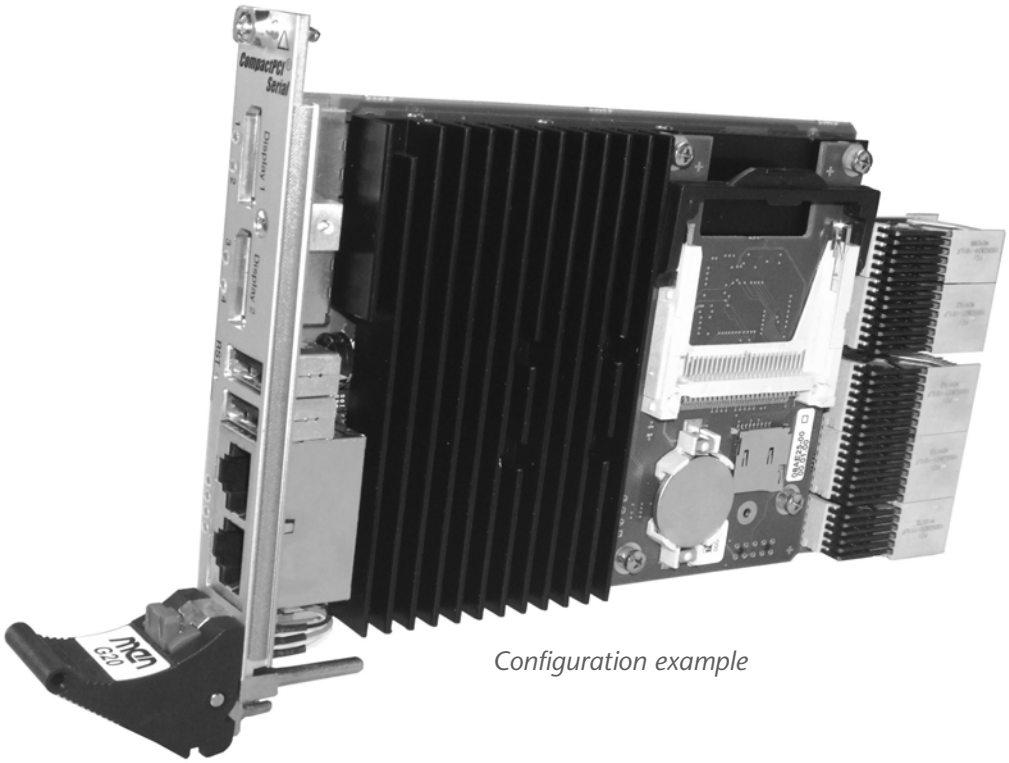
Embedded Solutions

G20 – 3U CompactPCI® Serial Intel® Core™ i7 SBC



Configuration example

User Manual

mikro elektronik
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G20 - 3U CompactPCI® Serial Intel® Core™ i7 SBC

The G20 versatile 4HP/3U single-board computer is MEN's first CompactPCI® Serial CPU board. As the new CompactPCI® Serial standard (PICMG CPCI-S.0, proposed standard currently under development) supports a multitude of modern serial interfaces it is perfectly suited for data-intensive applications which require high computing-power. The board is equipped with Intel®'s Core i7 processor running at up to 3.2 GHz maximum turbo frequency and offering the latest multi-core processor architecture from Intel® with full 64-bit support.

The memory configuration of the G20 includes a state-of-the-art fast DDR3 DRAM which is soldered to the board to guarantee optimum shock and vibration resistance. A robust CompactFlash® and microSD™ card device which are 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 8 USB, 6 SATA interfaces, one DisplayPort or HDMI (instead of one interface at the front panel), 5 PCI Express® x1 links, and two PEG x8 links.

Thermal supervision of the processor and a watchdog for the operating system complete the functionality of the G20.

The G20 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 G20 is suited for a wide range of industrial applications, e.g. for monitoring, vision and control systems as well as test and measurement. Main target markets comprise industrial automation, multimedia, traffic and transportation, aerospace, shipbuilding, medical engineering and robotics.

The G20 comes with a tailored passive heat sink within 4 HP height. Regardless, forced air cooling is always required inside the system. The robust design of the G20 makes the board especially suited for use in rugged environments with regard to shock and vibration according to applicable DIN, EN or IEC industry standards. The G20 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.

Technical Data

CPU

- Intel® Core™ i7-610E
  - 2.53 GHz processor core frequency
  - 3.2 GHz maximum turbo frequency
  - 1066 MHz system bus frequency
- Chipset
  - QM57 Platform Controller Hub (PCH)

Memory

- 4 MB L3 Cache integrated in i7 processor
- Up to 4 GB SDRAM system memory (8 GB when components available)
  - Soldered
  - DDR3 with ECC support
  - Up to 1066 MHz memory bus frequency
- 64 Mbits boot Flash
- Serial EEPROM 2 KB for factory settings
- CompactFlash® card interface
  - Via USB
  - Type I
- One microSD™ card slot
  - Via USB

Mass Storage

- Serial ATA (SATA)
  - Six channels via rear I/O
  - Transfer rates up to 3 Gbit/s
  - RAID level 0/1/5/10 support
  - Hot-plug together with G501

Graphics

- Integrated in QM57 chipset
  - 45nm, Hi-K process graphics
  - 5.75th generation
  - Maximum resolution: 2560x1600 (DisplayPort), 1920x1200 (HDMI/DVI)
- Two DisplayPort connectors at front panel
  - Optionally two DVI/HDMI ports via external adapter
- One DisplayPort at CPCI-S.0 rear connector (instead of one interface at the front)
  - Optionally SDVO or DVI/HDMI port

I/O

- USB
  - Two USB 2.0 host ports via Series A connector at front panel
  - Eight USB 2.0 host ports via CPCI-S.0 rear connector
  - Two USB 2.0 host ports via side-card connector
  - EHCI implementation
  - Data rates up to 480 Mbits/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
- SGPIO lines
  - Accessible via CPCI-S.0 rear connector

Front Connections

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

Rear I/O

- 6 SATA
- 1 DisplayPort
- 8 USB
- 5 PCI Express® x1 links
- 2 PEG x8 links
- SGPIO

PCI Express®

- Two x8 PCI Express® graphics links via CPCI-S.0 rear connector
- Five x1 PCIe® links via CPCI-S.0 rear connector
- Two x1 PCIe® links to connect local 1000Base-T Ethernet controllers
- One x1 PCIe® link via mezzanine-board connector
- Data rate 250 MB/s (2.5 Gbits/s per lane)

Miscellaneous

- Real-time clock with GoldCap backup, battery-buffered
- Power supervision and watchdog
- Temperature measurement
- 2 board status LEDs
- 2 user LEDs
- Reset button

CompactPCI® Serial

- Compliance with CompactPCI® Serial Specification CPCI-S.0 (proposed standard currently under development)
- System slot or peripheral slot

Electrical Specifications

- Supply voltage/power consumption:
  - +12V (9..16V), 45 W
  - +5V (-5%/+5%) standby voltage optional

Mechanical Specifications

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

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C
  - Airflow: min. 1.5 m/s
- 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: 15 g, 11 ms
- Bump: 10 g, 16 ms
- Vibration (sinusoidal): 1 g, 10..150 Hz
- Conformal coating on request

MTBF

- 244,466h @ 40°C according to IEC/TR 62380 (RDF 2000)

Safety

- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Conforming to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst)

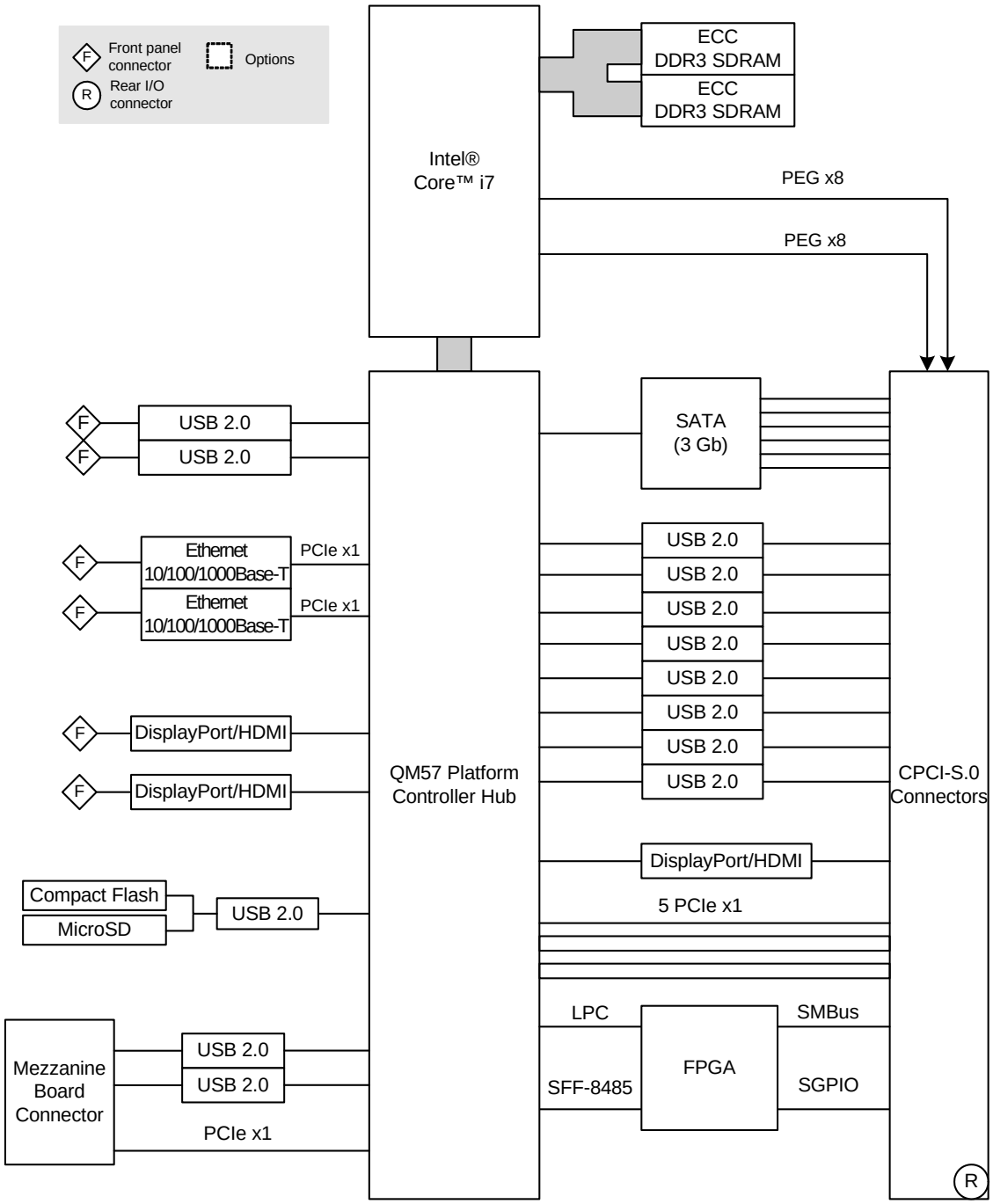
BIOS

- InsydeH2O™ UEFI Framework

Software Support

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

Block Diagram



Configuration Options

CPU

- Intel® Core™ i7-610E, 2.53GHz, 4MB Cache, 35W
- Intel® Core™ i7-620LE, 2GHz, 4MB Cache, 25W
- Intel® Core™ i7-620UE, 1.06GHz, 4MB Cache, 18W
- Intel® Core™ i5-520E, 2.4GHz, 3MB Cache, 35W
- Intel® Core™ i3-330E, 2.13 GHz, 3MB Cache, 35W

Memory

- System RAM
  - 2GB, 4GB or 8GB
- CompactFlash®
  - 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

Operating Temperature

- 0..+60°C
- Depends on board configuration (CPU, mezzanines, hard disk...)
- Minimum: -40°C (all processors)

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 69.

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 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	2010-12-08

Conventions

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".

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".

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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*

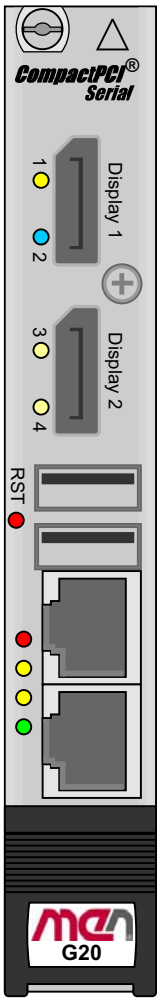
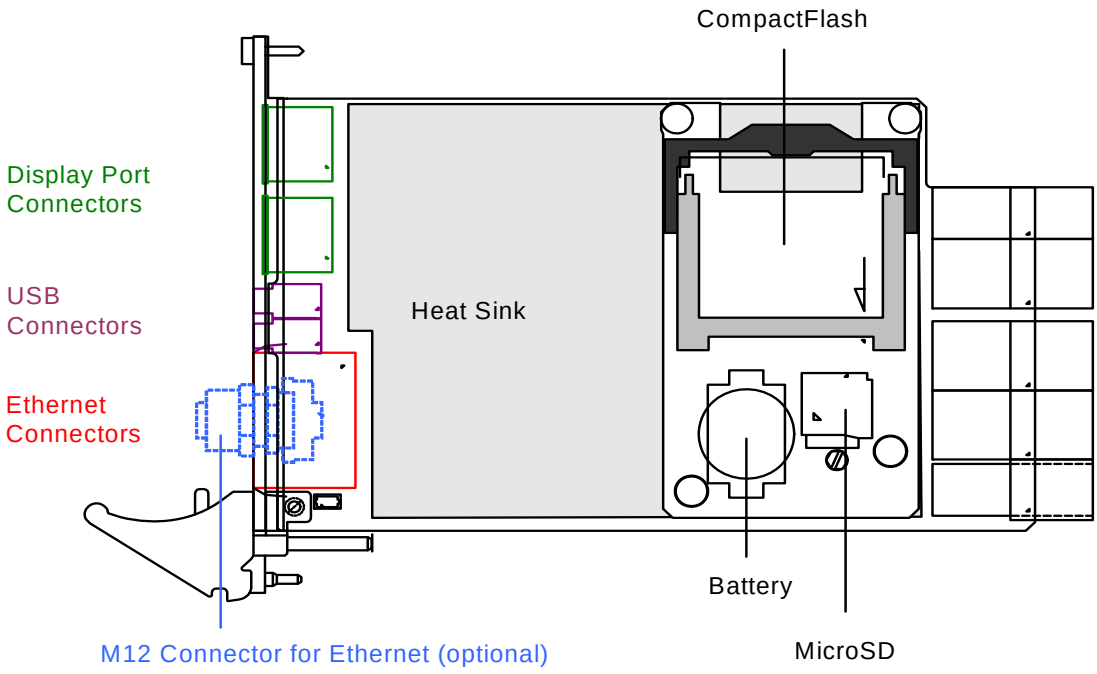


Figure 2. *Map of the board – top view*



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.

☑ CompactFlash

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

Refer to Chapter 2.7.1.1 Inserting and Extracting a CompactFlash Card on page 24 for details on the IDE interface.

☑ microSD

The board is shipped without a microSD card. You should check your needs and install a suitable microSD card. Refer to Chapter 2.7.2 MicroSD Card on page 24

☑ Expansion by a mezzanine board

The G20 offers the possibility to realize Ethernet at the rear via a special adapter board. Please contact MEN sales staff for further information.

1.3 Integrating the Board into a System

You can use the following check list when installing the G20 in a system for the first time and with minimum configuration.

- ☑ Power-down the system.
- ☑ Remove all boards from the CompactPCI system.
- ☑ Insert the G20 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.
- ☑ Power-up the system.
- ☑ You can start up the BIOS setup menu by hitting the <F2> key (see Chapter 3 BIOS on page 37).
- ☑ Now you can make configurations in BIOS (see Chapter 3 BIOS on page 37).
- ☑ Observe the installation instructions for the respective software.

1.4 Troubleshooting at Start-up

If you have any problems at start-up of the G20, you can start the board with EFI default settings for troubleshooting. Please refer to Chapter 3 BIOS on page 37.

1.5 Configuring BIOS

The G20 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 G20's BIOS in Chapter 3 BIOS on page 37.

1.6 Installing Operating System Software

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

By standard, 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.

1.7 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 70).

2.1 Power Supply

The G20 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 G20 board can optionally be supplied with +5V (+5%/-3%) standby voltage.

2.2 Board Supervision

The G20 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 Reset Behavior

The G20 can be reset using the reset button on the front panel or the *PRST#* signal on the backplane. (See also Chapter 2.13 Reset Button on page 35.)

2.4 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 GoldCap capacitor. The GoldCap 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.

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

For ordering options please see MEN's website.

2.5 Processor Core

The G20 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 on G20*

Processor Type	Core Frequency	Power Class	L2 Cache
Intel Core i7-610E	2.53GHz	35W	4MB
Intel Core i7-620LE	2GHz	25W	4MB
Intel Core i7-620UE	1.06GHz	18W	4MB
Intel Core i5-520E	2.4GHz	35W	3MB
Intel Core i3-330E	2.13 GHz	35W	3MB

2.5.1 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 G20 may cease. If you have any questions or problems regarding thermal behavior, please contact MEN.

2.6 Memory

The standard board versions provide a memory configuration suitable for many applications. However, memory on the G20 can also be configured for your needs.

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

2.6.1 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.

2.6.2 Boot Flash

The G20 has an 64-Mbit SPI Serial Flash implemented as on-board Flash for BIOS data.

2.6.3 EEPROM

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

2.7 Mass Storage

The G20 offers the possibility to connect a CompactFlash and a microSD card on a small adapter card in the heat sink area which is assembled by standard.

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

2.7.1 CompactFlash

Even with CompactFlash the board needs only one slot in the system.

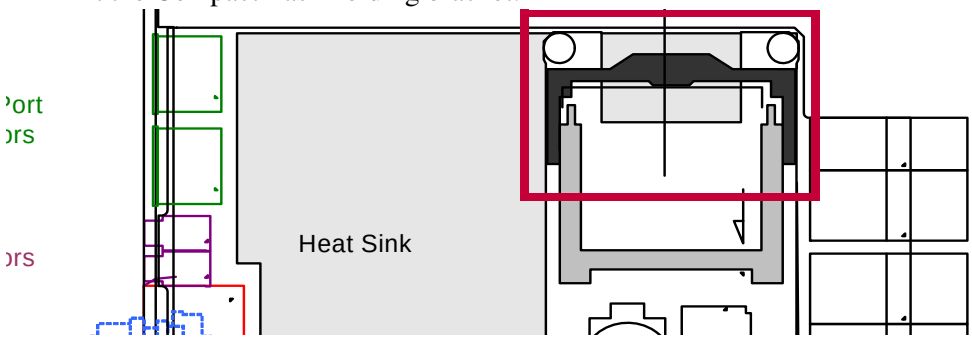
Please see MEN's website for ordering options.

2.7.1.1 Inserting and Extracting a CompactFlash Card

The G20 supports standard CompactFlash cards. For CompactFlash cards available from MEN see MEN's website.

The G20 is shipped without a CompactFlash card installed. To install CompactFlash, please stick to the following procedure.

- ☑ Power down your system and remove the G20 from the system.
- ☑ Put the board on a flat surface.
- ☑ Lift the CompactFlash holding bracket.



- ☑ Insert the CompactFlash card carefully as indicated by the arrow on top of the card.
- ☑ Make sure that all the contacts are aligned properly and the card is firmly connected with the card connector.
- ☑ Push the CompactFlash holding bracket back down until it clicks into place.
- ☑ Observe manufacturer notes on usage of CompactFlash cards.

2.7.2 MicroSD Card

The G20 provides an onboard microSD slot beside the CompactFlash on a small adapter card in the heat sink area. The slot is ready-to-use.

Even with a microSD card the board needs only one slot in the system.

Please see MEN's website for ordering options.

2.7.3 Serial ATA (SATA)

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

In compliance with the new CompactPCI Serial standard (PICMG CPCI-S.0, currently under development) these interfaces are led to CompactPCI Serial rear I/O connector P3.

The interface is compliant to the SATA generation 2 (3.0Gb/s) specification and can be run in AHCI and RAID mode.

See Chapter 2.12 CompactPCI Serial on page 32 for the rear I/O pin assignment.

2.8 Graphics

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

- 45nm, Hi-K process graphics
- 5.75th generation
- Maximum resolution: 2560x1600 (DisplayPort), 1920x1200 (HDMI/DVI)

2.8.1 Display Port

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

Connector types:

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

Table 2. *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 3. *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
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

2.8.2 Rear I/O

The G20 provides a digital display interface on CompactPCI Serial connector P2.

See Chapter 2.12 CompactPCI Serial on page 32.

2.9 USB Interfaces

The G20 provides fourteen USB 2.0 ports controlled by the QM57 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 mezzanine board connector. The remaining two interfaces are used for connection of the CompactFlash and the microSD card.

The USB interfaces support EHCI and UHCI.

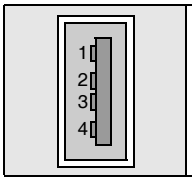
2.9.1 Front-Panel Connection

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 4. *Pin assignment of USB front-panel connectors*



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

Table 5. *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

2.9.2 Rear I/O Connection (CompactPCI Serial)

Eight USB interfaces are accessible via rear I/O in compliance to the new CompactPCI Serial standard PICMG CPCI-S.0 which is currently under development.

See Chapter 2.12 CompactPCI Serial on page 32 for rear I/O pin assignments.

2.9.3 Mezzanine Board Connection

Two USB interfaces are accessible via a mezzanine board which can be used to realize Ethernet via rear I/O.

Please contact MEN sales staff for more information on possible configurations.

See Chapter 2.12 CompactPCI Serial on page 32 for details on the mezzanine interface.

2.10 Ethernet Interfaces

The G20 has two Ethernet interfaces connected to the platform controller hub via two x1 PCI Express (PCIe) links. They are controlled by an Intel 82574L Ethernet controller and an 82577LM Ethernet Controller PHY. They support 10 Mbits/s up to 1000 Mbits/s as well as full-duplex operation and autonegotiation.

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 MAC addresses on G20 are:

- LAN1: `0x 00 C0 3A 05 8x xx - 0x 00 C0 3A 05 Bx xx`
- LAN2: `0x 00 C0 3A 05 Cx xx - 0x 00 C0 3A 05 Fx xx`

where "00 C0 3A" is the MEN vendor code, "05" is the MEN product code. The last four digits depend on the interface and the serial number of the product. The serial number is added to the offset, for example for LAN1:

• Serial number 0042: `0x xx xx = 0x8000 + 0x002A = 0x 80 2A.`

(See Chapter 6.2 Finding out the Product's Article Number, Revision and Serial Number on page 71.)

2.10.1 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 6. *Signal mnemonics of Ethernet 10/100/1000Base-T connectors*

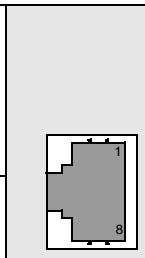
Signal	Direction	Function
BI_Dx+/-	in/out	Differential pairs of data lines for 1000Base-T

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 7. *Pin assignment and status LEDs of 8-pin RJ45 Ethernet 10/100/1000Base-T connectors (LAN1/LAN2)*

On: Link up Off: Link down	L ●		1	BI_DA+
			2	BI_DA-
			3	BI_DB+
			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-
			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.

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

		1000Base-T
	1	BI_DC-
	2	BI_DD+
	3	BI_DD-
	4	BI_DA-
	5	BI_DB+
	6	BI_DA+
	7	BI_DC+
	8	BI_DB-

2.11 PCI Express

2.11.1 General

PCI Express (PCIe) succeeds PCI and AGP and offers higher data transfer rates.

As opposed to the PCI bus, PCIe is no parallel bus but a serial point-to-point connection. Data is transferred using so-called lanes, with each lane consisting of a line pair for transmission and a second pair for reception. Individual components are connected using switches.

PCIe supports full-duplex operation and uses a clock rate of 1.25 GHz DDR. This results in a data rate of max. 250 MB/s per lane in each direction. (The standard PCI bus with 32 bits/33 MHz only allows a maximum of 133 MB/s.)

If you use only one lane, you speak of a PCIe x1 link. You can couple several lanes to increase the data rate, e.g. x2 with 2 lanes up to a x32 link using 32 lanes.

In addition, PCIe supports hot plug, for instance to exchange defect expansion boards during operation.

In terms of software, most operating systems can handle PCI Express boards just as well as the old PCI.

2.11.2 Implementation on G20

On G20 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 mezzanine board connector. See Chapter 2.13 Reset Button on page 35.

The platform controller hub of the G20 provides two additional PCI Express links over the PEG (PCI Express Graphics) ports which are also led to the CompactPCI Serial connectors.

2.12 CompactPCI Serial

2.12.1 General

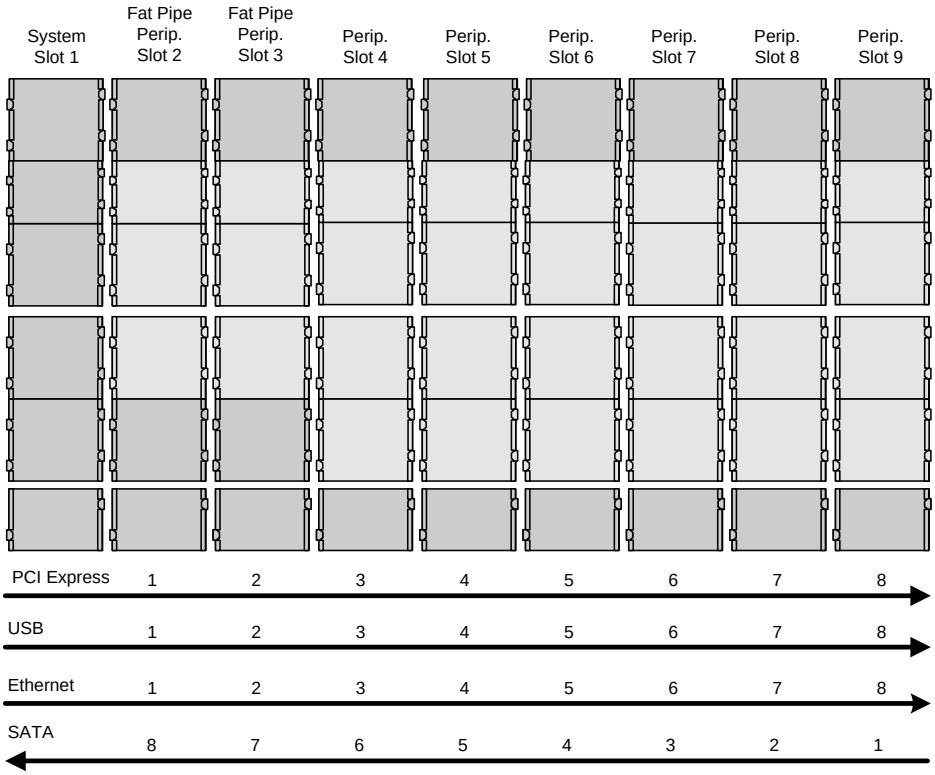
CompactPCI Serial is a new independent basic standard designated PICMG CPCI-S.0. This standard introduces a completely new connector which enables a high signal density and supports transmission frequencies of 12 Gb/s and more. CompactPCI Serial is based on the mechanics of CompactPCI®, so it remains 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 port from the system slot are led to the first peripheral slot, the second to the second etc. and the first SATA and Ethernet interfaces to the eighth peripheral slot, the second to the seventh etc. See Figure 3, CompactPCI Serial backplane with filling order on page 33.

Figure 3. *CompactPCI Serial backplane with filling order*



2.12.2 Implementation on the G20

The G20 supports 6 SATA interfaces, 8 USB 2.0, 1 DisplayPort, five PCI Express x1 links as well as two PEG x8 (PCI Express fat pipe) ports on the backplane.

The interfaces are accessible at the following slots on a standard 9-slot CompactPCI Serial backplane (see Figure 3, CompactPCI Serial backplane with filling order on page 33):

- One SATA interface on slot 4, 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

Please see the CompactPCI Serial specification PICMG CPCI-S.0 (under development) for more information and a detailed pin assignment of the backplane connectors.

2.12.3 Using the G20 as a Peripheral Board

The G20 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 G20 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 G20 cannot be booted via SATA in such a configuration.

2.13 Reset Button

The G20 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.

2.14 Status LEDs

The G20 provides four status LEDs at the front panel which are controlled by the board controller using SMBus commands.

Table 9. *Status LEDs*

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

2.14.1 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 10. *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

2.14.2 Hot-Swap LED

If the system is plugged into a peripheral slot (slave mode) and in S0 state when the Hot Swap Switch is opened, the board controller starts flashing the hot swap LED, initiates a power button press event and waits for system shutdown.

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 (master mode) 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 in master and in slave mode until the hot swap switch is closed.

2.14.3 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 G20 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.

3.1 Main

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

InsydeH2O Version	G20 BIOS V 1.xx
Processor Type	Intel Core i7-610E @ 2.53GHz
System Bus Speed	1066 MHz
System Memory Speed	1067 MHz
Cache RAM	1024kB
Total Memory	4096MB
Intel ME Version	6.1.10.1052
MEN EC Version (PIC)	1.3.1 (2)
SODIMM 0	2048MB
SODIMM 1	1024MB
Language	<English>
System Time	[hh:mm:ss]
System Date	[mm/dd/yyyy]

F1 Help	↑↓ Select Item	F5/F6 Change Values	F9 Setup Defaults
Esc Exit	← → Select Menu	Enter Select > Sub-menu	F10 Save and Exit

InsydeH2O Version / MEN Board / Processor Type / System Bus Speed / System Memory Speed / Cache RAM/ Total Memory / Intel ME Version/ MEN EC Version/ SODIMM 0 / SODIMM 1

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)

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						
Extra Bus Reserved					[Disabled]	
>Active Management Technology Support						
>PCI Express Configuration						
F1 Help		↑↓ Select Item		F5/F6 Change Values		F9 Setup Defaults
Esc Exit		← → Select Menu		Enter Select > Sub-menu		F10 Save and Exit

Boot Configuration — Sub-menu

```
NumLock                   [On]
Power Supply Type         [AT]
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]
Spread Spectrum Control   [On]
```

Numlock		
Description	Selects power-on state for Numlock	
Options	*On*	*Off*
Power Supply Type		
Description	Selects the type of power supply	
Options	*AT*	*ATX*
Watchdog		
Description	Enables or disables the G20 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*

Spread Spectrum Control		
Description	Enable or disable Spread Spectrum	
Options	*On*	Spread Spectrum enabled
	Off	Spread Spectrum disabled

Peripheral Configuration — Sub-menu

```
HD Audio            [Disabled]
LAN-1               [Enabled]
   Wake on LAN Enable [Enabled]
LAN-2               [Enabled]
```

HD Audio		
Description	Enable or disable the HD Audio controller.	
Options	*Disabled*	The controller is disabled even when there is an audio codec.
	Enabled	The controller is enabled independent of the presence of a codec.
LAN-1/LAN-2		
Description	Enables or disables the LAN interfaces.	
Options	*Enabled*	*Disabled*
Wake on LAN Enable		
Description	Enable or disable integrated LAN to wake the system.	
Options	*Enabled*	*Disabled*

IDE Configuration — Sub-menu

```
IDE Controller           [Enabled]
HDC Configure as         [AHCI]
AHCI/RAID SALP           [Enabled]
SGPIO Interface          [On]
SATA Port 0  - HotPlug   [Disabled]
             - Spin Up   [Disabled]
SATA Port 1  - HotPlug   [Disabled]
             - Spin Up   [Disabled]
SATA Port 2  - HotPlug   [Disabled]
             - Spin Up   [Disabled]
SATA Port 3  - HotPlug   [Disabled]
             - Spin Up   [Disabled]
SATA Port 4  - HotPlug   [Disabled]
             - Spin Up   [Disabled]
SATA Port 5  - HotPlug   [Disabled]
             - Spin Up   [Disabled]

>Serial ATA Port 0       [Not Installed]
>Serial ATA Port 1       [Not Installed]
>Serial ATA Port 2       [Not Installed]
>Serial ATA Port 3       [Not Installed]
>Serial ATA Port 4       [Not Installed]
>Serial ATA Port 5       [Not Installed]
```

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	
AHCI/RAID SALP		
Description	Enable/Disable AHCI/RAID Support Aggressive Link Power Management (SALP) in AHCI Host Capability Register Bit 26.	
Options	*Enabled*	*Disabled*
SGPIO Interface		
Description	Switch for starting (on) or stopping (off) the SGPIO interface	
Options	*On*	*Off*
SATA Port 0/1/2/3/4/5 Hot Plug		
Description	Enable/disable Hot Plug	
Options	*Enabled*	*Disabled*

SATA Port 0/1/2/3/4/5 Spin Up		
Description	On an edge detect from 0 to 1, the PCH starts a COMRESET initialization sequence to the device	
Options	*Enabled*	*Disabled*

Serial ATA Port 0/1/2/3/4/5	
Description	Not installed. You can make no changes here.

Thermal Configuration — Sub-menu

```
>Platform Thermal Configuration

     Shut Down Temperature      [120°C]
     Throttle on Temperature    [80°C]
     TC1                        [2]
     TC2                        [5]
     TPS                        [10]

>CPU Thermal Configuration

     DTS                        [Enabled]
     Thermal Mode               [TM1 and TM2]
     ACPI 3.0 T-States          [Disabled]

>Intelligent Power Sharing

     Intelligent Power Sharing  [Enabled]
     CPU Turbo                  [Enabled]
     MCH Turbo                  [Enabled]
```

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	
TC1/TC2		
Description	Thermal constant TC1 for the ACPI Passive Cooling (CPU Throttle On) Formula. Cannot be changed.	
TPS		
Description	It represents in 10th of a second how often the OS will read the temperature when Passive Cooling is enabled. Cannot be changed.	

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	
Thermal Mode		
Description	Setting this bit enables the thermal control circuit portion of the CPU Intel Thermal Monitor. TM1 = 50% duty cycle TM2 = Enhanced Intel Speed Step	
Options	*Disabled*	*TM1*
	TM2	*TM1 and TM2*
ACPI 3.0 T-States		
Description	Enable or disable ACPI 3.0 T-States	
Options	*Disabled*	*Enabled*
Intelligent Power Sharing		
Description	Intelligent Power Sharing configuration menu. Note: DTS must be enabled for Power Sharing to function.	
Options	*Disabled*	*Enabled*
CPU Turbo		
Description	Enable or disable CPU Turbo.	
Options	*Disabled*	*Enabled*
MCH Turbo		
Description	Enable or disable MCH Turbo.	
Options	*Disabled*	*Enabled*

Video Configuration — Sub-menu

```
PEG Force X1                [Disabled]
Render Standby              [Enabled]
Render Thermal Throttling   [Enabled]
IGD - Device2, Function1    [Enabled]
IGD - DVMT Pre-Allocated    [32MB]
IGD - DVMT Total Gfx Mem    [256MB]
```

PEG Force X1		
Description	When this option is enabled the PEG port is reduced to a x1 link.	
Options	*Enabled*	*Disabled*
Render Standby		
Description	Check to enable render standby support.	
Options	*Enabled*	*Disabled*
Render Thermal Throttling		
Description	This feature is applicable for Graphic SKUs only	
Options	*Enabled*	*Disabled*
IGD - Device2, Function1		
Description	Enable/Disable function 1 of the internal graphics device by setting item to the desired value	
IGD - DVMT Pre-Allocated		
Description	Select DVMT5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.	
Options	*32 MB*	*64 MB*
	128 MB	*256 MB*
	96 MB	*160 MB*
	224 MB	*352 MB*
IGD - DVMT Total Gfx Mem		
Description	Select the size of DVMT 5.0 that the Internal Graphics Device will use.	
Options	*128 MB*	*256 MB*

USB Configuration — Sub-menu

```
Setup Warning:
Disabling USB devices or ports may cause your system to not enter setup
and to prevent reenabling of USB devices or ports

USB Legacy              [Enabled]

EHCI 1                  [Enabled]

EHCI 2                  [Enabled]

Per-Port Control        [Disabled]

USB RMH Mode            [Enabled]
```

USB Legacy		
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.	
Options	*Enabled*	
EHCI 1/2		
Description	Enable/Disable EHCI 1/2	
Options	*Enabled*	*Disabled*
Per-Port Control		
Description	Enable/Disable the per port disable control override	
Options	*Enabled*	*Disabled*
USB RMH Mode		
Description	Enable/Disable the PCH USB Rate Matching Hubs Mode.	
Options	*Enabled*	*Disabled*

Chipset Configuration

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

PCI Latency Timer        [32]
VT-d                     [Enabled]
```

PCI Latency Timer		
Description	Value to be programmed into PCI Latency Timer Register	
Options	*32*	*64*
	96	*128*
	160	*192*
	224,	*248*

VT-d		
Description	Check to enable VT-d function on MCH	
Options	*Enabled*	*Disabled*

ACPI Table/Feature Control

```
FACP - RTC S4 Wakeup     [Enabled]
APIC - IO APIC Mode      [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 ICH4M.	
Options	*Enabled*	*Disabled*

Extra Bus Reserved

Description	Extra Bus reserved for bridges behind PCI-E Root Bridge.	
Options	*Enabled*	*Disabled*

Active Management Technology Support

```
Intel AMT Support               [Enabled]
Intel AMT Setup Prompt          [Enabled]
Intel AMT SPI Protected         [Disabled]
Intel AMT Password Write        [Enabled]
HECI Timeout                    [Enabled]
AMT Wait Timer                  [1]
Unconfigure ME                  [Disabled]
Verbose Mebx Output             [Enabled]
USB Configure                   [Enabled]
PET Progress                    [Enabled]
Me Local FW Update Enable       [Enabled]
Me Local FW Qualifier           [Always]

ASF Support                     [Enabled]
Watchdog Support                [Disabled]
   OS Timer                     [0]
   BIOS Timer                   [0]
```

Intel AMT Support

Description	Enable/disable Intel Active Management Technology BIOS extension. Note: iAMT H/W is always enabled. This option just controls the BIOS extension execution.	
Options	*Enabled*	*Disabled*

Intel AMT Setup Prompt

Description	Enable or disable Intel AMT Setup Prompt to wait for hot-key to enter setup.	
Options	*Enabled*	*Disabled*

Intel AMT SPI Protected		
Description	Enable or disable Intel AMT SPI write protect.	
Options	*Enabled*	*Disabled*
Intel AMT Password Write		
Description	Enable Intel AMT Password Write. Password is writeable when Enable is set.	
Options	*Enabled*	*Disabled*
HECI Timeout		
Description	Enable or disable HECI Timeout for send/read message and wait for initialization.	
Options	*Auto*	*Manual*
AMT Wait Timer		
Description	Set timer to wait before sending ASF_GET_BOOT_OPTIONS.	
Options	*1*	
Unconfigure ME		
Description	Unconfigure ME without password	
Options	*Enabled*	*Disabled*
Verbose Mebx Output		
Description	Enable or disable Verbose Mebx Output.	
Options	*Enabled*	*Disabled*
USB Configure		
Description	Enable or disable USB Configure function.	
Options	*Enabled*	*Disabled*
PET Progress		
Description	User can enable or disable PET events progress to receive PET events or not.	
Options	*Enabled*	*Disabled*
Me Local FW Update Enable		
Description	Enable or disable Me Local FW Update Enable function	
Options	*Enabled*	*Disabled*
Me Local FW Qualifier		
Description	Set Me Local FW Qualifier to:	
Options	*Always*	*Never*
	Restricted	
ASF Support		
Description	Enable or disable Alert Specification Format.	
Options	*Enabled*	*Disabled*

Watchdog Support		
Description	Enable or disable Watchdog timer.	
Options	*Enabled*	*Disabled*
OS Timer/Watchdog Timer		
Description	Fixed values that cannot be changed.	

PCI Express Configuration

```
PCI Express Clock Gating        [Enabled]
DMI Link ASPM Control           [L0sL1]
>PCI Express Root Port 1
  PCI Express Root Port 1       [Enabled]
  Automatic ASPM                [Auto]
  URR                           [Disabled]
  FER                           [Disabled]
  NFER                          [Disabled]
  CER                           [Disabled]
  CTO                           [Default]
  SEFE                          [Disabled]
  SENFE                         [Disabled]
  SECE                          [Disabled]
  PME Interrupt                 [Disabled]
  PME SCI                       [Disabled]
  Hot Plug                      [Disabled]

>PCI Express Root Port 2
>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
```

PCI Express Clock Gating		
Description		
Options	*Enabled*	*Disabled*
DMI Link ASPM Control		
Description		
Options	*L0sL1*	*Disabled*
	L0s	
PCI Express Root Port 1/2/3/4/5/6		
Description	If PCI Express Root Port 1 is disabled, PCI Express Root Ports 2 to 6 will also be disabled.	
Options	*Enabled*	*Disabled*

Automatic ASPM		
Description	Automatically enables ASPM based on reported capabilities and known issues.	
Options	*Disabled*	*Auto*
	L0s	L1
	L0sL1	
URR		
Description	Enable or disable PCI Express Unsupported Request Reporting.	
Options	*Enabled*	*Disabled*
FER		
Description	Enable or disable PCI Express Device Fatal Error Reporting.	
Options	*Enabled*	*Disabled*
NFER		
Description	Enable or disable Device Non-Fatal Error Reporting.	
Options	*Enabled*	*Disabled*
CER		
Description	Enable or disable PCI Express Device Correctable Error Reporting.	
Options	*Enabled*	*Disabled*
CTO		
Description	Set PCI Express Completion Timer.	
Options	*Default*	*Disabled*
	16-55 ms	*65-210 ms*
	260-900 ms	*1-3.5 ms*
SEFE		
Description	Enable or disable Root PCI Express System Error on Fatal Error.	
Options	*Enabled*	*Disabled*
SENFE		
Description	Enable or disable Root PCI Express System Error on Non-Fatal Error.	
Options	*Enabled*	*Disabled*
SECE		
Description	Enable or disable Root PCI Express System Error on Correctable Error.	
Options	*Enabled*	*Disabled*
PME Interrupt		
Description	Enable or disable Root PCI Express PME Interrupt.	
Options	*Enabled*	*Disabled*

PME SCI		
Description	Enable or disable PCI Express Hot Plug SCI.	
Options	*Enabled*	*Disabled*
Hot Plug		
Description	Enable or disable PCI Express Hot Plug.	
Options	*Enabled*	*Disabled*

3.3 Security

InsydeH2O Setup Utility						Rev. 3.5
Main	Advanced	Security	Power	Boot	Exit	
TPM Status			Not Installed			
Supervisor Password			[Installed/Not Installed]			
User Password			[Installed/Not Installed]			
Set Supervisor Password						
Power on password			[Disabled]			
User Access level			[View Only]			
Set User Password						
F1 Help		↑↓ Select Item		F5/F6 Change Values		F9 Setup Defaults
Esc Exit		← → Select Menu		Enter Select > Sub-menu		F10 Save and Exit

TPM Status

Description	TPM (Trusted Platform Module) Status. Not supported on the G20.
Options	*Not installed*

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.

Power On Password

Description	Select when the password has to be entered.	
Options	*Enabled*	The password has to be entered when the system starts.
	Disabled	The password has to be entered when changing to the setup menu.

User Access Level

Description	Set the User Access Level.	
Options	*View Only*	Access to InsydeH2O Setup allowed but the fields cannot be changed.
	Full	Any field can be changed except the Supervisor password.
	Limited	Only limited fields can be changed.

User Password

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

3.4 Power

InsydeH2O Setup Utility						Rev. 3.5
Main	Advanced	Security	Power	Boot	Exit	
>Advanced CPU Control						
>Platform Power Management						
>Break Event						
ACPI S3			[Enabled]			
Wake on PME			[Disabled]			
Auto Wake on S5			[Disabled]			
F1 Help		↑↓ Select Item		F5/F6 Change Values		F9 Setup Defaults
Esc Exit		← → Select Menu		Enter Select > Sub-menu		F10 Save and Exit

Advanced CPU Control – Sub-Menu

```
TXT                         [Disable]
P-States(IST)               [Enabled]
Boot Performance Mode       [Max Performance]
CMP Support                 [Auto]
HT Support                  [Auto]
Use XD Capability           [Enabled]
VT Support                  [Disabled]

C-States                    [Enabled]
Enhanced C-States           [Enabled]
Enable C6                   [Enabled]
Interrupt Filtering         [Disabled]

Turbo Mode                  [Enabled]
```

TXT		
Description	Enables utilization of additional hardware capabilities provided by Intel Trusted Execution Technology; changes require a full power cycle to take effect.	
Options	*Enabled*	*Disabled*
P-States (IST)		
Description	Enable processor performance states (P-States).	
Options	*Enabled*	*Disabled*
Boot Performance Mode		
Description	Select the performance state that BIOS will set before OS hand-off.	
Options	*Max Performance*	*Max Battery*
CMP Support		
Description	Enable or disable core multi processing.	
Options	*Auto*	*Disabled*
HT Support		
Description	Enable or disable Hyper Threading.	
Options	*Auto*	*Disabled*
Use XD Capability		
Description	Enable or disable XD capability.	
Options	*Enabled*	*Disabled*
VT Support		
Description	Enable or disable Vanderpool technology.	
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*
Interrupt Filtering		
Description	When enabled, only the core that is the destination of an interrupt while in C3/C6 will be notified to transition to C0. When disabled, all cores that are in C3/C6 will be notified to transition to C0, regardless of interrupt destination.	
Options	*Enabled*	*Disabled*
Turbo Mode		
Description	Enable processor Turbo Mode (requires EMTTM enabled too).	
Options	*Enabled*	*Disabled*

Platform Power Management – Sub-Menu

```
PCI Clock Run              [Enabled]
```

PCI Clock Run

Description	If Enabled,the CLKRUN# Logic will stop the PCI Clocks.	
Options	*Enabled*	*Disabled*

Break Event – Sub-Menu

```
Storage Break Event        [Disabled]
PCIE Break Event           [Disabled]
PCI Break Event            [Disabled]
EHCI Break Event           [Disabled]
UHCI Break Event           [Disabled]
HDA Break Event            [Disabled]
```

Storage Break Event

Description	If Enabled, Parallel IDE or Serial ATA master activity will cause BM_STS to be set and will cause a break from C3/C4.	
Options	*Enabled*	*Disabled*

PCIE Break Event

Description	If Enabled, PCI Express master activity will cause BM_STS to be set and will cause a break from C3/C4.	
Options	*Enabled*	*Disabled*

PCI Break Event

Description	If Enabled, PCI master activity will cause BM_STS to be set and will cause a break from C3/C4.	
Options	*Enabled*	*Disabled*

EHCI Break Event

Description	If Enabled, EHCI master activity will cause BM_STS to be set and will cause a break from C3/C4.	
Options	*Enabled*	*Disabled*

UHCI Break Event

Description	If Enabled, UHCI master activity will cause BM_STS to be set and will cause a break from C3/C4.	
Options	*Enabled*	*Disabled*

HDA Break Event

Description	If Enabled, Intel High Definition Audio master activity will cause BM_STS to be set and will cause a break from C3/C4.	
Options	*Enabled*	*Disabled*

ACPI S3

Description	Enable/Disable ACPI S1/S3 Sleep state	
Options	*Enabled*	*Disabled*

Wake on PME

Description	Determines the action taken when the system power is off and a PCI Power Management Enable wake up event occurs.	
Options	*Enabled*	*Disabled*

Auto Wake on S5

Description	Auto wake on S5, By Day of Month or Fixed time of every day	
Options	*Disabled*	*By every day*
	By day of month	

3.5 Boot

InsydeH2O Setup Utility					Rev. 3.5
Main	Advanced	Security	Power	Boot	Exit
UEFI Boot			[Enabled]		
Quick Boot			[Enabled]		
Quiet Boot			[Enabled]		
PXE Boot to LAN			[Disabled]		
ACPI Selection			[ACPI 3.0]		
USB Boot			[Enabled]		
Fast Boot			[Disabled]		
>EFI					
>Legacy					

F1 Help	↑↓ Select Item	F5/F6 Change Values	F9 Setup Defaults
Esc Exit	← → Select Menu	Enter Select > Sub-menu	F10 Save and Exit

UEFI Boot

Description	Enable/Disable UEFI Boot Function	
Options	*Enabled*	*Disabled*

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*

PXE Boot to LAN

Description	Disables or enables PXE boot to LAN.	
Options	*Enabled*	*Disabled*

ACPI Selection

Description	Select booting to Acpi3.0/Acpi1.0B	
Options	Acpi3.0/	Acpi1.0B

USB Boot

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

Fast Boot

Description	Disables or enables Fast Boot function.	
Options	*Enabled*	*Disabled*

EFI – Sub-Menu

```
EFI

ACPI(PNP0A03,0)/Pci(1D|0)/Usb(0, 0)/Usb(1,
0)/HD(Part1, SigD808A4A4)
```

EFI Boot Menu

Description	Selects the boot order for (U)EFI boot media. In the example a USB stick was detected as (U)EFI boot medium.

Legacy – 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
  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

InsydeH2O Setup Utility						Rev. 3.5
Main	Advanced	Security	Power	Boot	Exit	
Exit Saving Changes						
Save Change Without Exit						
Exit Discarding Changes						
Load Optimal Defaults						
Load Custom Defaults						
Save Custom Defaults						
Discard Changes						
F1 Help		↑↓ Select Item		F5/F6 Change Values		F9 Setup Defaults
Esc Exit		← → Select Menu		Enter Select > Sub-menu		F10 Save and 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 11. *SMBus devices*

Function	SMB Address	SMB Address[1] (Hex)
Clock generator	1101 001x	0xD2 / 0xD3
SPD EEPROM (memory channel A)	1010 000x	0xA0
SPD EEPROM (memory channel B)	1010 010x	0xA4
Board EEPROM	1001 111x	0xAE
Protected register	0110 010x	0x6E
Temperature sensor	0011 010x	0x3E

[1] The first address is for write command, the second for read command

4.2 PCI Express Root Port Interrupt Mapping

Table 12. *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

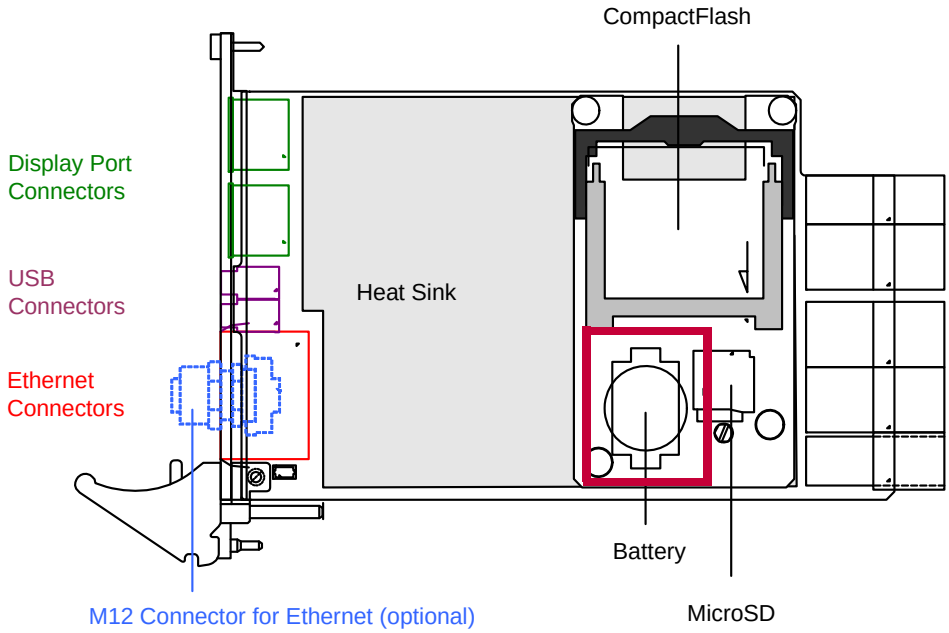
The board contains a lithium battery. There is a danger of explosion if the battery is incorrectly replaced!

Replace only with the same or equivalent type.

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

Dispose of used batteries according to the manufacturer's instructions.

Figure 4. *Position of battery on the CompactFlash adapter on the G20*



6 Appendix

6.1 Literature and Web Resources

- G20 data sheet with up-to-date information and documentation:
  www.men.de/products/02G020-.html

6.1.1 CPU

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

6.1.2 SATA

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

6.1.3 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

6.1.4 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

6.1.5 HD Audio

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

6.1.6 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 G20. 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 5. *Labels giving the product's article number, revision and serial number*