have the signals of the Ethernet connection available on a standard RJ45 connector, you need an adapter cable, which is offered by Kontron (KAB-MOPS-ETN1, Part Number 96048-0000-00-0).

The following table shows the pinout.

Header	Pin	Signal Name	Function	In/Out
	1	TXD+	10BASE-T Transmit	Differential Output
	2	TXD-	10BASE-T Transmit	Differential Output
	3	RXD+	10BASE-T Receive	Differential Input
	4	SHLDGND	Shield ground	
	5	SHLDGND	Shield ground	
	6	RXD-	10BASE-T Receive	Differential Input
	7	SHLDGND	Shield ground	
	8	SHLDGND	Shield ground	

Notes: TXD+, TXD- differential-output pair drives 10 and 100Mb/s Manchester-encoded data to 100/10BASE-T transmit lines.
RXD+, RXD- differential input pair receives 10 and 100Mb/s Manchester-encoded data from 100/10BASE-T receive lines.

To find the location of the Ethernet interface on the MOPS*lcd*GX1 board, please see the Appendix E: Connector Layout chapter.

16.2 Configuration

The onboard Davicom DM9102A Ethernet controllers can be enabled or disabled in BIOS setup utility. Refer to the I/O Device Configuration Submenu in the Appendix B: BIOS Operation chapter for additional information on configuration.

You can download available drivers from the Kontron Web site. For further information read the read-me file or contact technical support.

16.3 Ethernet Technical Support

If any problems occur, you can solve some of them by using the latest drivers for the Davicom DM9102A controller. Kontron provides you with the latest Kontron-tested drivers, which can differ from newer ones. For further technical support, contact either Kontron or get support information and downloadable software updates from Davicom.

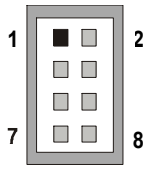
17. POWER CONNECTION

In some applications, the MOPS*lcd*GX1 is intended for use as a stand-alone module without a backplane. You need to have a power connector available on the board for direct power supply. The MOPS*lcd*GX1 is a +5V-only board. Peripherals can obtain additional voltage from the power connector next to the PC/104 bus. The additional voltages (+12V, -5V and -12V) are not generated onboard the MOPS*lcd*GX1.

17.1 *Connector*

The power connector is available as X2C (8 pins).

The following table shows the pinout.

Header	Pin	Signal Name	Function
	1	GND	Ground
	2	VCC	+5V
	3	BATT	Battery
	4	+12V	+12V
	5	-5V	-5V
	6	-12V	-12V
	7	GND	Ground
	8	VCC	+5V

To find the location of the power connector on the MOPS*lcd*GX1 board, please see the Appendix E: Connector Layout chapter.

17.2 Power Pins

Every power pin on the power connector as well as on the PC/104 bus connectors is limited to a maximum current of 1A per pin.

If a system using a MOPS*lcd*GX1 is only supplied from the power connector, the following limitations apply:

Power	Number of Pins	Max. Current
VCC (+5V)	2	2A
+12V	1	1A
-12V	1	1A
-5V	1	1A
GND	2	2A

A system using the MOPS*lcd*GX1 also can be supplied from the PC/104 bus connectors. If only those supply voltages pins are used, the following limitations apply:

Power	Number of pins on ISA part	Max. Current
VCC (+5V)	4	4A
+12V	2	2A
-12V	2	2A
-5V	2	2A
GND	8	8A

Modules on the PC/104 bus consuming a higher supply current must provide power supply through an additional connector.

Note: The MOPS*lcd*GX1 is not a replacement for a backplane. Use all power pins on the power connector and on the PC/104 connectors for power supply to the MOPS*lcd*GX1, and also use all additional power connectors on additional I/O cards, if your system exceeds the above limitations. It is not acceptable to use only the power pins of the PC/104 connector for power supply of the full PC/104 stack.

17.3 External Battery

You can connect an external battery to Pin 3 (BATT) of the power connector instead of Pin 9 of the keyboard connector. For more information refer to the Keyboard and Feature Interface section.

Note: The two battery inputs are protected against each other by diodes.

18. WATCHDOG TIMER

The watchdog timer is integrated in the Winbond W83977A Super-I/O device of the MOPS*lcd*GX1 and can issue a reset to the system. The watchdog timer circuit has to be triggered within a specified time by the application software. If the watchdog is not triggered because proper software execution fails or a hardware malfunction occurs, it will reset the system.

18.1 *Configuration*

You can set the watchdog timer to disabled or reset mode. You can specify the timeout from 15 seconds to about 30 minutes. The timeout is the time the watchdog has to be triggered within. You can make the initialization settings in the BIOS setup. Refer to the Watchdog Settings Submenu in the Appendix B: BIOS Operation chapter for information on configuration.

18.2 *Programming*

18.2.1. Initialization

You can initialize the watchdog timer from the BIOS setup. You also can set up the initialization from the application software with help of the JIDA (Jumptec Intelligent Device Architecture) programmer's interface or by using low-level programming.

18.2.2. Trigger

The watchdog needs to be triggered out of the application software within a specified timeout period. You can only do this in the application software by using low-level programming or with help of the JIDA programmer's interface.

For information about low-level programming for the watchdog timer, refer to Application Note WdogPGX1_E???.DOC, which you can request from Kontron technical support.

For information about the JIDA programmer's interface refer to the JIDA BIOS extension section in the Appendix B: BIOS chapter and separate documents available in the JIDA software packages on the Kontron Web site.

19. APPENDIX A: SYSTEM RESOURCE ALLOCATIONS

19.1 *Interrupt Request (IRQ) Lines*

Please note that Kontron PC/104 devices were designed after the draft of P996 Specification for ISA systems. Because of this, shareable interrupts are not supported. Some PC/104 add-on board manufacturers do not follow the P996 Specification and allow shareable interrupts. If you want to use such PC/104 boards with Kontron devices, contact the manufacturer of the add-on board and ask about switching to non-interrupt sharing.

IRQ #	Use	Available	Comment
0	Timer0	No	
1	Keyboard	No	
2	Cascade	No	
3	COM2	No	Note (1), Note (2)
4	COM1	No	Note (1), Note (2)
5		Yes	Note (3)
6	FDC	No	Note (1)
7	LPT1	No	Note (1), Note (3)
8	RTC	No	
9		Yes	
10	COM3	Yes	Note (4)
11	COM4	Yes	Note (4)
12	PS/2 Mouse	No	Note (1)
13	FPU	No	
14	IDE0	No	Note (1)
15	CompactFlash	No	Note (1)

Notes: (1) If the „used for“ device is disabled in setup, the corresponding interrupt is available for other devices.
(2) ATTENTION: BIOS settings determine which physical COM connector is assigned to a logical COM port.
(3) LPT1 also can be configured for IRQ5.
(4) Possible interrupts, if an external SMsC 669 Super-I/O controller is in the system

19.2 Direct Memory Access (DMA) Channels

DMA #	Used for	Available	Comment
0		Yes	
1		Yes	Note (3)
2	FDC	No	Note (1)
3	LPT	No	Note (2), Note (3)
4	Cascade	No	
5		Yes	
6		Yes	
7		Yes	

Notes: (1) If the „used for“-device is disabled in setup, the corresponding DMA channel is available for other devices.

(2) The DMA channel is only used in ECP mode of LPT, in other modes it is available.

(3) Possible alternative setting of LPT in ECP mode for used DMA channel.

19.3 I/O Address Map

The I/O-port addresses of the processor module MOPS*lcd*GX1 are functionally identical to a standard PC/AT. All addresses not mentioned in this table should be available. We recommend that you do not use I/O addresses below 0110hex with additional hardware for compatibility reasons, even if available.

I/O Address (h)	Use	Available	Comment
0000 - 000F	DMA Controller 1	No	Fixed
0010	System Control	No	Fixed
0020 - 0021	Interrupt Controller 1	No	Fixed
0022 - 0023	Configuration Registers	No	Fixed
0040 - 0044	Timer	No	Fixed
0060 - 0066	Keyboard controller	No	Fixed
0061	Port B Register	No	Fixed
0070	NMI Enable Register	No	Fixed
0070 - 0071	Real Time Clock	No	Fixed
0080	BIOS POST	No	Fixed
0081 - 008F	DMA Page Register	No	Fixed
0090 - 0094	System Control	No	Fixed
0092	Port A Register (Fast A20 Gate)	No	Fixed
00A0 – 00A1	Interrupt Controller 2	No	Fixed
00A2 – 00A3	System Control	No	Fixed
00C0 - 00DF	DMA Controller 2	No	Fixed
00E0 - 00EF	System Control	No	Fixed
00F0 - 00FF	Math Coprocessor	No	Fixed
0100 - 010F	General Purpose I/O	No	Kontron Control Port
0170 – 0177	CompactFlash	No	Fixed
01F0 - 01F7	Fixed Disk	No	Fixed
0278 - 027F		Yes	Free in standard configuration, but possible address of LPT1.
02E8 - 02EF		Yes	Free in standard configuration, but possible address of COM.
02F8 - 02FF	Serial Port 2	No	Default for COM B, free with different configuration.
0370 - 0377	Configuration Port	No	Configuration address for Winbond-controller.
0378 - 037F	Parallel Port 1	No	Default for LPT 1; free with different configuration.
03B0 – 03BF	Video Control	No	Fixed
03BC - 03C4		Yes	Free in standard configuration, but possible address of LPT1.
03E8 - 03EF		Yes	Free in standard configuration, but possible address of COM.
03F0 - 03F7	Diskette Controller	No	Fixed
03F8 - 03FF	Serial Port 1	No	Default for COM A, free with different configuration.
0481 - 048B	DMA Page Registers	No	Fixed
04D0 - 04D1	Interrupt Select	No	Fixed
0778 – 077A	System Control	No	Fixed
121C – 121F	ACPI Timer/Counter	No	Fixed

19.4 *Memory Map*

The MOPS*lcd*GX1 processor module can support up to 256MB memory modules. As the MOPS*lcd*GX1 uses Unified Memory Architecture (UMA) the amount of graphic memory reduces the available amount of main memory. The first 640KB of DRAM are used as main memory.

Using DOS, you can address 1MB of memory directly. Memory area above 1MB (high memory, extended memory) is accessed under DOS via special drivers such as HIMEM.SYS and EMM386.EXE, which are part of the operating system. Please refer to the operating system documentation or special textbooks for information about HIMEM.SYS and EMM386.EXE.

Other operating systems (Linux or Windows versions) allow you to address the full memory area directly.

Upper Memory	Use	Available	Comment
A0000h – BFFFFh	VGA Memory	No	Mainly used by graphic adapter cards. If an external PCI graphic card is in the system this memory area is mapped to the PCI bus.
C0000h – CBFFFh	VGA BIOS	No	Free for ISA bus or shadow RAM only when onboard graphic is disabled. C0000h – C7FFFh is mainly used by external ISA VGA cards.
CC000h – DFFFFh		Yes	Free for ISA bus or shadow RAM in standard configurations. If onboard LAN RPL ROM is enabled, or JRC is used, a 16K block is shadowed for BIOS extensions, starting with first free area at CC000h or D0000h, D4000h, D8000hor DC000h. (BIOS extensions do not use the whole shadow block). If the USB Legacy Support is enabled a 16K block base address can be selected for the OHCI Register MAP.
E0000h – F0000h	System BIOS	No	OHCI Register MAP in USB Legacy Support is starting at E0000h by default setting.

19.4.1. Using Expanded Memory Managers

MOPS*lcd*GX1 extension BIOSes may be mapped to an upper memory area. (See the previous table.). Some add-on boards also have optional ROMs or use drivers that communicate with their corresponding devices via memory mapped I/O such as dual-ported RAM. These boards have to share the upper memory area with the Expanded Memory Manager's EMS frame. This often causes several problems in the system.

Most EMMs scan the upper memory area for extension BIOSes (optional ROMs) and choose a free memory area for their frame if it is not explicitly set. Normally, they are not always capable of detecting special memory-mapped I/O areas. You need to tell the EMM which memory areas are not available for the EMS frames, which is most of the time done by using special exclusion parameters.

If the Expanded Memory Manager you use cannot detect extension BIOSes (optional ROMs), make sure you excluded all areas in the upper memory, which are used by extension BIOSes, too. Your instruction in the CONFIG.SYS concerning the Expanded Memory Manager should look like this: (question marks for location of extension BIOS).

MS-DOS Example

```
DEVICE=EMM386.EXE X=????-???? X=E000-FFFF
```

Note: When booting up your system using this configuration under MS-DOS, the exclusion of area F000 to FFFF causes a warning. Microsoft reports that this message will always appear when the F000 segment lies in the shadow RAM. This is a bug of EMM386, not of the MOPS*lcd*GX1.

Please read the technical manuals of add-on cards used with the MOPS*lcd*GX1 for the memory areas they use. If necessary, also exclude their memory locations to avoid a conflict with the EMM.

19.5 *Peripheral Component Interconnect (PCI) Devices*

All devices follow the PCI 2.1 specification. The BIOS and OS control memory and I/O resources. Please refer to the PCI 2.1 specification for details.

PCI Device (IDSEL)	PCI IRQ	REQ / GNT	Comment
South Bridge	-	REQ0 / GNT0	Required for CS5530A
Ethernet 1 (AD12)	INTA#	REQ1 / GNT1	
Ethernet 2 (AD21)	INTB#	REQ2 / GNT2	
USB Controller	INTA#	-	Integrated in CS5530A.

Note: The MOPS*lcd*GX1 offers no external PCI bus connectivity. PC/104Plus specification allows 3 external masters (REQ0, REQ1 and REQ2).

20. APPENDIX B: BIOS OPERATION

The MOPS*lcd*GX1 comes with a Phoenix BIOS 4.0, Release 6.1, which is located in an onboard Flash EEPROM in compressed form. The device has 8-bit access. The shadow RAM feature provides faster access (16 bits). The onboard Flash EEPROM also holds some special Kontron BIOS extensions, which are loaded during boot up if the corresponding feature is enabled.

You can update the BIOS using a Flash utility.

20.1 *Determining the BIOS Version*

To determine the BIOS version of the MOPS*lcd*GX1 , immediately press the **<Pause/Break>** key on your keyboard as soon as you see the following text display in the upper left corner of your screen:

```
PhoenixBIOS 4.0 Release 6.1
Copyright 1985-2000 Phoenix Technology Ltd.
All Rights Reserved
Kontron(R) BIOS Version <PGX1R115>
(C)Copyright 2001 Kontron Embedded Modules GmbH
```

Whenever you contact technical support about BIOS issues, providing a BIOS version <PGX1R???> is especially helpful.

The system BIOS provides additional information about the board's serial number, CPU, and memory information by displaying information similar to the following:

```
S/N: XJ4120101

CPU = National Geode GX1 300 MHz
638K System RAM Passed
59M Extended RAM Passed
System BIOS shadowed
Video BIOS shadowed

UMB upper limit segment address: E584
```

The board's serial number has value to technical support. MOPS*lcd*GX1 serial numbers always start with XJ and are followed by six or seven digits. The first digit represents the year of manufacturing, the next two digits stand for the lot number, and the last three or four digits are the number of the board in that lot.

In the example above, the board with the serial number XJ4120101 was manufactured in year 2004, lot 12 of that year, and is board number 101 of that lot.

20.2 *Setup Guide*

The Phoenix BIOS Setup Utility changes system behavior by modifying the BIOS configuration. The setup program uses a number of menus to make changes and turn features on or off.

The BIOS setup menus documented in this section represent those found in most models of the MOPS*lcd*GX1. The BIOS setup for specific models can differ slightly.

Note: Selecting incorrect values may cause system boot failure. Load setup-default values to recover by pressing <F9>.

20.2.1. Start Phoenix BIOS Setup Utility

To start the Phoenix BIOS Setup Utility, press the **<F2>** key when the following string appears during boot up.

```
Press <F2> to enter Setup
```

The Main Menu then appears.

20.2.2. General Information

The **Setup Screen** is composed of several sections:

Setup Screen	Location	Function
Menu Bar	Top	Lists and selects all top-level menus.
Legend Bar	Bottom	Lists setup navigation keys.
Item Specific Help Window	Right	Help for selected item.
Menu Window	Left Center	Selection fields for current menu.
General Help Window	Overlay (center)	Help for selected menu.

Menu Bar

The menu bar at the top of the window lists different menus. Use the left/right arrow keys to make a selection.

Legend Bar

Use the keys listed in the legend bar on the bottom to make your selections or exit the current menu. The table below describes the legend keys and their alternates.

Key	Function
<F1> or <Alt-H>	General Help window.
<Esc>	Exit menu.
← or → Arrow key	Select a menu.
↑ or ↓ Arrow key	Select fields in current menu.
<Tab> or <Shift-Tab>	Cycle cursor up and down.
<Home> or <End>	Move cursor to top or bottom of current window.
<PgUp> or <PgDn>	Move cursor to next or previous page.
<F5> or <->	Select previous value for the current field.
<F6> or <+> or <Space>	Select next value for the current field.
<F9>	Load the default configuration values for this menu.
<F10>	Save and exit.
<Enter>	Execute command or select submenu.
<Alt-R>	Refresh screen.

Selecting an Item

Use the ↑ or ↓ key to move the cursor to the field you want. Then use the + and - keys to select a value for that field. **Save Value** commands in the **Exit** menu save the values displayed in all menus.

Displaying Submenus

Use the ← or → key to move the cursor to the submenu you want. Then press <Enter>. A pointer (▸) marks all submenus.Item Specific Help Window

The Help window on the right side of each menu displays the Help text for the selected item. It updates as you move the cursor to each field.

General Help Window

Pressing **<F1>** or **<ALT-F1>** on a menu brings up the General Help window that describes the legend keys and their alternates. Press **<Esc>** to exit the General Help window.

20.3 Main Menu

Feature	Option	Description
System Time	HH:MM:SS	Set system time. Press <Enter> to move to MM or SS.
System Date	MM/DD/YYYY	Set system date. Press <Enter> to move to DD or YYYY.
Legacy Diskette A	360 kB, 5 ¼" 1.2 MB, 5 ¼" 720 kB, 3 ½" **1.44/1.25 MB**, 3 ½" 2.88 MB, 3 ½" Not installed Disabled	Select type of installed floppy disk drive.
Legacy Diskette B *	360 kB, 5 ¼" 1.2 MB, 5 ¼" 720 kB, 3 ½" 1.44/1.25 MB, 3 ½" 2.88 MB, 3 ½" Not installed **Disabled**	Select type of installed floppy disk drive.
‣ Primary Master	Autodetected drive	Displays results of PM autotyping.
‣ Primary Slave	Autodetected drive	Displays results of PS autotyping.
‣ Compact Flash	Autodetected drive	Displays result of SM autotyping.
System Memory	N/A	Displays total of conventional memory detected during boot-up.
Extended Memory **	N/A	Displays total of extended memory detected during boot-up.

Notes: In the Option column, bold shows default settings.
(*) Normally only one floppy drive is supported by the onboard floppy interface.
(**) Extended Memory = capacity of memory module – selected graphic memory

20.3.1. Master or Slave and Compact Flash Submenus

Feature	Option	Description
Type	None User **Auto** CD-ROM ATAPI Removable IDE Removable Other ATAPI	None = Autotyping is not able to supply the drive type or end user has selected None, disabling any drive that may be installed. User = End user supplies the hdd information. Auto = Autotyping, the drive itself supplies the information. CD-ROM = CD-ROM drive. ATAPI Removable = Read- and writeable media e.g. LS120 and USB-ZIP IDE Removable = Removable HDDs Other ATAPI = for ATAPI devices not supported by other HDD features.
Cylinders	1 to 65,536	Number of cylinders in CHS format.
Heads	1 to 256	Number of read/write heads in CHS format.
Sectors	1 to 63	Number of sectors per track in CHS format.
Maximum Capacity	N/A	Displays the calculated size of the drive using CHS format.
Total Sectors	N/A	Total number of sectors in LBA mode as reported by the drive during autotyping.
Maximum Capacity	N/A	Displays the calculated size of the drive by using the LBA format.
Multi-Sector Transfers	**Disabled** 2 sectors 4 sectors 8 sectors 16 sectors	Any selection except Disabled determines the number of sectors transferred per block. The standard is 1 sector per block.
LBA Mode Control	**Disabled** Enabled	Enabling LBA uses Logical Block Addressing instead of CHS.
32-Bit I/O	**Disabled** Enabled	Enables 32-bit communication between CPU and IDE card. Requires PCI or Local Bus.
Transfer Mode	**Standard** Fast PIO 1 Fast PIO 2 Fast PIO 3 Fast PIO 4 Fast PIO 3 / DMA 1 Fast PIO 4 / DMA 2	Selects the method for transferring the data between the hard disk and system memory.
SMART Device Monitoring	**Disabled** Enabled	Enables SMART warnings of imminent failure of drive.

Note: In the Option column, bold shows default settings.

20.4 *Advanced Menu*

All entries in this part of the BIOS setup utility are very vital to your system. Change settings only if you are sure of what you are doing. Some changes may not be suitable for your complete system and may lead to unwanted system behavior.

Feature	Option	Description
▸ Advanced Chipset Control	Submenu	Opens Advanced Chipset Control submenu.
PNP OS installed	Yes **No**	If your system has a PNP OS (e.g. Win98) select Yes to let the OS configure PNP devices not required for boot. No makes the BIOS configure them.
Secured Setup Configuration	**Yes** No	Yes prevents a Plug and Play OS from changing system settings.
Reset Configuration Data	**No** Yes	Yes erases all configuration data in ESCD, which stores the configuration settings for plug-in devices. Select Yes when required to restore manufacturer defaults.
▸ PCI Configuration	Submenu	Opens PCI Advanced submenu.
PS/2 Mouse	Disabled **Enabled** Auto Detect	Disables or enables PS/2 mouse. Auto Detect enables PS/2 mouse if BIOS detects one.
▸ Keyboard Features	Submenu	Opens Keyboard Features submenu.
▸ I/O Device Configuration	Submenu	Opens I/O Device Configuration submenu.
Large Disk Access Mode	**DOS** Other	Select DOS if you have DOS. Select Other if you have another OS such as UNIX. A large disk is one that has more than 1024 cylinders, more than 16 heads or more than 63 sectors per track.
Halt On Errors	Yes **No ***	Determines if post errors cause the system to halt.

Notes: In the Option column, bold shows default settings.
(*) Before BIOS version PGX1R114 the default setting was Yes.

20.4.1. Advanced Chipset Control Submenu

Feature	Option	Description
Multiple Monitor Support	Motherboard Disabled * Motherboard Primary **Adapter Primary**	Motherboard Primary enables motherboard graphics for VGA, Adapter Primary enables an external adapter or VGA, Motherboard Disable does not allocate graphics resources.
Video Resolution	Low Medium High **Super**	Determines the UMA memory size for VGA. Higher resolution means more VGA memory and less system memory. Super = 4MB, High = 2.125 MB, Medium = 1.5 MB, Low = 1.25 MB
Display Mode **	CRT only LCD only **Simultan**	Determines display mode.

Notes: In the Option column, bold shows default settings.
(*) If you choose Motherboard Disabled you will have no graphic outputs anymore.
You need to load the Default settings to return to graphic output.
To load the Setup Defaults during boot up, press <F2> until you hear a beep and then press <F9> <Enter> and <F10> <Enter>.
(**) This setup entry has been moved to Boot Menu after BIOS version PGX1R110

20.4.2. PCI Configuration Submenu

Feature	Option	Description
PCI IRQ line 1 *	Disabled **Auto Select** IRQ3, 4, 5, 7, 9, 10, 11, 12, 14,15	Select IRQ for PIC interrupt INTA. Select Auto to let BIOS assign IRQ.
PCI IRQ line 2 *	See above.	Select IRQ for PIC interrupt INTB. Select Auto to let BIOS assign IRQ.
PCI IRQ line 3 *	See above.	Select IRQ for PIC interrupt INTC. Select Auto to let BIOS assign IRQ.
PCI IRQ line 4 *	See above.	Select IRQ for PIC interrupt INTD. Select Auto to let BIOS assign IRQ.
‣ PCI/PNP ISA UMB Region Exclusion	Submenu	Opens UMB Region Exclusion submenu.
‣ PCI/PNP ISA IRQ Resource Exclusion	Submenu	Opens IRQ Exclusion submenu.
‣ PCI/PNP ISA DMA Resource Exclusion	Submenu	Opens IRQ Exclusion submenu.
ISA graphics device installed	**No** Yes	PCI devices may need to know if an ISA graphics device is installed in the system to enable card to function correctly.

Note: In the Option column, bold shows default settings.
(*) Setup entry available since BIOS version PGX1R115

20.4.3. PCI/PNP ISA UMB Region Exclusion Submenu

Feature	Option	Description
C800 - CBFF	**Available** Reserved	Reserves block of upper memory for use by legacy ISA devices. Don't set this option to Reserved on the MOPSlcd6, which has a video BIOS up to CBFF. This option should only be used with the MOPS/686+ (without graphic)
CC00 - CFFF	**Available** Reserved	Reserves block of upper memory for use by legacy ISA devices.
D000 – D3FF	**Available** Reserved	Reserves block of upper memory for use by legacy ISA devices.
D400 – D7FF	**Available** Reserved	Reserves block of upper memory for use by legacy ISA devices.
D800 - DBFF	**Available** Reserved	Reserves block of upper memory for use by legacy ISA devices.
DC00 - DFFF	**Available** Reserved	Reserves block of upper memory for use by legacy ISA devices.

Note: In the Option column, bold shows default settings.

20.4.4. PCI/PNP ISA IRQ Exclusion Submenu

Feature	Option	Description
IRQ3	**Available** Reserved	Reserves specified IRQ for use by legacy ISA devices.
IRQ4	**Available** Reserved	Reserves specified IRQ for use by legacy ISA devices.
IRQ5	**Available** Reserved	Reserves specified IRQ for use by legacy ISA devices.
IRQ7	**Available** Reserved	Reserves specified IRQ for use by legacy ISA devices.
IRQ9	**Available** Reserved	Reserves specified IRQ for use by legacy ISA devices.
IRQ10	**Available** Reserved	Reserves specified IRQ for use by legacy ISA devices.
IRQ12	**Available** Reserved	Reserves specified IRQ for use by legacy ISA devices.
IRQ14 *	**Available** Reserved	Reserves specified IRQ for use by legacy ISA devices.
IRQ15 *	**Available** Reserved	Reserves specified IRQ for use by legacy ISA devices.

Note: In the Option column, bold shows default settings.
(*) Only visible if the Local Bus IDE Adapter is disabled

20.4.5. PCI/PNP ISA DMA Exclusion Submenu

Feature	Option	Description
DMA 0	**Available** Reserved	Reserves specified DMA for legacy ISA devices.
DMA 1	**Available** Reserved	Reserves specified DMA for legacy ISA devices.
DMA 2	**Available** Reserved	Reserves specified DMA for legacy ISA devices.
DMA 3	**Available** Reserved	Reserves specified DMA for legacy ISA devices.
DMA 5	**Available** Reserved	Reserves specified DMA for legacy ISA devices.
DMA 6	**Available** Reserved	Reserves specified DMA for legacy ISA devices.
DMA 7	**Available** Reserved	Reserves specified DMA for legacy ISA devices.

Note: In the Option column, bold shows default settings.

20.4.6. Keyboard Features Submenu

Feature	Option	Description
NumLock	**Auto** On Off	'On' or 'Off' turns NumLock on or off at bootup. Auto turns NumLock on if it finds a numeric keypad.
Key Click	**Disabled** Enabled	Turns audible key click on.
Keyboard auto-repeat rate	**30/sec**, 26.7/sec, 21.8/sec, 18,5/sec, 13.3/sec, 10/sec, 6/sec, 2/sec	Sets the number of times to repeat a keystroke per second if you hold the key down.
Keyboard auto-repeat delay	¼ sec, ½ **sec**, ¾ sec, 1 sec	Sets the delay time before auto-repeat will start.

Note: In the Option column, bold shows default settings.

20.4.7. I/O Device Configuration Submenu

Feature	Option	Description
Local Bus IDE adapter	Disabled, Primary, Compact Flash, **Both**	Enables onboard PCI IDE device.
Onboard FDC	Disabled, **Enabled**	Enables onboard FDC controller.
External FDC *	**Disabled,** Enabled	Enables external FDC controller.
Base I/O address	**Primary** Secondary	Selects base address of onboard FDC controller. (Primary = 3F0h, Secondary = 370)
Floppy Drive Swap	**Disabled,** Enabled	Swap drive A and B
Serial Port A Serial Port B	Disabled Enabled **Auto**	Disabled turns off the port. Enabled requires end user to enter the base I/O address and the IRQ. Auto makes the BIOS configure the port.
Serial Port C * Serial Port D *	**Disabled** Enabled Auto	Disabled turns off the port. Enabled requires end user to enter the base I/O address and the IRQ. Auto makes the BIOS configure the port.
Base I/O address	**3F8h, 2F8h**, 3E8h, 2E8h	Select I/O base of port.
IRQ (Port A and B)	**IRQ 3, IRQ 4**	Select IRQ of Port A and B
IRQ (Port C and D) *	IRQ 10, IRQ 11	Select IRQ of Port C and D
Mode *	**Normal,,** IrDA, Ask-IR	Selects mode of Serial Port D.
IRDA Pins *	**Standard** Alternate	Selects which pins of the SMC669 to use for the IrDA interface.
Onboard LPT	Disabled Enabled **Auto**	Disabled turns off the port. Enabled requires end user to enter the base I/O address and the IRQ. Auto makes the BIOS configure the port.
External LPT *	**Disabled** Enabled Auto	Disabled turns off the port. Enabled requires end user to enter base I/O address and the IRQ. Auto makes the BIOS or OS configure the port, depending on PNP OS setting.
Mode	Output only Bi-directional **ECP** EPP	Set mode for the parallel port.
Base I/O address	**378h**, 278h, 3BCh	Select I/O base of port.
IRQ	IRQ 5, **IRQ 7**	Select IRQ of parallel port.
DMA	**DMA 1**, DMA 3	Select DMA channel of port if in ECP mode.

Note: In the Option column, bold shows default settings.
(*) Only visible if an external I/O controller (SMSC669) is on the OEM backplane.

USB Host Controller	**Disabled** Enabled	Enable or Disable onboard USB controller.
USB BIOS Legacy Support **	**Disabled** Enabled	Enable or disable support for USB keyboard and mice as well as USB boot support. Enable for use with non-USB aware OSes such as UNIX and DOS.
OHCI Registers at ***	**E0000h**, D0000h, C8000h, CC000h	Choose the memory location address where the 16K block for the OHCI registers starts.
▸Watchdog Settings	Submenu	Opens Watchdog Settings sub menu

Note: In the Option column, bold shows default settings.
(**) If legacy USB is enable, IRQ1 and IRQ12 do not wake the system from standby or suspend state.
(***) This entry is available since BIOS version PGX1R113. In former BIOS versions UMB region DC000h-E3FFFh was reserved for this purpose.

20.4.8. Ethernet Configuration Submenu

Feature	Option	Description
Onboard Ethernet 1	**Enabled** Disabled	Enable/Disable onboard Ethernet controller 1
Onboard Ethernet 2	**Enabled** Disabled	Enable/Disable onboard Ethernet controller 2

Note: In the Option column, bold shows default settings.

20.4.9. Watchdog Settings Submenu

Feature	Option	Description
Mode *	**Disabled** Reset	Select watchdog operation mode.
Timeout **	15s, 45s, **1:15m**, 2:15m, 5:15m, 10:15m, 30:15m	Max. trigger period.

Note: In the Option column, bold shows default settings.
(*) Compared to other products of the MOPS family, the MOPS*lcd*GX1 does not support NMI mode.
(**) Compared to other products of the MOPS family, the MOPS*lcd*GX1 does not have a delay time.

20.5 *Security Menu*

Feature	Option	Description
Set Supervisor Password *	Up to seven alphanumeric characters	Pressing **Enter** displays the dialog box for entering the user password. In related systems, this password gives full access to setup.
Set User Password *	Up to seven alphanumeric characters	Pressing **Enter** displays the dialog box for entering the user password. In related systems, this password gives restricted access to setup. Only available if supervisor password is set.
Diskette access	User **Supervisor**	Requires password on boot enabled. Supervisor does not allow user to access floppy disk.
Fixed disk boot sector	**Normal** Write Protect	Write protect enables virus protection of the boot sector on hard disk.
Virus check reminder	**Disabled** Daily Weekly Monthly	Displays a message during bootup asking whether you backed up the system or scanned for viruses (Y/N). Message returns on each boot until you respond with "Y". Daily displays the message on the first boot of the day, Weekly on the first boot after Sunday, and Monthly on the first boot of the month.
System backup reminder	**Disabled** Daily Weekly Monthly	Displays a message during bootup asking whether you backed up the system or scanned for viruses (Y/N). Message returns on each boot until you respond with "Y". Daily displays the message on the first boot of the day, Weekly on the first boot after Sunday, and Monthly on the first boot of the month.
Password on boot	**Disabled** Enabled	Enabled requires a password on boot. Requires prior setting of the supervisor password. If supervisor password is set and this option is Disabled, BIOS assumes user is booting.

Notes: In the Option column, bold shows default settings.

(*) Enabling "Set Supervisor Password" requires a password for entering Setup. Passwords are not case sensitive.
User and Supervisor passwords are related. You cannot have a User password without first creating a Supervisor password

20.6 *Power Menu*

A power management system reduces the amount of energy used after specified periods of inactivity. The setup menu supports a **Full On** state, a **Standby** state with partial power reduction, and a **Suspend** state with full power reduction.
Use the Activity Event submenu to specify whether or not an activity can terminate a Standby or Suspend state and restore Full On.

Feature	Option	Description
Power Savings	**Disabled** Enabled	Enables or disables power management.
Standby Timeout	Off, 1min, 2min, **4min**, 5min, 10min, 20min, 30min, 1h	Inactivity period required to put system in Standby mode (partial power shutdown).
Suspend Timeout	Off, 1min, 2min, **4min**, 5min, 10min, 20min, 30min, 1h	Inactivity period required after Standby to Suspend mode (maximum power shutdown).
Hard Disk Timeout	**Off**, 1min, 2min, 4min, 5min, 10min, 20min, 30min, 1h	Inactivity period of hard disk required before standby (motor off).
‣ Activity Event	Submenu	Opens activity event submenu.

Note: In the Option column, bold shows default settings.

20.6.1. Activity Event Submenu

Feature	Option	Description
IRQ1 *	**Yes** No	Wakes up system on IRQ1 (Keyboard).
IRQ12 *	**Yes** No	Wakes up system on IRQ12 (PS/2 Mouse).
IRQ3, 4, 5, 7, 9, 10,. 11	Yes **No**	Wakes up system on IRQ.

Note: In the Option column, bold shows default settings.
(*) If legacy USB is enabled, IRQ1 and IRQ12 do not wake system from standby or suspend state.

20.7 *Boot Menu*

Feature	Option	Description
Floppy Check	**Disabled** Enabled	Enabled verifies floppy type on boot. Disabled speeds up boot.
Summary Screen	**Disabled** Enabled	If Enabled, a summary screen is displayed just before booting the OS to let the end user see the system configuration.
QuickBoot Mode	Disabled **Enabled**	Allows the system to skip certain tests while booting. This will decrease the time needed to boot the system.
Dark Boot	**Disabled** Enabled	If Enabled, system comes up with a blank screen instead of the diagnostic screen during bootup.
▸ Boot Device Priority	Submenu	Opens boot device priority submenu
Onboard LAN PXE ROM	**Disabled** Enabled	Enables Remote Program Load ROM of the onboard LAN controller. Supports Intel PXE.
▸ Display Control *	Submenu	Opens display control submenu

Note: In the Option column, bold shows default settings.
(*) This submenu is available since BIOS PGX1R111.

20.7.1. Dark Boot

After you turn on or reset the computer, Dark Boot displays a graphical logo (default is a blank screen) instead of the text based POST screen, which displays a number of PC diagnostic messages.

The graphical logo stays up until just before the OS loads unless:

- You press **Esc** to display the POST screen
- You press **F2** to enter Setup
- POST issues an error message
- The BIOS or an option ROM requests keyboard input

20.7.2. Boot Device Priority Submenu

Feature	Option	Description
▸ Hard Drive	Boot priority and submenu.	Sets boot priority of Hard Disks as described in the respective submenu.
▸ Removable Devices	Boot priority and submenu.	Sets boot priority of Removable Devices as described in the respective submenu.
Atapi CD-ROM Drive	Boot priority	Sets boot priority of ATAPI CD ROM Drives.
▸ Network Boot	Boot priority and submenu.	Sets boot priority of Network Adapters as described in the respective submenu.

This menu allows you to select the order of the devices from which BIOS attempts to boot the OS. If BIOS is unsuccessful at booting from one device, during POST it will try the next one on the list.

The items on this menu each may represent the first of a class of items. For example, if you have more than one hard-disk drive, Hard Drive represents the first of such drives as specified in the Hard-Drive menu described below.

To change the order, select the device you want to change and press <-> to decrease or <+> to increase priority.

Removable Devices Priority Subentries

If you have more than one Removable Media drive, select Removable Devices and press <**Enter**> to display the Removable Media devices and choose which drive is represented in boot-order menu.

Note: The standard 1.44MB floppy drive is referenced as “Legacy Floppy Drives.”

Hard Drive Priority Subentries

If you have more than one bootable hard drive, select Hard Drive and press <**Enter**> to display the Fixed Disk Menu and choose the boot priority.

Network Boot Priority Subentries

If you have more than one bootable network adapter in the system, select **Network Boot** and press <**Enter**> to display the available network adapters and choose boot priority. Normally there is only one bootable network adapter in the system and no submenu is available.

20.8 *MultiBoot*

MultiBoot expands your boot options by letting you choose your boot device such as:

- Hard disk
- Floppy disk
- CD-ROM
- Network card

You can select your boot device in the Setup as described above, or you can choose a different device each time you boot by selecting your boot device in the **Boot First Menu**.

20.8.1. Boot First Menu

Display the **Boot First Menu** by pressing **<Esc>** during POST. In response, the BIOS first displays the message "Entering Boot Menu..." and then displays the **Boot Menu** at the end of POST.

Use the menu to select any of these options:

- Override the existing boot sequence (for this boot only) by selecting another boot device. If the specified device does not load the OS, BIOS reverts to the previous boot sequence.
- Enter Setup
- Press **<Esc>** to continue with the existing boot sequence.

20.8.2. Display Control Submenu

Feature	Option	Description
Display Mode	**Simultan,** LCD only, CRT only	Determines display mode.
Flat Panel Type *	**Auto Detect**, VGA, SVGA, XGA **	Select Auto Detect whenever using a JILI cable on the LCD interface. VGA, SVGA, XGA provide standard timings for LCD panel resolutions.

Note: In the Option column, bold shows default settings.
(*) Available since BIOS version PGX1R113.
(**) Standard timings for VGA, SVGA, XGA panels cannot drive all available displays of that type that are on the market. Use a JILI cable whenever possible.

20.9 Exit Menu

Feature	Option	Description
Exit Saving Changes	Saves selections and exits setup. The next time the system boots, the BIOS configures the system according to the Setup selection stored in CMOS.	Exit saving changes.
Exit Discarding Changes	Exits Setup without storing in CMOS any new selections you may have made. The selections previously in effect remain in effect.	Exit discarding changes.
Load Setup Defaults	Displays default values for all the Setup menus.	Load setup defaults.
Discard Changes	If, during a Setup session, you change your mind about changes you have made and have not yet saved the values to CMOS, you can restore the values you saved to CMOS.	Discard changes.
Save Changes	Saves all the selection without exiting Setup. You can return to the other menus to review and change your selection.	Save changes.

Note: In the Option column, bold shows default settings.

20.10 *Kontron BIOS Extensions*

Besides the Phoenix System BIOS, the MOPS*lcd*GX1 comes with a few BIOS extensions that support special features. All extensions are located in the onboard flash EEPROM. Some extensions are permanently available; some are loaded if required during boot up. Supported features include:

- JIDA standard
- Remote Control feature (JRC)
- Onboard LAN RPL/PXE ROM

All enabled BIOS extensions require shadow RAM. They will be loaded into the same 16K shadowed memory block, if possible. However, if the system memory cannot find free memory space because all the memory is already used for add-on peripherals, the BIOS extensions do not load.

20.10.1. JIDA BIOS extension

The JUMPtec Intelligent Device Architecture (JIDA) BIOS extension is not a true extension BIOS. It is part of the system BIOS and is located in the system BIOS segments after boot up. It is permanently available and supports the JIDA 32-bit standard. It is a software interrupt 15hex driven programmers interface and offers lots of board information functions. For detailed information about programming, refer to the JIDA specification and a source code example (JIDAI???.ZIP), which you can find at the Kontron Web site. The three question marks represent the revision number of the file. You also can contact technical support for this file.

For other operating systems, special drivers (JIDAIA??.ZIP) are available. You can download the zip file from the Kontron Web site.

20.10.2. Remote Control Client Extension

You can remotely control the MOPS*lcd*GX1 using software available from Kontron (JRC-1, Part Number 96047-0000-00-0). This software tool can communicate with the board via one of the serial ports. During boot up of the MOPS*lcd*GX! , the system BIOS scans the serial ports for an available JRC connection. If detected, it loads the JRC client BIOS extension into the memory. With the JRC client loaded into the first detected free memory location between C0000hex and D8000hex, a 16K block is shadowed.

For more information on the Remote Control usage, refer to the JRC-1 technical manual or Application Note JRCUsage_E???.PDF, which you can find on the Kontron Web site.

20.10.3. LAN RPL/PXE ROM

If the onboard LAN RPL/PXE ROM is enabled in the system BIOS setup, a special optional ROM for the Ethernet controller loads into memory during boot up. This optional ROM allows you to boot the MOPS*lcd*GX1 over an Ethernet connection. A server with Intel PXE/RPL boot support is required on the other side of the Ethernet connection. The setup and configuration of the server, including PXE/RPL support, is not the responsibility of Kontron.

The RPL ROM extension is loaded into the first free memory area between C0000hex and D8000hex and a 16K block of memory is shadowed.

20.11 *Updating or Restoring BIOS*

If your MOPS*lcd* GX1 board requires a newer BIOS version or the BIOS is damaged, you may need to update or restore the BIOS.

Phoenix PHLASH allows you to update or restore the BIOS with a newer version or restore a corrupt BIOS by using a floppy disk without having to install a new ROM chip.

1) Download Phoenix Phlash as a compressed file, CRD2PGX1.ZIP, from the Kontron Web site. It contains the following files:

File	Purpose
MAKEBOOT.EXE	Creates the custom boot sector on the Crisis Recovery Diskette.
CRISBOOT.BIN	Serves as the Crisis Recovery boot sector code.
MINIDOS.SYS	Allows the system to boot in Crisis Recovery Mode.
PHLASH.EXE	Programs the Flash ROM.
WINCRISIS.EXE	Creates the Crisis Recovery Diskette from Windows.
WINCRISIS.HLP	Serves as the help file of WINCRISES.EXE.
PLATFORM.BIN	Performs platform-dependent functions.
BIOS.ROM	Serves as the actual BIOS image to be programmed into Flash ROM.

2) To install Phoenix Phlash on a hard disk, unzip the content CRD2PPGX1.ZIP into a local directory such as C:\PHLASH.

3) To create a Crisis Recovery Diskette, insert a blank diskette into Drive A: or B: and execute WINCRISIS.EXE. This copies four files onto the Crisis Recovery Diskette.

File	Purpose
MINIDOS.SYS	Allows the system to boot in Crisis Recovery Mode.
PHLASH.EXE	Programs the Flash ROM.
PLATFORM.BIN	Performs platform-dependent functions.
BIOS.ROM	Serves as the BIOS image to be programmed into Flash ROM.

4) If the BIOS image (BIOS.ROM) changes because of an update or bug fix, copy the new BIOS.ROM image onto the diskette.

20.11.1. Running Phoenix Phlash

You can run Phoenix Phalsh in one of two modes:

- Command Line
- Crisis Recovery

Phlash can fail if the system uses memory managers. If this occurs, the utility displays this message:

```
Cannot flash when memory managers are present.
```

If you see this message after you execute Phlash, disable the memory manager.

20.12 *Preventing Problems When Updating or Restoring BIOS*

Updating the BIOS represents a potential hazard. Power failures or fluctuations that can occur during updating the Flash ROM can damage the BIOS code, making the system unbootable.

To prevent this potential hazard, many systems come with a boot-block Flash ROM. The boot-block region contains a fail-safe recovery routine. If the boot-block code finds a corrupted BIOS (checksum fails), it boots into the crisis recovery mode and loads a BIOS image from a crisis diskette (see above).

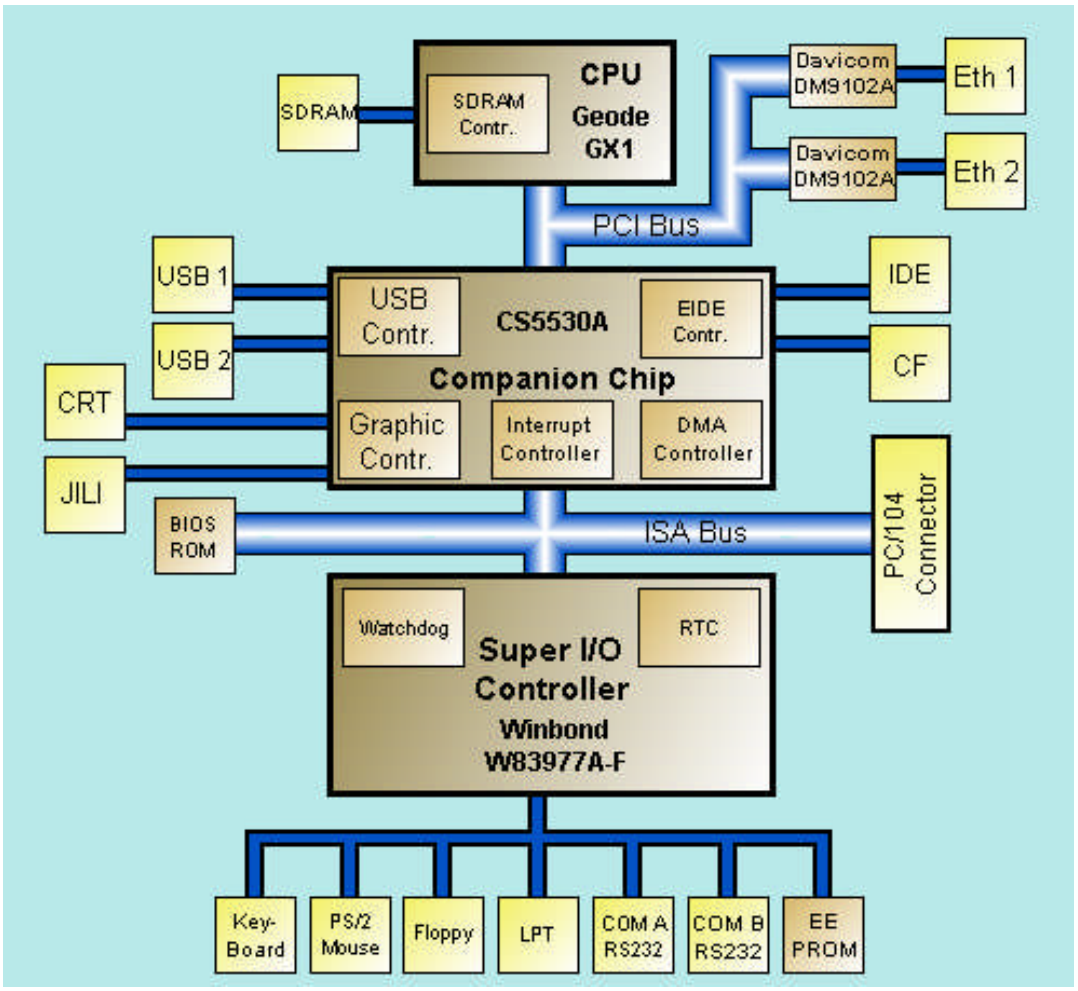
Additionally, the end user can insert an update key into the parallel port (LPT only) to force initiating the recovery routine for the boot block.

For further information on the update key and the crisis diskette, see a special application note (PHLASH_SC_E???.PDF), which is available from the Kontron Web site. (The three question marks indicate the revision number of the document.)

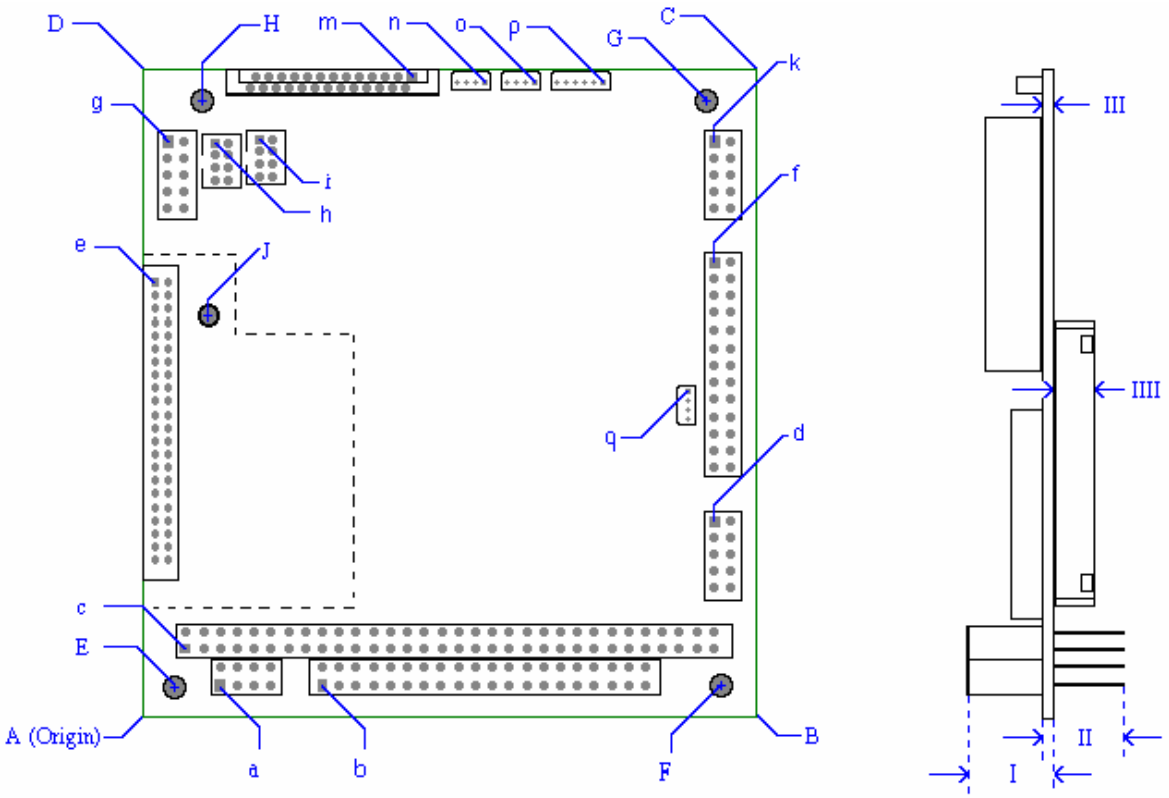
Note: The file BIOS.ROM on the crisis recovery disk may not be the latest version of the ROM file. Contact Kontron technical support for the latest version. Do not flash a BIOS ROM file if you are not sure it matches your hardware because the system might become unbootable. Kontron is not obligated to recover your system free of charge if the board does not boot because flash tools were used incorrectly.

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21. APPENDIX C: BLOCK DIAGRAM



22. APPENDIX D: MECHANICAL DIMENSIONS



All Dimensions in the tables below are relative to the origin location A.

Location	Horizontal (mm)	Vertical (mm)	Horizontal (mil)	Vertical (mil)
PCB Dimensions				
A (Origin)	0	0	0	0
B	90.17	0	3550	0
C	90.17	95.89	3550	3775
D	0	95.89	0	3775
Mounting Holes				
E	5.08	5.08	200	200
F	85.09	5.08	3350	200
G	82.55	90.81	3250	3575
H	8.89	90.81	350	3575
J	9.88	59.28	389	2333.84

Location	Horizontal (mm)	Vertical (mm)	Horizontal (mil)	Vertical (mil)
Interface Connectors				
a	11.43	5.08	450	200
b	26.67	5.08	1050	200
c	6.35	10.16	250	400
d	83.54	29.24	3289	1151
e	1.75	64.80	69	2551
f	83.54	67.34	3289	2651
g	4.04	85.12	159	3351
h	10.34	84.99	407	3346
i	16.84	85.12	663	3351
k	83.54	85.12	3289	3351
m	40.54	94.89	1596	3736
n	49.58	93.73	1952	3690
o	56.69	93.73	2232	3690
p	66.27	93.73	2609	3690
q	80.54	48.59	3171	1913

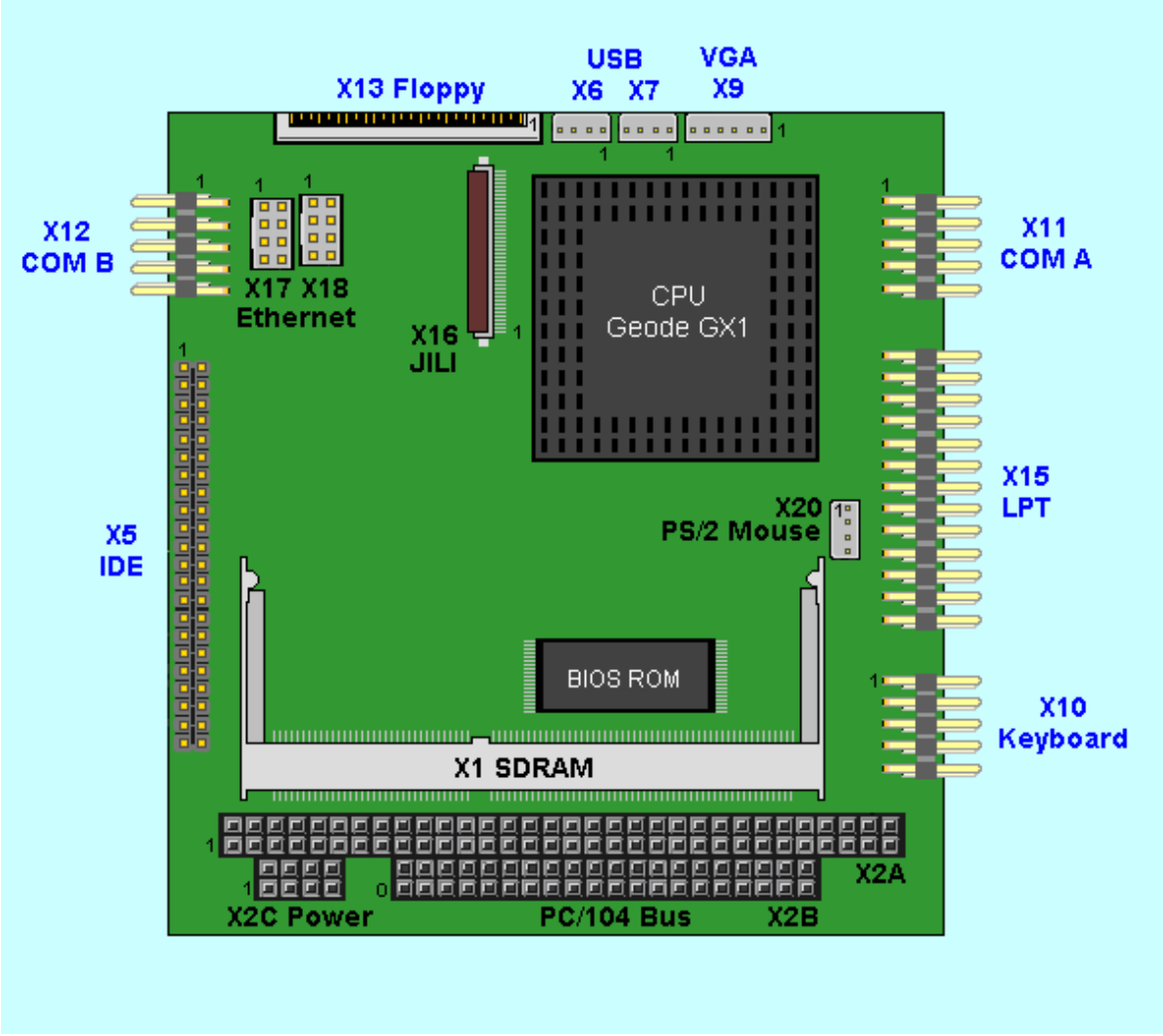
Height	Dimension (mm)	Dimension (mil)
I	13.10	515
II	10.40	410
III	1.57	62
IV	6.63	261

23. APPENDIX E: CONNECTOR LAYOUT

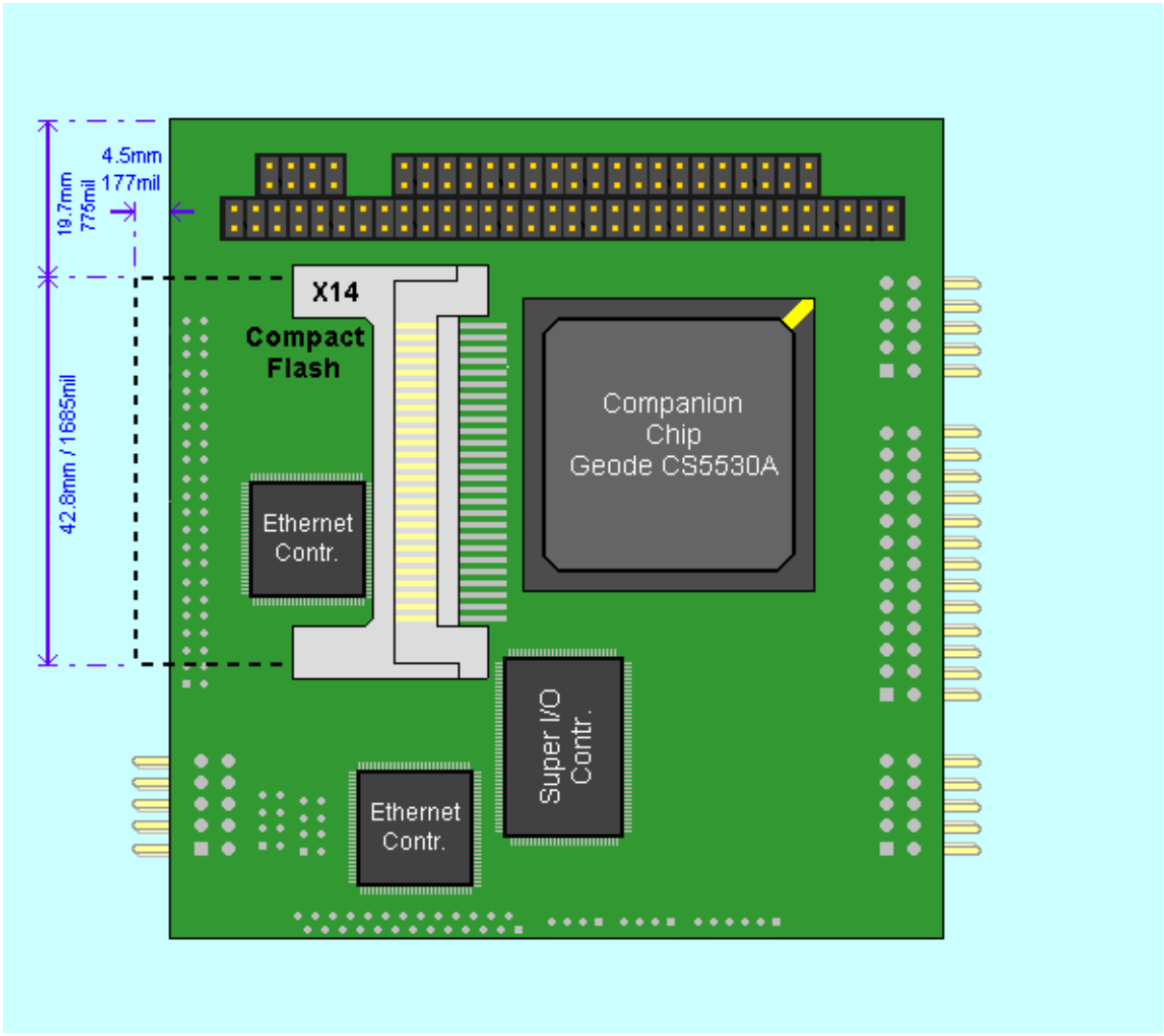
23.1 *Connector Locations*

Pin 1 of any connector is marked with "1" in this drawing and with a rectangular pad at the bottom side of the board's PCB.

23.1.1. Top Overlay



23.1.2. Bottom Overlay



23.2 Connector Functions and Interface Cables

The table notes connector functions, as well as mating connectors and available cables.

Connector	Function	Mating Connector	Available Cable	Cable Description
X1	SDRAM	-	-	-
X2A	PC/104 Bus (XT-Bus part)	2.54mm 64 pos. (EPT 962-60323-12 or compatible for board to board connection)		
X2B	PC/104 Bus (AT-Bus part)	2.54mm 40 pos. (EPT 962-60203-12 or compatible for board to board connection)		
X2C	Power Connector	2.54mm 8 pos. (EPT 962-60043-12 or compatible for board to board connection)		
X5	IDE Hard Disk Interface Connector	2mm 44 pos. (Berg 89361-144 or compatible)	KAB-IDE-25 (PN 96020-0000-00-0) or KAB-IDE-2MM (PN 96021-0000-00-0)	For 3.5" HDD Or 2.5" HDD
X6, X7	USB interface connectors	1.25mm 4 pos. (Molex 51021-0400 or compatible)	KAB-USB-1 (PN 96054-0000-00-0)	For standard USB adoption
X9	CRT-Monitor	1.25mm 6 pos. (Molex 51021-0600)	KAB-VGA-2 (PN 96053-0000-00-0)	For DSUB 15 adapt ion
X10	Keyboard and Feature Connector	2.54mm 10 pos. (AMP 1-215882-0 or compatible)	KAB-KB-1 (PN 96023-0000-00-0) or KAB-KB-PS2 (PN 96060-0000-00-0)	For AT-keyboard or PS/2 keyboard.
X11, X12	Serial Interfaces COM A and COM B Connectors	2.54mm 10 pos. (AMP 1-215882-0 or compatible)	KAB-DSUB9-2 (PN 96017-0000-00-0)	For DSUB 9 adaptation.
X13	Floppy Drive Interface Connector		ADA-FLOPPY-2 (PN 96001-0000-00-0) or KAB-FLOPPY/MOPS-1 (PN 96019-0000-00-0)	For 3.5" floppy or Slim-line floppy.
X14	CompactFlash Interface			For Compact Flash cards Type I
X15	Parallel Interface LPT Connector	2.54mm 26 pos. (AMP 2-215882-6)	KAB-DSUB25-1 (PN 96015-0000-00-0)	For DSUB 25 adaptation.
X16	Display (JILI)	-	KAB-JILI-?????	Kontron JILI cables
X17, X18	Ethernet Interface Connectors	2mm 8 pos. (Berg 90311-008)	KAB-MOPS-ETN1 (PN 96048-0000-00-0)	For RJ45 adaptation.
X20	PS/2 Mouse Interface Connector	1.25mm 4 pos. (Molex 51021-0400 or compatible)	KAB-MOUSE-PS2 (PN 96062-0000-00-0)	For PS/2 Mouse

23.3 Pinout Table

Pin	PC104 (A)	PC104 (B)	PC104 (C)	PC104 (D)
0			GND	GND
1	/IOCHCK	GND	/SBHE	/MEMCS16
2	SD7	RESETDRV	LA23	/IOCS16
3	SD6	VCC ***	LA22	IRQ10
4	SD5	IRQ9	LA21	IRQ11
5	SD4	-5V ***	LA20	IRQ12
6	SD3	DRQ2	LA19	IRQ15
7	SD2	-12V ***	LA18	IRQ14
8	SD1	/0WS	LA17	/DACK0
9	SD0	+12V ***	/MEMR	DRQ0
10	IOCHRDY	GND *	/MEMW	/DACK5
11	AEN	/SMEMW	SD8	DRQ5
12	SA19	/SMEMR	SD9	/DACK6
13	SA18	/IOW	SD10	DRQ6
14	SA17	/IOR	SD11	/DACK7
15	SA16	/DACK3	SD12	DRQ7
16	SA15	DRQ3	SD13	VCC ***
17	SA14	/DACK1	SD14	/MASTER
18	SA13	DRQ1	SD15	GND
19	SA12	/REFRESH **	GND	GND
20	SA11	SYSCLK		
21	SA10	IRQ7		
22	SA9	IRQ6		
23	SA8	IRQ5		
24	SA7	IRQ4		
25	SA6	IRQ3		
26	SA5	/DACK2		
27	SA4	T/C		
28	SA3	BALE		
29	SA2	VCC ***		
30	SA1	OSC		
31	SA0	GND		
32	GND	GND		

Notes: (*) Key pin for PC/104; GND for PC/104+ specification
(**) Not supported on MOPS*lcd*GX1 boards.
(***) To protect the external power lines of peripheral devices, make sure that:
- the wires have the right diameter to withstand the maximum available current
- the enclosure of the peripheral device fulfils the fire protecting requirements of
- IEC/EN 60950.

Pin	IDE	Floppy	LPT	Power	COM A	COM B
1	/RESET	VCC ***	/STB	GND	/DCD1	/DCD2
2	GND	/IDX	/AFD	VCC ***	/DSR1	/DSR2
3	HDD7	VCC ***	PD0	BATT	RXD1	RXD2
4	HDD8	/DR0	/ERR	+12V ***	/RTS1	/RTS2
5	HDD6	VCC ***	PD1	-5V ***	TXD1	TXD2
6	HDD9	/DSKCHG	/INIT	-12V ***	/CTS1	/CTS2
7	HDD5	NC	PD2	GND	/DTR1	/DTR2
8	HDD10	NC	/SLIN	VCC ***	/RI1	/RI2
9	HDD4	NC	PD3		GND	GND
10	HDD11	/MTR0	GND		VCC ***	VCC ***
11	HDD3	NC	PD4			
12	HDD12	/FDIR	GND			
13	HDD2	NC	PD5			
14	HDD13	/STEP	GND			
15	HDD1	GND	PD6			
16	HDD14	/WDATA	GND			
17	HDD0	GND	PD7			
18	HDD15	/WGATE	GND			
19	GND	GND	/ACK			
20	KEY (NC)	/TRK0	GND			
21	DRQ	GND	/BUSY			
22	GND	/WRTPRT	GND			
23	/IOW	GND	PE			
24	GND	/RDATA	GND			
25	/IOR	GND	/SLCT			
26	GND	/HDSEL	VCC ***			
27	IOCHRDY					
28	NC *					
29	/ACK					
30	GND					
31	IRQ					
32	NC					
33	SA1					
34	NC					
35	SA0					
36	SA2					
37	/CS1					
38	/CS3					
39	NC					
40	GND					
41	VCC ***					
42	VCC ***					
43	GND					
44	NC					

Notes: (*) Pin normally used as cable select. On MOPSlcdGX1 it is not connected.
(***) To protect the external power lines of peripheral devices, make sure that:
- the wires have the right diameter to withstand the maximum available current
- the enclosure of the peripheral device fulfils the fire protecting requirements of
- IEC/EN 60950.

Pin	KBD	LAN 1	LAN 2	PS/2 Mouse	USB 1	USB 2
1	Speaker	TXD1+	TXD2+	MSDAT	VCC ***	VCC ***
2	GND	TXD1-	TXD2-	VCC ***	USB00	USB10
3	/RESIN	RXD1+	RXD2+	GND	USB01	USB11
4	/KBLOCK	SHLDGND	SHLDGND	MSCLK	GND	GND
5	KBDAT	SHLDGND	SHLDGND			
6	KBCLK	RXD1-	RXD2-			
7	GND	SHLDGND	SHLDGND			
8	VCC ***	SHLDGND	SHLDGND			
9	BATT					
10	PWRGOOD					

Notes: (***) To protect the external power lines of peripheral devices, make sure that:
- the wires have the right diameter to withstand the maximum available current
- the enclosure of the peripheral device fulfils the fire protecting requirements of
- IEC/EN 60950.

24. APPENDIX F: PC ARCHITECTURE INFORMATION

The following sources of information can help you better understand PC architecture.

24.1 *Buses*

24.1.1. ISA, Standard PS/2 - Connectors

- AT Bus Design: Eight and Sixteen-Bit ISA, E-ISA and EISA Design, Edward Solari, Annabooks, 1990, ISBN 0-929392-08-6
- AT IBM Technical Reference Vol 1&2, 1985
- ISA & EISA Theory and Operation, Edward Solari, Annabooks, 1992, ISBN 0929392159
- ISA Bus Specifications and Application Notes, Jan. 30, 1990, Intel
- ISA System Architecture, Third Edition, Tom Shanley and Don Anderson, Addison-Wesley Publishing Company, 1995, ISBN 0-201-40996-8
- Personal Computer Bus Standard P996, Draft D2.00, Jan. 18, 1990, IEEE Inc
- Technical Reference Guide, Extended Industry Standard Architecture Expansion Bus, Compaq 1989

24.1.2. PC/104, PCI - Information

- Embedded PC 104 Consortium
  The consortium provides information about PC/104 and PC/104-Plus technology. You can search for information about the consortium on the Web.
- PCI SIG
  The PCI-SIG provides a forum for its ~900 member companies, who develop PCI products based on the specifications that are created by the PCI-SIG. You can search for information about the SIG on the Web.
- *PCI & PCI-X Hardware and Software Architecture & Design*, Fifth Edition, Edward Solari and George Willse, Annabooks, 2001, ISBN 0-929392-63-9.
- *PCI System Architecture,* Tom Shanley and Don Anderson, Addison-Wesley, 2000, ISBN 0-201-30974-2.

24.2 General PC Architecture

- *Embedded PCs*, Markt&Technik GmbH, ISBN 3-8272-5314-4 (German)
- *Hardware Bible*, Winn L. Rosch, SAMS, 1997, 0-672-30954-8
- *Interfacing to the IBM Personal Computer*, Second Edition, Lewis C. Eggebrecht, SAMS, 1990, ISBN 0-672-22722-3
- *The Indispensable PC Hardware Book*, Hans-Peter Messmer, Addison-Wesley, 1994, ISBN 0-201-62424-9
- *The PC Handbook: For Engineers, Programmers, and Other Serious PC Users, Sixth Edition*, John P. Choisser and John O. Foster, Annabooks, 1997, ISBN 0-929392-36-1

24.3 Ports

24.3.1. RS-232 Serial

- EIA-232-E standard
  The EIA-232-E standard specifies the interface between (for example) a modem and a computer so that they can exchange data. The computer can then send data to the modem, which then sends the data over a telephone line. The data that the modem receives from the telephone line can then be sent to the computer. You can search for information about the standard on the Web.
- *RS-232 Made Easy: Connecting Computers, Printers, Terminals, and Modems*, Martin D. Seyer, Prentice Hall, 1991, ISBN 0-13-749854-3
- National Semiconductor
  The Interface Data Book includes application notes. Type “232” as a search criteria to obtain a list of application notes. You can search for information about the data book on National Semiconductor’s Web site.

24.3.2. ATA

AT Attachment (ATA) Working Group
This X3T10 standard defines an integrated bus interface between disk drives and host processors. It provides a common point of attachment for systems manufacturers and the system. You can search for information about the working group on the Web.
We recommend you also search the Web for information on *4.2 I/O cable*, if you use hard disks in a DMA3 or PIO4 mode.

24.3.3. USB

USB Specification
USB Implementers Forum, Inc. is a non-profit corporation founded by the group of companies that developed the Universal Serial Bus specification. The USB-IF was formed to provide a support organization and forum for the advancement and adoption of Universal Serial Bus technology. You can search for information about the standard on the Web.

24.4 *Programming*

- *C Programmer's Guide to Serial Communications*, Second Edition, Joe Campbell, SAMS, 1987, ISBN 0-672-22584-0
- *Programmer's Guide to the EGA, VGA, and Super VGA Cards*, Third Edition, Richard Ferraro, Addison-Wesley, 1990, ISBN 0-201-57025-4
- *The Programmer's PC Sourcebook,* Second Edition, Thom Hogan, Microsoft Press, 1991, ISBN 1-55615-321-X
- *Undocumented PC, A Programmer's Guide to I/O, CPUs, and Fixed Memory Areas*, Frank van Gilluwe, Second Edition, Addison-Wesley, 1997, ISBN 0-201-47950-8

25. APPENDIX G: DOCUMENT-REVISION HISTORY

Revision	Date	Edited by	Changes
PGX1M101	14.03.02	FK	Created manual.
PGX1M102	27.03.02	JL	Formatted and edited manual.
PGX1M103	04.04.02	FK and JL	Updated manual throughout.
PGX1M110	08.04.02	FK and JL	Initial release of manual.
PGX1M111	06.05.02	MD	Updated BIOS chapter.
PGX1M112	20.06.02	FK	Updated information on supply voltage, interrupt-request lines, and the Setup Boot Menu.
PGX1M113	23.07.02	FK	Updated Upper Memory Area Map table.
PGX1M114	23.09.02	FK	Updated pin table for PS/2 Mouse Interface chapter.
PGX1M115	07.01.03	FK	Updates USB chapter information.
PGX1M116	25.02.03	VGG	Add environment note
PGX1M117	30.09.04	BHO and JL	Completely revised, brought to Kontron style, added video modes, corrected and completed specifications, added I/O map, added drawings
PGX1M118	31.08.05	BHO	Changed update key for BIOS to LPT, added Ethernet note, new drawings for connectors