User Manual

G20 – 3U CompactPCI® Serial Intel® Core™ i7 CPU Board

G20 - 3U CompactPCI® Serial Intel® Core™ i7 CPU Board

The G20 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 Intel®'s Core i7 processor running at up to 3.2 GHz maximum turbo frequency and offering multi-core architecture from Intel® with full 64-bit support. The G20 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.

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. 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 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. Up to eight Gigabit Ethernet interfaces can be realized using a rear I/O adapter board.

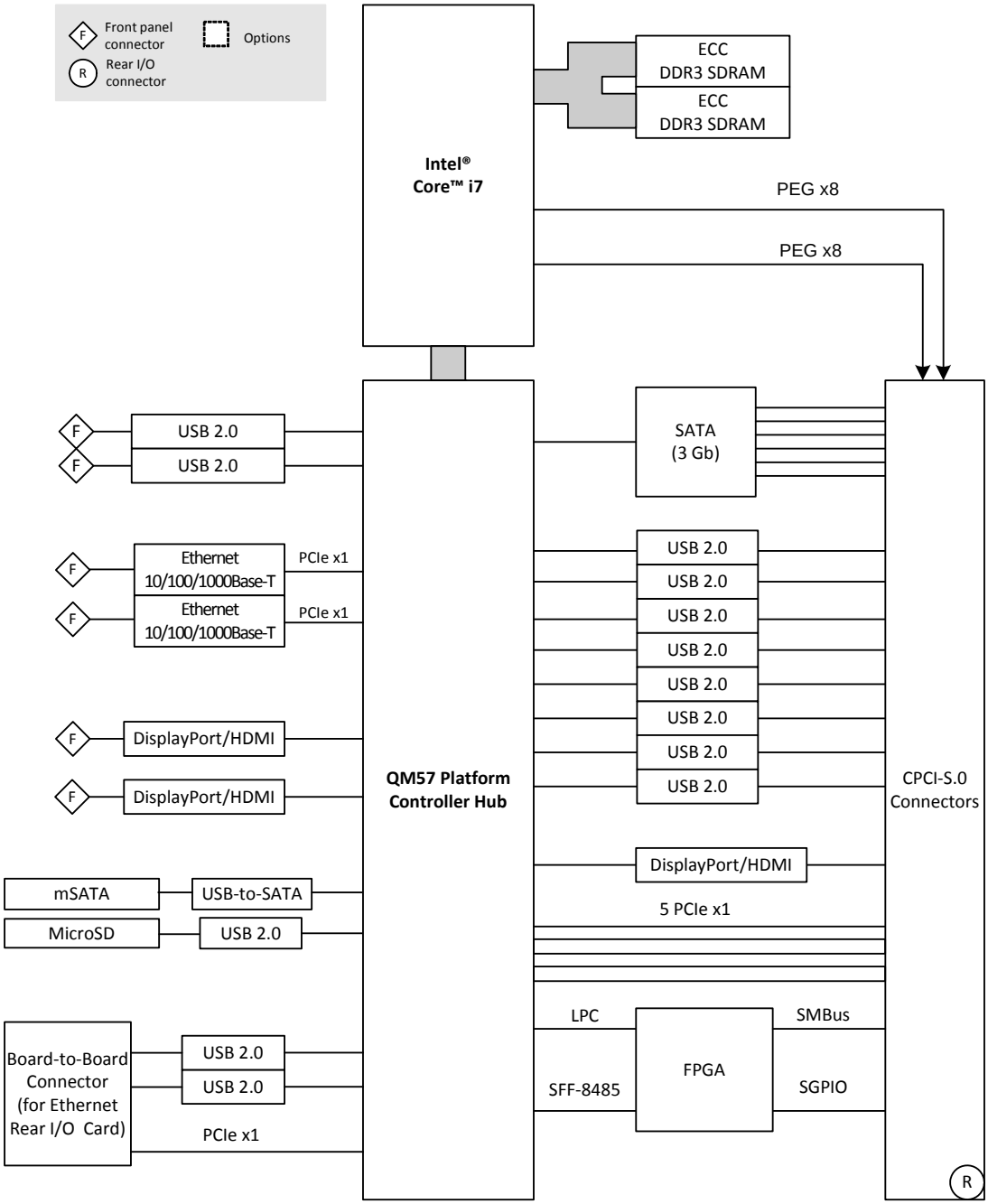
Thermal supervision of the processor and a watchdog for the operating system complete the functionality of the G20.

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. 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.

Diagram


Front panel connector
Rear I/O connector
Options
Intel® Core™ i7
ECC DDR3 SDRAM
ECC DDR3 SDRAM
PEG x8
PEG x8
USB 2.0
USB 2.0
Ethernet 10/100/1000Base-T
Ethernet 10/100/1000Base-T
PCIe x1
PCIe x1
DisplayPort/HDMI
DisplayPort/HDMI
mSATA
USB-to-SATA
MicroSD
USB 2.0
Board-to-Board Connector (for Ethernet Rear I/O Card)
USB 2.0
USB 2.0
PCIe x1
QM57 Platform Controller Hub
SATA (3 Gb)
USB 2.0
USB 2.0
USB 2.0
USB 2.0
USB 2.0
USB 2.0
USB 2.0
USB 2.0
DisplayPort/HDMI
5 PCIe x1
LPC
SFF-8485
FPGA
SMBus
SGPIO
CPCI-S.0 Connectors
R

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
  - 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 USB-to-SATA bridge
- One microSD™ card slot
  - Via USB

Mass Storage

- Serial ATA (SATA)
  - Six channels via rear I/O
  - SATA Revision 2.x support
  - Transfer rates up to 300 MB/s (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 for connection of the rear I/O card
  - EHCI implementation
  - Data rates up to 480 Mbit/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 for connection of the rear I/O card
- PCIe® 1.x support
- Data rate 250 MB/s (2.5 Gbit/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 PICMG CPCI-S.0 Specification
- System slot

Electrical Specifications

- Supply voltage/power consumption:
  - +12V (9..16V), 45W
  - +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):
  - 0..+60°C
  - Airflow: min. 1.5 m/s, typical power dissipation 29W, 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

- 435 685h @ 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), IEC 61000-4-2 (ESD), IEC 61000-4-3 (electromagnetic field immunity), IEC 61000-4-4 (burst), IEC 61000-4-5 (surge) and 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
  - tested/verified with: Ubuntu 10.04 (kernel 2.6.32-21) 32-bit and 64-bit versions
  - OpenSuse 11.3 32-bit and 64-bit versions
  - Detailed matrix of supported interfaces under Ubuntu 10.04 and OpenSuse 11.3
- 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™ i7-610E, 2.53 GHz, 4 MB Cache, 35 W
- Intel® Core™ i7-620LE, 2 GHz, 4 MB Cache, 25 W
- Intel® Core™ i7-620UE, 1.06 GHz, 4 MB Cache, 18 W
- Intel® Core™ i5-520E, 2.4 GHz, 3 MB Cache, 35 W, no AMT support
- Intel® Core™ i3-330E, 2.13 GHz, 3 MB Cache, 35 W, no AMT support

Memory

- System RAM
  - 2 GB or 4 GB
- 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

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

Operating Temperature

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

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 86.

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	2010-12-08
E2	Added description of AMT functionality, new board versions -02 and -03 with mSATA disk, GM1 installation, DisplayPort adapter examples, pin assignment of CompactPCI Serial rear connectors	2011-11-17
E3	Clarified description of Ethernet rear I/O card, corrected front panel drawing, clarified description of CompactPCI Serial backplane	2012-03-09
E4	Update, removed peripheral slot option, modified Chapter 2.3 Intel Active Management, cosmetics	2012-10-26
E5	Removed 8 GB DRAM option, added Ethernet port number for AMT, added RTC accuracy, corrected screw type for mSATA installation	2014-01-21

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".

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.

Legal Information

Changes

MEN Mikro Elektronik GmbH ("MEN") reserves the right to make changes without further notice to any products herein.

Warranty, Guarantee, Liability

MEN makes no warranty, representation or guarantee of any kind regarding the suitability of its products for any particular purpose, nor does MEN assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including, without limitation, consequential or incidental damages. TO THE EXTENT APPLICABLE, SPECIFICALLY EXCLUDED ARE ANY IMPLIED WARRANTIES ARISING BY OPERATION OF LAW, CUSTOM OR USAGE, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE OR USE. In no event shall MEN be liable for more than the contract price for the products in question. If buyer does not notify MEN in writing within the foregoing warranty period, MEN shall have no liability or obligation to buyer hereunder.

The publication is provided on the terms and understanding that:

1. MEN is not responsible for the results of any actions taken on the basis of information in the publication, nor for any error in or omission from the publication; and

2. MEN is not engaged in rendering technical or other advice or services.

MEN expressly disclaims all and any liability and responsibility to any person, whether a reader of the publication or not, in respect of anything, and of the consequences of anything, done or omitted to be done by any such person in reliance, whether wholly or partially, on the whole or any part of the contents of the publication.

Conditions for Use, Field of Application

The correct function of MEN products in mission-critical and life-critical applications is limited to the environmental specification given for each product in the technical user manual. The correct function of MEN products under extended environmental conditions is limited to the individual requirement specification and subsequent validation documents for each product for the applicable use case and has to be agreed upon in writing by MEN and the customer. Should the customer purchase or use MEN products for any unintended or unauthorized application, the customer shall indemnify and hold MEN and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim or personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that MEN was negligent regarding the design or manufacture of the part. In no case is MEN liable for the correct function of the technical installation where MEN products are a part of.

Trademarks

All products or services mentioned in this publication are identified by the trademarks, service marks, or product names as designated by the companies which market those products. The trademarks and registered trademarks are held by the companies producing them. Inquiries concerning such trademarks should be made directly to those companies.

Conformity

MEN products are no ready-made products for end users. They are tested according to the standards given in the Technical Data and thus enable you to achieve certification of the product according to the standards applicable in your field of application.

RoHS

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.

Germany
MEN Mikro Elektronik GmbH
Neuwieder Straße 3-7
90411 Nuremberg
Phone +49-911-99 33 5-0
Fax +49-911-99 33 5-901
E-mail info@men.de
www.men.de

France
MEN Mikro Elektronik SA
18, rue René Cassin
ZA de la Châtelaine
74240 Gaillard
Phone +33 (0) 450-955-312
Fax +33 (0) 450-955-211
E-mail info@men-france.fr
www.men-france.fr

USA
MEN Micro Inc.
860 Penllyn Blue Bell Pike
Blue Bell, PA 19422
Phone (215) 542-9575
Fax (215) 542-9577
E-mail sales@menmicro.com
www.menmicro.com

Contents

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*

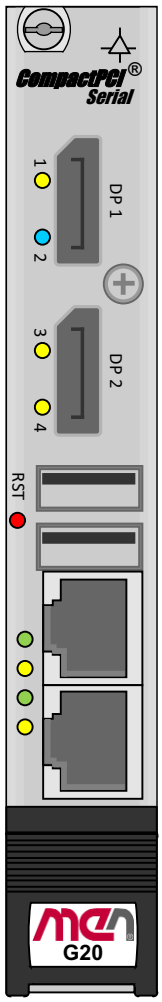


Figure 2. *Map of the board – top view with CompactFlash (board versions 02G020-00 and -01)*

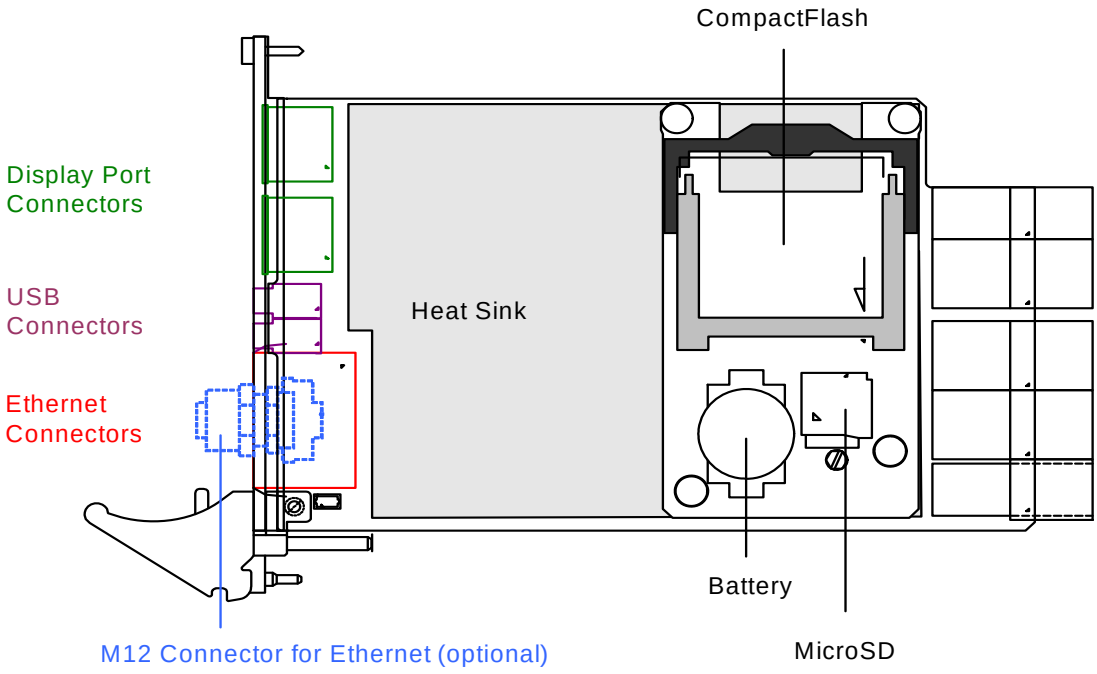


Figure 3. *Map of the board – top view with mSATA disk (board versions 02G020-02 and -03)*

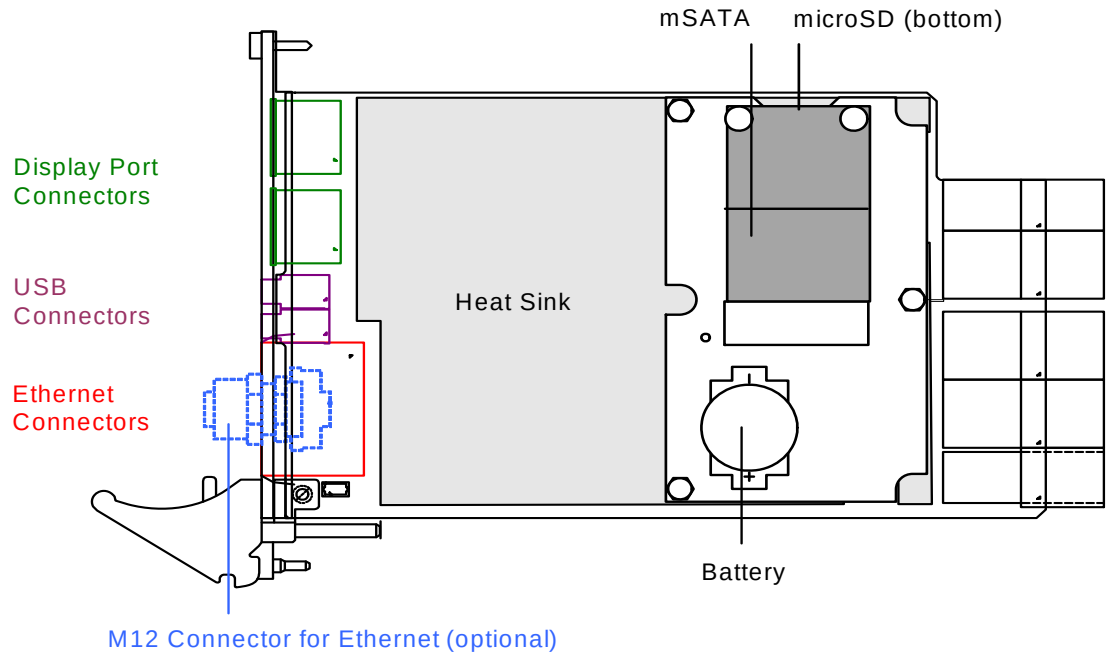
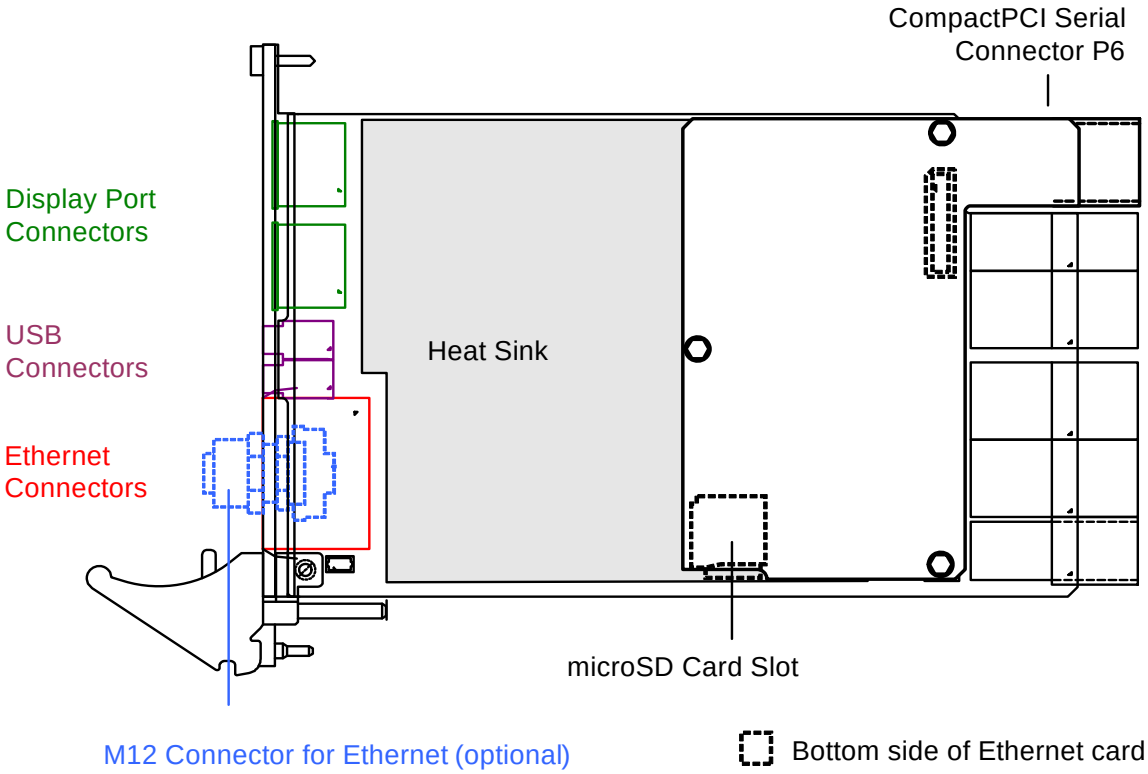


Figure 4. *Map of the board – top view with Ethernet rear I/O card*



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.

☑ CompactFlash (board versions -00 and -01)

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

Refer to Chapter 2.8.1.1 Inserting and Extracting a CompactFlash Card on page 28 for details on the IDE interface.

☑ microSD card

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

Refer to Chapter 2.8.2 microSD Card on page 29

☑ mSATA (board versions -02 and -03)

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

Refer to Chapter 2.8.3 mSATA Disk on page 31

☑ Ethernet via rear I/O according to CompactPCI Serial

The G20 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 2.13.4 Ethernet Rear I/O Card on page 48

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.
  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 54).
- ☑ Now you can make configurations in BIOS (see Chapter 3 BIOS on page 54).
- ☑ 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 UEFI default settings for troubleshooting. Please refer to Chapter 3 BIOS on page 54.

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 54.

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.

1.6.1 Installing Windows XP or Windows 7 on USB Devices

The CompactFlash (on board versions -00 and -01) and the microSD card of the G20 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 G20 (on board versions -02 and -03).
- 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 88).

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 Intel Active Management Technology (AMT)

G20 boards equipped with an Intel Core i7 processor support Intel Active Management Technology (AMT). 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 G20. 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 G20 loses its complete AMT settings due to Intel's security standards.

2.4 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 2.14 Reset Button on page 52.)

2.5 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. 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 G20.

For ordering options please see MEN's website.

2.6 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	AMT Support
Intel Core i7-610E	2.53 GHz	35 W	4 MB	yes
Intel Core i7-620LE	2 GHz	25 W	4 MB	yes
Intel Core i7-620UE	1.06 GHz	18 W	4 MB	yes
Intel Core i5-520E	2.4 GHz	35 W	3 MB	no
Intel Core i3-330E	2.13 GHz	35 W	3 MB	no

2.6.1 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.

2.7 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.

2.7.1 DRAM System Memory

The board provides 4 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.

2.7.2 Boot Flash

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

2.7.3 EEPROM

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

2.8 Mass Storage

The G20 offers the possibility to connect an mSATA disk (CompactFlash on the older board versions 02G020-00 and 02G020-01) 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.

2.8.1 CompactFlash (Board Versions -00 and -01)

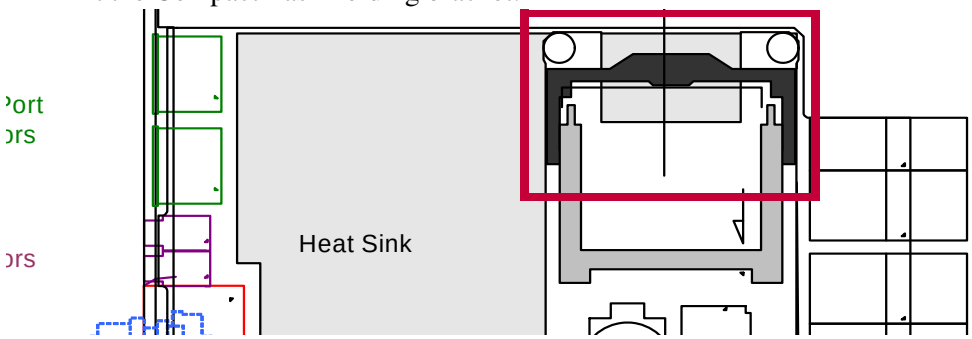
Even with CompactFlash the board needs only one slot in the system.

2.8.1.1 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.

2.8.2 microSD Card

The G20 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 G20 is shipped without a microSD card installed.

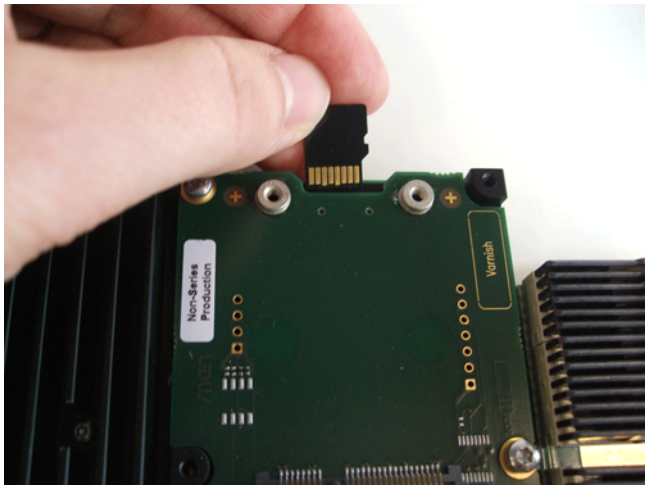
Please see MEN's website for ordering options.

2.8.2.1 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 G20 from the system.
- ☑ Put the board on a flat surface.
- ☑ Insert the microSD card into the slot with the contacts at the top.



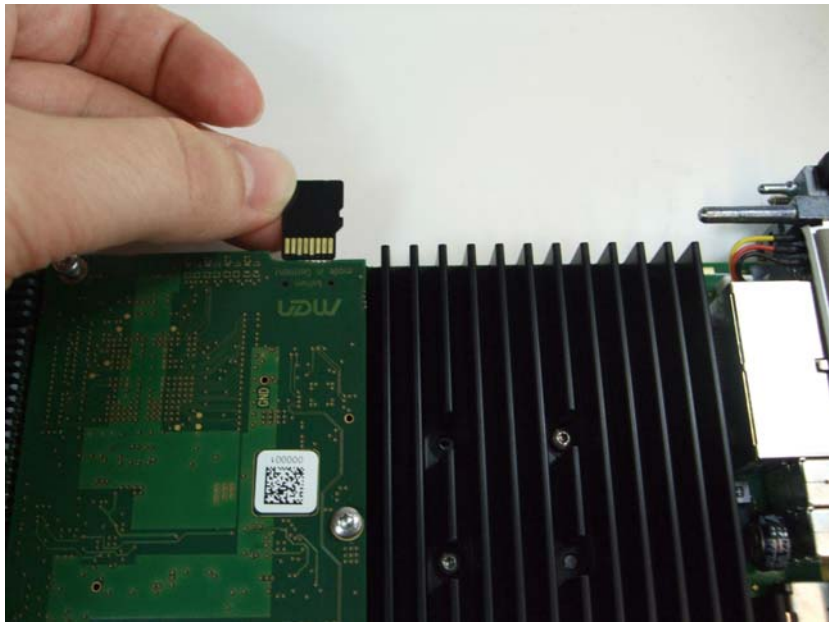
- ☑ Make sure that it clicks into place properly.
- ☑ For extracting the card push it down and pull it out.

2.8.2.2 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 G20 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.

2.8.3 mSATA Disk

The G20 is shipped without an mSATA disk installed.

Please see MEN's website for ordering options.

2.8.3.1 Installing an mSATA disk

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

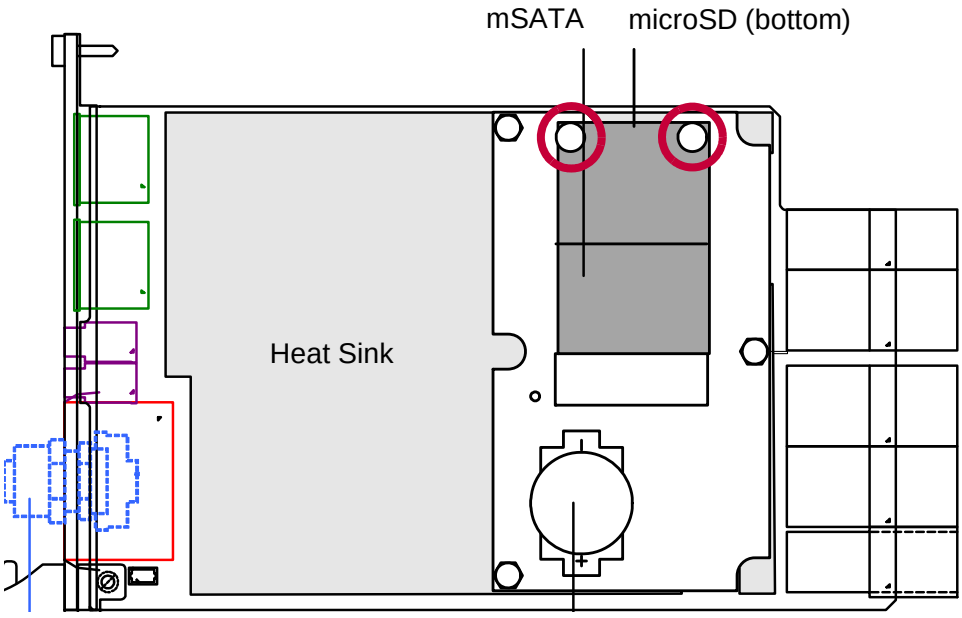
☑ Power down your system and remove the G20 from the system.

☑ 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).



2.8.4 Serial ATA (SATA)

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

In compliance with the CompactPCI Serial standard these interfaces are led to CompactPCI Serial rear I/O connector P3.

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

See Chapter 2.13 CompactPCI Serial on page 40 for the rear I/O pin assignment.

2.9 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)

2.9.1 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 G20.

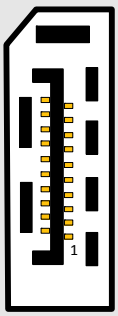
Table 2. *DisplayPort adapters for the G20*

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 3. *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 4. *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

2.9.2 Rear I/O

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

See Chapter 2.13 CompactPCI Serial on page 40.

2.10 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 board-to-board connector for the Ethernet rear I/O adapter card (e.g. GM1). The remaining two interfaces are used for connection of the mSATA disk (CompactFlash on board versions -00 and -01) and the microSD card.

The USB interfaces support EHCI and UHCI.

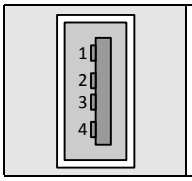
2.10.1 Front-Panel Connection

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



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

Table 6. *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

2.10.2 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.

See Chapter 2.13 CompactPCI Serial on page 40 for rear I/O pin assignments.

2.10.3 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 2.13.4 Ethernet Rear I/O Card on page 48 for details on the mezzanine interface.

2.11 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 89.)

2.11.1 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 7. *Signal mnemonics of Ethernet front panel connectors*

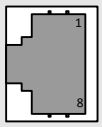
Signal	Direction	Function
BI_Dx+/-	in/out	Differential pairs of data lines for 1000Base-T
RX+/-	in	Differential pair of receive data lines for 10/100Base-T
TX+/-	out	Differential pair of transmit data lines for 10/100Base-T

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 8. *Pin assignment and status LEDs of 8-pin RJ45 Ethernet front panel connectors (LAN1/LAN2)*

				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.

Table 9. *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-

2.11.2 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 G20 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 2.13.4 Ethernet Rear I/O Card on page 48.

2.12 PCI Express

2.12.1 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.

2.12.2 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 board-to-board connector for the Ethernet rear I/O card. See Chapter 2.13.4 Ethernet Rear I/O Card on page 48.

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. See Chapter 2.13.3 CompactPCI Serial Connectors P1..P5 on page 42 for a detailed description of the CompactPCI Serial connectors.

2.13 CompactPCI Serial

2.13.1 General

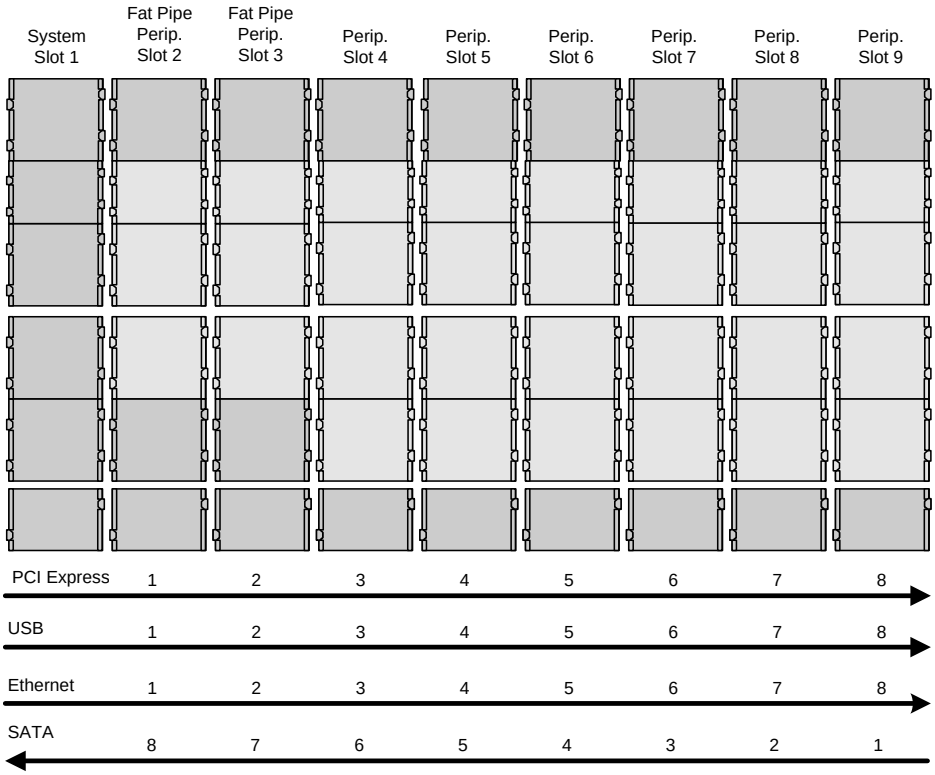
CompactPCI Serial is an independent basic standard designated PICMG CPCI-S.0. This standard introduces a completely new connector which enables a high signal density and supports transmission frequencies of 12 Gb/s and more. CompactPCI Serial is based on the mechanics of CompactPCI, so it remains compatible 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 5, CompactPCI Serial backplane with filling order on page 41.

Figure 5. *CompactPCI Serial backplane with filling order*



2.13.2 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.

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 G20 in the system slot.

The interfaces are accessible at the following slots (see Figure 5, CompactPCI Serial backplane with filling order on page 41):

- 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 for more information.

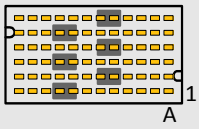
2.13.3 CompactPCI Serial Connectors P1..P5

Pin Assignment of Connector P1

Connector type of P1:

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

Table 10. *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	

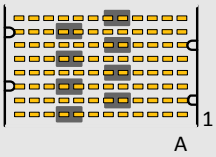
Note: The signals written in gray are specified in the CompactPCI Serial specification but not supported on this board.

Pin Assignment of Connectors P2, P3 and P4

Connector type of P2, P3, P4:

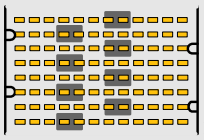
- 96-pin Airmax VS 4 pair, right angle header, 8 rows, 2 walls

Table 11. *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	

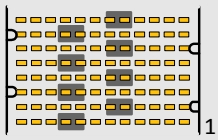
Table 12. *Pin assignment of CompactPCI Serial P3 connector*



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.

Table 13. *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	

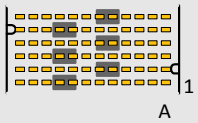
Note: The signals written in gray are specified in the CompactPCI Serial specification but not supported on this board.

Pin Assignment of Connector P5

Connector type of P5:

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

Table 14. *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.

Table 15. *Signal mnemonics of CompactPCI Serial rear connectors*

	Signal	Direction	Function
Compact-PCI 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

2.13.4 Ethernet Rear I/O Card

The eight Ethernet interfaces defined in the CompactPCI Serial standard on the P6 connector are not implemented directly on the G20, but on a special mezzanine board. This way, the number of Ethernet interfaces can be varied as required.

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

The Ethernet rear I/O card is connected to the G20 using a 40-pin connector leading two USB ports and one PCI Express interface to the card.

2.13.4.1 Installing the Rear I/O Card on the G20

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 G20.

Removing the mSATA Adapter Board

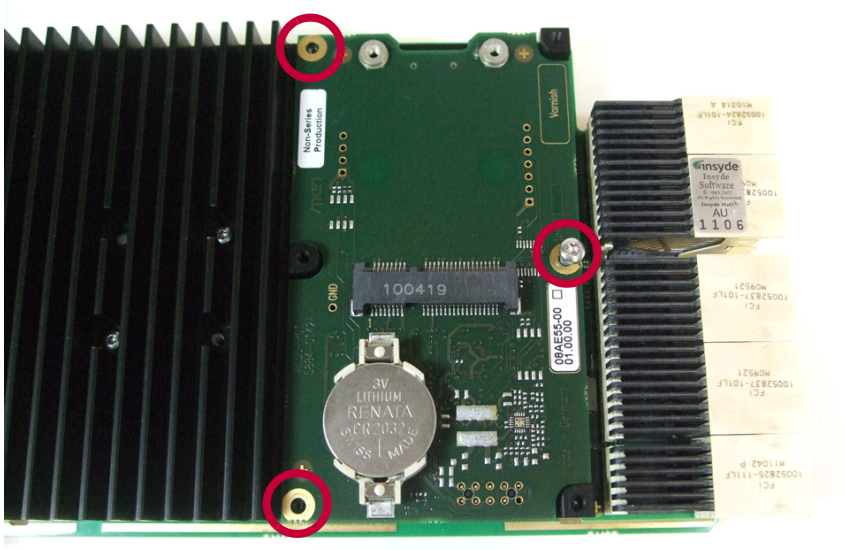
For installing the rear I/O card (e.g. the GM1) on the G20 you have to remove the adapter board with the mSATA disk and the microSD card.

Carry out the following steps:

☑ Power down your system and remove the G20 from the system.

☑ Put the board on a flat surface.

☑ Loosen and remove the screws (highlighted in red) fastening the mSATA adapter to the G20.

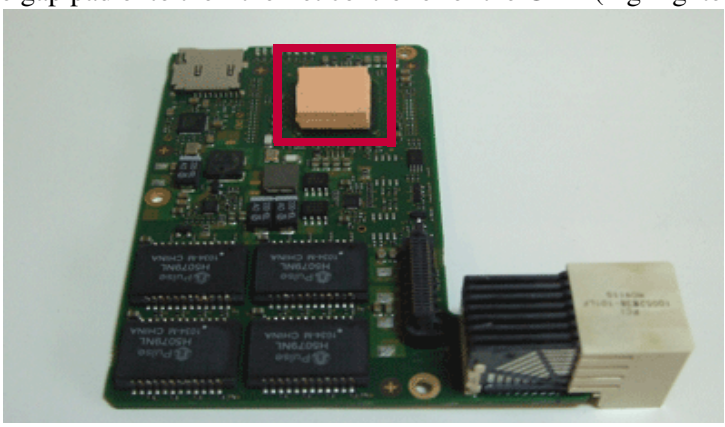


☑ Remove the adapter taking care not to damage the pins of the board-to-board connector.

Installing the GM1 on the G20

☑ Take the gap pad from the mounting material delivered with the rear I/O card and remove the plastic film from one side of the gap pads.

☑ Press the gap pad onto the Ethernet controller of the GM1 (highlighted in red).



☑ Remove the plastic film on the other side.

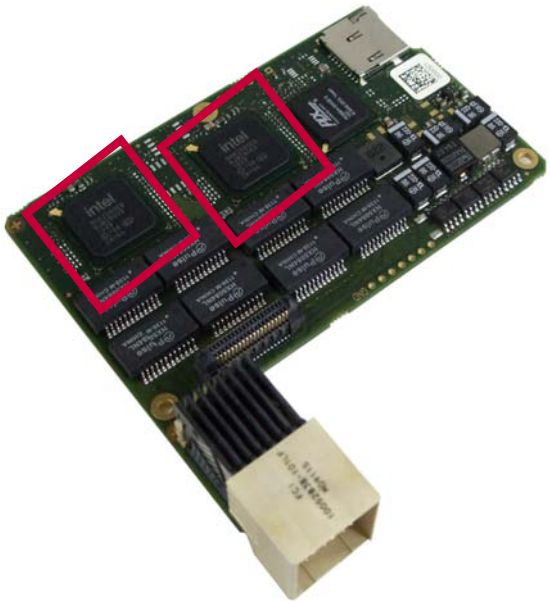
☑ Align the board-to-board connectors of the G20 and the rear I/O card and push the card down carefully.

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

Installing the GM2 on the G20

☑ Take the gap pads from the mounting material delivered with the rear I/O card and remove the plastic film from one side of the gap pads.

☑ Press the gap pads onto the Ethernet controllers of the GM2 (highlighted in red).



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

☑ Align the board-to-board connectors of the G20 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.

2.14 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.

2.15 Status LEDs

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

Table 16. *Status LEDs*

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

2.15.1 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 17. *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

2.15.2 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.

2.15.3 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			Axxx 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 Axxx 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]

Pre-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*

Pre-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						
Clear 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 Axxx.
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.

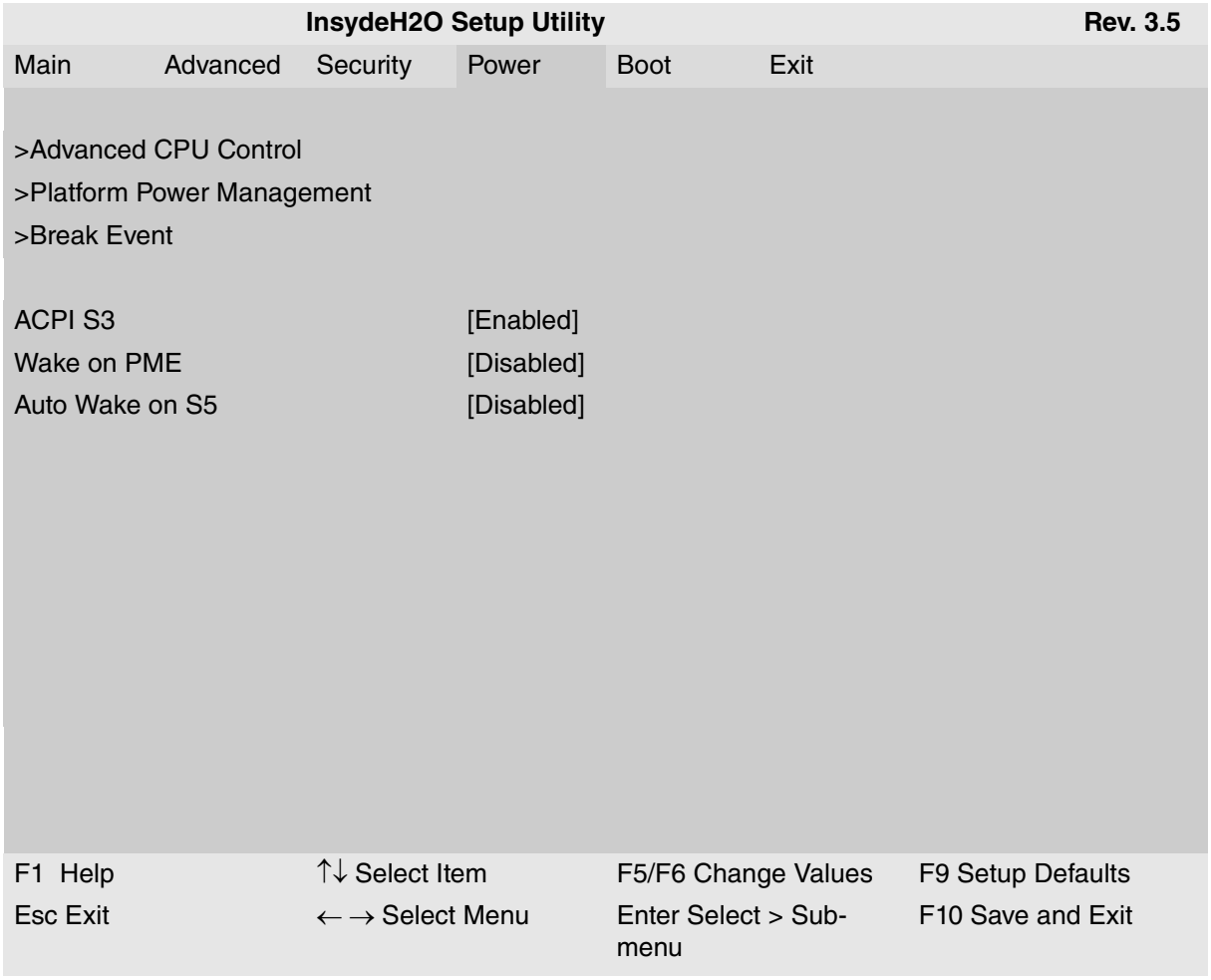
Set User Password

Description	Enter and confirm the user password under this menu item.

Clear User Password

Description	Clear the user password. Only possible for a supervisor or user in the access levels full or limited.

3.4 Power



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 memory device 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
  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

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 18. *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 19. *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 CompactFlash adapter on the G20 (board versions -00 and -01)*

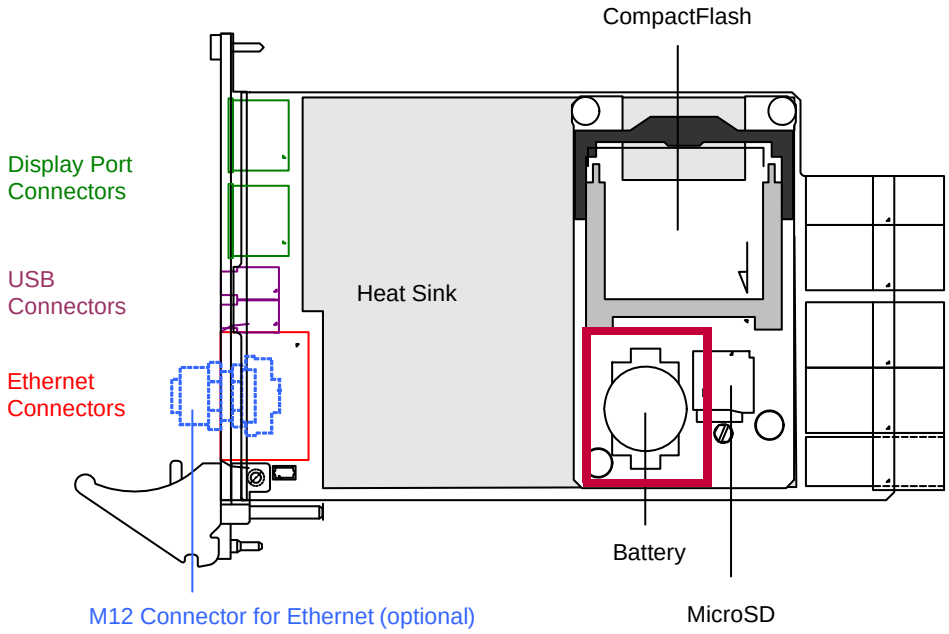
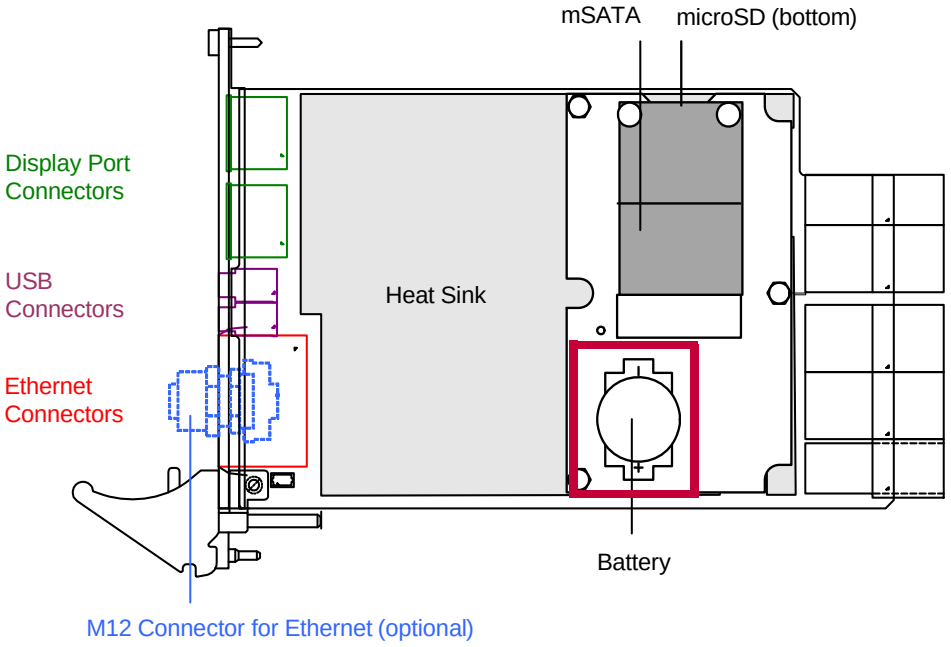


Figure 7. *Position of battery on the mSATA adapter on the G20 (board versions -02 and -03*



6 Appendix

6.1 Literature and Web Resources

- G20 data sheet with up-to-date information and documentation:
  www.men.de/products/02G020-.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 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 8. *Labels giving the product's article number, revision and serial number*