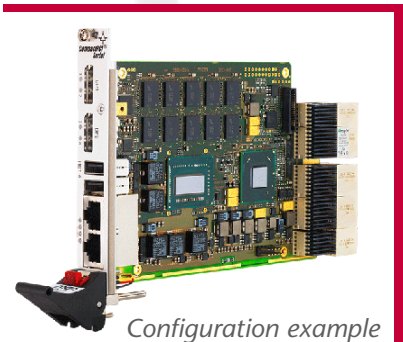
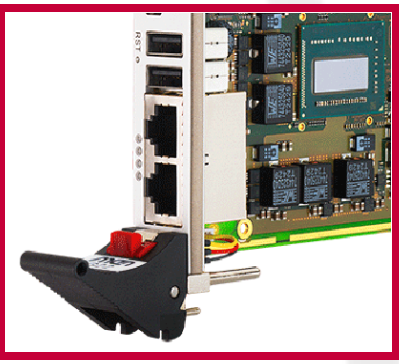
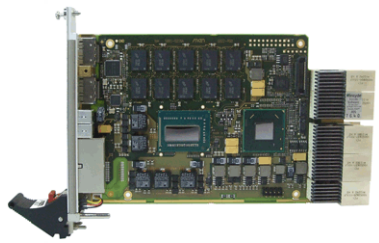
User Manual

G22 – 3U CompactPCI® Serial Intel® Core™ i7 CPU Board



Configuration example





G22 - 3U CompactPCI® Serial Intel® Core™ i7 CPU Board

The G22 is a versatile 4HP/3U single-board computer supporting a multitude of modern serial interfaces according to the CompactPCI® Serial standard. It is thus perfectly suited for data-intensive applications which require high computing-power. The CPU card is equipped with the Intel® third-generation Core i7 processor running at up to 3.3 GHz maximum turbo frequency and offering the latest multi-core processor architecture from Intel® with full 64-bit support. The processor frequency can be stepped down via the BIOS to lower power consumption and make the board more suitable for high temperatures. The G22 supports the Intel® Active Management technology which makes it possible to access the board via the network even when it is in soft-off or standby state.

For system security, a Trusted Platform Module is available on request.

The memory configuration of the G22 includes a state-of-the-art fast DDR3 DRAM which is soldered to the board to guarantee optimum shock and vibration resistance. An mSATA disk connected via a SATA channel and a microSD™ card device which is connected via a USB interface offer nearly unlimited space for user applications.

The board delivers an excellent graphics performance. Two DisplayPort® interfaces are accessible at the board front. Using an external adapter two HDMI or two DVI ports can also be realized. In addition the standard front I/O comprises two PCIe®-driven Gigabit Ethernet and two USB 2.0 ports.

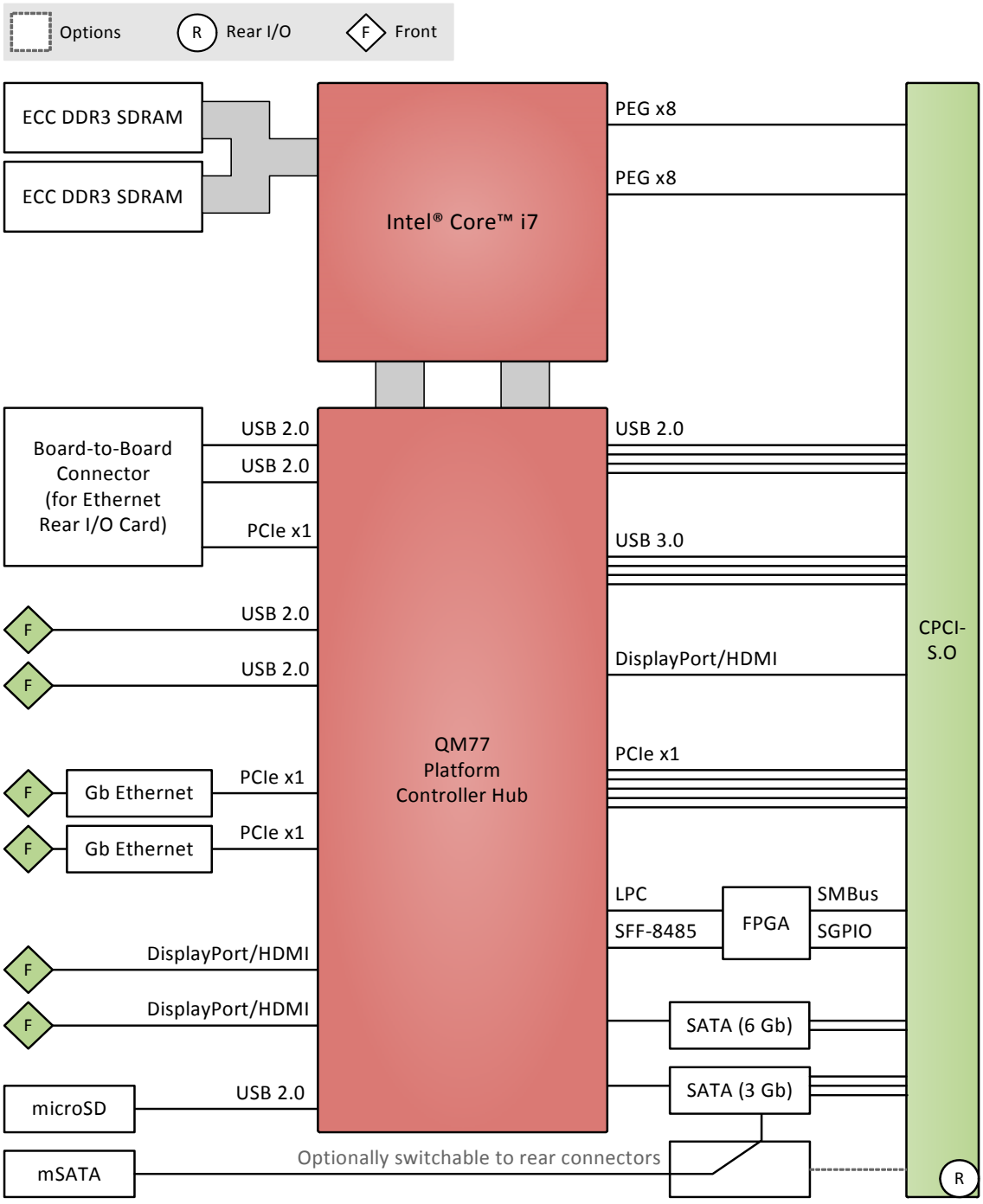
Serial interfaces at the rear I/O connectors are 4 USB 2.0, 4 USB 3.0, 5 SATA interfaces, one DisplayPort® or HDMI, 5 PCI Express® x1 links, and two PEG x8 links. Up to eight Gigabit Ethernet interfaces can be implemented using a rear I/O adapter board.

A board management controller provides thermal supervision of the processor and a watchdog for the operating system.

The G22 operates in Windows® and Linux environments as well as under real-time operating systems that support Intel®'s multi-core architecture. The InsydeH2O™ EFI BIOS was specially designed for embedded system applications.

The G22 comes with a tailored passive heat sink within 4 HP height. All components are soldered for protection against shock and vibration according to applicable DIN, EN or IEC industry standards. As an option, the board can be equipped with an M12 Ethernet connector. The G22 is also ready for coating so that it can be used in humid and dusty environments and has a guaranteed minimum standard availability of 7 years. These features make the G22 perfectly suited for harsh environments.

Diagram


Options
R
Rear I/O
F
Front
ECC DDR3 SDRAM
ECC DDR3 SDRAM
Intel® Core™ i7
PEG x8
PEG x8
Board-to-Board Connector (for Ethernet Rear I/O Card)
USB 2.0
USB 2.0
PCIe x1
USB 2.0
USB 2.0
F
F
QM77 Platform Controller Hub
USB 2.0
USB 3.0
DisplayPort/HDMI
PCIe x1
CPCI-S.O
Gb Ethernet
Gb Ethernet
PCIe x1
PCIe x1
LPC
SFF-8485
FPGA
SMBus
SGPIO
DisplayPort/HDMI
DisplayPort/HDMI
SATA (6 Gb)
SATA (3 Gb)
microSD
USB 2.0
mSATA
Optionally switchable to rear connectors
R

Technical Data

CPU

- Intel® Core™ i7-3615QE
  - 2.3 GHz processor core frequency
  - 3.3 GHz maximum turbo frequency
  - 1066 MHz system bus frequency
- Chipset
  - QM77 Platform Controller Hub (PCH)

Board Management Controller

- Power supervision and watchdog
- Temperature measurement
- 2 board status LEDs
- 2 user LEDs
- Reset button

Memory

- 6 MB last level cache integrated in i7 processor
- Up to 8 GB SDRAM system memory
  - Soldered
  - DDR3 with ECC support
  - Up to 1066 MHz memory bus frequency
- 64 Mbits boot Flash
- Serial EEPROM 2 KB for factory settings
- mSATA disk slot
  - Connected via one SATA port from the PCH
- Serial GPIO (SGPIO)
  - One interface via CPCI-S.0 rear connector
  - Compliant with SFF 8485 specification
- One microSD™ card slot
  - Via USB

Mass Storage

- Serial ATA (SATA)
  - Five channels via rear I/O (six if the link to the mSATA disk is not required, can be switched in BIOS)
  - Four ports with transfer rates up to 3 Gbit/s (SATA Revision 2.x)
  - Two ports with transfer rates up to 6 Gbit/s (SATA Revision 3.x)
  - RAID level 0/1/5/10 support
  - Hot-plug together with G501

Graphics

- Integrated in QM77 chipset
  - Maximum resolution: up to 2560x1600
- Two DisplayPort® connectors at front panel
  - Optionally two DVI/HDMI ports via external adapter
- One DisplayPort® at CPCI-S.0 rear connector
  - Optionally SDVO or DVI/HDMI port

I/O

- USB 2.0
  - Two USB 2.0 host ports via Series A connector at front panel
  - Up to eight USB 2.0 host ports via CPCI-S.0 rear connector (depending on the number of used USB 3.0 ports)
  - Two USB 2.0 host ports for connection of the rear I/O card
  - EHCI implementation
  - Data rates up to 480 Mbit/s
- USB 3.0
  - Four USB 3.0 host ports via CPCI-S.0 rear connector
  - Data rate up to 5 Gbit/s
- Ethernet
  - Two 10/100/1000Base-T Ethernet channels at the front
  - RJ45 connectors at front panel
  - Ethernet controllers are connected by two x1 PCIe® links
  - Two onboard LEDs to signal LAN link, activity status and connection speed

Front Connections

- Two DisplayPort®
- Two USB 2.0 (Series A)
- Two Ethernet (RJ45)

Rear I/O

- 5 SATA (6 switchable in BIOS)
- 1 DisplayPort®
- 4 USB 2.0
- 4 USB 3.0
- 5 PCI Express® x1 links
- 2 PEG x8 links
- SGPIO

PCI Express®

- Two x8 PCI Express® graphics links via CPCI-S.0 rear connector
  - Data rate 985 MB/s (8 Gbit/s per lane)
- Five x1 PCIe® links via CPCI-S.0 rear connector
  - Data rate 500 MB/s (5 Gbit/s per lane)
- Two x1 PCIe® links to connect local 1000Base-T Ethernet controllers
  - Data rate 250 MB/s (2.5 Gbit/s per lane)
- One x1 PCIe® link via for connection of the rear I/O card
  - Data rate 500 MB/s (5 Gbit/s per lane)

Miscellaneous

- Real-time clock with supercapacitor backup, battery-buffered

CompactPCI® Serial

- Compliance with CompactPCI® Serial PICMG CPCI-S.0 Specification
- System or peripheral slot

Electrical Specifications

- Supply voltage/power consumption:
  - +12V (9..16V), 4 A nominal, 5.8 A maximum
  - +5V (-5%/+5%) standby voltage optional

Mechanical Specifications

- Dimensions: conforming to CompactPCI® Serial specification for 3U boards
- Front panel: 4HP with ejector
- Weight:
  - 208 g (w/o heat sink)
  - 398 g (with heat sink and mSATA adapter)

Environmental Specifications

- Temperature range (operation):
  - Depends on system configuration (CPU, hard disk, heat sink...)
  - Maximum: +85°C
  - Minimum: -40°C (all processors)
  - Airflow: min. 1.5 m/s, typical power dissipation tbd, with Windows® XP operating system, 1 Gb Ethernet, without CPU clock reduction
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300 m to + 3,000 m
- Shock: 50 m/s², 30 ms
- Vibration (function): 1 m/s², 5 Hz – 150 Hz
- Vibration (lifetime): 7.9 m/s², 5 Hz – 150 Hz
- Conformal coating on request

MTBF

- 455,629 h @ 40°C according to IEC/TR 62380 (RDF 2000)

Safety

- Flammability
  - PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers
  - Insulation measurement test according to EN 50155 (12.2.9.1)
  - Voltage withstand test according to EN 50155 (12.2.9.2)
  - Information technology equipment test according to EN 60950

EMC Conformity

- EN 55022 (radio disturbance)
- IEC 61000-4-2 (ESD)
- IEC 61000-4-3 (electromagnetic field immunity)
- IEC 61000-4-4 (burst)
- IEC 61000-4-5 (surge)
- IEC 61000-4-6 (conducted disturbances)

BIOS

- InsydeH2O™ UEFI Framework

Intel® Active Management Technology

- Out of Band (OOB) Access
  - Power off Access
  - Independent of OS status
  - Power status control
  - Keyboard-Video-Mouse (KVM) Viewer (VNC-compatible)
  - IDE-Redirect
  - Serial-over-LAN
- Manageability Engine in Chipset
- Network Filters in Chipset
- Dedicated Flash Storage Area

Software Support

- Windows®
- Linux
- VxWorks® (on request)
- QNX® (on request)
- For more information on supported operating system versions and drivers see online data sheet.

Configuration Options

CPU

- Intel® Core™ i7
- Intel® Core™ i5
- Intel® Core™ i3
- Intel® Celeron®
- For more details regarding possible CPU options, please see Table 1, Processor core options for the G22, on page 26

Memory

- System RAM
  - 2 GB, 4 GB, 8 GB or 16 GB (16 GB when components available)
- mSATA disk
  - 0 MB up to maximum available
- microSD™ card
  - 0 MB up to maximum available

I/O

- Ethernet
  - One Gigabit Ethernet on M12 connector instead of two interfaces on RJ45

Rear I/O

- PCI Express®
  - 8 PCI Express® lanes
- Ethernet
  - Up to eight Gigabit Ethernet interfaces on the backplane using rear I/O card (e.g. GM1)

Operating Temperature

- Depends on system configuration (CPU, hard disk, heat sink...)
- Maximum: +85°C
- Minimum: -50°C

Cooling Concept

- Also available with conduction cooling in MEN CCA frame

Please note that some of these options may only be available for large volumes. Please ask our sales staff for more information.

For available standard configurations see online data sheet.

Product Safety

Lithium Battery

This board contains a lithium battery. There is a danger of explosion if the battery is incorrectly replaced!

See Chapter 5 Maintenance on page 80.

Electrostatic Discharge (ESD)

Computer boards and components contain electrostatic sensitive devices. Electrostatic discharge (ESD) can damage components. To protect the board and other components against damage from static electricity, you should follow some precautions whenever you work on your computer.

- Power down and unplug your computer system when working on the inside.
- Hold components by the edges and try not to touch the IC chips, leads, or circuitry.
- Use a grounded wrist strap before handling computer components.
- Place components on a grounded antistatic pad or on the bag that came with the component whenever the components are separated from the system.
- Store the board only in its original ESD-protected packaging. Retain the original packaging in case you need to return the board to MEN for repair.

About this Document

This user manual is intended only for system developers and integrators, it is not intended for end users.

It describes the hardware functions of the board, connection of peripheral devices and integration into a system. It also provides additional information for special applications and configurations of the board.

The manual does not include detailed information on individual components (data sheets etc.). A list of literature is given in the appendix.

History

Issue	Comments	Date
E1	First issue	2013-04-05
E2	New layout, added GM2 and GM3 installation chapters, updated BIOS chapter, added RTC accuracy.	2014-04-10

Conventions

This sign marks important notes or warnings concerning the use of voltages which can lead to serious damage to your health and also cause damage or destruction of the component.

This sign marks important notes or warnings concerning proper functionality of the product described in this document. You should read them in any case.

italics — Folder, file and function names are printed in *italics*.

bold — **Bold** type is used for emphasis.

`monospace` — A `monospaced` font type is used for hexadecimal numbers, listings, C function descriptions or wherever appropriate. Hexadecimal numbers are preceded by "0x".

comment — Comments embedded into coding examples are shown in green color.

hyperlink — Hyperlinks are printed in blue color.

The globe will show you where hyperlinks lead directly to the Internet, so you can look for the latest information online.

IRQ# /IRQ — Signal names followed by "#" or preceded by a slash ("/") indicate that this signal is either active low or that it becomes active at a falling edge.

in/out — Signal directions in signal mnemonics tables generally refer to the corresponding board or component, "in" meaning "to the board or component", "out" meaning "coming from it".

Vertical lines on the outer margin signal technical changes to the previous issue of the document.

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Since July 1, 2006 all MEN standard products comply with RoHS legislation.

Since January 2005 the SMD and manual soldering processes at MEN have already been completely lead-free. Between June 2004 and June 30, 2006 MEN's selected component suppliers have changed delivery to RoHS-compliant parts. During this period any change and status was traceable through the MEN ERP system and the boards gradually became RoHS-compliant.

WEEE Application

The WEEE directive does not apply to fixed industrial plants and tools. The compliance is the responsibility of the company which puts the product on the market, as defined in the directive; components and sub-assemblies are not subject to product compliance.

In other words: Since MEN does not deliver ready-made products to end users, the WEEE directive is not applicable for MEN. Users are nevertheless recommended to properly recycle all electronic boards which have passed their life cycle.

Nevertheless, MEN is registered as a manufacturer in Germany. The registration number can be provided on request.

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Figures

Tables

1 Getting Started

This chapter gives an overview of the board and some hints for first installation in a system.

1.1 Map of the Board

Figure 1. *Map of the board – front panel*

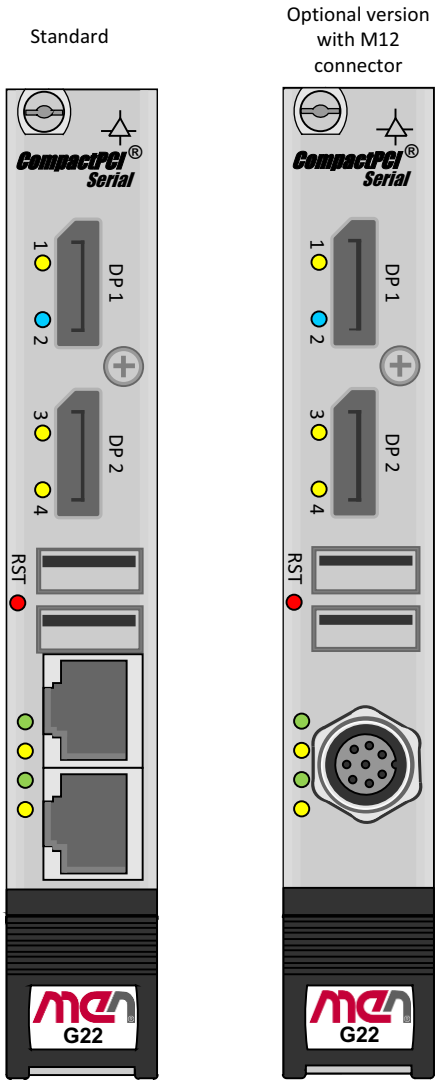


Figure 2. *Map of the board – top view with mSATA disk*

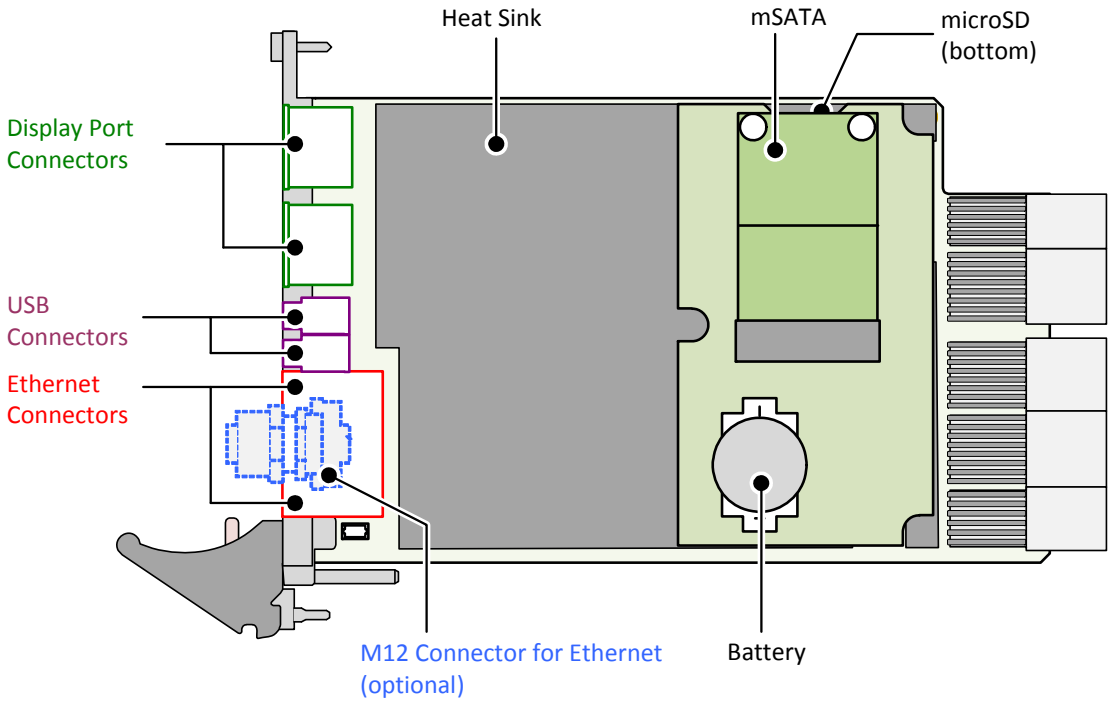
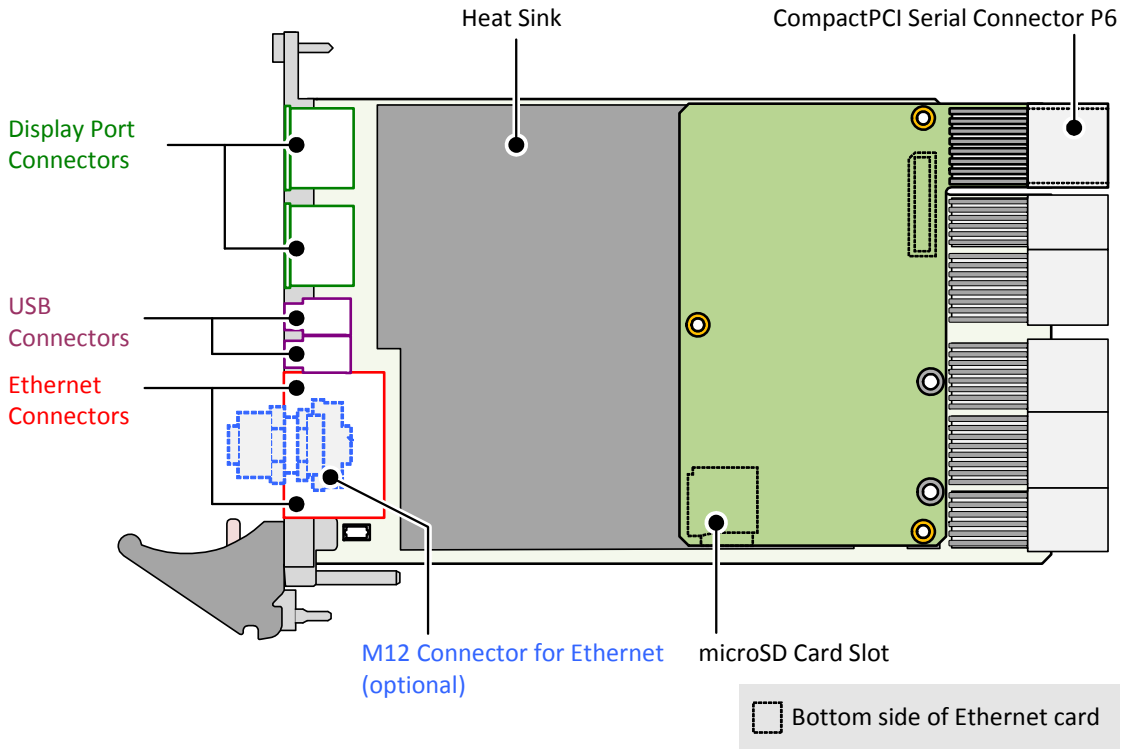


Figure 3. *Map of the board – top view with Ethernet rear I/O card*



1.2 Configuring the Hardware

You should check your hardware requirements before installing the board in a system, since most modifications are difficult or even impossible to do when the board is mounted in a system.

The following check list gives an overview on what you might want to configure.

☑ microSD card

The board is shipped without a microSD card. You should check your needs and install a suitable microSD card.

Refer to Chapter 2.9.1 microSD Card on page 28

☑ mSATA

The board is shipped without an mSATA disk. You should check your needs and install a suitable mSATA disk.

Refer to Chapter 2.9.2 mSATA Disk on page 30

☑ Ethernet via rear I/O according to CompactPCI Serial

The G22 offers the possibility to realize a different number of Ethernet ports at the rear via a special adapter card. In that case no CompactFlash or mSATA can be used and no battery is available to buffer the real time clock.

See Chapter 2.14.5 Ethernet Rear I/O Card on page 50

1.3 Integrating the Board into a System

You can use the following check list when installing the G22 in a system for the first time and with minimum configuration.

- ☑ Power-down the system.
- ☑ Remove all boards from the CompactPCI system.
- ☑ Insert the G22 into the system slot of your CompactPCI Serial system, making sure that the CompactPCI Serial connectors are properly aligned.

  Note: The system slot of every CompactPCI Serial system is marked by a triangle on the backplane and/or at the front panel. It also has red guide rails.
- ☑ Connect a USB keyboard and mouse to the USB connectors at the front panel.
- ☑ Connect a display to the Display Port connector at the front panel.
  MEN offers a DisplayPort to DVI-D adapter as an accessory. See MEN's website for ordering information.
- ☑ Power-up the system.
- ☑ You can start up the BIOS setup menu by hitting the <F2> key. (see Chapter 3 BIOS on page 57).
- ☑ Now you can make configurations in BIOS. (see Chapter 3 BIOS on page 57).
- ☑ Observe the installation instructions for the respective software.

1.4 Troubleshooting at Start-up

If you have any problems at start-up of the G22, you can start the board with UEFI default settings for troubleshooting. Please refer to Chapter 3 BIOS on page 57.

1.5 Configuring BIOS

The G22 is equipped with an InsydeH2O UEFI framework. Normally you won't need to make any changes in the BIOS setup. If you do, however, you find further details on the G22's BIOS in Chapter 3 BIOS on page 57.

1.6 Installing Operating System Software

The board supports Windows, Linux, VxWorks (on request), and QNX (on request).

By default, no operating system is installed on the board. Please refer to the respective manufacturer's documentation on how to install operating system software!

You can find any software available on MEN's website.

1.6.1 Installing Windows XP or Windows 7 on USB Devices

The microSD card of the G22 is connected via USB. A standard Windows operating system (like Windows XP Professional or Windows 7 Ultimate) does not support direct installation on USB memory devices.

There are three possible solutions:

- Install the operating system on the mSATA disk of the G22.
- Add a hard drive (SATA, mSATA) on a peripheral board or side card
- Switch to an Embedded Windows (like Windows Embedded Standard or Windows Embedded Standard 7). These Embedded Windows operating systems support being installed on and booted from a USB device.

Linux supports booting from a USB device without problems.

1.7 Installing Driver Software

For a detailed description on how to install driver software please refer to the respective documentation.

You can find any driver software and documentation available for download on MEN's website.

2 Functional Description

The following describes the individual functions of the board and their configuration on the board. There is no detailed description of the individual controller chips and the CPU. They can be obtained from the data sheets or data books of the semiconductor manufacturer concerned (Chapter 6.1 Literature and Web Resources on page 81).

2.1 Power Supply

The G22 board is supplied with +12V only. The voltage range is +9 V up to +16 V (absolute maximum voltage). The voltage is monitored within these borders.

The G22 board can optionally be supplied with +5V (+5%/-3%) standby voltage.

2.2 Board Supervision

The G22 provides an intelligent board management controller (BMC) with the following main features:

- Board power sequencing control
- Voltage supervision
- System watchdog
- Software reset functionality
- Error state logging
- Power mode settings
- SMBus communication with main CPU

The watchdog device monitors the board on operating system level. If enabled, the watchdog must be triggered by application software. If the trigger is overdue, the watchdog initiates a board reset and this way can put the system back into operation when the software hangs.

The watchdog uses a configurable time interval or is disabled. Settings are made through BIOS or via an MEN software driver.

MEN provides a dedicated software driver for the board controller. For a detailed description of the functionality of the driver software please refer to the drivers' documentation.

You can find any driver software and documentation available for download on MEN's website.

2.3 Intel Active Management Technology (AMT)

G22 boards equipped with an Intel Core i7 or i5 processor support Intel Active Management Technology (AMT 8.0). Intel AMT is powered by a separate hardware engine in Intel chipsets which enables e.g. out-of-band (OOB) diagnostics, remote control, IDE-Redirect, Serial-over-LAN (SOL), agent presence checking and network traffic filtering.

AMT is supported on the lower front Ethernet interface (ETH2) of the G22. For information on how to enable the AMT BIOS extension see Chapter 3 BIOS.

MEN provides an application note on how to switch on the AMT functionality and log onto the CPU board via VNC afterwards. See MEN's website.

If the supercapacitor and/or the battery is empty, the G22 loses its complete AMT settings due to Intel's security standards.

As an option, a BIOS setting can be implemented which makes it possible to switch the AMT interface to the backplane via the Ethernet rear I/O card. In this case, there is only one Ethernet interface (ETH1) available at the front panel.

Please contact MEN's sales team for further information.

2.4 Trusted Platform Module

As an assembly option, a trusted platform module to protect the content of the SATA storage devices can be implemented on the G22. A TPM module compliant to the TPM v1.2 specification can be used.

Please contact MEN's sales team for further information.

2.5 Reset Behavior

The G22 can be reset using the reset button on the front panel or the *PRST#* signal on the backplane. (See also Chapter 2.15 Reset Button on page 55.)

2.6 Real-Time Clock

2.6.1 Internal Real-Time Clock

The board includes a real-time clock connected to the chipset. For data retention during power off the RTC is backed up by a supercapacitor. The supercapacitor gives an autonomy of approx. 14 hours when fully loaded. Under normal conditions, replacement should be superfluous during lifetime of the board. The RTC can generate interrupt requests to the chipset.

The RTC has an accuracy of approximately 1.7 seconds/day (11 minutes/year) at 25°C.

For retention of time/date data after a power off of more than 8-10 hours the RTC is also backed by a battery.

Note: The battery is not available if you use an Ethernet rear I/O card (e.g. GM1) on the G22.

For ordering options please see MEN's website.

2.6.2 External Real-Time Clock

The G22 provides an additional RTC device which is connected to the platform controller hub via SMBus. This device can be used instead of the internal RTC.

The internal RTC of the platform controller hub requires more power than an external RTC.

2.7 Processor Core

The G22 can be equipped with different types of Intel Core i7, i5 or i3 processors. The following table gives a performance overview:

Table 1. *Processor core options for the G22*

Processor Type	Core Frequency	Cores/ Threads	Power Consumption	L2 Cache	AMT Support
Core i7-3615QE	2.3 GHz	4/8	45 W	6 MB	yes
Core i7-3612QE	2.1 GHz	4/8	35 W	6 MB	yes
Core i7-3555LE	2.5 GHz	2/4	25 W	4 MB	yes
Core i7-3517UE	1.7 GHz	2/4	17 W	4 MB	yes
Core i5-3610ME	2.7 GHz	2/4	35 W	3 MB	yes
Core i3-3120ME	2.4 GHz	2/4	35 W	3 MB	no
Core i3-3217UE	1.6 GHz	2/4	17 W	3 MB	no
Celeron 1020E	2.2 GHz	2/2	35 W	2 MB	no
Celeron 1047UE	1.4 GHz	2/2	17 W	2 MB	no

2.7.1 Thermal Considerations

A suitable heat sink is provided to meet thermal requirements. For special requirements a larger heat sink is also available on request. Please contact MEN sales for more information.

Please note that if you use any other heat sink than that supplied by MEN, or no heat sink at all, warranty on functionality and reliability of the G22 may cease. If you have any questions or problems regarding thermal behavior, please contact MEN.

2.8 Memory

The standard board versions provide a memory configuration suitable for many applications. However, memory on the G22 can also be configured for your needs.

For standard memory sizes and ordering options please see MEN's website.

2.8.1 DRAM System Memory

The board provides up to 8 GB on-board, soldered DDR3 (double data rate) SDRAM. The memory bus is 2x72 bits wide (dual channel) and operates with up to 1066 MHz.

2.8.2 Boot Flash

The G22 has an 64-Mbit SPI Serial Flash implemented as on-board Flash for BIOS data.

2.8.3 EEPROM

The board has a 2-kbit serial EEPROM for factory data.

2.9 Mass Storage

The G22 offers the possibility to connect an mSATA disk and a microSD card on a small adapter card in the heat sink area which is assembled by default.

The slots are controlled via one USB port and one SATA port from the chipset.

2.9.1 microSD Card

The G22 provides an onboard microSD card slot on the bottom side of the mSATA adapter card in the heat sink area. The slot is ready-to-use. The G22 is shipped without a microSD card installed.

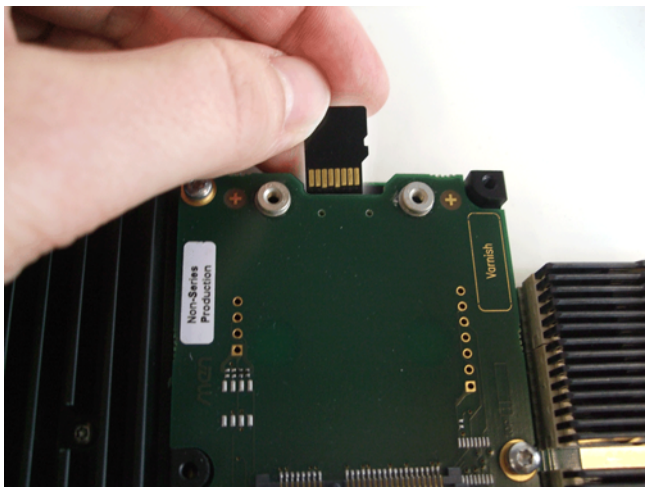
Please see MEN's website for ordering options.

2.9.1.1 Inserting and Extracting a microSD Card on the mSATA Adapter

The microSD card has to be installed before the mSATA disk as it is difficult to access it afterwards.

To install a microSD card, please stick to the following procedure.

- ☑ Power down your system and remove the G22 from the system.
- ☑ Put the board on a flat surface.
- ☑ Insert the microSD card into the slot with the contacts at the top.



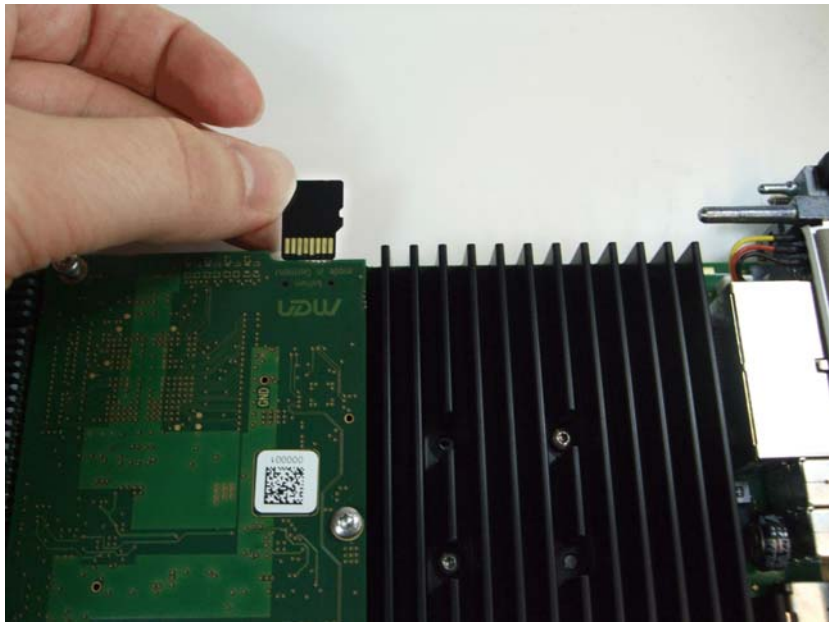
- ☑ Make sure that it clicks into place properly.
- ☑ For extracting the card push it down and pull it out.

2.9.1.2 Inserting and Extracting a microSD Card on the Ethernet Rear I/O Card

The Ethernet rear I/O card (e.g. GM1) also offers a microSD card slot.

To install a microSD card, please stick to the following procedure.

- ☑ Power down your system and remove the G22 from the system.
- ☑ Put the board on a flat surface.
- ☑ Insert the microSD card into the slot with the contacts at the top.



- ☑ Make sure that it clicks into place properly.
- ☑ For extracting the card push it down and pull it out.

2.9.2 mSATA Disk

The G22 is shipped without an mSATA disk installed.

Please see MEN's website for ordering options.

2.9.2.1 Installing an mSATA disk

To install an mSATA disk, please stick to the following procedure.

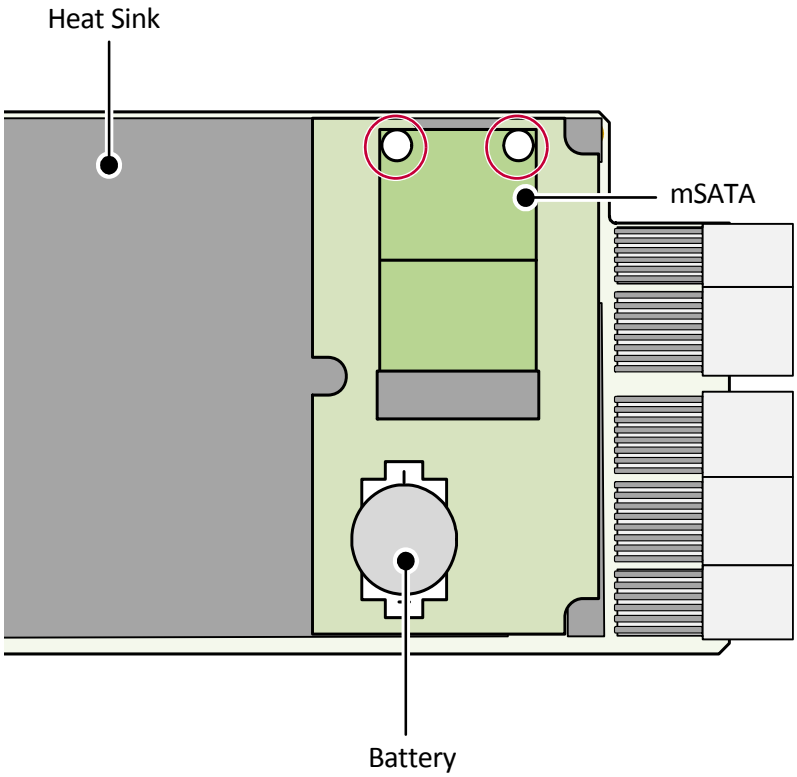
☑ Power down your system and remove the G22 from the system.

☑ Put the board on a flat surface.

☑ Insert the mSATA disk carefully in a 30° angle.

☑ Make sure that all the contacts are aligned properly and the card is firmly connected with the card connector.

☑ Fix the card using two M2.5 x4 screws (highlighted in red).



2.9.3 Serial ATA (SATA)

The serial ATA (SATA) interface is controlled by the platform controller hub and provides five or six SATA channels.

By default, five interfaces are led to CompactPCI Serial rear I/O connector P3 . One interface is by default used for connection of the mSATA disk. If no mSATA disk is needed this sixth interface can also be led to the backplane using a BIOS setting.

Four interfaces are compliant to the SATA generation 2 (3.0 Gb/s) specification, two interfaces on the rear I/O connector support SATA generation 3 (6.0 Gb/s).

All interfaces can be run in AHCI and RAID mode.

Peripheral Use

If the G22 is used in a peripheral slot, the interfaces on the CompactPCI Serial connectors are switched off. For a detailed listing of the SATA ports and their state in peripheral mode see the following table.

See Chapter 2.14 CompactPCI Serial on page 41 for the rear I/O pin assignment.

Table 2. *SATA ports speed and state in peripheral mode*

SATA Port	Speed	State in Peripheral Mode
CPCI-S.0 8_SATA	Generation 3	OFF
CPCI-S.0 7_SATA	Generation 3	OFF
CPCI-S.0 6_SATA	Generation 2	OFF
CPCI-S.0 5_SATA	Generation 2	OFF
CPCI-S.0 4_SATA	Generation 2	OFF
mSATA default	Generation 2	ON
CPCI-S.0 3_SATA		OFF

2.10 Graphics

The graphics subsystem is part of the CPU and the chipset and supports the following features:

- Up to three independent displays
- Digital display resolutions up to 2560 x 1600 pixels @ 60Hz
- HDMI 1.4a specification
- DisplayPort 1.1a specification
- Dynamic Video Memory Technology (DVMT)
- DirectX® 11, OpenCL 1.1, OpenGL 3.1
- High-bandwidth Digital Content Protection for high definition content playback over digital interfaces
- Integrated audio codecs for audio support over HDMI and DisplayPort interfaces

2.10.1 Display Configuration

There are two different display configurations possible:

- If two display interfaces are used simultaneously, resolutions of up to 2560x1600 pixels are possible for each interface. DisplayPort, HDMI or DVI are supported on both interfaces.
- Three display interfaces can be used simultaneously if two interfaces are fixed as DisplayPort. The third interface can then be used as DisplayPort, HDMI or DVI. The maximum resolution of one fixed DisplayPort interface is 2560x1600, the maximum resolution of the second fixed DisplayPort interface is 1920x1200 and the maximum resolution of the third DisplayPort, HDMI or DVI capable interface is 1920x1200.

2.10.2 Display Port

Two DisplayPort interfaces can be accessed at the front panel. Using adapters two DVI or two HDMI interfaces are also possible.

MEN offers a DisplayPort to DVI-D Adapter as an accessory. See MEN's website for ordering information.

In the following table you can find a list of adapters that have also been tested and can be used with the G22.

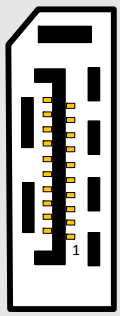
Table 3. *DisplayPort adapters for the G22*

Manufacturer	Ordering Number
ACTEBIS	1444334 (ROHS)
CONRAD	971726-62 (ROHS)
HP	FH973AT (ROHS)
JJ COMPUTER	AVC 123 0,2M (ROHS)

Connector types:

- 20-pin DisplayPort receptacle
- Mating connector:
  20-pin DisplayPort plug

Table 4. *Pin assignment of 20-pin DisplayPort connector*



20	POWER	19	RETURN PWR
18	HOTPLUG	17	AUX-
16	GND	15	AUX+
14	CONFIG2	13	CONFIG1
12	LANE_3-	11	GND
10	LANE_3+	9	LANE_2-
8	GND	7	LANE_2+
6	LANE_1-	5	GND
4	LANE_1+	3	LANE_0-
2	GND	1	LANE_0+

Table 5. *Signal mnemonics of 20-pin DisplayPort connector*

Signal	Direction	Function
GND	-	Ground
AUX-, AUX+	in/out	Bi-directional half-duplex auxiliary channels for device management and device control
CONFIG1, CONFIG2	-	Connected to Ground
HOTPLUG	in	Hot Plug Detect

Signal	Direction	Function
LANE_[3..0]+, LANE_[3..0]-	out	Main Link data lanes
POWER	out	Power for connector (3.3 V, 500 mA)
RETURN PWR	-	Return for Power

2.10.3 Rear I/O

The G22 provides a digital display interface on CompactPCI Serial connector P2. See Chapter 2.10.1 Display Configuration for more information on supported interfaces and resolutions. When the G22 is used in peripheral mode, the rear interface is switched off.

See Chapter 2.14 CompactPCI Serial on page 41.

2.11 USB Interfaces

The G22 provides fourteen USB 2.0 ports controlled by the QM77 platform controller hub. Two USB interfaces are routed to standard front-panel connectors, eight can be accessed on the CompactPCI Serial rear I/O connectors and two are led to the board-to-board connector for the Ethernet rear I/O adapter card (e.g. GM1). One of the remaining two interfaces is used for connection of the microSD card. One interface is not used.

USB 3.0

Up to four USB 3.0 interfaces can be used at the backplane. Four USB 3.0 and four USB 2.0 interfaces can be used in this case.

Peripheral Use

If the G22 is used in a peripheral slot, the USB interfaces on the CompactPCI Serial connectors are switched off. For a detailed listing of the USB ports and their state in peripheral mode see the following table.

Table 6. *USB ports speed and state in peripheral mode*

USB Port	Speed	State in peripheral mode
CPCI-S.0 1_USB2 1_USB3	USB 3.0	OFF
CPCI-S.0 2_USB2 2_USB3	USB 3.0	OFF
CPCI-S.0 3_USB2 3_USB3	USB 3.0	OFF
CPCI-S.0 4_USB2 4_USB3	USB 3.0	OFF
CPCI-S.0 5_USB2	USB 2.0	OFF
CPCI-S.0 6_USB2	USB 2.0	OFF
CPCI-S.0 7_USB2	USB 2.0	OFF
CPCI-S.0 8_USB2	USB 2.0	OFF
Front	USB 2.0	ON
Front	USB 2.0	ON
Mezzanine card (e.g. GM1)	USB 2.0	ON
Mezzanine card (e.g. GM1)	USB 2.0	ON

USB Port	Speed	State in peripheral mode
mSATA adapter board	USB 2.0	ON
not used		

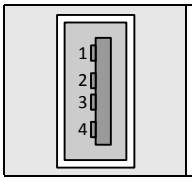
2.11.1 Front-Panel Connection

Two USB interfaces are accessible at the front panel.

Connector types:

- 4-pin USB Series A receptacle according to Universal Serial Bus Specification Revision 1.0
- Mating connector:
  4-pin USB Series A plug according to Universal Serial Bus Specification Revision 1.0

Table 7. *Pin assignment of USB front-panel connectors*



1	+5V
2	USB_D-
3	USB_D+
4	GND

Table 8. *Signal mnemonics of USB front-panel connectors*

Signal	Direction	Function
+5V	out	+5 V power supply
GND	-	Digital ground
USB_D+, USB_D-	in/out	USB lines, differential pair

2.11.2 Rear I/O Connection (CompactPCI Serial)

Eight USB interfaces are accessible via rear I/O in compliance to the CompactPCI Serial standard PICMG CPCI-S.0. Four of these interfaces support USB 3.0. See Chapter Table 6. USB ports speed and state in peripheral mode.

See Chapter 2.14 CompactPCI Serial on page 41 for rear I/O pin assignments.

2.11.3 Ethernet Rear I/O Card Connection

Two USB interfaces are led to the Ethernet rear I/O adapter card which is used to realize Ethernet via rear I/O and a microSD card interface.

See Chapter 2.14.5 Ethernet Rear I/O Card on page 50 for details on the mezzanine interface.

2.12 Ethernet Interfaces

The G22 has two Ethernet interfaces connected to the platform controller hub via two x1 PCI Express (PCIe) links. They are controlled by an Intel I211 Ethernet controller and an 82579LM Ethernet Controller PHY. They support 10 Mbits/s up to 1000 Mbits/s as well as full-duplex operation and autonegotiation.

The lower front Ethernet interface (ETH2) of the G22 supports AMT. See Chapter 2.3 Intel Active Management Technology (AMT).

The unique MAC address is set at the factory and should not be changed. Any attempt to change this address may create node or bus contention and thereby render the board inoperable. The naming of the interfaces may differ depending on the operating system. The MAC addresses on G22 are:

- ETH1: `0x 00 C0 3A C2 38 00 - 0x 00 C0 3A C2 57 FF`
- ETH2: `0x 00 C0 3A C2 58 00 - 0x 00 C0 3A C2 77 FF`

where "00 C0 3A" is the MEN vendor code. The last six digits describe the range from which the addresses for the board are taken. The serial number is added to the first number in the range:

Serial number 0042: `0x 38 xx = 0x3800 + 0x002A = 0x 38 2A.`

(See Chapter 6.2 Finding out the Product's Article Number, Revision and Serial Number on page 82.)

2.12.1 Front-Panel Connection

Two standard RJ45 connectors are available at the front panel. There are two status LEDs for each channel at the front panel.

The pin assignment corresponds to the Ethernet specification IEEE802.3.

Table 9. *Signal mnemonics of Ethernet front panel connectors*

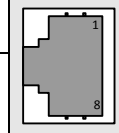
Signal	Direction	Function
BI_Dx+/-	in/out	Differential pairs of data lines for 1000Base-T
RX+/-	in	Differential pair of receive data lines for 10/100Base-T
TX+/-	out	Differential pair of transmit data lines for 10/100Base-T

Connection via RJ45 Connectors

Connector types:

- Modular 8/8-pin mounting jack according to FCC68
- Mating connector:
  Modular 8/8-pin plug according to FCC68

Table 10. *Pin assignment and status LEDs of 8-pin RJ45 Ethernet front panel connectors (ETH1/ETH2)*

				1000Base-T	10/100Base-T
On: Link up Off: Link down	L		1	BI_DA+	TX+
			2	BI_DA-	TX-
			3	BI_DB+	RX+
			4	BI_DC+	-
On: Transmit or receive activity Off: No transmit or receive activity Blinking: Transmit or receive activity	A		5	BI_DC-	-
			6	BI_DB-	RX-
			7	BI_DD+	-
			8	BI_DD-	-

Connection via M12 Connector (optional)

An 8-pin M12 connector can be implemented as an option. In this case, only one Gigabit Ethernet connection can be used. The interface supports AMT.

Table 11. *Pin assignment of 8-pin M12 Ethernet front panel connector*

		1000Base-T	10/100Base-T
	1	BI_DC-	-
	2	BI_DD+	-
	3	BI_DD-	-
	4	BI_DA-	TX-
	5	BI_DB+	RX+
	6	BI_DA+	TX+
	7	BI_DC+	-
	8	BI_DB-	RX-

2.12.2 Rear I/O Connection (CompactPCI Serial)

The CompactPCI Serial standard defines up to eight Ethernet interfaces at the rear. To achieve more flexibility, these interfaces are not implemented directly on the G22 but on a small adapter card (e.g. the GM1) which is equipped with the CompactPCI Serial connector P6. Two cards with 4 or 8 Ethernet interfaces are already available.

See MEN's website for ordering information or Chapter 2.14.5 Ethernet Rear I/O Card on page 50.

2.13 PCI Express

On G22 the two Gigabit Ethernet channels are permanently connected via two PCIe x1 links.

Another five x1 links are available for use via rear I/O. One x1 link is led to the board-to-board connector for the Ethernet rear I/O card. See Chapter 2.14.5 Ethernet Rear I/O Card on page 50. This link can also be led to the backplane on a special board version, if the complete number of 8 PCI Express links as defined in the standard are needed. Please contact MEN's sales team for further information.

The platform controller hub of the G22 provides two additional PCI Express links over the PEG (PCI Express Graphics) ports which are also led to the CompactPCI Serial connectors. See Chapter 2.14.4 CompactPCI Serial Connectors P1..P5 on page 44 for a detailed description of the CompactPCI Serial connectors.

If the G22 is used in a peripheral slot, the interfaces on the CompactPCI Serial connectors are switched off.

2.14 CompactPCI Serial

2.14.1 General

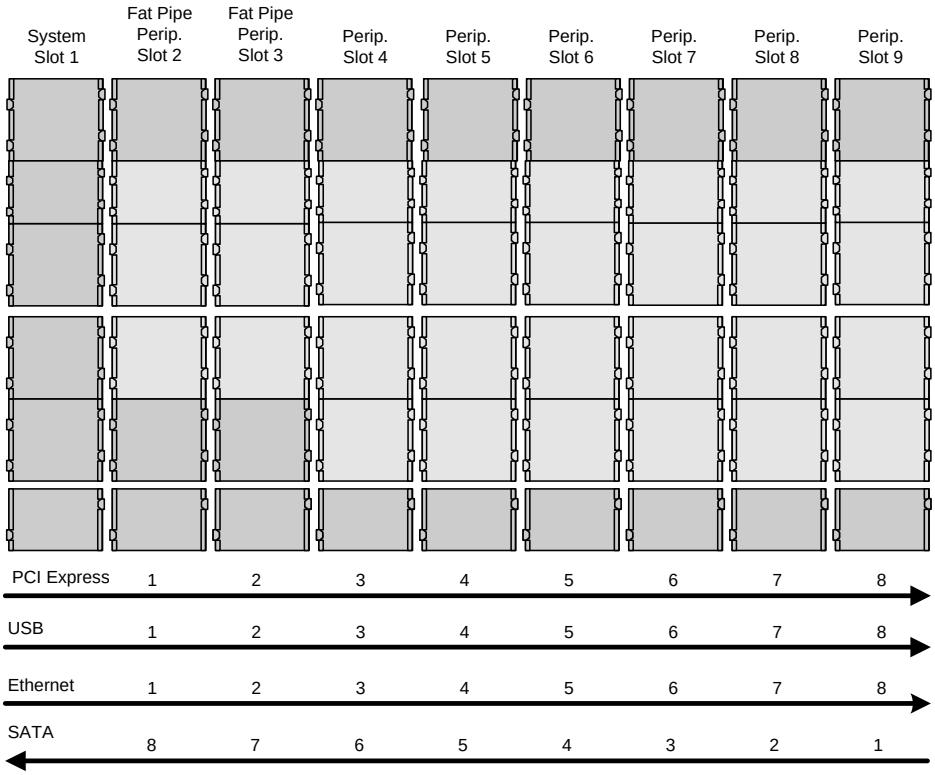
CompactPCI Serial is an independent basic standard designated PICMG CPCI-S.0. This standard introduces a completely new connector which enables a high signal density and supports transmission frequencies of 12 Gb/s and more. CompactPCI Serial is based on the mechanics of CompactPCI, so it remains compatible to IEC 1101, but it only supports modern point-to-point connections. This compatibility allows to use all standard 19" system solutions, because the dimensions of the backplanes are identical and are fixed in the same way. The front panels, handles, and the well-proven hot plug mechanics – the switch in the handle – also remain the same. Only the connector is replaced by a modern type which is able to support the high frequencies.

The CompactPCI Serial architecture, a simple star combined with a complete mesh for Ethernet, functions without switches and bridges. There is a system slot and up to eight peripheral slots with congruent pin assignments.

The CompactPCI Serial standard supports a maximum of 2 PCI Express x8 links (fat pipe), 6 PCI Express x4, 8 SATA, 8 USB and 8 Ethernet interfaces.

To guarantee maximum compatibility between different board manufacturers and to optimize the usability in CompactPCI Serial systems the order to implement the interfaces is defined. PCI Express, USB and Ethernet are ascending; SATA/SAS is descending. This means that the first PCI Express link and the first USB and Ethernet ports from the system slot are led to the first peripheral slot, the second to the second etc. and the first SATA interface to the eighth peripheral slot, the second to the seventh etc. See Figure 4, CompactPCI Serial backplane with filling order on page 42.

Figure 4. *CompactPCI Serial backplane with filling order*



2.14.2 Implementation on the G22

The G22 supports up to six SATA interfaces, eight USB 2.0 ports (or four USB 2.0 and four USB 3.0), 1 DisplayPort, five PCI Express x1 links as well as two PEG x8 (PCI Express fat pipe) ports on the backplane.

Please note that slot 9 does not support PCI Express and slots 2 and 3 do not support SATA on a standard 9-slot CompactPCI Serial backplane with the G22 in the system slot.

The interfaces are accessible at the following slots (see Figure 4, CompactPCI Serial backplane with filling order on page 42):

- One SATA interface on slot 4 (switchable in BIOS), 5, 6, 7, 8 and 9 each
- One USB interface on slot 2, 3, 4, 5, 6, 7, 8 and 9 each
- One PCI Express x8 link on slot 2 and 3 each
- One PCI Express x1 link on slot 4, 5, 6. 7 and 8 each (a sixth x1 link on slot 9 is possible on a special board version)

Please see the CompactPCI Serial specification PICMG CPCI-S.0 for more information.

2.14.3 Using the G22 as a Peripheral Board

The G22 is designed to be a system or a peripheral slot CPU in a CompactPCI Serial system. Due to that it is possible to use more than one G22 board within a CPCI-S.0 system to build a redundant system or a cluster with more processing power. The communication between the boards is done via Ethernet in this case and the other high-speed interfaces cannot be used. The G22 cannot be booted via SATA in such a configuration.

In peripheral mode the following interfaces available on the CPCI-S.0 connector are disabled by the BIOS automatically:

- PCI Express
- Display Port
- USB
- SATA
- All control signals which are only available for system boards

The BIOS detects if the board is inserted in a peripheral slot by monitoring the SYS_EN# pin on CompactPCI Serial connector P1.

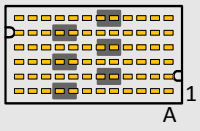
2.14.4 CompactPCI Serial Connectors P1..P5

Pin Assignment of Connector P1

Connector type of P1:

- 72-pin Airmax VS 4 pair, right angle header, 6 rows, 4 walls

Table 12. *Pin assignment of CompactPCI Serial P1 connector*



1_PE_ Rx03-	1_PE_ Rx03+	GND	1_PE_ Tx03-	1_PE_ Tx03+	GND	1_PE_ Rx02-	1_PE_ Rx02+	GND	1_PE_ Tx02-	1_PE_ Tx02+	GND	6
GND	1_PE_ Rx01-	1_PE_ Rx01+	GND	1_PE_ Tx01-	1_PE_ Tx01+	GND	1_PE_ Rx00-	1_PE_ Rx00+	GND	1_PE_ Tx00-	1_PE_ Tx00+	5
1_SA-TA_Rx-	1_SA-TA_Rx+	GND	1_SA-TA_Tx-	1_SA-TA_Tx+	GND	reserved	reserved	GND	1_ USB2-	1_ USB2+	GND	4
GA3	SATA_ SL	SATA_ SCL	GA2	SATA_ SDO	SATA_ SDI	PWR_ FAIL#	1_USB3 _Rx-	1_USB3 _Rx+	PWR BTN#	1_USB3 _Tx-	1_USB3 _Tx+	3
GND (SYS EN#)	reserved	GND	WAKE_ IN#	PRST#	GND	RST#	PS_ON#	GND	IPMB_ SDA	IPMB_ SCL	GND	2
GND	+12V	+12V	GND	+12V	+12V	GND	+12V	+12V	GND	STND BY	+12V	1
L	K	J	I	H	G	F	E	D	C	B	A	

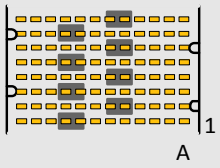
Note: The signals written in gray are specified in the CompactPCI Serial specification but not supported on this board.

Pin Assignment of Connectors P2, P3 and P4

Connector type of P2, P3, P4:

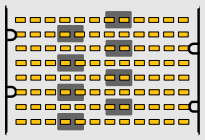
- 96-pin Airmax VS 4 pair, right angle header, 8 rows, 2 walls

Table 13. *Pin assignment of CompactPCI Serial P2 connector*



4_ USB2-	4_ USB2+	1_D-DP_HPD	3_ USB2-	3_ USB2+	GND	2_ USB2-	2_ USB2+	GND	1_D-DP_01-	1_D-DP_01+	GND	8
GND	1_DDP_AUX-	1_D-DP_AUX+	GND	1_D-DP_03-	1_D-DP_03+	GND	1_DDP_02-	1_D-DP_02+	GND	1_D-DP_00-	1_D-DP_00+	7
2_PE_Rx07-	2_PE_Rx07+	GND	2_PE_Tx07-	2_PE_Tx07+	GND	2_PE_Rx06-	2_PE_Rx06+	GND	2_PE_Tx06-	2_PE_Tx06+	GND	6
GND	2_PE_Rx05-	2_PE_Rx05+	GND	2_PE_Tx05-	2_PE_Tx05+	GND	2_PE_Rx04-	2_PE_Rx04+	GND	2_PE_Tx04-	2_PE_Tx04+	5
2_PE_Rx03-	2_PE_Rx03+	GND	2_PE_Tx03-	2_PE_Tx03+	GND	2_PE_Rx02-	2_PE_Rx02+	GND	2_PE_Tx02-	2_PE_Tx02+	GND	4
GND	2_PE_Rx01-	2_PE_Rx01+	GND	2_PE_Tx01-	2_PE_Tx01+	GND	2_PE_Rx00-	2_PE_Rx00+	GND	2_PE_Tx00-	2_PE_Tx00+	3
1_PE_Rx07-	1_PE_Rx07+	GND	1_PE_Tx07-	1_PE_Tx07+	GND	1_PE_Rx06-	1_PE_Rx06+	GND	1_PE_Tx06-	1_PE_Tx06+	GND	2
GND	1_PE_Rx05-	1_PE_Rx05+	GND	1_PE_Tx05-	1_PE_Tx05+	GND	1_PE_Rx04-	1_PE_Rx04+	GND	1_PE_Tx04-	1_PE_Tx04+	1
L	K	J	I	H	G	F	E	D	C	B	A	

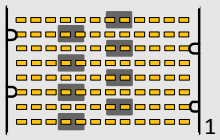
Table 14. *Pin assignment of CompactPCI Serial P3 connector*



8_SATA_Rx-	8_SATA_Rx+	GND	8_SATA_Tx-	8_SATA_Tx+	GND	7_SATA_Rx-	7_SATA_Rx+	GND	7_SATA_Tx-	7_SATA_Tx+	GND	8
GND	6_SATA_Rx-	6_SATA_Rx+	GND	6_SATA_Tx-	6_SATA_Tx+	GND	5_SATA_Rx-	5_SATA_Rx+	GND	5_SATA_Tx-	5_SATA_Tx+	7
4_SATA_Rx-	4_SATA_Rx+	GND	4_SATA_Tx-	4_SATA_Tx+	GND	3_SATA_Rx-	3_SATA_Rx+	GND	3_SATA_Tx-	3_SATA_Tx+	GND	6
GND	2_SATA_Rx-	2_SATA_Rx+	GND	2_SATA_Tx-	2_SATA_Tx+	GND	8_USB3_Rx-	8_USB3_Rx+	GND	8_USB3_Tx-	8_USB3_Tx+	5
7_USB3_Rx-	7_USB3_Rx+	GND	7_USB3_Tx-	7_USB3_Tx+	GND	6_USB3_Rx-	6_USB3_Rx+	GND	6_USB3_Tx-	6_USB3_Tx+	GND	4
GND	5_USB3_Rx-	5_USB3_Rx+	GND	5_USB3_Tx-	5_USB3_Tx+	GND	4_USB3_Rx-	4_USB3_Rx+	GND	4_USB3_Tx-	4_USB3_Tx+	3
3_USB3_Rx-	3_USB3_Rx+	GND	3_USB3_Tx-	3_USB3_Tx+	GND	2_USB3_Rx-	2_USB3_Rx+	GND	2_USB3_Tx-	2_USB3_Tx+	GND	2
GND	8_USB2-	8_USB2+	GND	7_USB2-	7_USB2+	GND	6_USB2-	6_USB2+	GND	5_USB2-	5_USB2+	1
L	K	J	I	H	G	F	E	D	C	B	A	

Note: The signals written in gray are specified in the CompactPCI Serial specification but not supported on this board. The interface 3_SATA is not supported by default, it has to be set in BIOS.

Table 15. *Pin assignment of CompactPCI Serial P4 connector*



6_PE_ Rx03-	6_PE_ Rx03+	GND	6_PE_ Tx03-	6_PE_ Tx03+	GND	6_PE_ Rx02-	6_PE_ Rx02+	GND	6_PE_ Tx02-	6_PE_ Tx02+	GND	8
GND	6_PE_ Rx01-	6_PE_ Rx01+	GND	6_PE_ Tx01-	6_PE_ Tx01+	GND	6_PE_ Rx00-	6_PE_ Rx00+	GND	6_PE_ Tx00-	6_PE_ Tx00+	7
5_PE_ Rx03-	5_PE_ Rx03+	GND	5_PE_ Tx03-	5_PE_ Tx03+	GND	5_PE_ Rx02-	5_PE_ Rx02+	GND	5_PE_ Tx02-	5_PE_ Tx02+	GND	6
GND	5_PE_ Rx01-	5_PE_ Rx01+	GND	5_PE_ Tx01-	5_PE_ Tx01+	GND	5_PE_ Rx00-	5_PE_ Rx00+	GND	5_PE_ Tx00-	5_PE_ Tx00+	5
4_PE_ Rx03-	4_PE_ Rx03+	GND	4_PE_ Tx03-	4_PE_ Tx03+	GND	4_PE_ Rx02-	4_PE_ Rx02+	GND	4_PE_ Tx02-	4_PE_ Tx02+	GND	4
GND	4_PE_ Rx01-	4_PE_ Rx01+	GND	4_PE_ Tx01-	4_PE_ Tx01+	GND	4_PE_ Rx00-	4_PE_ Rx00+	GND	4_PE_ Tx00-	4_PE_ Tx00+	3
3_PE_ Rx03-	3_PE_ Rx03+	GND	3_PE_ Tx03-	3_PE_ Tx03+	GND	3_PE_ Rx02-	3_PE_ Rx02+	GND	3_PE_ Tx02-	3_PE_ Tx02+	GND	2
GND	3_PE_ Rx01-	3_PE_ Rx01+	GND	3_PE_ Tx01-	3_PE_ Tx01+	GND	3_PE_ Rx00-	3_PE_ Rx00+	GND	3_PE_ Tx00-	3_PE_ Tx00+	1
L	K	J	I	H	G	F	E	D	C	B	A	

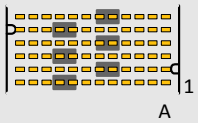
Note: The signals written in gray are specified in the CompactPCI Serial specification but not supported on this board.

Pin Assignment of Connector P5

Connector type of P5:

72-pin Airmax VS 4 pair, right angle header, 6 rows, 2 walls

Table 16. *Pin assignment of CompactPCI Serial P5 connector*



L	K	J	I	H	G	F	E	D	C	B	A	
8_PE_ CLK-	8_PE_ CLK+	8_PE_ CLKE#	7_PE_ CLK-	7_PE_ CLK+	7_PE_ CLKE#	6_PE_ CLK-	6_PE_ CLK+	6_PE_ CLKE#	5_PE_- CLK-	5_PE_ CLK+	5_PE_- CLKE#	6
4_PE_ CLKE#	4_PE_ CLK-	4_PE_ CLK+	3_PE_ CLKE#	3_PE_ CLK-	3_PE_ CLK+	2_PE_ CLKE#	2_PE_ CLK-	2_PE_ CLK+	1_PE_- CLKE#	1_PE_ CLK-	1_PE_- CLK+	5
8_PE_ Rx03-	8_PE_ Rx03+	GND	8_PE_ Tx03-	8_PE_ Tx03+	GND	8_PE_ Rx02-	8_PE_ Rx02+	GND	8_PE_ Tx02-	8_PE_ Tx02+	GND	4
GND	8_PE_ Rx01-	8_PE_ Rx01+	GND	8_PE_ Tx01-	8_PE_ Tx01+	GND	8_PE_ Rx00-	8_PE_ Rx00+	GND	8_PE_ Tx00-	8_PE_ Tx00+	3
7_PE_ Rx03-	7_PE_ Rx03+	GND	7_PE_ Tx03-	7_PE_ Tx03+	GND	7_PE_ Rx02-	7_PE_ Rx02+	GND	7_PE_ Tx02-	7_PE_ Tx02+	GND	2
GND	7_PE_ Rx01-	7_PE_ Rx01+	GND	7_PE_ Tx01-	7_PE_ Tx01+	GND	7_PE_ Rx00-	7_PE_ Rx00+	GND	7_PE_ Tx00-	7_PE_ Tx00+	1

Note: The signals written in gray are specified in the CompactPCI Serial specification but not supported on this board. The 8_PE PCI Express interface can be made available on a special board version.

Table 17. *Signal mnemonics of CompactPCI Serial rear connectors*

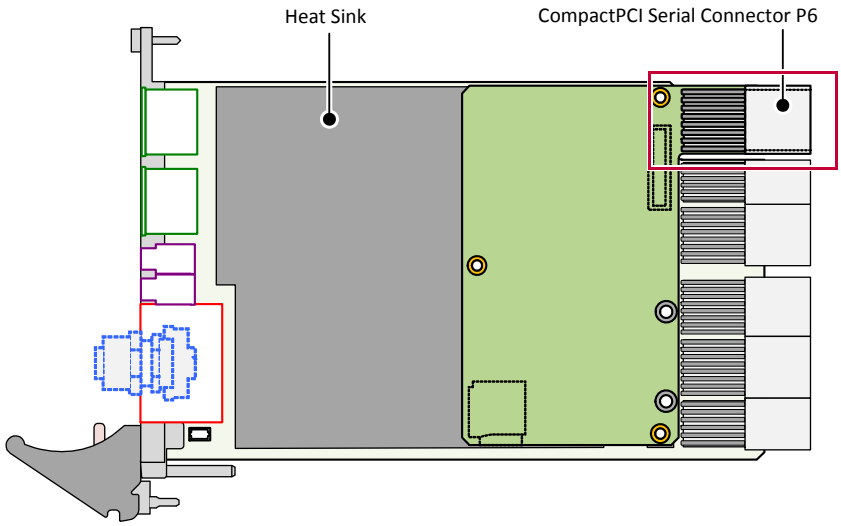
	Signal	Direction	Function
CompactPCI Serial	PS_ON#	out	Power supply control signal
	PRST#	in	Push button reset
	PWR_FAIL#	in	Power supply fail
	RST#	out	Reset signal
	SYSEN#	-	System slot identification (connected to ground at the system slot)
	PWRBTN#	in	Power button
	GA2, GA3	-	Geographical addressing
	WAKE_IN#	in	Wake signal
	IPMB_SDA	in/out	I²C system management bus data
	IPMB_SCL	out	I²C system management bus clock
Power	+12V	in	+12 V power supply
	GND	-	Digital ground
	STNDBY	in	Standby voltage
SATA	x_SATA_Tx-, x_SATA_Tx+	out	Differential pair of SATA transmit lines, port 1 to port 8
	x_SATA_Rx-, x_SATA_Rx+	in	Differential pair of SATA receive lines, port 1 to port 8
SGPIO	SATA_SC	out	Clock signal
	SATA_SL	out	Last clock of a bit stream; begin a new bit stream on the next clock
	SATA_SDO	out	Serial data output bit stream
	SATA_SDI	in	Serial data input bit stream (may not be supported by all SGPIO devices)
PCI Express	x_PE_Rx00-..x_PE_Rx07-, x_PE_Rx00+..x_PE_Rx07+	out	Differential PCI Express receiver lanes 0 to 7 for link 1 and 2 (x = 1 or x = 2)
	x_PE_Tx00-.. x_PE_Tx07-, x_PE_Tx00+..x_PE_Tx07+	in	Differential PCI Express transmitter lanes 0 to 7 for link 1 and 2 (x = 1 or x = 2)
	x_PE_Rx00-.. x_PE_Rx03-, x_PE_Rx00+..x_PE_Rx03+	out	Differential PCI Express receiver lanes 0 to 3 for link 3 to link 8 (x = 3 to 8)
	x_PE_Tx00-..x_PE_Tx03-, x_PE_Tx00+..x_PE_Tx03+	in	Differential PCI Express transmitter lanes 0 to 3 for link 3 to link 8 (x = 3 to 8)
	x_PE_CLK-, x_PE_CLK+	out	Differential 100 MHz reference clock for link 1 to 8 (x = 1 to 8)
	PE_CLKE#	in	Presence Detect

USB	x_USB3_Tx-, x_USB3_Tx+	out	Differential pair of USB 3.0 transmit lines, port 1 to port 8 (x = 1 to 8)
	x_USB3_Rx-, x_USB3_Rx+	in	Differential pair of USB 3.0 receive lines, port 1 to port 8 (x = 1 to 8)
	x_USB2-, x_USB2+	in/out	Differential pair of USB 2.0 lines, port 1 to port 8 (x = 1 to 8)
Digital Display	1_DDP_00-..1_DDP_03- 1_DDP_00-..1_DDP_03+	out	Differential pairs of digital display interface data lines
	DDP_AUX-, DDP_AUX+	in/out	Auxiliary channels for device management and device control
	DDPC_HPD	in	Digital display interface hot plug detect

2.14.5 Ethernet Rear I/O Card

The eight Ethernet interfaces defined in the CompactPCI Serial standard on the P6 connector (marked in red in the following drawing) are not implemented directly on the G22, but on a special mezzanine board. This way, the number of Ethernet interfaces can be varied as required.

Figure 5. *CompactPCI serial P6 connector*



Two cards with 4 (GM1) or 8 (GM2) Ethernet interfaces are already available. See MEN's website for ordering information.

The Ethernet rear I/O card is connected to the G22 using a 40-pin connector leading two USB ports and one PCI Express interface to the card.

As an option, the Ethernet port with AMT functionality at the front panel can be led to the backplane via the rear I/O card.

2.14.5.1 Installing the Rear I/O Card on the G22

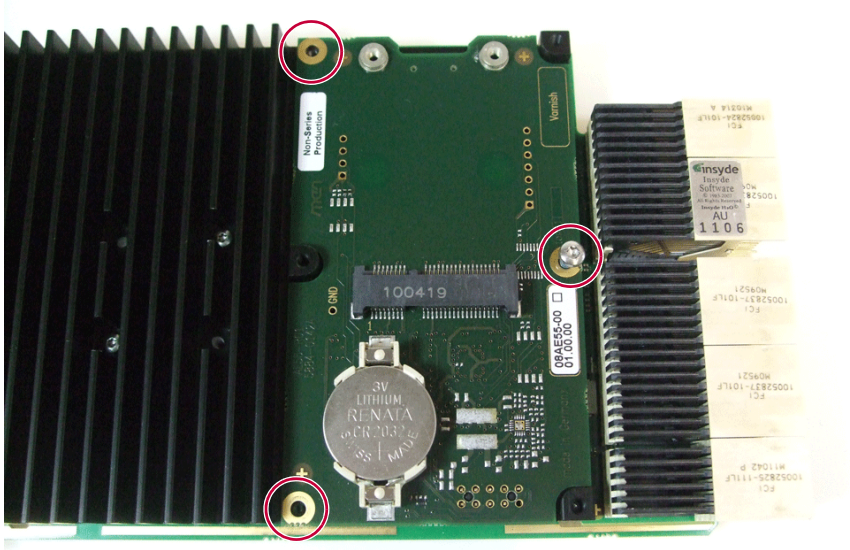
The mounting material needed for the installation is included in the delivery of the adapter card. It contains three screws for fixing the module and the gap pads required for thermally connecting the Ethernet controllers to the heat sink of the G22.

Removing the mSATA Adapter Board

For installing the rear I/O card (e.g. the GM1) on the G22 you have to remove the adapter board with the mSATA disk and the microSD card.

Carry out the following steps:

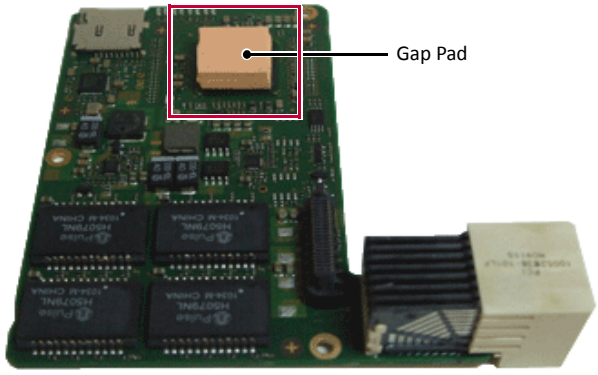
- ☑ Power down your system and remove the G22 from the system.
- ☑ Put the board on a flat surface.
- ☑ Loosen and remove the screws (highlighted in red) fastening the mSATA adapter to the G22.



- ☑ Remove the adapter taking care not to damage the pins of the board-to-board connector.

Installing a mezzanine card for CompactPCI® Serial CPU boards

☑ Take the gap pad from the mounting material delivered with the rear I/O card.



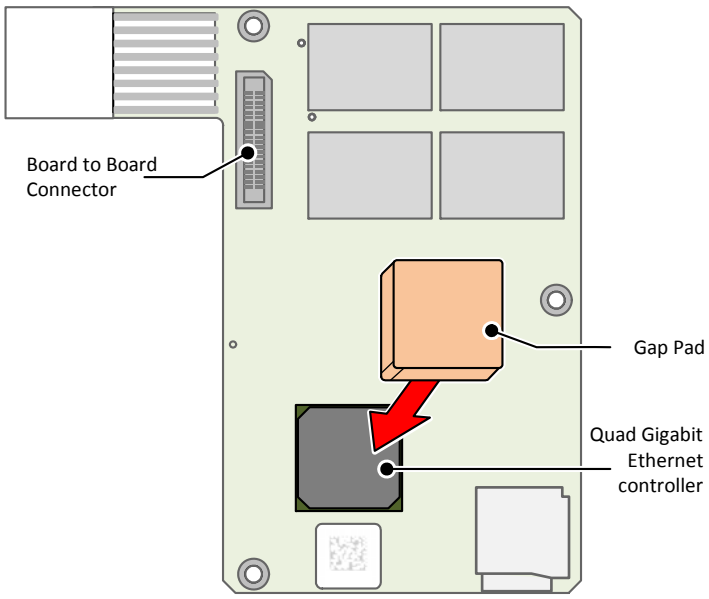
Installing the GM1 on the G22

☑ Remove the plastic film from the one side of the gap pad.

☑ Press the gap pad onto the Ethernet controller of the GM1.

☑ Remove the plastic film on the other side.

☑ Align the board-to-board connectors of the G22 and the rear I/O card and push the card down carefully.



☑ Fasten the rear I/O card using the three screws included in the delivery of the card.

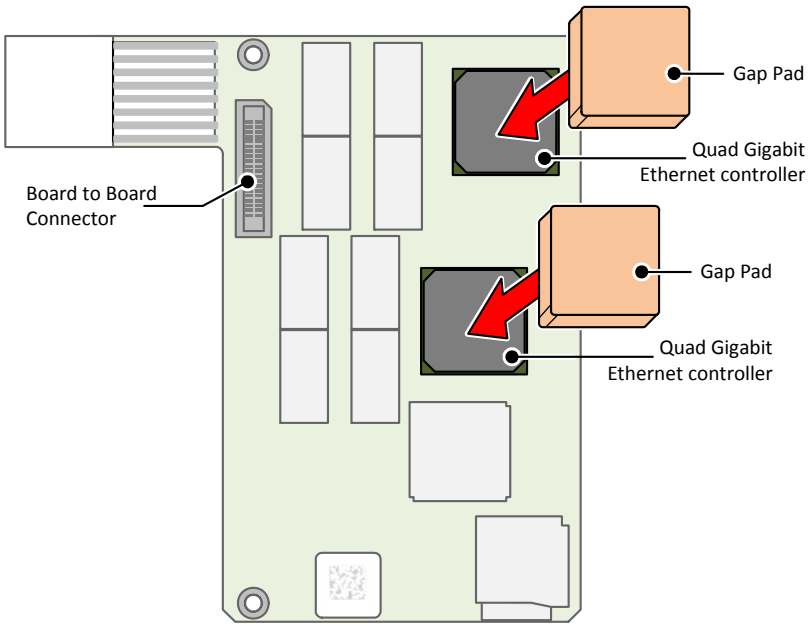
Installing the GM2 on the G22

☑ Remove the plastic film from the one side of the gap pad.

☑ Press the gap pads onto the Ethernet controllers of the GM2

☑ Remove the plastic film on the other side of the pads.

☑ Align the board-to-board connectors of the G22 and the rear I/O card and push the card down carefully.

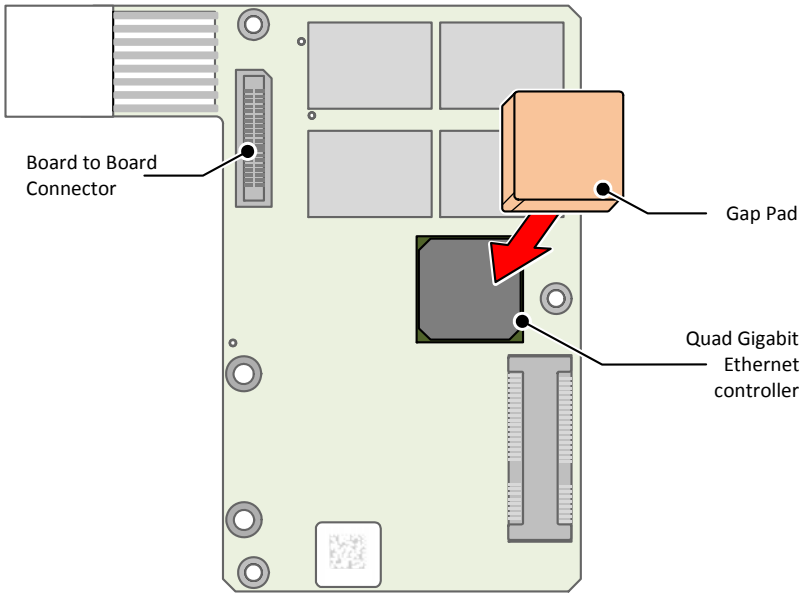


☑ Fasten the rear I/O card using the three screws included in the delivery of the card.

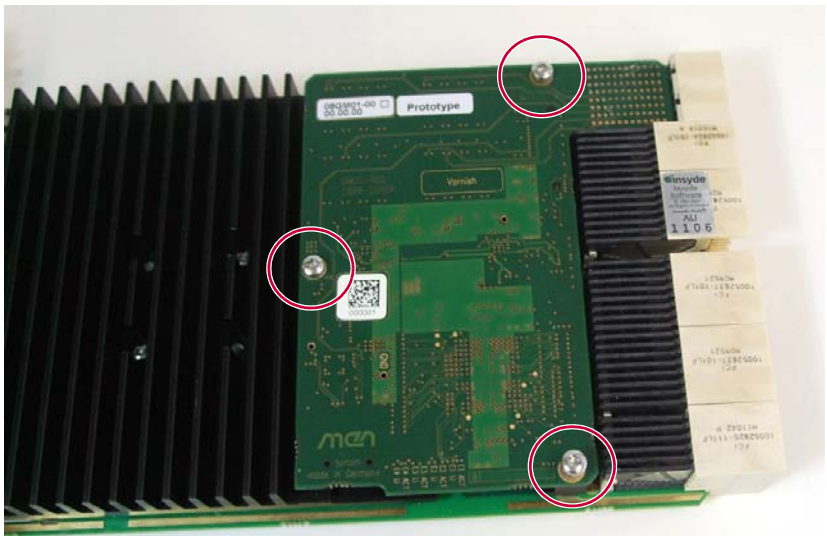
Installing the GM3 on the G22

The GM3 also provides an onboard mSATA J3 connector for connecting an mSATA disk. The mSATA disc must be connected before the GM3 is mounted onto the G22. Instructions for installing the mSATA disc are available in the GM3 user manual. Once the mSATA disc is connected, continue with the instructions below:

- ☑ Remove the plastic film from the one side of the gap pad.
- ☑ Press the gap pads onto the Ethernet controllers of the GM3.
- ☑ Remove the plastic film on the other side of the pads.
- ☑ Align the board-to-board connectors of the G22 and the rear I/O card and push the card down carefully.



- ☑ Fasten the rear I/O card using the three screws included in the delivery of the card.



2.15 Reset Button

The G22 is equipped with a reset button which is recessed within the front panel and requires a tool, e.g. paper clip to be pressed, preventing the button from being inadvertently activated.

2.16 Status LEDs

The G22 provides four status LEDs at the front panel which are controlled by the board controller using SMBus commands.

Table 18. *Status LEDs*

LED No.	Color	Name
1		Board Status LED
2		Hotswap LED
3		User LED
4		User LED

2.16.1 Status LED

The yellow status LED shows board status messages. The LED is controlled by a GPIO pin of the board controller. It is switched on when the BIOS starts, switched off when the board is switched off and flashing when the board is in stand-by (S3) status.

During normal operation the LED can be switched on and off using the MEN driver for the board controller. See MEN's website for further information.

In case of a board failure, the LED displays the following error messages:

Table 19. *Error codes signaled by board management controller via LED flashes*

Number of Flashes	Error
1	+V3.3A failure
2	Input voltage failure
3	External power supply failure
4	CPU too hot
5	BIOS timeout
>5	Internal Board Error

2.16.2 Hot-Swap LED

After system shutdown or if the system is in S4 or in S5 state, the hot swap LED lights continuously.

If the system is plugged into the system slot and in S0 state or in S3 state, the board controller ignores the hot swap switch.

If the hot swap switch is closed while the hot swap sequence is in progress, the board controller stops flashing the hot swap LED and no longer waits for system shutdown. If the hot swap switch is closed after system shutdown, the board controller initiates Power Resume.

If the hot swap switch is open during power-up, the board controller delays the power-up sequence and lights the hot swap LED until the hot swap switch is closed.

2.16.3 User LEDs

The user LEDs can be switched on and off using the MEN driver for the board controller. See MEN's website for further information.

3 BIOS

The G22 is equipped with an InsydeH2O setup utility from Insyde Software. InsydeH2O is Insyde Software's firmware product line designed to replace traditional PC BIOS. It is an implementation of the Intel's Platform Innovation Framework for UEFI /EFI. The UEFI/EFI specification defines a new model for the interface between operating systems and platform firmware. This interface consists of data tables that contain platform-related information, plus boot and runtime service calls that are available to the operating system and its loader. Together, these provide a standard environment for booting an operating system and running pre-boot applications. This product line is the next generation of PC BIOS technology.

The ">" character in front of a menu item means that a sub-menu is available. An "x" in front of a menu item means that there is a configuration option which needs to be activated through a higher configuration option before being accessible.

The G22 BIOS has two configuration modes. One mode shows only a selection of the most important items and hides items where normally no changes in the settings are required. This manual only describes the short mode. You can easily switch between the two modes via a menu item (see Chapter Full Configuration Mode on page 60).

3.1 Main

InsydeH2O Setup Utility					Rev. 3.5
Main	Advanced	Security	Power	Boot	Exit

MEN G22 Version	0.14
Processor Type	Intel Core i7-3612 QE CPU 2.10 GHz
System Bus Speed	100 MHz
System Memory Speed	1600 MHz
MEN BMC Rev	1.5.0
MEN Board Rev	Not detected
MEN Board S/N	2344
Cache RAM	1024kB
Total Memory	8192 MB
Channel A	
SODIMM 0	4096 MB
SODIMM 1	Not installed
Channel B	
SODIMM 0	4096 MB
SODIMM 1	Not installed
Platform Configuration	
CPU ID:	0x306A9
Microcode Rev:	0x15
Number of Core:	4
Number of Thread:	8
SMX/TXT:	Supported
VT-d:	Supported
VMX:	Supported
PCH-Rev:	04 (PPT-C1 Stepping)
VBIOS Version:	2137
Intel ME Version:	8.1.20.1336
SA-Rev:	09 (E1 Stepping)
Language	[English]
System Time	[hh:mm:ss]

InsydeH2O Setup Utility			Rev. 3.5
System Date	[mm/dd/yyyy]		
About this Software			
Full configuration mode	[No]		
F1 Help	↑↓ Select Item	F5/F6 Change Values	F9 Setup Defaults
Esc Exit	← → Select Menu	Enter Select > Submenu	F10 Save and Exit

MEN G22 Version / Processor Type / System Bus Speed / System Memory Speed/MEN Board Rev/ MEN BMC Rev / MEN Board Rev/ MEN Board S/N/ Cache RAM/ Total Memory / SODIMM 0 / SODIMM 1/Platform Configuration/CPU ID/Microcode Rev/Number of Core/Number of Thread/SMX/TXT/VT-d/VMX/PCH-Rev/VBIOS Version/Intel ME Version/ SA-Rev

Description	You cannot change any values in these fields. They are only for information.

Language

Description	Select the default language
Options	*English*

System Time

Description	Change the internal clock.	
Options	*hh*	Hours (Valid range from 0 to 23)
	mm	Minutes (Valid range from 0 to 59)
	ss	Seconds (Valid range from 0 to 59)

System Date

Description	Change the date	
Options	*mm*	Month (Valid range from 1 to 12)
	dd	Day (Valid range from 1 to 31)
	yyyy	Year (Valid range from 2000 to 2099)

Full Configuration Mode

Description	The G22 BIOS has two configuration modes. One mode shows only a selection of the most important items and hides items where normally no changes in the settings are required.	
Options	*Yes*	Enable full configuration mode
	No	Disable full configuration mode

3.2 Advanced

InsydeH2O Setup Utility						Rev. 3.5
Main	Advanced	Security	Power	Boot	Exit	
>Boot Configuration						
>Peripheral Configuration						
>IDE Configuration						
>Thermal Configuration						
>Video Configuration						
>USB Configuration						
>Chipset Configuration						
>ACPI Table/Features Control						
>Active Management Technology Support						
>PCI Express Configuration						
F1 Help	↑↓ Select Item			F5/F6 Change Values		F9 Setup Defaults
Esc Exit	← → Select Menu			Enter Select > Submenu		F10 Save and Exit

Boot Configuration — Sub-menu

```
SCU Resolution            [1024 x 768]
SATA-5 Switch             [On-board]
Add additional delay during BIOS boot process [No delay]
Power Supply Type         [ATX]
Watchdog                  [Off]
PWRON after PWR-Fail      [On]
ATX_PWRGD Failure Mode    [Check at Start-Up]
External PS Control       [Switched]
Platform Reset Management [RESET_IN is enabled]
```

SCU Resolution		
Description	Change resolution of setup utility.	
Options	*640 x 480*	*800 x 600*
	1024 x 768	

SATA-5 Switch		
Description	Switches SATA link 5 between the mSATA disk and rear I/O.	
Options	*On-board*	SATA-5 available at the mSATA disk
	Rear-I/O	SATA-5 available at rear I/O

Add additional `delay during BIOS boot process`		
Description	Helpful for init delay of peripheral boards	
Options	*No delay*	100 ms delay
	200 ms delay	300 ms delay
	400 ms delay	500 ms delay
	600 ms delay	700 ms delay
	800 ms delay	

Power Supply Type		
Description	Selects the type of power supply	
Options	*AT*	*ATX*

Watchdog		
Description	Enables or disables the G22 Watchdog	
Options	*Off*	*10 min*
	1 min	*15 min*
	2 min	*20 min*
	5 min	*30 min*

PWRON after PWR-Fail		
Description	Sets the system power status when power returns to the system from a power failure situation.	
Options	*On*	*Off*
	Former State	

ATX_PWRGD Failure Mode		
Description	Determines the system behavior in case of a failure at the ATX power good signal	
Options	*Check at Start-Up*	*Check always*

External PS Control		
Description	Controls the external Power Supply	
Options	*Always on*	*Switched*

Platform Reset Management		
Description	Enables or blocks the RESET_IN signal of the board.	
Options	*RESET_IN is enabled*	*RESET_IN is blocked*

Peripheral Configuration — Sub-menu

```
LAN-1               [Enabled]

LAN-2               [Enabled]
```

LAN-1/LAN-2		
Description	Enables or disables Intel 82579 GbE (AMT).	
Options	*Enabled*	*Disabled*

IDE Configuration — Sub-menu

```
IDE Controller                      [Enabled]
HDC Configure as                    [AHCI]
>Software Feature Mask Configuration

    HDD Unlock                      [Enabled]
    LED Locate                      [Enabled]

Aggressive LPM Support              [Enabled]
SATA Port 0                         [Enabled]
  SATA Port Hot Plug                [Disabled]
  Spin-Up Device                    [Disabled]
  SATA Device Type                  [Hard Disk Drive]
  Port Multiplier                   [Disabled]
SATA Port 1                         [Enabled]
  SATA Port Hot Plug                [Disabled]
  Spin-Up Device                    [Disabled]
  SATA Device Type                  [Hard Disk Drive]
  Port Multiplier                   [Disabled]
SATA Port 2                         [Enabled]
  SATA Port Hot Plug                [Disabled]
  Spin-Up Device                    [Disabled]
  SATA Device Type                  [Hard Disk Drive]
  Port Multiplier                   [Disabled]
SATA Port 3                         [Enabled]
  SATA Port Hot Plug                [Disabled]
  Spin-Up Device                    [Disabled]
  SATA Device Type                  [Hard Disk Drive]
  Port Multiplier                   [Disabled]
SATA Port 4                         [Enabled]
  SATA Port Hot Plug                [Disabled]
  Spin-Up Device                    [Disabled]
  SATA Device Type                  [Hard Disk Drive]
  Port Multiplier                   [Disabled]
SATA Port 5                         [Enabled]
  SATA Port Hot Plug                [Disabled]
  Spin-Up Device                    [Disabled]
  SATA Device Type                  [Hard Disk Drive]
  Port Multiplier                   [Disabled]

> Serial ATA Port 5                  [SFSA8192U1BR4TO-I-DT]
 Submenu:   Security Mode: Uninstall
```

IDE Controller

Description	Enables or disables the IDE controllers.	
Options	*Enabled*	*Disabled*

HDC Configure as

Description	Set hard disk controller configure type.	
Options	*IDE*	*RAID*
	AHCI	

> **Software Feature Mask Configuration**		
HDD Unlock		
Description	Enables or disables the unlock button for protected drives in the Intel RST manager.	
Options	*Enabled*	*Disabled*
LED Locate		
Description	If enabled, it is indicated that the LED/SGPIO hardware is attached and the pin to locate the feature is enabled in the OS.	
Options	*Enabled*	*Disabled*
Aggressive LPM support		
Description	Enables or disables aggressive LPM support.	
Options	*Enabled*	*Disabled*
SATA Port 0/1/2/3/4/5		
Description	Enables or disables SATA ports.	
Options	*Enabled*	*Disabled*
SATA Port Hot Plug		
Description	Enables or disables the SATA Port Hot Plug feature.	
Options	*Enabled*	*Disabled*
Spin-up Device		
Description	Enables or disables Spin-up device.	
Options	*Enabled*	*Disabled*
SATA Device Type		
Description	Selects the SATA device.	
Options	*Hard Disk Drive*	*Solid State Drive*
Port Multiplier		
Description	Enables or disables port multiplier.	
Options	*Enabled*	*Disabled*
> **Serial ATA port 5**		
Serial ATA port 5		
Description	Serial ATA port 5 device configuration	
Options	*uninstall*	

Thermal Configuration — Sub-menu

```
>Platform Thermal Configuration

     Shut Down Temperature      [100°C]
     Throttle on Temperature    [85°C]

>CPU Thermal Configuration

     DTS                        [Enabled]
     Bidirectional PROCHOT#     [Disabled]
     ACPI 3.0 T-States          [Disabled]
```

Shut Down Temperature		
Description	ACPI Critical Trip Point - the point at which the OS will shut down the system.	
Options	*70°C*	*75°C*
	80°C	*85°C*
	90°C	*100°C*
	110°C	*120°C*

Throttle on Temperature		
Description	Set the CPU temperature point of Throttle on.	
Options	*40°C*	*45°C*
	50°C	*55°C*
	60°C	*65°C*
	70°C	*75°C*
	80°C	*85°C*
	90°C	

DTS		
Description	Enables CPU Digital Thermal Sensor function. Out of spec: ACPI Thermal Management uses EC reported temperature values and DTS SMM is used to handle Out of Spec condition.	
Options	*Critical reporting*	*Disabled*
	Enabled	

Bidirectional PROCHOT#		
Description	This value cannot be changed.	
Options	*Disabled*	

ACPI 3.0 T-States		
Description	Enable or disable ACPI 3.0 T-States	
Options	*Disabled*	*Enabled*

Video Configuration — Sub-menu

```
Primary Display                [Auto]

>Internal Graphic Device

    Internal Graphics Device   [Auto]
    IGD - Gtt Size             [2 MB]
    IGD - Aperture Size        [256 MB]
    IGD - DVMT Pre-Allocated   [64 MB]
```

Primary Display

Description	Selects Primary Display Mode.	
Options	*Auto*	*IGFX*
	PEG	*PCI*

Internal Graphics Device

Description	Enables or disables the Internal Graphics Device (IGD).	
Options	*Enabled*	*The IGD is enabled in any case.*
	Disabled	*The IGD is disabled*
	Auto	*The IGD is enabled only when a monitor is found*

IGD – Gtt Size

Description	Selects the size of the Gtt (graphics translation table) memory.	
Options	*1 MB*	*2 MB*

IGD – Aperture Size

Description	Selects the size of the system memory that is used by the Internal Graphics Device.	
Options	*128 MB*	*256 MB*
	512 MB	

IGD - DVMT Pre-Allocated

Description	Select DVMT Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.	
Options	*0 MB*	*32 MB*
	64 MB	*96 MB*
	128 MB	*160 MB*
	192 MB	*224 MB*
	256 MB	*288 MB*
	320 MB	*352 MB*
	384 MB	*416 MB*
	448 MB	*480 MB*
	512 MB	*1024 MB*

USB Configuration — Sub-menu

```
USB BIOS Support          [Enabled]
EHCI 1                    [Enabled]
EHCI 2                    [Enabled]
Pre-Port Control          [Disabled]
```

USB BIOS Support

Description	If this menu item is enabled it is possible to boot from USB devices and use a USB keyboard under DOS. Cannot be changed. No BIOS setup is possible if this item is not enabled.	
Options	*Enabled*	

EHCI 1/2

Description	Enable/Disable EHCI 1/2.	
Options	*Enabled*	*Disabled*

Pre-Port Control

Description	Enable/Disable the pre-port disable control override.	
Options	*Enabled*	*Disabled*

Chipset Configuration

```
Setup warning
Setting items on this screen to incorrect values may cause your system
to malfunction!

VT-d                      [Enabled]
```

VT-d

Description	Check to enable the VT-d (Intel Virtualization Technology for Directed I/O) function.	
Options	*Enabled*	*Disabled*

ACPI Table/Feature Control

```
FACP - RTC S4 Wakeup     [Enabled]
APIC - IO APIC Mode      [Enabled]
TCO Watchdog Support     [Enabled]
Watchdog ACPI Table      [Enabled]
```

FACP - RTC S4 Wakeup

Description	Value only for ACPI. Enable/Disable for S4 Wakeup from RTC.	
Options	*Enabled*	*Disabled*

APIC - IO APIC Mode

Description	This item is valid only for WIN2k and WINXP.Also, a fresh install of the OS must occur when APIC Mode is desired.Test the IO ACPI by setting item to Enable.The APIC Table will then be pointed to by the RSDT, the Local APIC will be initialized, and the proper enable bits will be set in chipset.	
Options	*Enabled*	*Disabled*

TCO Watchdog Support

Description	Enables or disables TCO Watchdog Support.	
Options	*Enabled*	*Disabled*

Watchdog ACPI Table

Description	Enables or disables Watchdog ACPI Table.	
Options	*Enabled*	*Disabled*

Active Management Technology SupportPCI Express Configuration

```
PCIE Port assigned to LAN      2

>PCI Express Root Port 1

  PCI Express Root Port 1       [Enabled]

>PCI Express Root Port 3
>PCI Express Root Port 4
>PCI Express Root Port 5
>PCI Express Root Port 6
>PCI Express Root Port 7
>PCI Express Root Port 8
```

PCIE Port assigned to LAN

Description	Determines the number of the PCI Express port which is assigned to the LAN interface.
Options	*2*

PCI Express Root Port 1/2/3/4/5/6/7/8

Description	Enables or disables PCI Express ports. If PCI Express Root Port 1 is disabled, PCI Express Root Ports 2 to 8 will also be disabled.	
Options	*Enabled*	*Disabled*

3.3 Security

InsydeH2O Setup Utility						Rev. 3.5
Main	Advanced	Security	Power	Boot	Exit	
Supervisor Password			[Installed/Not Installed]			
Set Supervisor Password						
F1 Help		↑↓ Select Item		F5/F6 Change Values		F9 Setup Defaults
Esc Exit		← → Select Menu		Enter Select > Submenu		F10 Save and Exit

Supervisor Password

Description Shows whether a supervisor password has been entered.

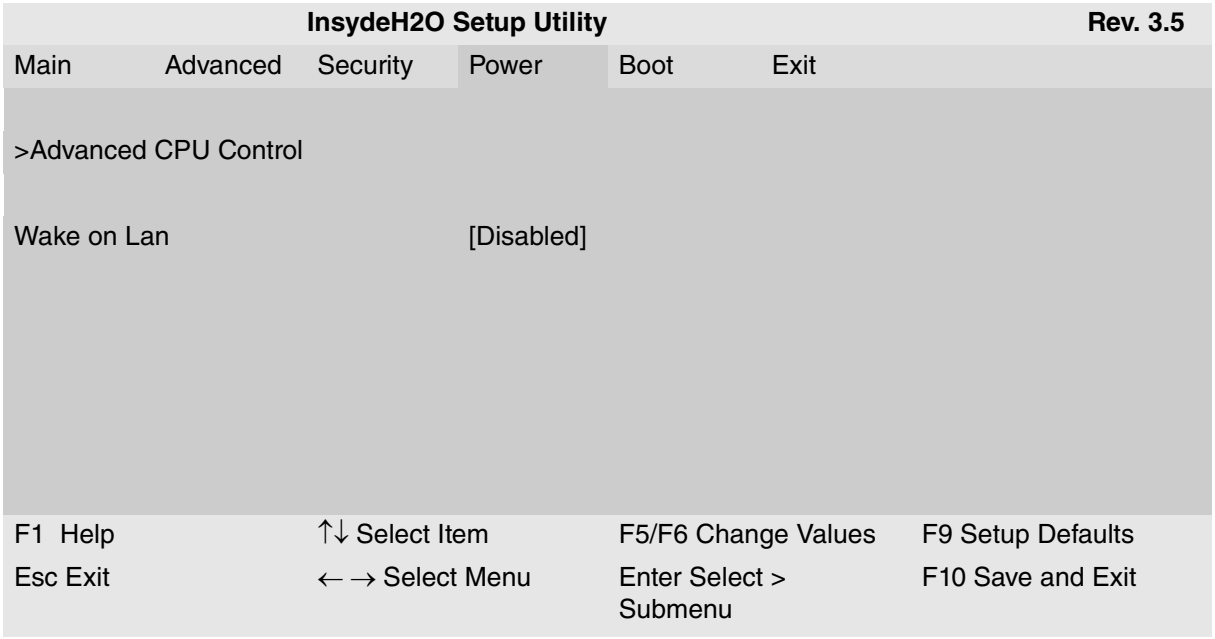
User Password

Description Shows whether a user password has been entered.

Set Supervisor Password

Description Enter and confirm the supervisor password under this menu item. To delete the password enter an empty password.

3.4 Power



Advanced CPU Control – Sub-Menu

```
P-States(IST)             [Enabled]
Active Processor Cores    [All Cores]
HT Support                [Auto]
VT Support                [Disabled]
Max CPUID Value Limit     [Disabled]
C-States                  [Enabled]
Enhanced C-States         [Enabled]
```

P-States (IST)

Description	Enable processor performance states (P-States).	
Options	*Enabled*	*Disabled*

Active Processor Cores

Description	Selects the number of active processor cores.	
Options	*All Core*	*1 Core*
	2 Core	*3 Core*

HT Support

Description	Enable or disable Hyper Threading.	
Options	*Auto*	*Disabled*

VT Support

Description	Enable or disable Vanderpool technology.	
Options	*Enabled*	*Disabled*

Max CPUID Value Limit		
Description	Enable or disable Max CPUID Value Limit.	
Options	*Enabled*	*Disabled*

C-States		
Description	Enable processor idle power saving states (C-States).	
Options	*Enabled*	*Disabled*

Enhanced C-States		
Description	Enable P-State transitions to occur in combination with C-States.	
Options	*Enabled*	*Disabled*

Enable C6		
Description	Enables or disables the C6 state (Deep Power Down Technology).	
Options	*Enabled*	*Disabled*

Wake on Lan

Description	Determines the action taken when the system power is off and a Wake on Lan event occurs.	
Options	*Enabled*	*Disabled*

3.5 Boot

InsydeH2O Setup Utility					Rev. 3.5
Main	Advanced	Security	Power	Boot	Exit
Boot Type			[Dual Boot Type]		
Quick Boot			[Enabled]		
Quiet Boot			[Enabled]		
Network Stack			[Disabled]		
PXE Boot Capability			[Disabled]		
Add Boot Options			[Auto]		
ACPI Selection			[ACPI 5.0]		
USB Boot			[Enabled]		
EFI Device First			[Disabled]		
Timeout			[0]		
Automatic Failover			[Disabled]		
>EFI					
>Legacy					
F1 Help		↑↓ Select Item		F5/F6 Change Values	F9 Setup Defaults
Esc Exit		← → Select Menu		Enter Select > Submenu	F10 Save and Exit

Boot Type

Description	Determines the boot type.
Options	*Dual Boot Type* *Legacy Boot Type* *UEFI Boot Type*

Quick Boot

Description	Allows InsydeH2O to skip certain tests while booting. This will decrease the time needed to boot the system.
Options	*Enabled* *Disabled*

Quiet Boot

Description	Disables or enables booting in Text Mode
Options	*Enabled* *Disabled*

Network Stack

Description	Network Stack Support: Windows 8, Bitlocker Unlock, UEFI IPv4/ IPv6 PXE, Legacy PXE OPROM	
Options	*Enabled*	*Disabled*

PXE Boot Capability

Description	Disables or enables PXE boot to LAN. Cannot be changed.	
Options	*Disabled*	

Add Boot Options

Description	Position in boot order for shell, network and removables.	
Options	*Auto*	*First*
	Last	

ACPI Selection

Description	Select booting to Acpi4.0/Acpi5.0	
Options	Acpi5.0	Acpi4.0

USB Boot

Description	Disables or enables booting to USB boot devices.	
Options	*Enabled*	*Disabled*

EFI Device First

Description	Determines whether the EFI device or the legacy device is booted first. If enabled the EFI device is booted first. If disabled the legacy device is booted first.	
Options	*Enabled*	*Disabled*

Timeout

Description	The number of seconds that the firmware will wait before booting the original default boot selection.	
Options	*0*	

Automatic Failover

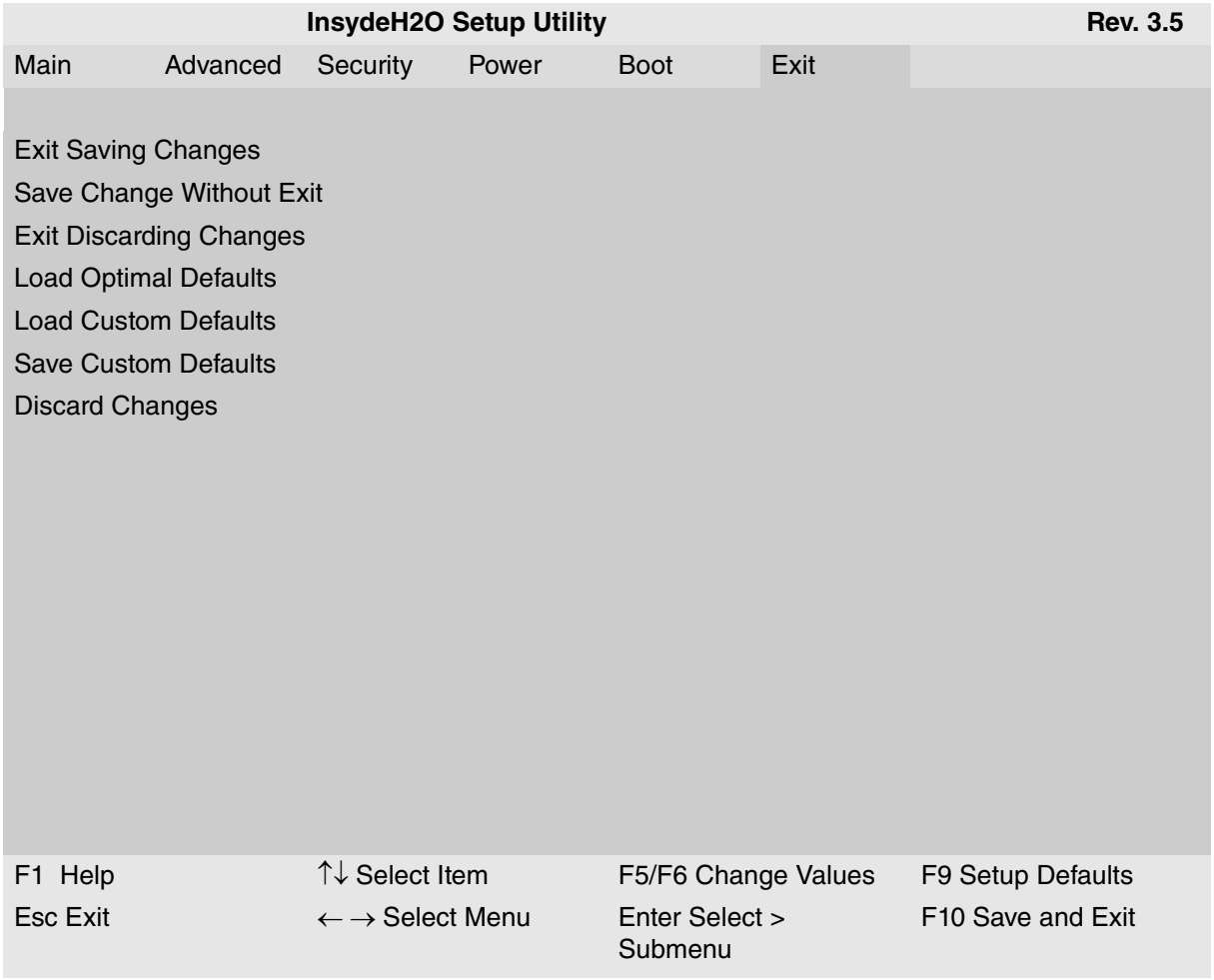
Description	Enable: if boot to default device fails, it will directly try to boot next device. Disable: if boot to default device fails, it will pop warning then go into firmware UI.	
Options	*Enabled*	*Disabled*

EFI – Sub-MenuLegacy – Sub-Menu

```
Boot Device Priority
> Normal Boot Menu          [Normal/Advance]

Normal                          Advance

> Boot Type Order               KingstonDataTraveler G3

  Floppy Drive
  Hard Disk Drive
  CD/DVD-ROM Drive
  USB
  Others


> USB
  KingstonDataTraveler G3
```

Normal Boot Menu		
Description	Selects the type of boot order	
Options	*Normal*	Sub-menu Boot Type Order: Under this menu option it is possible to select the boot order of device groups (e.g. Hard Disk before Floppy Drive). Sub-menu USB: Under this menu option it is possible to select the boot order of single devices within a device group, e.g. USB-HDD before SATA-HDD
	Advance	Under this menu option there are no device groups. The single devices are listed and can be moved to select the boot order, e.g.: SATA-HDD1 USB-Floppy USB-DVD-DRIVE SATA-HDD2

3.6 Exit



3.6.1 Exit Saving Changes

Exit system setup and save your changes.

3.6.2 Save Change Without Exit

Save your changes without exiting the system.

3.6.3 Exit Discarding Changes

Exit system setup without saving your changes.

3.6.4 Load Optimal Defaults

If this option is selected, a verified factory setup is loaded.

On the first BIOS setup configuration, this loads safe values for setup, which make the board boot up.

3.6.5 Load Custom Defaults

If this option is selected the custom defaults that have been saved in a former session with Save Custom Defaults (see Chapter 3.6.6 Save Custom Defaults) are loaded.

3.6.6 Save Custom Defaults

Save custom defaults.

3.6.7 Discard Changes

Discard changes.

4 Organization of the Board

4.1 SMBus Devices

Table 20. *SMBus devices*

Function	SMB Address[1]	SMB Address (Hex)
SPD EEPROM[2] (memory channel A)	1010 000x	0xA0
Protected register	0110 000x	0x60
Temperature sensor A	0011 000x	0x30
SPD EEPROM[3] (memory channel B)	1010 010x	0xA4
Protected register	0110 010x	0x64
Temperature sensor B	0011 010x	0x34
Board EEPROM	1001 111x	0xAE
Protected register	0110 010x	0x6E
Board temperature sensor	0011 010x	0x3E
Board controller	1001 101x	0x9A
External RTC	1010 001x	0xA2

[1] x = 0 means write command; x = 1 means read command
[2] only available for BIOS during start-up
[3] only available for BIOS during start-up

4.2 PCI Express Root Port Interrupt Mapping

Table 21. *PCI Express Root Port Interrupt Mapping for Downstream Devices*

Port	INTA#	INTB#	INTC#	INTD#
1	INTA#	INTB#	INTC#	INTD#
2	INTB#	INTC#	INTD#	INTA#
3	INTC#	INTD#	INTA#	INTB#
4	INTD#	INTA#	INTB#	INTC#
5	INTA#	INTB#	INTC#	INTD#
6	INTB#	INTC#	INTD#	INTA#
7	INTC#	INTD#	INTA#	INTB#
8	INTD#	INTA#	INTB#	INTC#

5 Maintenance

5.1 Lithium Battery

The board contains a lithium battery. There is a danger of explosion if the battery is incorrectly replaced!

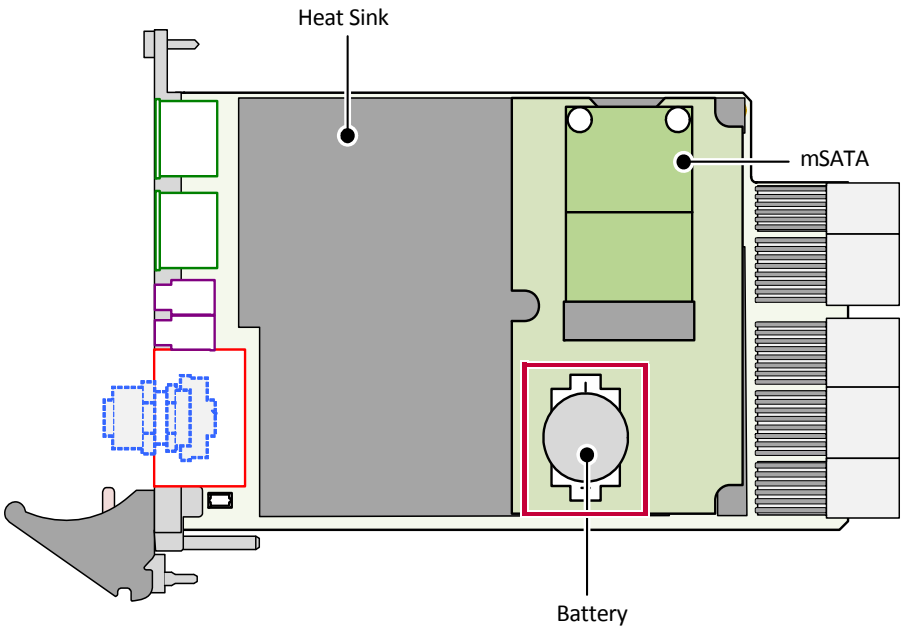
Replace only with the same or equivalent type.

- Manufacturer: Renata
- Type: CR2032
- Capacity: 235 mAh

The battery has to be UL listed.

Used batteries have to be disposed of according to the local regulations concerning the disposal of hazardous waste.

Figure 6. *Position of battery on the mSATA adapter on the G22*



6 Appendix

6.1 Literature and Web Resources

- G22 data sheet with up-to-date information and documentation:
  www.men.de/products/02G022-.html
- GM1 data sheet with up-to-date information and documentation:
  www.men.de/products/08GM01-.html
- GM2 data sheet with up-to-date information and documentation:
  www.men.de/products/08GM02-.html

6.1.1 CompactPCI Serial

- CompactPCI Serial Specification PICMG CPCI-S.0 Revision 1.0: 2011; PCI Industrial Computers Manufacturers Group (PICMG)
  www.picmg.org
- Introduction to CompactPCI Serial on Wikipedia:
  en.wikipedia.org/wiki/CompactPCI_Serial

6.1.2 CPU

- Intel Embedded Processors:
  developer.intel.com/products/embedded/processors.htm

6.1.3 SATA

- Serial ATA International Organization (SATA-IO)
  www.serialata.org

6.1.4 USB

- USB:
  Universal Serial Bus Specification Revision 1.0; 1996; Compaq, Digital Equipment Corporation, IBM PC Company, Intel, Microsoft, NEC, Northern Telecom
  www.usb.org

6.1.5 Ethernet

- Ethernet in general:
  - The Ethernet, A Local Area Network, Data Link Layer and Physical Layer Specifications, Version 2.0; 1982; Digital Equipment Corporation, Intel Corp., Xerox Corp.
  - ANSI/IEEE 802.3-1996, Information Technology - Telecommunications and Information Exchange between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications; 1996; IEEE
    www.ieee.org

- www.ethermanage.com/ethernet/
  links to documents describing Ethernet, components, media, the Auto-Negotiation system, multi-segment configuration guidelines, and information on the Ethernet Configuration Guidelines book
- www.iol.unh.edu/training/ethernet.html
  collection of links to Ethernet information, including tutorials, FAQs, and guides
- ckp.made-it.com/ieee8023.html
  Connectivity Knowledge Platform at Made IT technology information service, with lots of general information on Ethernet

6.1.6 HD Audio

- Intel High Definition Audio:
  www.intel.com/design/chipsets/hdaudio.htm

6.1.7 PCI Express

- PCI Special Interest Group
  www.pcisig.com

6.2 Finding out the Product's Article Number, Revision and Serial Number

MEN user documentation may describe several different models and/or design revisions of the G22. You can find information on the article number, the design revision and the serial number on two labels attached to the board.

- **Article number:** Gives the product's family and model. This is also MEN's ordering number. To be complete it must have 9 characters.
- **Revision number:** Gives the design revision of the product.
- **Serial number:** Unique identification assigned during production.

If you need support, you should communicate these numbers to MEN.

Figure 7. *Labels giving the product's article number, revision and serial number*